

Understanding Occupational Safety and Health Issues of Nanotechnology: A Progress Report

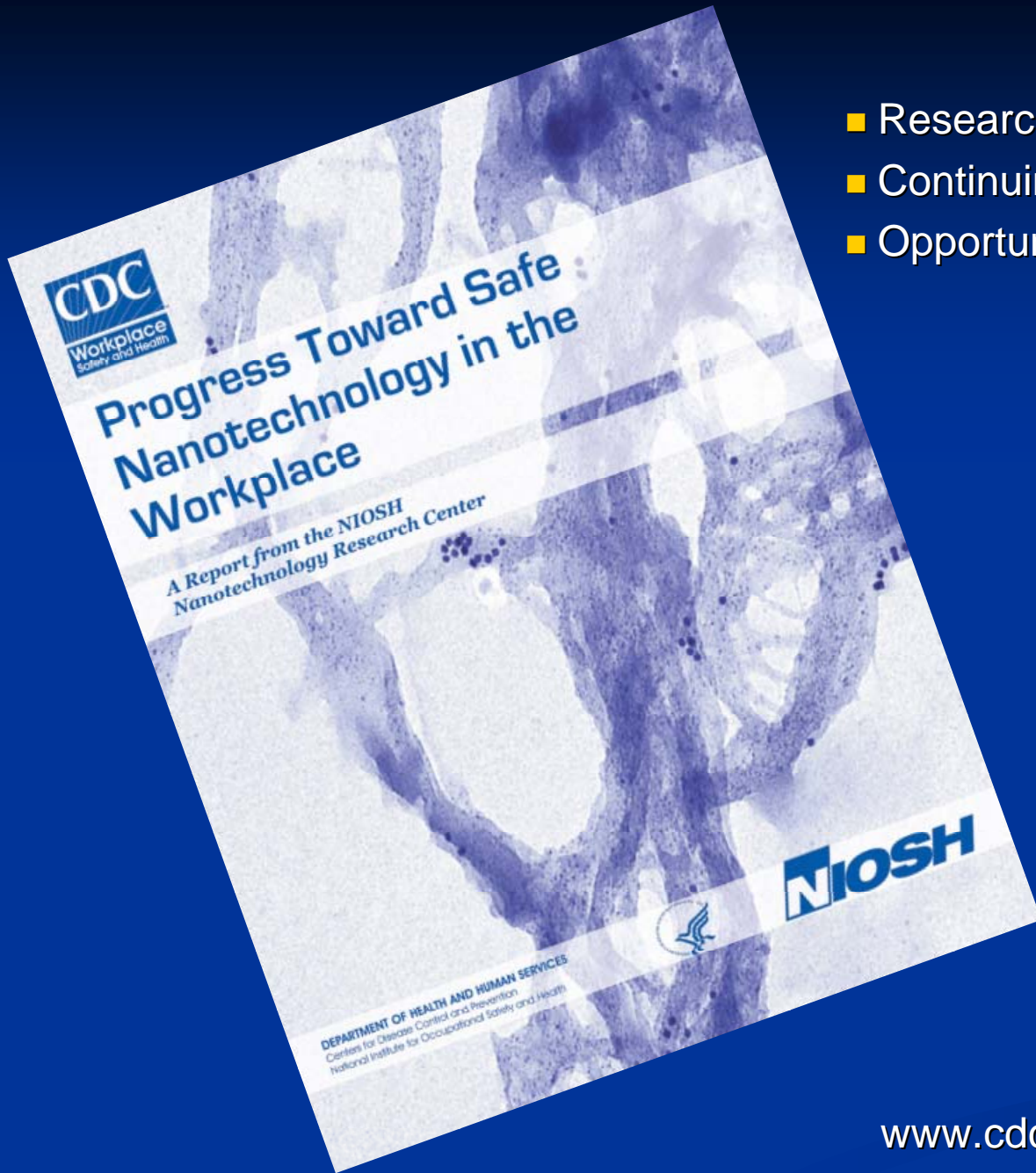
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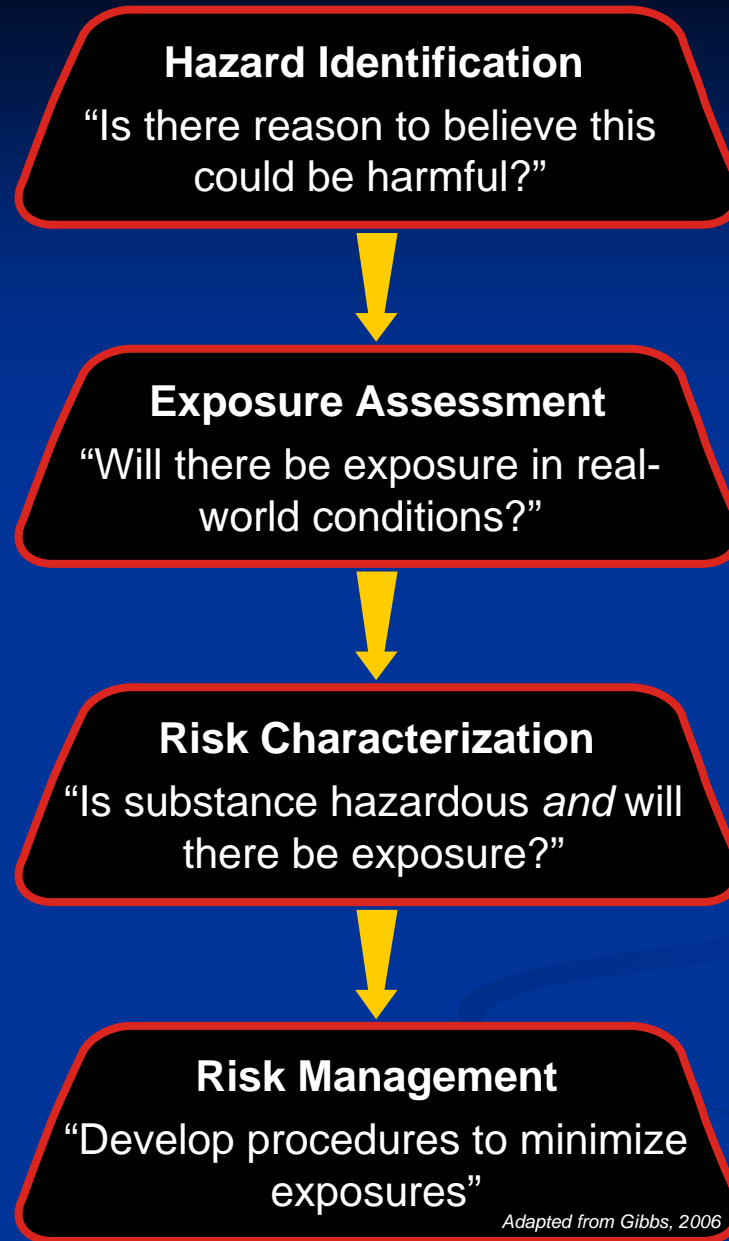
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- Research progress in 10 key areas
- Continuing project plans
- Opportunities for collaboration

