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# **Risk Management and Control:** Key Research Areas for NanoEHS Success

## Charles L. Geraci, Jr., PhD,CIH

U.S. National Institute for Occupational Safety and Health



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- Workers and consumers worldwide are potentially exposed to nanomaterials during production and use products
- Few occupational exposure limits (OELs) have been developed for specific nanomaterials
- Adequacy of existing OELs is often not known
- A prospective risk management approach builds in safeguards in the absence of data and allows the technology to advance



## **Effective Risk Management**

- Assessment needed of:
  - Material
  - Processes
  - Tasks
  - Applications
- Apply strategies to design out risks and mitigate exposures



# **Goals of CoR 6**

- Identify effective risk management strategies
- Demonstrate their utility
- Exchange knowledge
- Develop best practices
- Identify gaps



# **Current State**

- ENMs being created and applications developed faster than health or risk data.
- Sufficient health data for concern
- Result: apply risk management practices <u>now</u> while health, exposure and risk assessment studies continue.



## Jumping Ahead in the Risk Management Research Framework



### Source: US NNI EHS Research Strategy





Grieger, K., Baun, R., Owen, R. 2010. Redefining Risk Research Priorities for Nanomaterials. *Journal of Nanoparticle Research*,2(2): 383–392



## **Predictive Thinking Along the Life Cycle**

- Research Laboratories: what must be done differently?
  10s of workers
- Scale up: are risk management practices 'scalable'?
  - 1,000s of workers
- Pilot Manufacturing: greatest variability and highest risk:
  - 1,000s of workers
- Manufacture of ENM: reapply known strategies?
  - 10,000s of workers
- Applications (Nano-enabled products)
  - Workers, consumers, general public, environment



## **Risk Management Opportunities**



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Photos courtesy of M. Methner, NIOSH

## **Controls for Laboratory-Scale Work**



- Effective controls that factor budget and space limitations are available
- Select controls based on task-based exposure risks











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## Lab Study: Assessing Containment

### **Particle Generation System**







FMPS

SMPS

## New Material: MWCNT Sheet and Thread Creative Reapplication of Containment





Photos courtesy Nanocomp Technologies, Inc.

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## **Case Study: Use of LEV during reactor cleanout**



Average percent reduction from the use of a local exhaust ventilation unit: 96 +/- 6% based on particle counts 88 +/- 12% based on mass



Mark Methner, PhD, CIH; JOEH June 2008

# Don't forget other nanofabrication hazards

- Toxic gases and chemicals
- High temperatures >600°C
- High pressures
- Lasers
- Strong magnetic fields



# **Fire and Explosion Safety**

 Experiments thus far indicate moderate combustibility



Increased volume of dry ENM will require addition risk management



# Work needed on personal protective equipment: gloves, garment, respirators







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**Bayer MaterialScience** 

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#### Nanocomp Technologies' Carbon Nanotube Products

Carbon nanotubes have been the subject of research and development for several decades. Nanocomp's processes create a special form of this material that is markedly different from that of other manufactures. To learn more about how our CNTs are different, how we developed them to be the safest forms possible, and what makes all CNTs promising and challenging from an environmental, safety, and heath perspective, **click here** +

## EHS research opportunities Materials Applications Markets



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### Welcome to the GoodNanoGuide - Beta Version

The GoodNanoGuide is a collaboration platform designed to enhance the ability of experts to exchange ideas on how best to handle nanomaterials in an occupational setting. It is meant to be an interactive forum that fills the need for up-to-date information about current good workplace practices, highlighting new practices as they develop.

We encourage you to participate in this community effort. There are many levels in which you can help. Visit our How to Help section to learn more.

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## Thank you for listening. And, thanks to all of my co-workers! <u>CGeraci@cdc.gov</u> www.cdc.gov/niosh/topics/nanotech/



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