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Paper title: Designed nanoparticles: boon or bane for human life

Abstract:

With the rapid industrial revolution in nanotechnology, engineered nanoparticles (NPs) with diverse physical and chemical properties in NPs such as nanotubes, fullerenes, quantum dots or metal oxide-based particles are manufactured worldwide. They are also commercially used in multiple fast expanding industrial fields including automobiles, optics, microelectronics, cosmetics, medicine, diagnostic, therapeutic and drug delivery. Because of their extremely small size of <100 nm and a very high volume ratio, with high reactivity potential, the physicochemical properties of engineered NPs differ substantially from those of their native bulk materials.

The physical and chemical properties provide NPs with unprecedented technological properties to enable them in novel tasks in industrial and technical uses. The newly gained properties of NPs on the other hand could lead to unexpected and sometimes harmful interactions to cause serious adverse health effects in humans and ecosystem. With this inkling, several studies have attempted to explore whether some of the commercially used NPs can be toxic in cellular and animal studies and potentially infiltrate lung and migrate to other parts of the body to inflict injury. Adverse NPs-induced toxicity to different organelles (e.g. mitochondria) and organs (e.g. lymph nodes, spleen, heart, liver, pancreas, kidney, bone marrow, and even brain) is an important apprehension in the absence of biological evidence.

However, at the present time, the public opinion still does not regard nanotechnology as a substantial threat for human health. Nonetheless, this momentary stance could change rapidly with the further progression and spread of nanotechnology and parallel increasing evidence in NPs adverse health effects. Therefore, even with limited evidence on the biological effects NPs, now is the right time to inform the public about the numerous potential bio-hazards of engineered NPs. It is also the right time to enforce new basic safety guidelines in alliance with industries and establish toxicity test procedures that will ensure protection of workers and control release of NPs to the environment. In order to successfully tackle all the issues associated with nanotechnology, it is important to assemble a multidisciplinary team of experts in industry, engineering, industrial hygiene, toxicology, molecular biology and federal agencies to institute round robin studies on toxicity and formulate guidelines on exposure. A long and successful exploitation of the nanotechnology with many promising technical capabilities we need to answer the unanswered health effects NPs and the environmental issues.