

NCI Alliance for Nanotechnology in Cancer

"Engineering safe nanoparticles"





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Nanoparticles are small

Highly crystalline





Huge surface areas



C-sixty 1nm

Cadmium Selenide nanocrystal 6 nm

Lysozyme 3 nm

Nanotechnology and Cancer







Public fear of nanotechnology

 Sweeping claims about safety or danger by scientists

Make safety and testing part of early stage research

In-Vitro Cytotoxicity



C₆₀ colloidal Particles (4 ppm)



DMEM



HDP cells, seeded (Human Diploid Fibroblasts)

48 Hours



Live

Dead

Nolan J S; Packer L Monolayer culture techniques for normal human diploid fibroblasts. METHODS IN ENZYMOLOGY (1974), 32(Part B), 561-8.
 LIVE/DEAD Viability/Cytotoxicity Kit (L-3224). Molecular Probes Operation Manuel. p. 1. 1999.

In-Vitro Screening for Nanoparticles



What makes nanoparticles toxic?



• Surfaces that make particles more oil soluble

Reactive core materials that can generate free radicals

Structure-activity relationships for C₆₀



Public policy and partnerships

International Council on Nanotechnology



All parties have a seat at the table
Academia, Industry,
Non-governmental, Government
Consensus building activities
Concrete policy work
Terminology standards
Laboratory health and safety
Hazards assessment framework

Ensuring Nanoparticle Safety

• Surfaces matter more than composition.

Safety will not be only a function of core composition, but more about the surface

- <u>Nanoparticle toxicity can be turned on and off</u> We can engineer nanoparticles to be biocompatible, or not, through appropriate control over the surface
- <u>Safe nanotechnology needs non-technical effort</u>. Partnerships between industry, non-governmental organizations, and academia are developing to shepherd this new area.

