

# Global Safety and Health Issues and their Impact on Worker Training

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*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*





**Globalization:** Process of growing interdependence of all people on the planet

Linked together by trade, investments, information, media, and governance



# NIOSH Strategic Goal 3

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## Enhance global workplace safety and health through international collaborations

- Take a leadership role in developing a global network of occupational health centers.
- Investigate alternative approaches to workplace illness and injury reduction and provide technical assistance to put solutions in place.
- Build global professional capacity to address workplace hazards through training, information sharing and research experience.

# UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

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- Single globally harmonized system
- To address classification, labels and MSDS
  - 1992 – work began
  - 2002 – first edition
  - 2005 – revised first edition

# GHS Pictograms and Hazard Classes



- Oxidizers



- Flammables
- Self Reactives
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Organic Peroxides



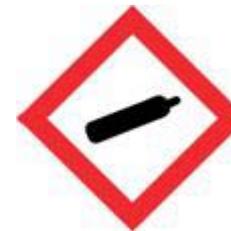
- Explosives
- Self Reactives
- Organic Peroxides



- Acute toxicity (severe)



- Corrosives



- Gases Under Pressure



- Carcinogen
- Respiratory Sensitizer
- Reproductive Toxicity
- Target Organ Toxicity
- Mutagenicity
- Aspiration Toxicity



- Environmental Toxicity



- Irritant
- Dermal Sensitizer
- Acute toxicity (harmful)
- Narcotic Effects
- Respiratory Tract
- Irritation

# Hazard Communication Standard

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OSHA proposing to modify HazCom to conform with GHS

- Revised criteria for classification of chemical hazards (pictograms, hazard statements, labeling)
- A specified format for safety data sheets
- Requirements for employee training on labeling and safety data sheets

# REACH

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## *Legislation issued in 2007 by European Commission*

- Registration, Evaluation, Authorization and Restriction of Chemicals
- Puts responsibility of assuring safety of chemicals on industry
- Based on principle: no data—no market
- Amount of effort-function of tonnage
  - Threshold: 1 metric ton/yr
    - ◆ Acute toxicity
    - ◆ In vitro skin and eye irritation
    - ◆ Mutagenicity (Ames test)
  - More extensive testing at 10, 100, and 1,000 ton levels

