

Nanotechnology: An Opportunity For Partnership, Good Science and Good Policy

Nanotechnology & Society:
Emerging Organizations,
Oversight, and Public Policy Systems

UMass- Amherst
September 24, 2010

Charles L. Geraci, Ph.D., CIH

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy



Why?

Every day:

New materials being created

New applications

New processes

But...

New hazard data (toxicology)

Hazards not completely known

Risk not characterized

Background Issues

- Adopting new OSH standards has become more complex
- EOHS issues remain the top challenge to commercialization
- Rapid adoption of new standards for workers (first exposed) seems unlikely
- Could Good Partnerships and Good Research help shape good Policy for managing worker risk?
- Is there broader application of this model?

Background Issues

■ Key Business Issue

- EHS issues remain the top challenge to commercialization

■ Key EH&S Questions

- Issues of hazard, exposure, risk and fate are complex.
- Could resources be combined to address these issues?
- How can the benefits of nanotechnology be realized while proactively minimizing the potential risk?

What Risks?

- Human health
- Environment
- Economic
- Public Trust

All are related. A collaborative effort is needed

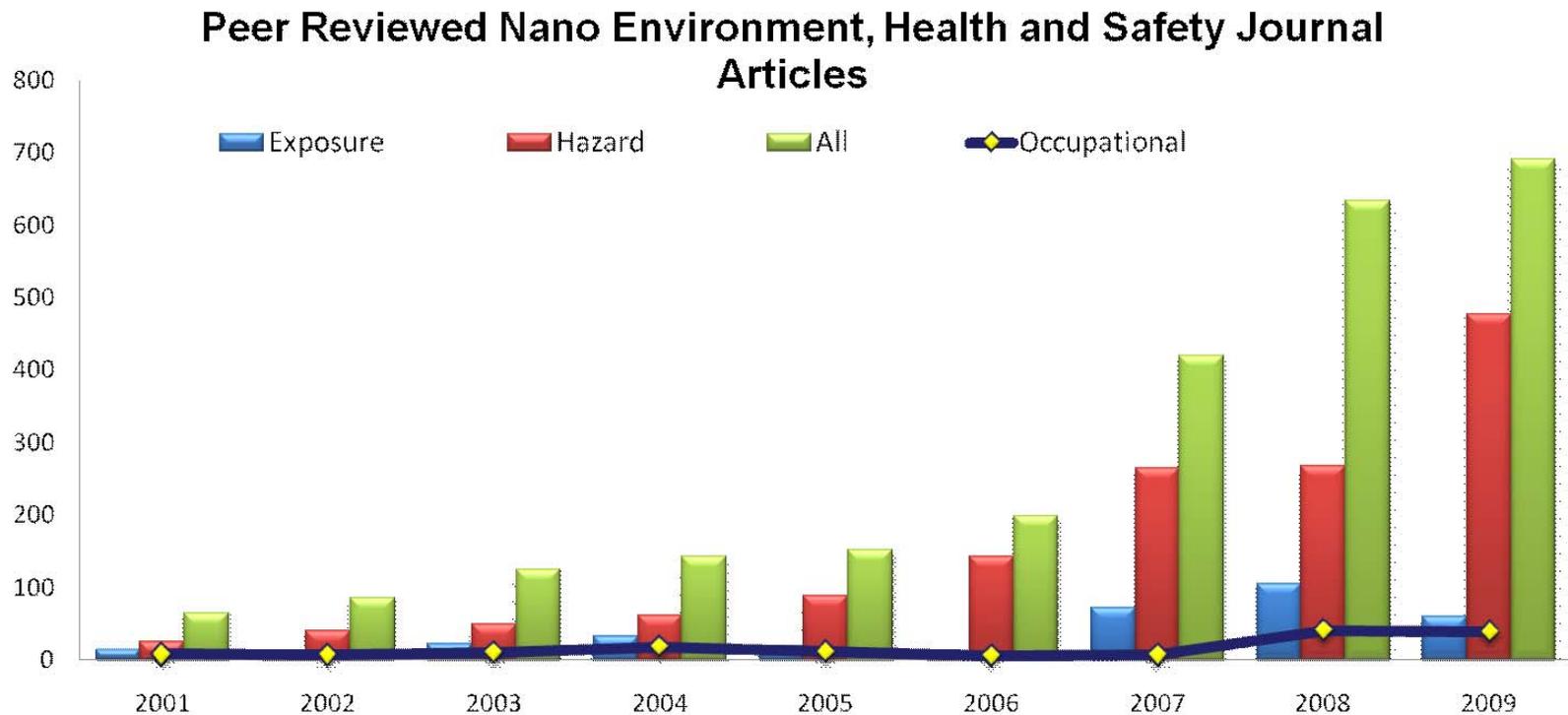
Specific to Workers

- First exposed: labs, scale up, make and use
- Encounter the new material or technology as the history is still developing
- Regulatory authority granted to OSHA
- Regulatory process is 'slow' and an innovative approach is needed

Slow = Commercialization is outpacing risk research

Do We have Adequate Worker Data?

Occupationally Relevant Research is Lagging



Less than 6% of all nano impacts research is of high occupational relevance

All , All published research relating to the potential environmental, health and safety effects of nanomaterials
Occupational Health , e.g., efficacy of gloves, respirators; workplace exposure assessment
SOURCE: ICON Virtual Journal of Nano Environment, Health and Safety <http://icon.rice.edu/research.cfm>



