12B.1

Effects on manufactured nanoparticles on lung and vascular cells. JOHN VERANTH, N. Shane Cutler, Cassandra Deering, Agnes Ostafin, Garold Yost, University of Utah.

Recent publications by our laboratory related to the effects of manufactured nanoparticles on lung epithelial cells and on vascular endothelial cells will be integrated and summarized. Fluorescent labled nanoparticles are shown to be taken up by various cell types leading to concern about the potential biological effects of other nanomateials as well. Nanoparticles from metal oxides appear to have low potency for the induction of proinflammatory signaling compared to soil-derived dusts. In addition the metal oxide particles have limited ability to induce formation of reactive oxygen species in the tested cell cultures. Use of various pathway-specific inhibitors provides insights into the cell signaling pathways mediating biological responses. The in vitro lung and vascular models provide an easily manipulated biological system for studying particle-induced toxicities, but details of the cell culture conditions can affect observed results.

12B.2

Size Distribution and Characteristics of Airborne Unrefined Carbon Nanotube Particles. JUDY Q. XIONG, Maire S.A. Heikkinen, Beverly S. Cohen, New York University School of Medicine.

Carbon nanotubes (CNTs) are among the most dynamic and fast-growing nanomaterials due to their novel properties. With a compound annual global production growth rate of well above 60%, the potential of human exposure to this new type material in the workplace as well as in the general environment are rising, and their impacts on human health are of largely concern.

A method has been developed in our laboratory for sampling, quantifying and characterizing airborne CNT particles utilizing a 13-stage Electrical Low Pressure Impactor (ELPI) combined with image analysis by Atomic Force Microscopy (AFM). The method is capable of identifying agglomerated nanoparticles in the presence of other airborne particles, and measuring size-resolved number concentrations.

The technology has been applied for sampling and characterizing airborne unrefined CNT samples (raw material) of various types including single-walled (SWNT), double-walled (DWNT) and multi-walled (MWNT) nanotubes. The experimental data showed that the particle sizes generated from all types of CNT raw materials were widely distributed across all 13 stages of the ELPI including the filter stage ranging from 7 nm to 10 um in diameter. The particle size distributions varied with the type of CNTs and with the methods by which they were manufactured. AFM results also showed that the CNTs tend to agglomerate rather than exist as single particles, physically. As deposition efficiency and sites of inhaled particles within the respiratory system largely depends on particle size, the deposition pattern of agglomerated nanoparticles should be similar to those larger equivalent sized non-agglomerated particles. Nevertheless, entrained particles depositing on/in the deep lung surfaces of the bronchioles or alveoli will contact pulmonary surfactants in the surface hypophase and the agglomerated CNT are likely to (ultimately) be de-agglomerated. Therefore, to investigate human exposure to airborne CNTs, the full size range of inhalable particles must be taken into account.

12B Nanoparticle Measurement and Health Effects (Platform)
Nevada 1/2

Peter Jaques and Bing Guo, chairs

11:00

12B.1 Effects on manufactured nanoparticles on lung and vascular cells. JOHN VERANTH, N. Shane Cutler, Cassandra Deering, Agnes Ostafin, Garold Yost, University of Utah.

11:15

12B.2 Size Distribution and Characteristics of Airborne Unrefined Carbon Nanotube Particles. JUDY Q. XIONG, Maire S.A. Heikkinen, Beverly S. Cohen, New York University School of Medicine.

11:30

12B.3 Measured Airborne Nanoparticle Exposures at an NSF Nanoscale Science and Engineering Center. SU-JUNG TSAI, Kwangseog Ahn, Earl Ada, Michael J. Ellenbecker, University of Massachusetts Lowell.

11:45

12B.4 The fate of airborne nanoparticles from a leak in a manufacturing process into a working environment. NICHOLAS STANLEY, David Y.H. Pui, Thomas Kuehn, University of Minnesota; Christof Asbach, Thomas Kuhlbusch, Heinz Fissan, Institute of Energy and Environmental Technology.

12:00

12B.5 Evaluating the potential for release of carbon nanotubes and subsequent occupational exposure during processing of a nanocomposite. AMIT GUPTA, Mark L. Clark, Battelle Toxicology Northwest; Daniel J. Gaspar, Pacific Northwest National Laboratory; Michael G. Yost, University of Washington; Gwen M. Gross, Paul E. Rempes, The Boeing CompanyL; John C. Martin, Jr., Washington Technology Center, Seattle, WA.

12:15

12B.6 Murine Pulmonary Pathology and Systemic Immune Function Following Inhalation of Multiwalled Carbon Nanotubes (MWCNTs). LEAH A. MITCHELL, Andrew Gigliotti, Jacob D. McDonald, Lovelace Respiratory Research Institute; Jun Gao, Scott W. Burchiel, University of New Mexico.