NANOTECHNOLOGY in the Workplace: Occupational Health Safety and the Environment

Managing Uncertainty

Kenneth A. Mundt, Ph.D.

Securing the Promise of Nanotechnology: Is US Environmental Law Up to the Job?

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Workplace Issues - Overview

- Explosive growth projected in commercialization of nanotechnology products
- Hundreds of thousands of new and redefined jobs
- Substantial potential for exposures
  - Unseen materials
  - “Clean” workplaces
- Currently early stages of development - now is the time to define needs and proceed
- How should we proceed?
Key Questions?

- What do we know about these products?
- What rules and regulations exist?

- We know very little about health effects (though many are laying the foundation)
- There are no laws in the US currently regulating nanotechnology
Motivation for Action

- Moral and ethical obligations to employees, society
- Good business practices
- Fear of future litigation (lessons learned from past transgressions)
- Additional pressures
  - Investors
  - Insurance Industry
Model for Action

Practical occupational health strategies

Scientific foundations

Appropriate regulations
- Protective of health
- Supportive of safe production
What is the Workforce?

- Current workforce mixed, technology-based
  - R&D operations
  - Large numbers of small facilities and labs
  - Universities and small enterprises

- Increasing shift toward piloting and ramping-up operations

- Full-scale production is projected to take years
Nanotechnology is Everywhere - NOW

- Foods, additives, packaging
- Construction materials, coatings
- Defense, aerospace
- Energy production, storage distribution
- Environmental remediation
- Fibers, textiles
- Electronics, communications
- Consumer products, cosmetics, pharmaceuticals
- Health care
Potential for Nanoparticle Exposures

- Employees in all areas will have potential for exposure
- Workforce is at front line
- Current employees (and those soon to be employed) probably will have the greatest exposures
  - Possible lack of appropriate controls
  - Ability to measure limited
Exposure Potential

- Serious potential for harm if proper actions not taken

- Mass production just beginning
  - Automation prevalent
  - Relatively huge volumes

- Increased concern about upsets, exposure beyond immediate application/manufacturing site

- Larger potential volume of wastes to handle
Gateway to the Environment

- Employees needed in diverse work areas
  - Manufacturing
  - Transport
  - Application
  - Take-home exposures
  - Emissions
  - Waste streams
  - Product streams

- Specific exposure and health issues will differ
What do we know (too little)

Why?

Scientific bases of toxicology, epidemiology (exposure assessment and risk evaluation) lagging behind
- Inherently slower
- Long-term effects subject to long latency periods

Meanwhile, pragmatic approaches needed
- Production could outpace protections
- Not all materials will be problematic
Practical Approaches to Managing Uncertainty

- Prioritization of issues
- Identifying pragmatic approaches
  - Classifying substances
  - Performance-based controls
    - Adaptations of existing successful approaches
    - Potent compounds model (pharma, biotech, microbiological)
  - Not all substances of equal concern
    - Unclear which are priority materials
    - Understanding is evolving
- Ability to be proactive vs. reactive
- Exposure reduction, control
Pragmatic approaches

- Engineering control of exposure
- PPE and employee training
- Exposure monitoring
- Health surveillance

- Willing to adjust or pull the plug if necessary
Scientific Base

- Scientific foundation must be built in parallel to interim workplace measures
- Societal obligation to generate and publish scientific findings
- Necessary to support policy formulation
Conclusions

- Limited available science should not deter development of effective safeguards
  - Build on existing models
  - Err conservatively

- Multidisciplinary approaches preferred

- Objective communication of both risks and safety critical in an environment susceptible to sensationalism
  - Substantiated through science and practice
  - Not limited to scientific community
Thank You

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