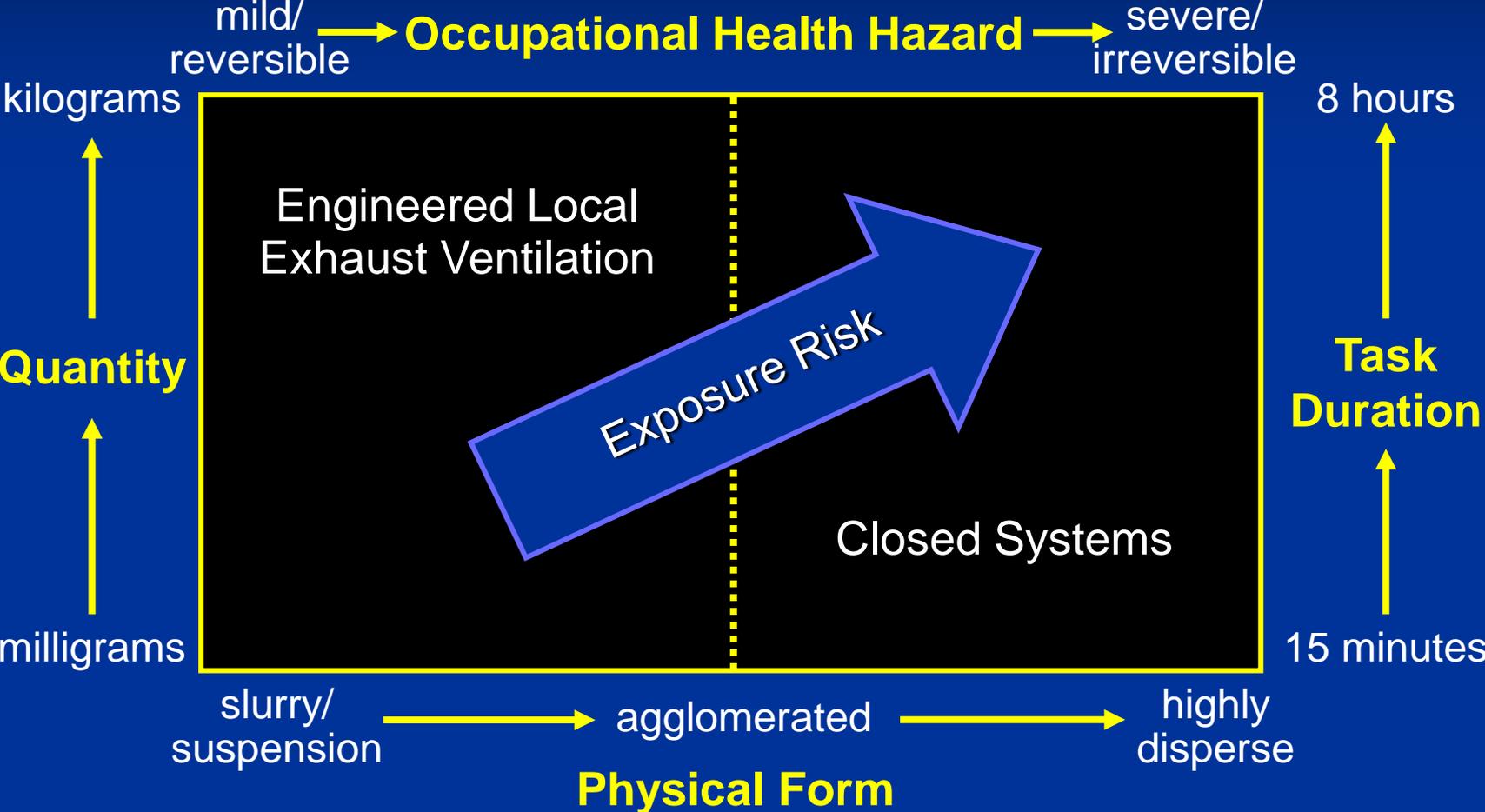
- Change that may be most confusing to workers will be “new exposure limits”
  - Derived no effect levels (DNELs)
  - Level above which humans should not be exposed
  - >10 tons requires calculation of DNEL
  - Potential for more than 20 DNELs based on combination of
    - ◆ Target population
    - ◆ Routes of exposure
    - ◆ Duration of exposure
    - ◆ Whether effect is local or systemic
  - The “worker-inhalation-chronic-systemic” combination most similar to traditional OEL

# Control Banding

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- Majority of substances - No Occupational Exposure Limit (OEL)
- Many small businesses lack expertise and money to measure exposures and implement controls
- Control banding
  - Grouping chemical exposures:
    - According to similar chemical and physical characteristics
    - Intended process handling
    - Anticipate exposure scenarios
- Derived from: U.S. pharmaceutical industry
- British HSE work began in 1990s

