3224 Identifying Environmental Toxin "Hot Spots" Using Health Care Data

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Deloitte is a multi-national professional services firm with more than 71,000 professionals in the US and more than 270,000 worldwide. At Deloitte there is interest in mining Big Data to be predictive of functional human health outcomes to support better and more timely responses by health and human services agencies. Vast amounts of data are characterized by Medicaid claims/encounters, All Payer Claims databases, and most recently statewide Health Information Exchanges (HIE). These data have the potential to be used to identify, and potentially address, "Hot Spots" (these could be geographic, demographic, etc.) due to adverse effects induced by environmental toxins. Data sets that are available to states via HIE is especially interesting: with the correct machine learning model and process we could support the scanning of data flowing through an HIE and identification of hotspots in near real time. In a different but related context, we have recently used this approach and these same data sets to identify opioid abuser hotspots along with enabling prescribers.

3225 Risk Assessment of Consumer Products and Articles: Critical Considerations and Case Studies for Characterizing and Quantifying Consumer-Relevant Exposures to Chemicals and Nanomaterials

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Increasingly, toxicologists are challenged to do risk assessments for consumer products for which the determination of relevant exposure is not straightforward. Quantification of potential exposure from many types of existing and emerging consumer products (e.g., textiles, toys, furniture, diapers, 3D printed products) is still an emerging science and the application of nanomaterials introduces even further challenges. Quantifying exposure that mimics actual and foreseeable consumer use associated with a range of consumer products can require advanced sampling approaches and analytical capability. This raises the question of how we should define what is "reasonably conservative" versus "not relevant" when developing methods. Given the limitations/absence of these capabilities and/or accepted methods, overly conservative methods and assumptions are often used that are not relevant to consumer exposures or represent extreme worst-case use scenarios. The session will provide examples of frameworks and sampling and analytical methods that have been developed to determine exposures from products and articles that are relevant for actual consumer use scenarios. Case studies include the estimation of chemical migration and relevant consumer exposure estimates to engineered nanomaterials along the product value chain, release of silver from nanotechnology-based children's products, and the potential for migration of any constituents above a TTC-based threshold from a disposable diaper. Factors that are important to consider when developing extraction methods for mimicking consumer use scenarios, including relevant solvents, will be discussed. These data can then be used in robust risk assessments leading to informed decisions on the safety of chemicals in such products under normal usage conditions and improve product safety and risk communication to the public. This session will also consider what exposure data are needed by regulators associated with the new Frank R. Lautenberg Chemical Safety for the 21st Century Act and how end uses of a chemical are considered when estimating the potential for consumer exposure.

3226 Introduction: Relevance of Exposure Data for Toxicological Research and Risk Assessment of Chemicals and Emerging (Nano) Materials in Consumer Products

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Assessing potential health risks from chemicals and emerging materials incorporated into consumer products/articles (e.g., clothes, toys, furniture, hygiene products) requires robust data from a number of disciplines including toxicology, exposure science and risk assessment. The releases of chemicals of interest from products and subsequent are influenced by a number of factors including product use patterns and exposure science plays an important role in developing methods to adequately characterize and quantify consumer exposures. The toxicology community must produce data that is relevant for these real-world consumer exposures. Risk assessors must also engage with these communities to ensure the development of exposure and toxicity data and that this information is appropriately incorporated in risk assessments and the results communicated to stakeholders. As emerging materials, such as nanomaterials continue to be commercialized, their potential health impacts will be assessed along with other chemicals. In 2018, the Society of Toxicology took an important step forward in embracing exposure science by developing an exposure assessment specialty section. This workshop will explore the relationship between exposure assessment and the relevance of exposure data for toxicity research and risk assessment for traditional and emerging chemicals and materials, and how information for these various classes of compounds can be utilized to develop more robust risk assessments for a range of chemicals in consumer products. Case studies will be presented that highlight these concepts.

3227 Understanding the Changing Exposure and Toxicity Profile of Engineered Nanomaterials from Production to Application

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Engineered nanomaterials, because of their electrical, chemical, and thermal properties, are being incorporated into existing, everyday products, with broad applications to medicine, electronics, composites, and construction. From smart phones, to water purification, to cosmetics, to thermoplastics (e.g., toys, containers), human exposure to engineered nanomaterials and their applications is inevitable. It is critical that interpretations of potential toxicity along the product value chain be exposure-informed as TSCA requires a risk evaluation at all points along the life cycle of a chemical. Properly understanding and developing risk profiles for workers and end-users are necessary to prevent unintended health consequences. Engineered nanomaterial research initially focused on as-produced (pristine) material with little attention to downstream applications. Given the broad applications of nanomaterials into existing and emerging technologies, a more expansive characterization of exposure was needed to understand potential health risks. To accomplish this goal, a multidisciplinary team with private sector partnerships was needed. This work will describe a comprehensive case study evaluating carbon nanotubes, which represent a highly visible engineered nanomaterial due to the significant toxicity observed following *in vivo* evaluations. The work evaluates the changing toxicity and exposure characteristics along the product value chain from the as-produced material, to post-production modification, to matrix (or product) incorporation. The results clearly indicate that exposure and toxicity, and thus potential risks to workers and end users can be quite different from product to product. Understanding the changing exposure profile of engineered nanomaterials along the product value chain is critical for determining potential human health risks and overcoming risk-driven concerns that are potential barriers to increased commercialization. The case study also provides a framework and recommendations for evaluating other materials and scenarios, develops reproducible methods, and highlights new, or alterations to existing, methodology to characterize exposure and toxicity at different points along the product value chain. The comprehensive approach of combining toxicity and exposure assessments is necessary to provide direct inference to potential consumer risks.

3228 Estimating the Release of, and Exposure to, Silver from Nanotechnology-Based Consumer Products for Children

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Silver nanoparticles (nanosilver) are gaining significant attention in the academic and regulatory communities, not only because of their antimicrobial effects and subsequent product applications, but also because of their potential health and environmental impacts. Although some human health effects of silver and silver nanoparticles have been reported, realistic exposure levels from the use of consumer products must be estimated to inform toxicology studies. The objective of this work was to characterize the release and potential exposure to silver and silver-containing particles during the normal use of silver nanotechnology consumer products for children. We developed a framework to assess (1) whether products contained silver, (2) whether silver in products was in nanoparticulate form, (3) whether products might release silver under realistic usage scenarios, and (4) in what form and concentration silver releases are most likely to take place. To put this framework to use, we compiled an inventory of 82 children's consumer products that claim to contain nanosilver and selected 13 products for presence of silver and its release into liquid media, into air, and onto skin. All products contained some form of silver, but silver-containing particles were observed in only four products, with sizes ranging from nanoscale up to 10 μm in size. Silver leached preferably into synthetic biological media with higher chloride concentrations, such as sweat and urine. We determined that levels of silver to which children would be exposed during normal use of these products are likely to be low, and bioavailable silver is expected to be in ionic rather than particulate form. This framework may be used to assess exposure from other increasingly popular nanotechnology-enabled consumer products.

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