Why not a National Partnership?

What is needed for an Effective Partnership?

- Do good science (Quality)
- Do the right science (Relevant and Prioritized)
- Communicate the results (Training)
- Implement good practices (Practice)
- Focus on impact (Eliminate EHS risks)
- Provide input to decisions (Policy)

A Collaborative Effort



Shared Responsibility

Shared Responsibilities

- Researchers: understand new materials and hazards; quality data
- Business alliances: foster knowledge and collaboration
- Manufacturers: develop and share good practices
- Workers and Users: Follow good practices, feedback
- Risk managers: provide HS&E guidance
- Government Agencies: evidence based guidance

The key: Communication

One Element: The NIOSH Plan

Established a research program to address the implications and applications of nanotechnology on workplace safety and health.

- NIOSH Nanotechnology Research Center: Create a prioritized research program
- Project Activities in critical areas
- Outreach: Information, Education and Recommendations
- Follow the Risk Management Model

Steps to Protect Workers Involved with Nanotechnology

Hazard Identification
"Is there reason to believe this could be harmful?"



Hazard Characterization
"How and under what conditions could it be harmful?"



Exposure Assessment
"Will there be exposure in real-world conditions?"



Risk Characterization
"Is substance hazardous and will there be exposure?"



Risk Management
"Develop procedures to minimize exposures"

Adapted from Gibbs, 2006

NIOSH Focus

-
- Toxicologic research
 - Health effects assessment
 - Safety research

-
- Toxicologic research
 - Field assessment
 - Epidemiology research

-
- Metrology research
 - Field assessment
 - Control technology research
 - Personal protective equipment (PPE) research

-
- Risk assessment
 - Dose modeling
 - Exposure characterization

-
- Risk communication
 - Guidance development for controls, exposure limits, PPE, and medical surveillance
 - Information dissemination

NIOSH uses the Risk Management model to identify and organize key areas of research

