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Impacts of Manufactured Nanomaterials on Human Health and the Environment – A Focus on Nanoparticulate Aerosol and Atmospherically Processed Nanoparticulate Aerosol

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Abstract

The goal of the current research is to determine the potential effects of manufactured nanoparticles on human health if they were to become entrained in the atmosphere. Because a number of physical and chemical properties are size-dependent on nanometer length scales, it is important to fully characterize nanomaterials in any studies related to the environmental and health impacts of these materials. The approach to this study is to characterize a variety of manufactured nanomaterials using a wide range of techniques and analysis methods including surface spectroscopy and surface reactivity so that both bulk and surfaces properties are well understood on a molecular level. These well-characterized particles are then used in inhalation exposure studies. Additional characterization of the particles are done once the aerosol has been generated to determine if the particles aggregate or retain the size distribution determined prior to aerosol generation. Toxicology assessments of the animals exposed to these well-characterized nanoparticulate aerosols include murine acute pulmonary inflammation assay, murine sub-acute pulmonary toxicology evaluation, and murine microbial challenge host resistance evaluation to screen for acute and sub-chronic pulmonary effects. Our studies thus far have focused on some of the smallest available commercial nanoparticles, 5 nm TiO₂. A series of acute and sub-chronic exposures have been completed. The results of these studies will be discussed.