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P2. Effects of Nanomaterials on Lungs

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Nanotechnology industry is expected to grow very fastly towards 2020. Mass production of nanomaterials will also mean a dramatic increase of workers dealing with nanomaterials and becoming possibly exposed, large numbers of exposed consumers.

Exposure to nanomaterials during the production or use is most likely to occur via the lungs. There is good evidence that ultrafine ambient air particles (e.g. diesel exhaust particles) pose considerable health risks if they gain access to the airways. The symptoms can include rhinitis, bronchitis and pulmonary inflammation. Evidence exists that nano-sized particles may be more potent than larger particles in evoking inflammatory and toxic responses in the lungs since these nanoparticles will be more efficiently retained in the alveolar region.

Titanium dioxide (TiO2) nanoparticles are widely used in the field of life-sciences, biotechnology, pharmaceuticals, cosmetics and the textile industries. Oberdörster et al. reported that ultrafine anatase TiO2 particles (primary particle size of 20 nm), when instilled intra-tracheally into rats or mice, induced a much greater pulmonary-inflammatory neutrophil response than fine anatase TiO2 (primary particle size of 250 nm) when both types of particles were instilled at the same mass dose.

Zinc oxide nanoparticles (ZnONP) are utilised in many commercial products including cosmetics, paints, textiles, food additives, and personal hygiene products and sunscreens. It has been previously reported that airway exposure to ZnO nanoparticles could induce eosinophil infiltration and pulmonary fibrosis in mouse models.

Carbon nanotubes, fullerenes, and mesoporous carbon structures constitute a new class of carbon nanomaterials which have many applications. The needle-like shape of certain type of CNTs has been compared to asbestos, raising concerns that their widespread use may lead to pleural fibrosis and/or mesothelioma (cancer of the lining of the lung), which are today diseases mostly associated with exposure to asbestos.

Keywords: Nanomaterial, health, lung effects