

single high exposure concentration and to assess whether these pleural lesions are likely to progress to neoplasia. (Funded by The Hamner Institutes for Health Sciences and North Carolina State University College of Agricultural and Life Sciences).

PS 2206 COMPARATIVE PROTEOMICS, GENOMICS AND PULMONARY TOXICITY OF INSTILLED SINGLE WALLED CARBON NANOTUBES, CROCIDOLITE ASBESTOS AND ULTRAFINE CARBON BLACK IN MICE.

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CNT has emerged as a nanomaterial of considerable concern to the occupational and environmental health and safety communities. Early, consistent reports from high-dose, short-term screening studies in rodents suggest a sequence of biological events and pulmonary pathology similar to that caused by asbestos and synthetic vitreous fibers (SVF). Whether CNT strictly adhere to the asbestos paradigm of pulmonary toxicity is a question of critical importance. The pulmonary response of mice exposed repeatedly (4 doses, 28 days, pharyngeal aspiration) to single-walled CNT (SWCNT), crocidolite asbestos (AS) and ultrafine carbon black (CB) was assessed by global proteomics and genomics of lung tissue and ELISA protein microarray of bronchial lavage fluid. Three cytokines, IL-6 and IL-12 and Mip-1g were considerably higher in SWCNT and AS treated animals compared to CB. The T cell chemotactic protein MDC was present in high levels in SWCNT and AS groups, but not detectable in control or CB treated groups. Two sentences on similarities and differences via proteomics. Microarray analysis of lung tissue revealed over 3000 genes significantly changed by SWCNT exposure, compared to only 469 with AS and 71 with CB. Strikingly, the significant genes lists for CB and AS were complete subsets of the SWCNT data set, with both the number of genes and magnitude of gene changes being the highest in the SWCNT treatment group.

PS 2207 PERMEABILITY OF THE BLOOD-CSF BARRIER IN THE CHOROID PLEXUS AS AFFECTED BY SINGLE-WALLED CARBON NANOTUBES, *IN VITRO*.

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Nanotechnology is an emerging field and has made great advances in production and product integration. Nanoparticle use in medical imaging, diagnosis and drug delivery vectors has created novel exposure routes, raising concerns about biological fate and susceptible organs. The blood and the brain are separated by two distinct barrier systems: the blood-brain barrier (BBB) and the blood-cerebrospinal fluid barrier (BCB). The BCB is formed by the choroid plexus, a tissue with high blood flow and large surface area. The BCB plays a key role in maintaining the homeostasis of internal milieu and protecting the brain against toxic insults in the blood. Improper function of the BCB has been linked to a variety of neurodegenerative diseases. The hypothesis tested was that exposure to single-walled carbon nanotubes (SWCNT) may damage the structure and function of the BCB. A BCB model utilizing an immortalized Z310 choroidal epithelial cell line was used to assess the effect of SWCNT exposure. Cell viability and ROS generation were determined with the colorimetric MTS and fluorometric DCF assays, respectively. A confluent cell monolayer grown on a permeable membrane in the Transwell inserts was used to estimate the para-cellular diffusion of C-14 labeled sucrose, a parameter reflecting the leakage of the barrier. Following 24-hr incubation with SWCNT, the cell viability decreased 6% ($p < 0.05$) and 17% ($p < 0.01$) at the dose of 10 and 50 $\mu\text{g/mL}$, respectively. More drastic alterations were observed with 72 hr treatments where 10 and 50 $\mu\text{g/mL}$ caused a 16% ($p < 0.05$) and 27% ($p < 0.01$) loss in cell viability. A concentration of SWCNT as low as 1 $\mu\text{g/mL}$ created a significant increase in ROS generation after a 24-hr exposure. The diffusion rate of sucrose across the cell monolayer after treatment with 10 $\mu\text{g/mL}$ SWCNT for 48 hrs approached, but did not reach a statistical significance ($p = 0.0585$). Taken together, our data suggest that SWCNT exposure produces a negative effect on BCB function. Additional studies are warranted to better characterize nanoparticle toxicity on brain barrier systems.