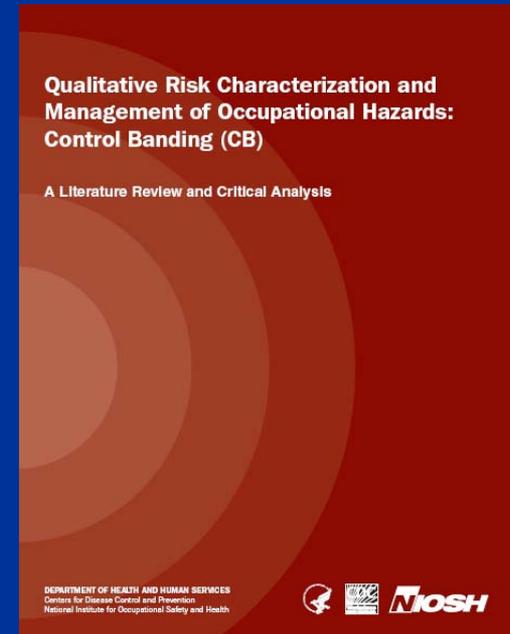
# Factors Influencing Control Selection



# NIOSH 2009 Document

## Qualitative Risk Characterization and Management of Occupational Hazards: Control Banding (CB)

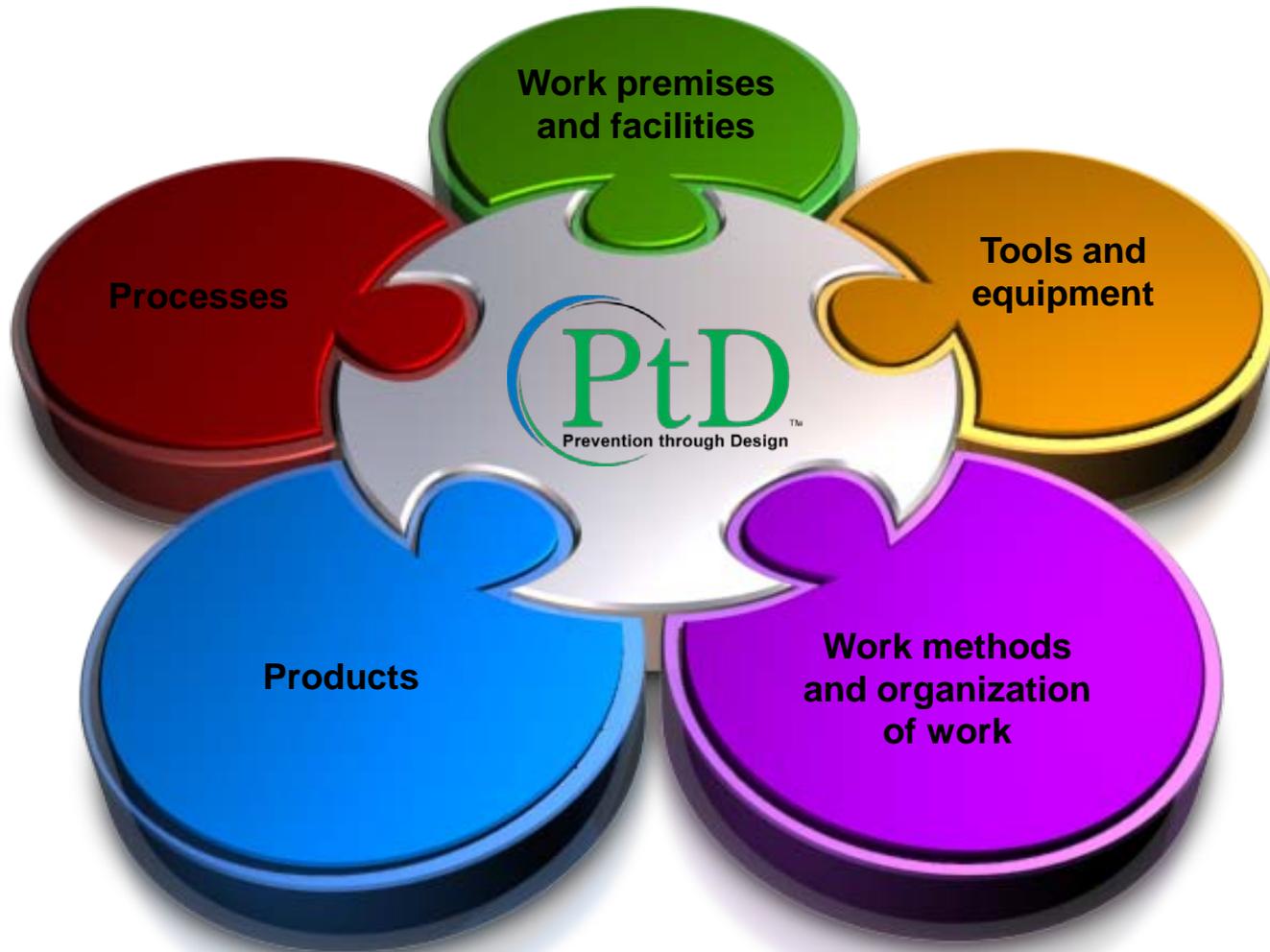
**Scope:** a literature review and critical analysis of the state-of-the-art, validation, and effectiveness of control banding