A concurrent approach:
not sequential

The NIOSH Plan

Strategic Plan

for NIOSH Nanotechnology Research and Guidance

Filling the Knowledge Gaps

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



Research organized by Critical area

Input from key stakeholders

Peer reviewed

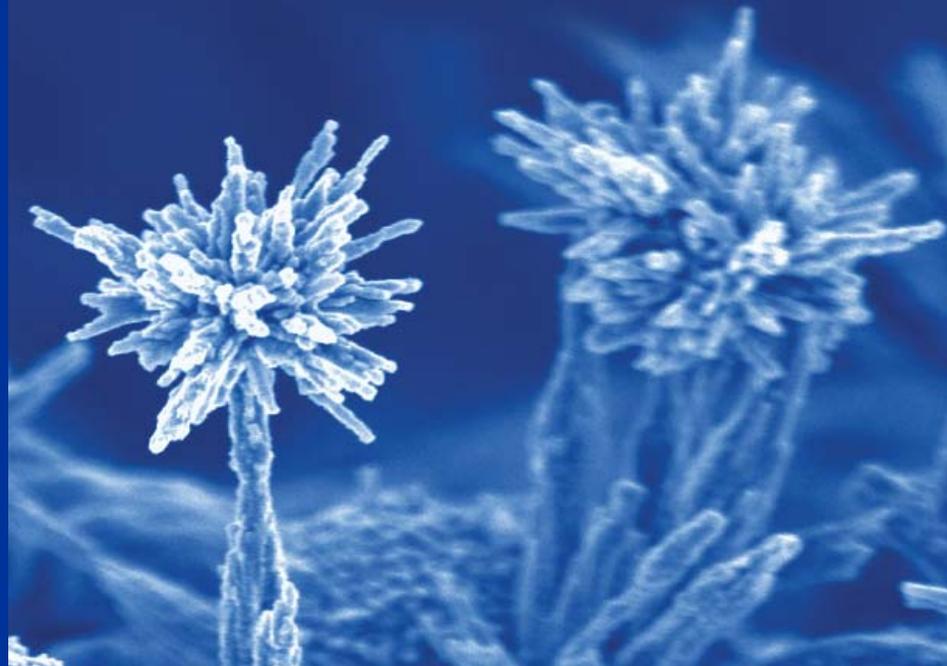
Updated regularly

Key NIOSH Contributions

- Develop and disseminate guidance
- Research results in support of a Risk Management approach
- Communicate findings
- Collaborate with partners

Approaches to Safe Nanotechnology

Managing the Health and Safety Concerns
Associated with Engineered Nanomaterials



DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

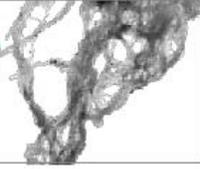


Basic Guidance from NIOSH

- First Issued in 2005 and updated twice and reissued in 2009
- Based on direct experience and applied research results
- Updated as new information is developed
- A starting point for building a responsible nanomaterial management program

www.cdc.gov/niosh/topics/nanotech

The Nanotechnology Field Research Team Update



In 2006, NIOSH established a Nanotechnology Field Research Team to expand its knowledge and understanding of the potential health and safety risks that workers may encounter during the research, production, and use of engineered nanomaterials. This effort has complimented NIOSH's extensive laboratory-based research program, as well as helped NIOSH identify and more fully understand the variety of work processes used to generate and manufacture engineered nanomaterials. It has also provided NIOSH with the opportunity to observe and evaluate work practices and engineering controls used to ensure worker health and safety in the nanotechnology industry.

NIOSH has conducted site visits to several facilities around the country that are involved in the research, manufacture, or use of various types of nanomaterials including, metal and metal oxide nanoparticles, carbon nanofibers, electrospun nanofibers, quantum dots, fullerenes, and nanocomposites. As a result, NIOSH obtained valuable information that is being used to assist in developing workplace guidance documents to protect nanotechnology workers from occupational injury and illness, and has learned that:



- basic particle counting and sizing instruments can be used to identify emissions from nanomaterial processes,
- careful interpretation of the particle data is needed to differentiate between incidental (background) and process-related nanoparticles, and
- engineering controls do minimize workplace exposure to engineered nanoparticles.

