

Health Effects of Inhaled Engineered and Incidental Nanoparticles

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Abstract: Engineered nanoscale materials provide tremendous promise for technological advancements; however, concerns have been raised about whether research of the possible health risks of these nanomaterials is keeping pace with products going to market. Research on nanomaterials, including carbon nanotubes, semiconductor crystals, and other ultrafine particles (i.e., titanium dioxide, quantum dots, iridium) will be examined to illustrate what is currently known or unknown about how particle characteristics (e.g., size, agglomeration, morphology, solubility, surface chemistry) and exposure/dose metrics (e.g., mass, size, surface area) influence the biological fate and toxicity of inhaled nanosized particles. The fact that nanosized particles (1) have a potentially high efficiency for deposition; (2) target both the upper and lower regions of the respiratory tract; (3) are retained in the lungs for a long period of time, and (4) induce more oxidative stress and cause greater inflammatory effects than their fine-sized equivalents suggest a need to study the impact of these particles on the body. Achieving a better understanding of the dynamics at play between particle physicochemistry, transport patterns, and cellular responses in the lungs and other organs will provide a future basis for establishing predictive measures of toxicity or biocompatibility and a framework for assessing potential human health risks.

Keywords: *Carbon nanotube; health risk; nanoparticles; particle physicochemistry; pulmonary; titanium dioxide*