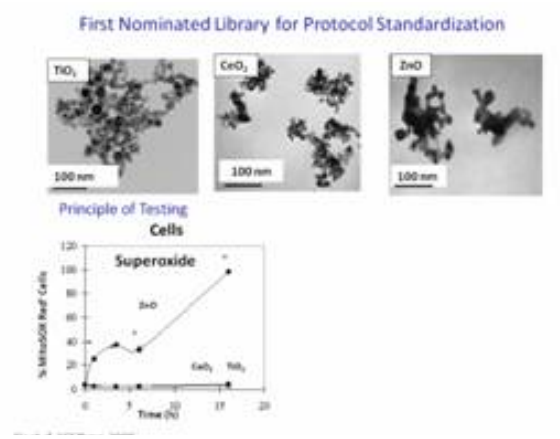
UC Center for Environmental Implications of Nanotechnology (UC CEIN)

The UC Center for Environmental Implications of Nanotechology (UC CEIN) was established in September 2008 to ensure that nanotechnology is introduced and implemented in a responsible and environmentally compatible manner to allow the U.S. and the International community to leverage the benefits of nanotechnology for global economic and social benefit. The center is taking a multidisciplinary integrative research approve to develop a library of reference Nanomaterials (NMs) and develop a predictive model of toxicology and environmental impacts of NMs. This information will be ultimately be used to develop guidelines and decision tools for safe design and use of NMs.

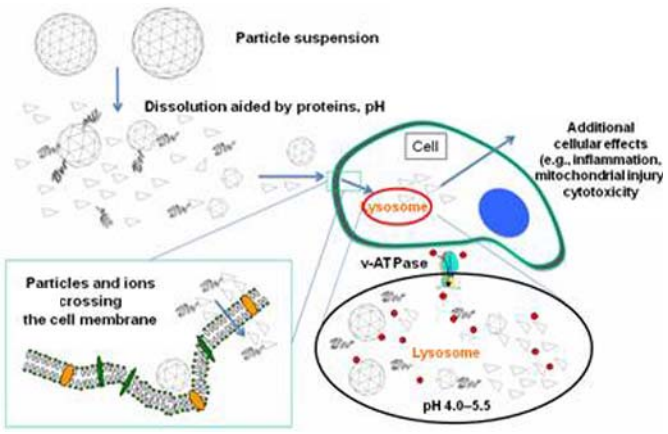
Early Center Progress

Establishment of a Standard Reference Material Library



We have designed and synthesized a preliminary collection of metal oxide nanoparticles (TiO_2, CeO_2, ZnO), acquired commercially produced analogs, and distributed them all CEIN laboratories involved with physical-chemical characterization as well as environmental transport, fate, and toxicity studies. Internal CEIN working groups are focused on (a) harmonizing physical-chemical characterization protocols and analyses, and (b) extending the collection of reference materials to include multi-fold variants designed to hypothesized probable mechanisms governing environmental transport, fate, and toxicity (Hoek).

Initial Results on Toxicological Studies Involving First Nominated Reference Materials



Utilizing the primary material library of 3 metal oxides, we have used high content screening to study the toxicity of these particles, including establishment of dose-response relationships and time kinetics in macrophages (figure). (Nel)

In studies to determine relative toxicity of bacterial-delivered NMs versus those taken up directly into protozoa, the toxicity tests were conducted to study the effects of TiO_2 and CdSE quantum dots in various media. Based on preliminary experiments, sufficient quantities of NMs are taken up by bacteria to enable an assessment on the effects on protozoa. (Holden)

References/Publications

Lopez, M.L. et al. Concentration and biotransformation of arsenic by Prosopis sp. Grown in soil treated with chelating agents and phytohormones. *Environmental Chemistry*, 2008, 5(5) 320-331.

Nel et al. *Nature Materials* 2009.

Priester et al. Effects of soluble cadmium salts versus CdSe quantum dots on the growth of planktonic pseudomonas aeruginosa. *Environmental Science & Technology* – accepted. Es-2008-02806n.R1.

Xia, T et al. Comparison of the mechanism of toxicity of Zinc Oxide and Cerium Oxide nanparticles based on the hierarchical oxidative stress paradigm. *ACS Nano*, 2008, 2(10) 2121-2134.