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NanoLectures Series 2014 - 2015

The Effects of Inhaled Nanoscale Particles in the Central Nervous System

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Date: May 21, 2015
Time: 12:30-1:30pm
Place: 665 Huntington Ave,
Bldg. 1, Room 1302,
Boston, MA 02115

Abstract: Inhaled nanoscale particles (<100 nm in diameter, also ultrafine particles) deposit with high efficiency in all regions of the respiratory tract. Studies with very poorly-soluble nanoscale particles demonstrate translocation to distal tissues (e.g., liver, brain); with respect to the brain, we showed that some of this accumulation could be explained by solid particle transport via the olfactory nerve. Thus, we are now investigating whether there are adverse consequences of such accumulation, such as local inflammation or the induction or exacerbation of neurodegenerative processes. Using poorly-soluble nanoscale Mn oxide particles, it was found that markers of oxidative stress and inflammatory cell activation were elevated in the same regions of the brain where Mn accumulated following whole-body inhalation exposure in rats. Using a mouse model of Alzheimer's disease (AD), it was also demonstrated that exposure led to persistent microglial and astrocyte activation, elevations in amyloid β-42 protein, and decreases in synaptophysin staining. Similar studies were done using concentrated ambient ultrafine particles. These studies showed that inflammatory gene expression was elevated in brain in response to inhaled ambient ultrafine particles and that such elevation was more pronounced in the transgenic AD mice as compared to non-transgenic mice. Taken collectively, the findings from these studies suggest that inhaled particles can be transported to the central nervous system and that they can elicit tissue responses that could contribute to the progression of pathology in those regions where accumulation occurs.

Biographical Sketch: Alison Elder, Associate Professor of Environmental Medicine at the University of Rochester, is an inhalation toxicologist with research interests that include the pulmonary, cardiovascular, and central nervous system inflammatory and oxidative stress-related effects of engineered nanomaterials and ambient air particulate matter and the physicochemical properties of the particles that are linked to response outcomes. Particle biokinetics and the impacts of age and other underlying vulnerabilities on response are also of interest. Dr. Elder has authored numerous research papers in the field, as well as review articles and book chapters. She is an editorial board member for five journals and is deputy Editor-in-Chief of *Nanotoxicology*. She also serves on the Threshold Limit Value-Chemical Substances committee of the American Conference of Governmental Industrial Hygienists.

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