# Prevention through Design (PtD)



**Mission:** To prevent occupational injuries, illnesses, and fatalities through the inclusion of prevention principles in all designs that impact workers



# Incorporates Hierarchy of Controls



# Prevention through Design (PtD)

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## *Driven by global issues*

- Large burden of occupational disease and injury
- Need to be competitive
- Practices in other countries
  - UK
  - Australia
  - Europe
- Growth of ergonomics
- Sustainability/Green

# Prevention through Design

A National initiative on PtD has been inaugurated by NIOSH and a group of collaborating organizations

*American Industrial Hygiene Association*

*American Society of Safety Engineers*

*Association of Equipment Manufacturers*

*The Center for Construction Research and Training (CPWR)*

*Kaiser Permanente*

*Liberty Mutual*

*National Safety Council*

*Occupational Safety and Health Administration*

*ORC WorldWide™*

*Regenstrief Center for Healthcare Engineering*



# Factors Influencing Goals Development

## Education

## Practice

Develop/disseminate education programs

Expand education reach

PtD in textbooks

Expand curricula

Include PtD in licensure and certification exams

Share successful practices

Identify PtD tools/equipment

Share successful processes

Demonstrate business value

Integrate PtD into org. behavior

Expand incident investigation

Increase worker involvement

Build PtD into existing systems

PtD consensus standard

Add PtD to existing standards, regulations and guidelines

Gov. agencies adopt PtD

Define PtD vision and outcomes

Include PtD in sustainable design and construction practices

Improve surveillance

Investigate PtD ROI

Investigations identify design-related factors

Investigate motivators and barriers

Investigate effective designs

**Prevent or reduce occupational injuries, illnesses, and fatalities**

## Policy

## Research

# Potential Climate-Related Occupational Hazards

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- Increased ambient temperatures
- Air pollution
- Ultraviolet exposure
- Extreme weather
- Vector-borne diseases/expanded habitats
- Industrial transitions/emerging industries
- Changes in the built environment

(Schulte and Chun, 2009)

# Potential Climate Change Impacts

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*Climate change effects, if they occur, are likely to...*

- Increase prevalence, distribution and severity of known hazards
- Result in increased incidence of morbidity, mortality, and injury

*No evidence of unique of previously unknown hazards*

- *But...*the possibility should not be excluded because of potential for interaction of known hazards and new conditions leading to new hazards

# Impact on OS&H Research and Practice

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- Need research linking climate and occupational disease
- Identify workers potentially affected
- *Based on findings, develop*
  - New hazard controls/guidance
  - Occupational exposure limits
  - Hazard and risk communication, and training
  - Expanded surveillance
- Modify risk assessment methods
- Develop leading indicators of climate potentiated effects
- Collaborate with environmental scientists/ "green movement"
- Integrate worker health and safety into sustainability
  - *Going Green: Safe and Healthy Jobs*

# Green Jobs/Chemistry/Sustainability

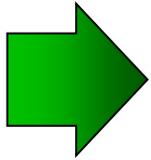
Planetary warming  
Energy limitations



Design to limit impacts  
Green jobs movement



What is green is not necessarily  
worker safe



# Going Green: Safe and Healthy Jobs

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***Sustainability must include worker safety and green jobs must be safe jobs***

- Enhance the safety and health protection of the American workforce
- Expand and apply our knowledge in occupational safety and health to new workplaces, processes, and products
- Ensure the training and re-training of the workforce that will fill these new jobs includes relevant safety and health information



