Nanotoxicology

Nanoparticles: particles between 1 and 100 nanometer (nm) in size with a surrounding interfacial layer. The interfacial layer is an integral part of nanoscale matter, fundamentally affecting all of its properties. The interfacial layer typically consists of ions, inorganic and organic molecules.

Nanotoxicology is the study and application of toxicity of nanomaterials, it intends to determine at what extent their properties may pose a threat to the environment and human being.

Toxicity of nanomaterial depends on physicochemical properties of nanoparticles

1. Surface area – Greater potential hazard may relate to the surface area of nanoparticles compared with that for the same mass concentration of larger particles
2. Morphology - Health effects of nanoparticles are likely to depend on their morphology.
3. Chemical composition – Toxicity of nanoparticles depends on their chemical composition, but also on the composition of any chemical adsorbed onto their surface.
4. Size – Size is a key factor in determining the potential toxicity. Smaller a particle, greater is its surface area to volume ratio and the higher its chemical reactivity and biological activity.
5. Surface charge – The aggregation of nanoparticles with biological materials may depend on surface charge.
6. Solubility – Poorly soluble nanoparticles have been shown to cause cancer and can exhibit more pronounced toxicity.

The toxicity of nanomaterials can be broadly classified into two

- Biological toxicity
- Environmental toxicity

Nanoparticles can enter into body via –

- *Intravenous *Dermal
- *Subcutaneous *Intraperitonial
- *Oral *Nasal (Inhalation) routes

Various engineered nanoparticles present in consumer products enter into human body

Route	Type of Product
Skin (Dermal)	Sunscreen lotion, Skin care lotions
	Paints and coatings
	Sealants
Lungs (Inhalation)	Spray (Skin care), Air fresheners
	Paints and coatings
	Food additives and colourings
Gastrointestinal tract	Food supplements, Health supplements

DISEASES ASSOCIATED TO NANOPARTICLE EXPOSURE

C. Buzea, I. Pacheco, & K. Robbie, Nanomaterials and nanoparticles: Sources and toxicity, Biointerphases 2 (2007) MR17-MR71