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Editorial

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Nanotoxicology in Pathology

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Editorial Note

Scientific developments have enhanced the capacity to synthesize unique particulates in the size range of 1 to 100 nm, increasing interest in nanotoxicology and Nanoscale Particulates (NPS). As part of the study of ultrafine particles, the toxicology of certain NPs has been studied for a long time. NPS, which are components of pollutants from combustion and dust-producing manufacturing processes, are ultrafine particles. The abundance, chemical composition, and physical characteristics of very small particulates in possible occupational and environmental exposures have all changed as a result of nanotechnology's newly engineered NPs. For toxicologic pathologists used to working in the pharmaceutical industry, it's worth noting that the regulation of many NPs varies greatly from that of pharmaceuticals. Most nonpharmaceutical particulates are governed by their chemical composition rather than their size and shape, except for certain mineral fibres. The Occupational Safety and Health Administration (OSHA) controls airborne particulates of a chemical composition not explicitly noted in legislation in the workplace as Particulates Not Otherwise Covered (PNOR). For an 8-hour time-weighted average total PNOR concentration, the OSHA allowable exposure limit (PEL) is 15 mg/m3. However, since the proportion of those PNOR in the respirable range is smaller than the total PNOR, another PEL for PNOR with an aerodynamic diameter of 5 mm or less exists; this PEL is 5 mg/m^3 As a result, existing regulations allow for the commercial production and use of most NPS without additional safety testing, based on requirements established for larger respirable particulates of the same chemical composition or as PNOR. One problem is that as particulate sizes shrink, the surface area to mass ratio increases, and particulate toxicity mostly, but not always, correlates with the surface area rather than mass. Some NPs can cross epithelial barriers in the skin and lungs, penetrate flexed skin, cause lymphangiectasia, be transported in sensory nerves, and interact with mitotic spindles, as will be discussed later Because of their regulated structure, electrical conductivity, and high tensile strength, carbon nanotubes have a wide variety of possible applications. The fact that particulate size decreases increase the surface area per unit volume or mass is a major concern for NPs. This increases the surface area available for a reaction for reactive particles, and it speeds up dissolution for soluble particles. Understanding how smaller dimensions impact biological responses should help in the evaluation of these new products' protection. However, since NPS are so small, subcellular interactions may be important. In short, pathologists who have thrown away their slide holders will want to invest in a new one. Unfortunately, toxicology study on nanoparticles lags well behind the development of new engineered nanoparticles. Several studies of the toxicology of NPS, on the other hand, stress the value of nanotoxicology research as well as the specific challenges it poses. Nonetheless, a recent PubMed search using the term "nanotechnology" yielded more than 20,000 scientific publications published in the last ten years.

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