

## **NTP PROJECTS ADDRESSING POSSIBLE HUMAN HEALTH RISKS ASSOCIATED WITH NANOTECHNOLOGY AND NANOSCALE MATERIALS**

Ongoing research activities are initially focusing on 4 classes of materials: (1) metal oxides, (2) fluorescent crystalline semiconductors (quantum dots), (3) fullerenes, and (4) nanotubes.

### ***1. Metal oxides***

Initial focus is on nanoscale titanium dioxide and zinc oxide due to their presence in cosmetics. Ongoing and/or planned activities:

- Characterization of size, crystallinity, and coating of these metal oxides in representative commercial sunscreens
- Evaluation of photoactivation of titanium dioxide in *in vitro*, *ex vivo*, and *in vivo* models
- Dermal penetration of titanium dioxide in *in vivo* and *in vitro* models
- Phototoxicology of titanium dioxide in mice
- Photocarcinogenicity of titanium dioxide in transgenic mice

### ***2. Fluorescent crystalline semiconductors (Quantum dots)***

Initial focus is on cadmium selenide/zinc sulfide spheres and rods of varying sizes and surface chemistry as a model system to test hypotheses about role of size and surface chemistry on tissue distribution. Ongoing and/or planned activities:

- Synthesis and characterization of specific materials
- Development of quantitative fluorescent microscopy system and IPC-mass spectroscopy approach for evaluating tissue levels
- Quantitative evaluation of the tissue distribution following dermal and systemic routes of exposure

### ***3. Fullerenes***

Initial focus is on carbon based fullerenes of varying cage size and surface derivatisation. Ongoing and/or planned activities:

- Physicochemical characterization of procured materials and formulation development
- *In vivo* repeat dose toxicity studies following oral exposure
- Pulmonary toxicity and evaluations following a single intratracheal instillation
- Immunotoxicological evaluation of fullerene C60

### ***4. Nanotubes***

Initial focus is on single walled carbon nanotubes. Through a NIEHS-NIOSH interagency agreement we are supporting the development of exposure systems for inhalation toxicity studies of single walled nanotubes