Making Green Jobs Safe Workshop  
December 14 – 16, 2009

# Green Jobs Emphasis Areas

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1. Construction / Infrastructure / Re-Purposing
  - Buildings, bridges, roads, weatherization projects
2. Manufacturing and Emerging Technologies
  - Green chemistry, green nanotechnology, green products
3. Transportation
  - Rail, car, truck, air, battery and solar-powered
4. Agriculture, Forestry, Fishing, including food and food processing
  - New hazards, equipment, and chemicals linked to green practices, alternative fuels
5. Energy and Mining
  - Smart grid, wind farms, solar power, biofuels, alternative energy
6. Waste Management and Recycling

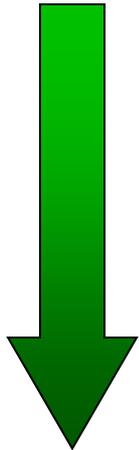
# Green Jobs Occupational Hazards

Old



New

Traditional  
Jobs



Green  
Jobs

## What we know

- Utilize the body of knowledge from safety, industrial hygiene and occupational medicine
- Identify where old hazards are not being addressed adequately.

*How do we apply what we already know to a re-employed / re-deployed workforce?*

## What we know we don't know

- Develop research agenda and planning
- Conduct ongoing assessment of guidance and regulations

*How do we (quickly) support research, disseminate results and transfer it into practice?*

## What we don't know we know

- Determine the extent to which old hazards will be manifest in green jobs
- Determine how to adapt old guidance to new jobs

*How do we identify and apply "old" knowledge to these new jobs?*

## What we don't know we don't know

- Be alert for sentinel events
- Consider leading indicators

# Nanotechnology

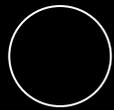
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- Understanding phenomena of materials at the nanoscale (1-100 nm) will impact all sectors
- Nanoscale particles may be more toxic than larger ones
- Current exposure limits for substance may not be appropriate for their nanoscale variants
- Work practices and engineering controls are crucial for worker safety
- Nanotechnology is a global effort

# Increasing & Coalescing Evidence from Animal Studies of Engineered Nanomaterials

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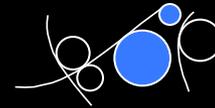
- Studies of experimental animals show cancer, pulmonary fibrosis, cardiovascular effects
- Consistent patterns of toxic effects related to oxidative stress
- Effects seen after relatively short exposure and low doses
- Variability due to contaminants and physico-chemical parameters