Companies interested in receiving a visit by the Field Research Team are encouraged to contact NIOSH. All site visits are initiated by the respective companies and are completely voluntary. This program is fully funded by NIOSH; therefore, there is no monetary cost to the participant. Three companies who have voluntarily received site evaluations from the NIOSH Field Research Team were recently interviewed by Nanowork, LLC for its August/September 2007 issue of Nanorisk (www.nanorisk.org/). Overall, they described the collaboration as beneficial, and encouraged other companies to take advantage of NIOSH's expertise, services, instrumentation, and unbiased assessments.

For more information about occupational safety and health topics pertaining to engineered nanomaterials, including fact sheets about the Field Research effort and other nanotechnology research programs, please visit the NIOSH nanotechnology topic page at www.cdc.gov/niosh/topics/nanotech. To discuss the possibility of receiving a site evaluation by the NIOSH Field Research Team, contact Charles Geraci, Ph.D., CIH at (513) 533-8339, CGeraci@cdc.gov or Mark Methner, Ph.D., CIH at (513) 841-4325, MMethner@cdc.gov.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health



NIOSH

Building the knowledge base

The NIOSH Nanotechnology field team is collaborating with partners for field assessments.

- Share knowledge
- Use expertise
- Build experience
- Partner

Truth: number of nanomaterials that could exist is huge.
A substance-by-substance approach is impractical.

A New Approach?

- Current processes require detailed risk profiles
- Knowledge of potential nanomaterial risks are just emerging.
- To protect workers, and the public health, a new approach is needed.
- It must be proactive and collaborative
- Government, industry, workers, an academia must participate.

Aims of a Nanotechnology Partnership

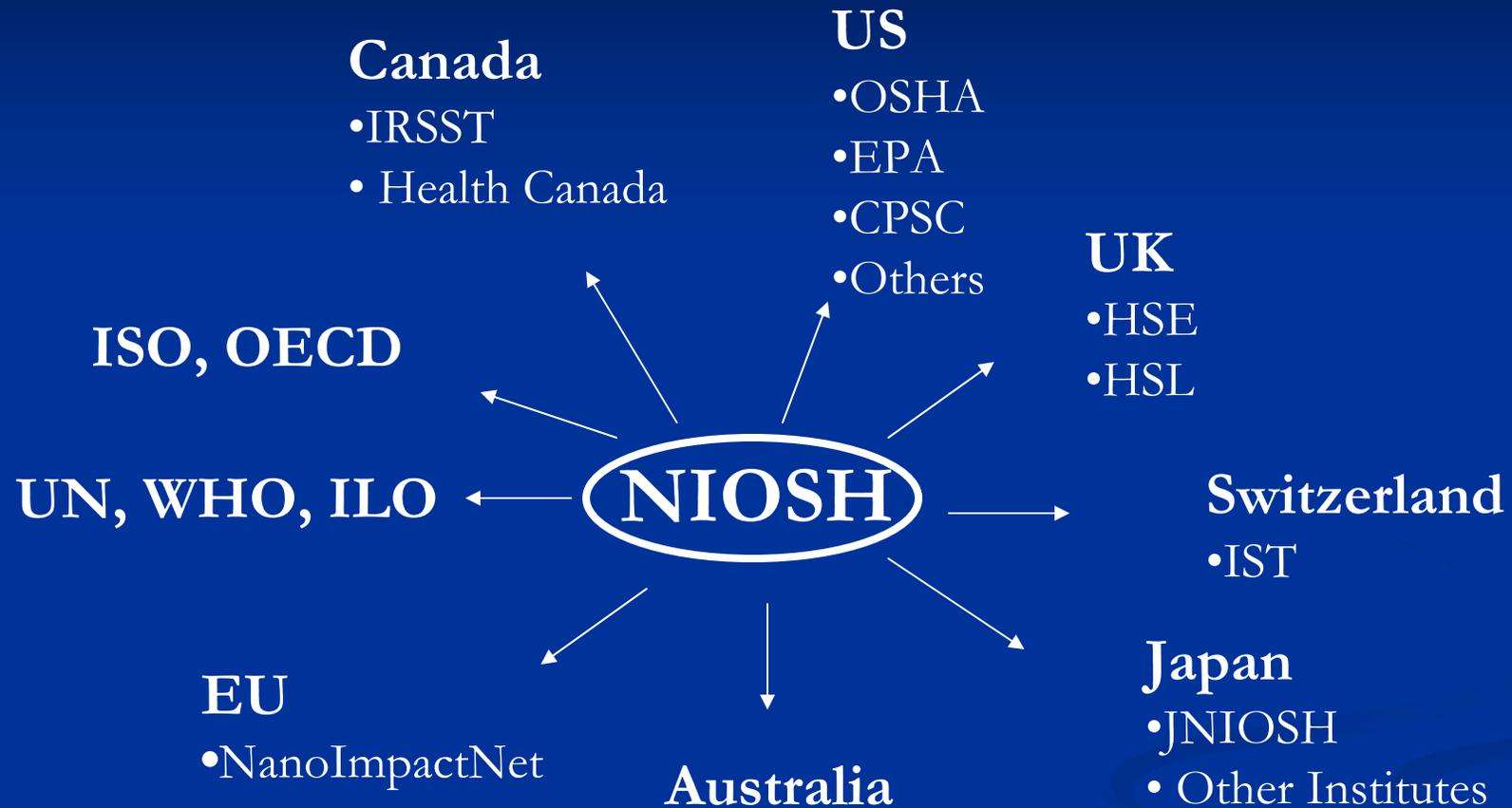
- Encourage prudent exposure control measures.
- Promote nanomaterial risk assessment and management research.
- Collect and share exposure information.
- Evaluate various risk management practices.
- Develop evidence base to protect workers
- Promote development of recommendations by NIOSH

