

**National Nanotechnology Initiative (NNI)**

**Nanoscale Science Engineering and Technology subcommittee (NSET)**

**Nanoscale Environmental and Health Implications (NEHI)**

**Environmental, Health, and Safety Research Needs  
for Engineered Nanoscale Materials**

([www.nano.gov](http://www.nano.gov))

Dr. James Murday

Past, Executive Secretary of NSET

Now, Univ of Southern California

Engineered nanoscale materials – purposefully manufactured or synthesized

EHS research needs document is specifically NOT associated with:

naturally occurring nanomaterials

incidental byproducts of manufacturing, combustion, ...

**However**, the substantial body of knowledge about risks related to exposures to these categories will inform risk assessment and management for engineered nanoscale materials

# **Instrumentation, Metrology and Analytical Methods**

## Research and Information Needs

- Methods for detecting nanomaterials in biological matrices / environment / workplace
- Methods for standardizing particle size and size distribution
- Standardized tools for assessing nanomaterial shape, structure, and surface area
- An inventory of engineered nanomaterials and their uses

# Nanomaterials and Human Health

## Research and Information Needs

- Methods to quantify / characterize exposure to nanomaterials in biological matrices
- Understanding absorption / transport of nanomaterials throughout the body
- Understanding the properties of nanoscale materials eliciting biological response
- *In vitro* and *in vivo* assays/models to predict *in vivo* human responses to exposure

# **Nanomaterials and the Environment**

## Research and Information Needs

- Evaluation of testing schemes for ecological effects
- Factors affecting the transport of nanomaterials in the environment
- Understanding transformation of nanomaterials under different environmental conditions

# Health and Environmental Surveillance

## Research and Information Needs

- Workplace processes and factors that affect exposure to nanomaterials
- Quantification of nanomaterial exposure from industrial processes, consumer products and other products
- Establishment of environmental monitoring protocols

# **Risk Management Methods**

## Research and Information Needs

- Understanding unique challenges for process design and engineering control systems applied to airborne engineered nanoscale materials
- Understanding and development of manufacturing approaches that minimize environmental impact
- Determination of the stages in a product's life cycle that introduce potential EHS risks
- Evaluation of whether current risk communications methods are adequate for known and/or anticipated risks

## **Next Steps in EHS for NSET**

- Further prioritize research needs among those identified in this report
- Evaluate in greater detail the current NNI EHS research portfolio
- Perform a “gap analysis” of the NNI EHS research compared to the prioritized needs
- Coordinate and facilitate among the NNI agencies’ research programs to address priorities
- Establish a process for periodic review of progress and for updating the research needs and priorities