Spherical homogeneous



Agglomerate homogeneous



Agglomerate heterogeneous



Fibrous homogeneous



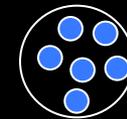
Heterogeneous concentric



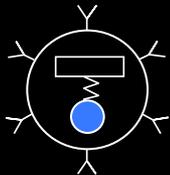
Active particle



Non-spherical homogeneous



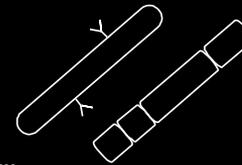
Heterogeneous distributed



Multifunctional particle



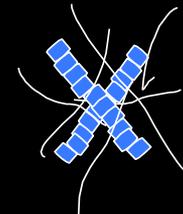
Non-spherical heterogeneous



Fibrous heterogeneous



Agglomerate fibrous homogeneous



Agglomerate fibrous heterogeneous

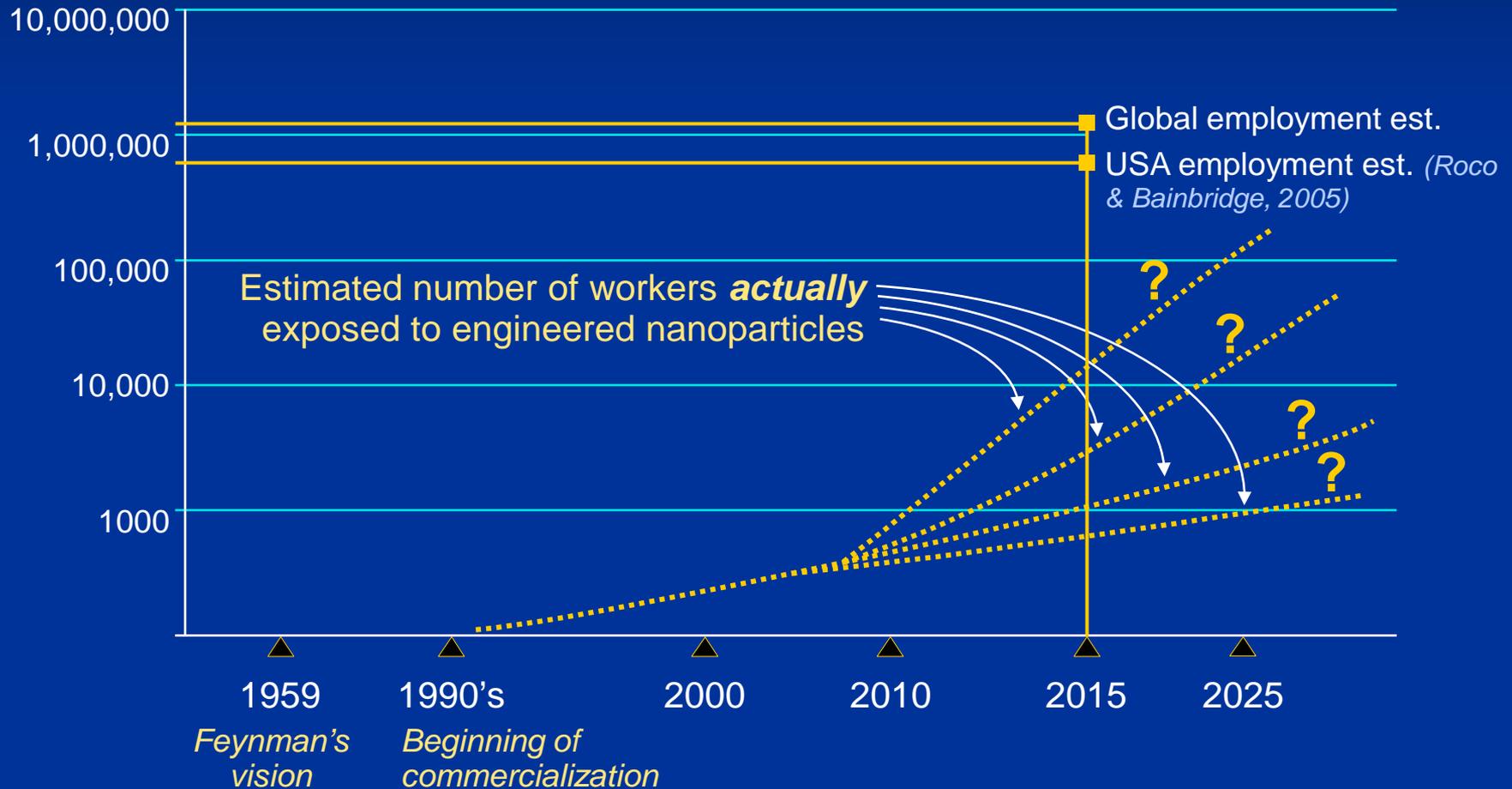
# Critical issues

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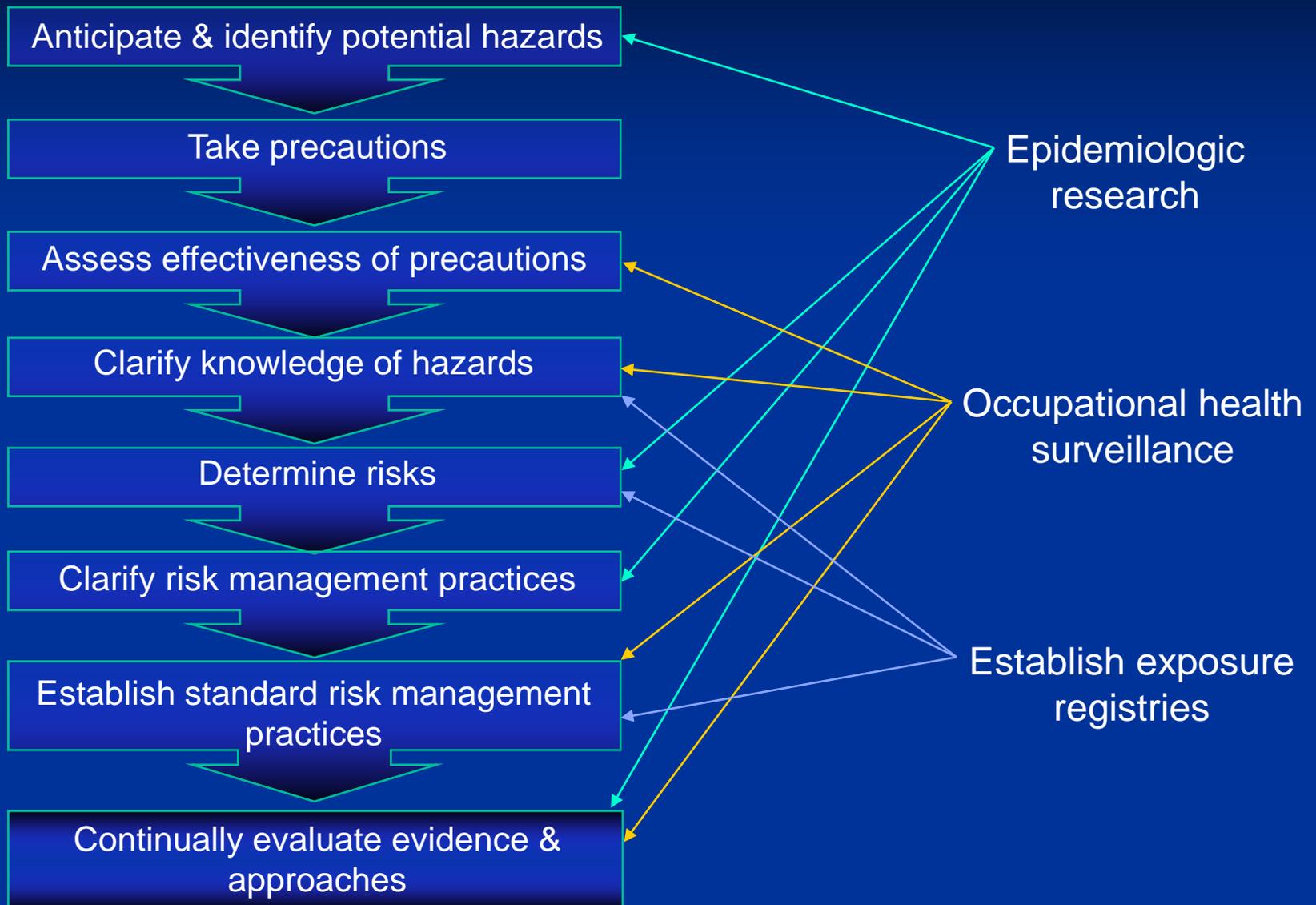
- What metrics to use
- What are current exposures
- Where are the workers
- What occupational health surveillance is warranted

# Dilemmas in Identifying Workers Exposed to Engineered Nanoparticles

Number of Workers Exposed



# Steps to Protect Workers from Hazards of an Emerging Technology



# World Health Organization/International Labour Organization/International Programme for Chemical Safety

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## *67 WHO network of collaborating centers*

- Develop national action plans on worker health
  - Silica, asbestos, HBV
- Develop practical tool kits for worker health protection and health promotion
- Improve performance of OHS Services
- Encourage research on nanotechnology and climate change
- Incorporate worker health into non-health policies and product
  - Economic benefits to worker health
  - Guidance to banks
  - High-risk and vulnerable population
- IPCS Chemical Safety Cards