PS 2208 ENHANCED OCCUPATIONAL EXPOSURE TO NANOMATERIALS WHEN MIXED IN ENVIRONMENTALLY-RELEVANT MATRICES.

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The goal of this research was to assess the release of engineered nanomaterials into the laboratory when handling and preparing nanomaterials for mixing into environmentally-relevant matrices. Air-borne fullerene (C60), underivatized multi-

walled carbon nanotubes (Raw MWCNT), hydroxylated MWCNT (MWCNT-OH), and carbon black (CB) were measured as the nanomaterials were weighed and transferred to beakers filled with water, as well as when sonicated in de-ionized water and reconstituted freshwater with natural organic matter (100 ppm). Air-borne nanomaterials were measured for 20 minutes using a handheld condensation particle counter, confirmed by transmission electron microscopy, and expressed as total particles per cubic centimeter of sampled air within six specific size ranges from 300-10,000 nm. After adjustment for background particle number concentrations, it was evident that increases in air-borne particle concentrations occurred for each nanomaterial except CB during weighing. Air-borne particle concentrations were inversely correlated with particle size. Sonicating nanomaterial-spiked water resulted in increased air-borne nanomaterials. The increase in air-borne nanomaterials after sonication was most evident with MWCNT-OH, the more hydrophilic form of MWCNT, in water with natural organic matter and CB, a natural functionalized carbon-based NM. In conclusion, engineered nanomaterials, especially when functionalized or in water containing natural organic matter, can become air-borne when mixed in solution by sonication, putting workers at increased risk of occupational exposure of air-borne nanomaterials.

PS 2209 IN VITRO BIOCOMPATIBILITY OF SILVER NANOPARTICLES ANCHORED ON MULTI-WALLED CARBON NANOTUBES.

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Silver nanoparticles (Ag NPs) have a variety of applications due to their high extinction coefficient and surface plasmon resonance emission. By manipulating the surface and the core-shell structure of Ag NPs, different functionalities can be engineered to explore the molecular behaviors in living cells. This study investigates if Ag NPs anchored to different types of multi-walled carbon nanotubes (MWCNTs) show biocompatibility. Ag NPs were anchored via a novel chemical route involving silver nitrate, nanotubes and a reducing agent. Scanning electron microscopy (SEM), X-ray powder diffraction, and transmission electron microscopy (TEM) were performed to characterize the nanomaterials. The human keratinocyte cell line (HaCaT) was exposed to the nanomaterials at various concentrations and time points and biocompatibility was evaluated using mitochondrial function and morphology. MWCNTs correspond to pure MWCNTs, COx-MWCNTs to carbonyl doped and CNx-MWCNT to N-doped. The chemical reactivity of the Ag NPs on the nanotubes was MWCNTs < COx-MWCNTs < CNx-MWCNT. The average Ag NP size on the nanotubes was MWCNTs 6.64nm +/- 2.25nm; CNx-MWCNTs, 13.24nm +/- 3.94nm, and COx-MWCNT/Ag were 11.75nm +/- 4.65nm. The X-ray diffraction patterns show peaks corresponding to graphite and silver. Cytoflux enhanced light microscopy imaging revealed nuclear binding for all of the materials. After 48 hour exposure, there was disruption of the actin filaments and continued nuclear localization and binding. The MTS assay did not show a reduction in mitochondrial function, indicating potential for biocompatibility. The lack of toxicity combined with NPs binding to the nucleus indicates potential for a novel method of delivering Ag or other nanoparticles to the nucleus. Further studies are in progress to demonstrate biocompatibility and to deliver modified Ag NPs in a non-invasive way to other specific regions within cells.

PS 2210 IL-1 β REGULATES THE EXPRESSION OF MIP-1 α AND MIP-1 β INDUCED BY CARBON NANOTUBES IN A MULTIPLE CELLULAR CO-CULTURE SYSTEM.

