2C.7

A mechanistic Model to Predict the Deposition of Inhaled Asbestos Fibers in Rat and Human Lungs. BAHMAN ASGHARIAN, Owen T Price, Stephen H Gavett, Annie M Jarabek, *Applied Research Associates*

Inhaled fibrous materials deposited on airway surfaces pose a health risk due to their elongated geometry and biodurability. To accurately assess health risk, the deposited dose of the inhaled fibers must be linked to the biological end points observed or measured in epidemiological and experimental studies. External forces that cause fibers to deposit in the lung depend on fiber orientation in the air, which in turn is affected by the exerted fluid dynamics force and torque on the fiber. Hence, models of fiber transport and deposition in lung airways are far more involved than those for spherical particles. Models of fiber inhalability and respirability have been obtained in humans and rats. In this study, Models of fiber transport and deposition by sedimentation, diffusion, and impaction mechanisms were developed in a single lung airway for both species. Deposition due to interception was combined with other deposition mechanisms: fibers were transported near the walls due to sedimentation or diffusion where losses by interception occurred when one tip of the fiber touched the wall. A convective-diffusion model of fiber transport was formulated with a sink term to account for deposition losses by the above mechanisms for which deposition efficiency expressions were obtained. The transport and deposition model was implemented in expanding-contracting lungs to calculate fiber losses during a complete breathing cycle. Fiber deposition in the tracheobronchial region was significant for short, thin fibers due to Brownian diffusion. Fibers deposited in the alveolar region by sedimentation for large fibers and Brownian diffusion for small fibers. The dosimetry and deposition model developed in this study can be linked to a response model to describe the exposure-dose-response relationship. This study was funded by the Environmental Protection Agency under contract number EP-W-10-051. These views do not represent US EPA policy.

2C.8

Comparison of Eluent and Aerosol vs. Liquid Spike Challenge Tests for Influenza Virus Recovery from Non-woven Fabrics. ZHILI ZUO, Martha Abin, Yogesh Chander, Thomas Kuehn, et al., *University of Minnesota Twin Cities*

Seasonal influenza in the U.S. annually causes >200,000 hospitalizations and ~36000 deaths. One way to reduce the spread of influenza is to use personal protective equipment (PPE). Previous studies which used liquid spike tests have found that influenza virus could survive on PPE and virus could transfer from contaminated PPE to human hands. To better understand influenza survival on PPE and assess the risk of influenza virus transfer from contaminated PPE, there is a need for determining the optimum eluent for recovering influenza from PPE by comparing the recovery efficiency of different eluents. In addition, the relative contribution for influenza transmission by large droplets and smaller aerosol particles is controversial. Virus recovery may be different when the virus is applied as a liquid suspension vs. an aerosol.

In this study, eight eluents (phosphate buffer saline (PBS), minimum essential medium (MEM), and beef extract (BE) of two different concentrations (1.5% and 3.0%) at three different pH values (7.0, 8.0, and 9.0)) were evaluated for their recovery efficiency of avian influenza virus H9N9 from three non-woven fabrics (polypropylene, polyester, and Nylon) that are commonly used to manufacture PPE. Spike tests followed by elution at three drying times (immediately after applying the virus suspension, the time when the applied virus became air-dried, and 30 min after the virus dried) showed no significant difference in the recovery efficiencies of the eleunts ($p = 0.13$). However, the type of non-woven fabric significantly affected the recovery ($p < 0.000$), with the largest from PP and the smallest from Nylon. In addition, recovery efficiency generally decreased with increased drying time ($p < 0.000$), due to virus desiccation. Preliminary aerosol challenge tests using both virus infectivity assay and uranine tracer showed the recovery was lower than for the spike tests. Detailed comparison of recovery between the spike tests and aerosol tests are presented.