Simulating drug delivery systems toxicity of gold nanostructures.

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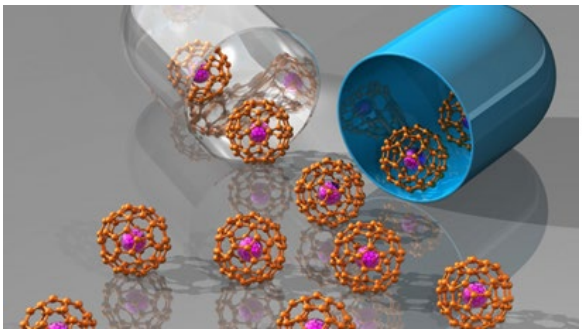
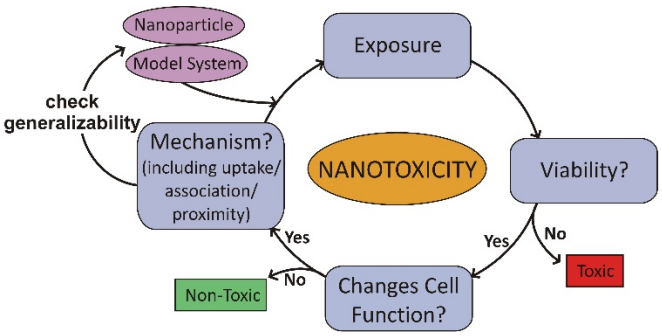
Nanomedicine and nano delivery systems are a relatively new but rapidly developing science where materials in the nanoscale range are employed to serve as means of diagnostic tools or to deliver therapeutic agents to specific targeted sites in a controlled manner. Drug delivery systems (DDSs) are engineered devices used to transport a pharmaceutical compound throughout the body in order to release its therapeutic cargo in a controlled manner. By encapsulating the molecules within a protective shell-like structure, potential physical-chemical or enzymatic disruptions of the active compound are diminished. In turn, not only the bioavailability of the active compound is increased but also undesirable side effects resulting from unspecific systemic distribution are reduced. One of the most notable advantages offered by nano-delivery systems for drug therapy is the controlled drug release not only at a specific location level but in a time-dependent manner via passive or active targeting. Assembly of surface-active ligands onto the surface of the drug delivery systems, enables DDSs recognize and interact with a receptor in the target cell. As a result of the interaction between ligands and receptors, the drug delivery specificity and nanoparticle up-take is enhanced.





The manipulation of matter at the scale of atoms, “nanotechnology”, is creating many new materials with characteristics not always easily predicted from current knowledge. Within the near-limitless diversity of these materials, some happen to be toxic to biological systems, others are relatively benign, while others confer health benefits. Particle size and surface area are important material characteristics from a toxicological perspective. As the size of a particle decreases, its surface area increases and also allows a greater proportion of its atoms or molecules to be displayed on the surface rather than the interior of the material. The change in the physicochemical and structural properties of engineered Nano material with a decrease in size could be responsible for a number of material interactions that could lead to toxicological effect.