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In vitro models are very useful to understand the cellular mechanisms related to particulate matter (PM) toxicity. The use of single cell cultures, or even co-cultures of two different cells may overlook the important interactions with other cell types and the communication with distant cells, such as the possible cross talk between the lung epithelium and the vascular endothelium. In the present study, we evaluated the proinflammatory effect of single wall carbon nanotubes (SWCNT) on co-cultures of multiple human cells that have been used successfully to evaluate urban PM. METHODS. Single cultures (pneumocytes, A549; macrophages, THP-1; mast cells, HMC-1), Bicultures (A549+THP-1; A549+HMC-1; THP-1+HMC-1) and Tricultures (A549+THP-1+HMC-1) were exposed to 0, 1, 3, 10 or 30 $\mu\text{g/cm}^2$ of SWCNT. Inserts containing endothelial cells (EAHY926) were introduced to some Tricultures after 12 h of exposure. TNF α , IL-1 β , IL-6, IL-8, MIP-1 α , MIP-1 β and G-CSF concentrations were quantified in all the cultures after 24 h of ex-

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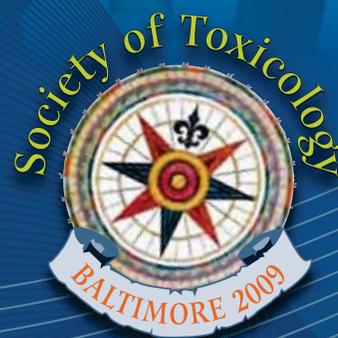
Supplement to *Toxicological Sciences*

An Official Journal of the
Society of Toxicology



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48th Annual Meeting
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WHY SUBMIT A PROPOSAL?

1. To present new developments in toxicology.
2. To provide attendees an opportunity to learn about state-of-the-art technology and how it applies to toxicological research.
3. To provide attendees an opportunity to learn about the emerging fields and how they apply to toxicology.

SESSION TYPES

Continuing Education—Emphasis on quality presentations of generally accepted, state-of-the-art knowledge in toxicology

Note: CE Courses will be held on Sunday.

Symposia—“Cutting-edge” science; new areas, concepts, or data

Workshops—State-of-the-art knowledge in toxicology

Roundtables—Controversial subjects

Historical Highlights—Review of a historical body of science that has impacted toxicology

Informational Sessions—Scientific planning or membership development

Education-Career Development Sessions—Sessions that provide the tools and resources to toxicologists that will enhance their professional and scientific development

2010 Thematic Approach

The Scientific Program Committee will continue the thematic approach for the 2010 Annual Meeting. All proposal submissions will be reviewed for their relevance under the following themes—*Cell Signaling, Gene-Environment Interactions, Metabolic Disease, Mitochondrial Basis of Disease, Toxicity Testing in the 21st Century*, and *Translational Toxicology* for the 2010 meeting. Please note that while we are actively soliciting proposals for the themes listed above, all proposal submissions will be reviewed under the current criteria for their timeliness and relevance to the field of toxicology.

Please refer to the SOT 2009 *Program*, Scientific Program Overview on the fold-out cover for a list of 2009 sessions highlighted under the thematic approach.

You can now submit your proposal on-line at www.toxicology.org

Preface

This issue of *The Toxicologist* is devoted to the abstracts of the presentations for the continuing education, symposia, workshop, roundtable, platform, and poster discussion sessions of the 48th Annual Meeting of the Society of Toxicology, held at the Baltimore Convention Center, March 15–19, 2009.

An alphabetical Author Index, cross referencing the corresponding abstract number(s), begins on page 469.

The issue also contains a Key Word Index (by subject or chemical) of all the presentations, beginning on page 487.

The abstracts are reproduced as accepted by the Scientific Program Committee of the Society of Toxicology and appear in numerical sequence.

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