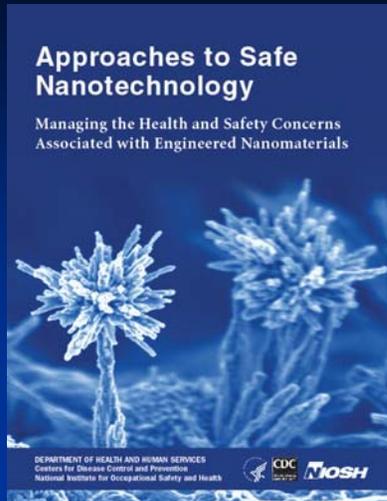
Expectations of a Partnership

- Develop harmonized exposure assessment methods
- Effective sharing of research results
- Temporary exposure guidelines
- Develop and share effective control strategies
- Training
- Work within existing regulatory frameworks
- Regular evaluation of activities

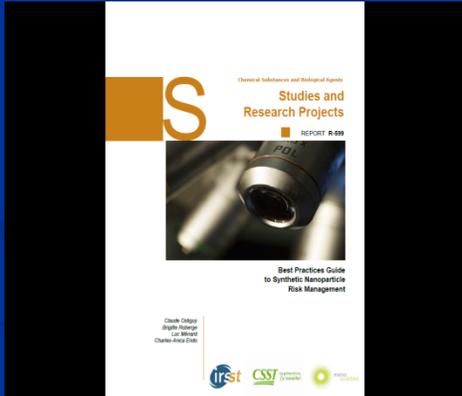
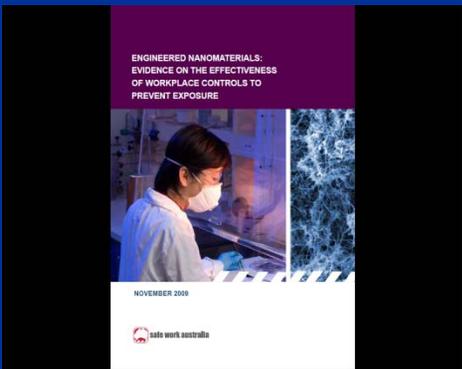
Should this not be considered globally?

Global Collaboration





Good Guidance Supporting Good Policy Globally



There is still work to be done.





Thank you!

Charles.Geraci@cdc.hhs.gov

