

WORKER TRAINING

**WHAT MUST WORKERS
LEARN WHEN OUR
KNOWLEDGE IS
INCOMPLETE?**

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CURRENT SITUATION

- Emerging Technology
 - Number Of Workers Affected Will Increase In Future
- Hazard And Risk Information Incomplete
 - Concerns Identified

CURRENT SITUATION

- No OSHA Standard on Nanoparticles
 - Training Would Be Required
 - Topics To Cover Would Be Defined
 - Hazard Communication Standard Applies
 - Otherwise, Training Largely “Voluntary”

CURRENT SITUATION

- Only Few Worker Safety and Health Training Programs Developed
 - WISHA On-Line Training
 - ORC Worldwide
 - University Labs – Columbia
- Most University Lab Training Has No Focus On Nanotechnology

ISSUES AFFECTING TRAINING

- Incomplete Information
 - Nature/Extent Of Exposure
 - Methods to Assess Exposure
 - Use Conditions

ISSUES AFFECTING TRAINING

- Incomplete Information
 - Effective Exposure Controls
 - Human Health Effects
 - Hazard/Risk Data

ISSUES AFFECTING TRAINING

- Worker Concerns
 - Is This The Next Asbestos?
- Level Of Protective Measures To Implement?
 - Framework Important

WORKER TRAINING ELEMENTS

- Definitions and Background
- Hazards and Risks
- Exposures and Assessment
- Framework For Worker Protection Efforts
- Exposure Control Methods
- Applicable OSHA Standards

DEFINITIONS & BACKGROUND

- Define Nanotechnology
- Describe Scale/Examples
- Describe Properties/Uniqueness
 - Differences At Smaller Scale
 - Large Surface Area
 - Large # Particles/Unit Mass

DEFINITIONS & BACKGROUND

- Distinguish Nanomaterials Between:
 - Engineered Nanoparticles
 - Carbon Nanotubes
 - Quantum Dots
 - Incidental Nanoparticles
 - Ultrafine Particles
 - Welding Fumes
 - Diesel Exhaust

DEFINITIONS & BACKGROUND

- Products And Uses
- Future For Nanotechnology
 - Predicted Uses
 - Workers Using/Exposed
 - R&D
 - Commerce

HAZARDS AND RISKS

- Not A Great Deal Known At Present
- What Is Known – Cause For Concern
- Animal Studies: Engineered Nanoparticles
 - Increase Pulmonary Inflammation
 - Decrease Pulmonary Function
 - Fibrosis
 - Translocation

HAZARDS AND RISKS

- Human Data
 - No Info On Engineered Nanoparticles
 - Incidental Nanoparticles (Ultrafine)
 - Decreased Lung Function
 - Lung Fibrosis
 - Lung Cancer

EXPOSURES AND ASSESSMENT

- Cover Routes Of Exposure
- Describe Methods To Assess Exposure
- Explain Problem With Conventional Use of Mass Concentration
 - Surface Area and Particle Size More Important
- No Concensus On Monitoring Technique

EXPOSURES AND ASSESSMENT

- Describe Activities That Increase Likelihood Of Exposure
 - Handling/Transport
 - Maintenance Of Equipment
 - Cleaning Activities
 - Process Upsets/Spills
 - Disposal
 - Disturbance

FRAMEWORK FOR WORKER PROTECTION

- Have Incomplete Knowledge
- Uncertainty About Risk
- Knowledge We Do Have Raises Cause For Concern
- Precaution Is Important

FRAMEWORK FOR WORKER PROTECTION

- Outline Precautionary Principle
- Describe Precautionary Approach
- Treat Nanoparticles As Potential Hazard To Workers
- Use Hazard Approach And Control Measures For Ultrafine Particles
- Revise As Knowledge Warrants

EXPOSURE CONTROL METHODS

- Stress Importance Of Eliminating Or Minimizing Exposure
- Re-emphasize Precautionary Approach
- Outline Hierarchy of Controls
- Elimination – Not Likely

EXPOSURE CONTROL METHODS

- Discuss Substitution
 - Possible
 - Safer Design Of Nanomaterial
- Stress Use Of Engineering Controls
- Describe Engineering Approaches
 - Enclosure
 - LEV
 - HEPA Filters

EXPOSURE CONTROL METHODS

- Work Practices/Administrative
 - Cleaning - HEPA Vacuum
 - Wet Wiping
- PPE – Stress Inadequacies
 - Respirators
 - Protective Clothing

APPLICABLE OSHA STANDARDS

- Hazard Communication (1910.1200)
 - Quality Of MSDS's
- Respiratory Protection (1910.134)
- Laboratory Chemicals (1910.1450)
- Access To Exposure And Medical Records (1910.1020)

TRAINING ISSUES TO ADDRESS

- No Best Practice or Concensus Guidance
- Addressing Knowledge Gaps
 - Updating To New Knowledge
- Assuring Understanding
 - Receiving vs Understanding
 - Format/Learning Techniques

TRAINING ISSUES TO ADDRESS

- Language, Literacy, Education Level
- Ability To Interact With Instructor
- Qualifications Of Trainers
 - Worker Trainers
- Incorporation Of Medical Surveillance

TRAINING ISSUES TO ADDRESS

- Required vs Voluntary Training
- How Often, Circumstances?
 - During Working Hours
 - Length
- Who Is Covered
 - Exposed/Potentially Exposed