



# HESI Nanomaterial Environmental, Health and Safety Project Committee

## Chair:

**Raymond M. David, PhD, DABT**

(BASF Corporation)

## Vice-Chair:

**Hon-Wing Leung, PhD, DABT, CIH**

(Arkema Inc.)

January 19, 2009, Assembly of Members Meeting  
HESI Annual Meeting  
Tucson, AZ



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# 2008 Participation

## INDUSTRY

Arkema  
BASF  
Coca-Cola  
Dow Chemical  
L'Oreal  
Procter & Gamble

## PUBLIC

CDC National Institute of Occupational  
Safety and Health (NIOSH)  
East Carolina University  
NIH National Institute of Environmental  
Health Sciences (NIEHS)  
North Carolina State University  
University of Rochester  
US Consumer Product Safety  
Commission (CPSC)  
US Environmental Protection Agency  
US Food and Drug Administration



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# Project Goals

- **Determine the current knowledge-base and research needs for toxicology and safety evaluations of engineered nanomaterials.**
  - **Identify unresolved scientific issues, research needs, and/or data gaps that would facilitate the development of a comprehensive risk assessment for nanomaterials.**
  - **Develop a better understanding of the fundamental behavior of nanomaterials.**
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# **Eight-Part Series in *Toxicological Sciences* (2005-2006)**

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## **Research strategies for safety evaluation of nanomaterials:**

- 1. Human health implications of exposure**
  - 2. Toxicological and safety evaluation**
  - 3. Nanoscale technologies**
  - 4. Risk assessment of nanoparticles**
  - 5. Role of dissolution in biological fate and effects of nanoscale particles**
  - 6. Characterization of nanoscale particles**
  - 7. Consumer exposure**
  - 8. International efforts to develop risk-based safety evaluations**
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# Research Objectives

- Explore human health effects associated with pulmonary exposure to the same well-characterized materials in *in vivo* and *in vitro* test systems.
- Evaluate the distribution and fate of nanomaterials in biological systems.
- Multi-sector **consortium** established to conduct research.



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# Pulmonary Toxicity Studies: *In Vivo*

## Materials

- Titanium dioxide (TiO<sub>2</sub>)
- multi-walled carbon nanotubes (MWCNT)
- carbon black

## Routes of Administration (rat)

- Nose-only inhalation chamber (BASF)
- Pharyngeal aspiration (NIOSH)
- Exposure levels were consistent from test system to test system.

## Results

- Slight differences were observed in responses to different nanoparticles.



# Fate Studies (Tissue Distribution) Following Systemic or Lung Exposure (Procter & Gamble)

## Material

- Nanoscale polystyrene fluorescent beads

## Routes of Administration (rat)

- pharyngeal aspiration
- iv injection (systemic exposure)

## Results

- Small particles (20 nm) distribute differently from larger ones (100-1000 nm).
  - Smaller particles are not as persistent.
  - Distribution is route-specific.
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# ***In Vitro* Evaluations**

(East Carolina University)

## **Material**

- $\text{TiO}_2$
- MWCNT

## **Methodology**

- Incubation of rat, human lung cells, rat alveolar macrophages, and CHO cells with nanomaterials
- Cytotoxicity and cell proliferation evaluated.

## **Results**

- Differences were observed in response sensitivity between rat and human cell lines.
- There may be differences in response to  $\text{TiO}_2$  and MWCNT.





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# 2009 Project Committee Activity

## Webinar

- February 2009
- “Genotoxicity of Nanomaterials”
- ~ 50 invited participants
- Speakers from BASF and University of Copenhagen



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# Project Committee Sunset

- **Project Committee has elected to disband, effective March 31, 2009.**
- **Interested parties are encouraged to submit targeted proposals on nanomaterial safety and toxicity to HESI for consideration via the Emerging Issues process.**