Steps to Protect Nanotechnology Workers



Hazard Identification

What we know

- Health effects from industrial ultrafines, fibers, and air pollution
- Some single walled carbon nanotubes caused fibrosis in mice lungs
- Cardiovascular response from SWCNT and TiO_2
- SWCNT effects on skin cells
- Some explosive, reactivity, and flammability potential

What we don't know

- Applicability to engineered nanoparticles
- Nature and severity of effects on lungs
- Extent of movement to other parts of the body
- What properties of nanoparticles influence how the body responds
- Extent of skin absorption
- Extent of explosivity, reactivity, and flammability

Exposure Assessment

What we know

- Nanoparticles can be measured
- Engineered nanoparticles can get into workplace air
- Specific tasks may increase risk of exposure
- Maintenance work can result in skin and inhalation exposure

What we don't know

- What are the best measures
- What is the extent of exposure
- Sampling techniques not readily applicable
- Personal breathing zone monitoring techniques need development

Risk Characterization

What we know

- Greater risk from nanoparticles on a mass basis than larger particles of the same material
- Animal models can describe human risks
- Using animal data on ultrafines: lifetime risks to workers at current OELs may be $>1/1000$

What we don't know

- What are the risks the beyond experimentally characterized range
- How chemical and physical factors influence risk
- Exposure-response relationships for most nanoparticles
- Long term health effects

Risk Management

What we know

- Airborne exposure to nanoparticles can be controlled
- Good work practices can minimize exposures
- Respirators should be effective
- Current macroscale OELs are probably not protective at the nanoscale

What we don't know

- Limits of controls
- No appropriate OELs specifically for engineered nanoparticles
- Limits of respirators and PPE
- Focus for medical surveillance

What would additional funding enable NIOSH to do:

- Assess more nanoparticles for toxicity \$ 2 million/yr
 - Conduct more field visits to assess nanoparticle exposure \$ 1 million/yr
 - Conduct a broader range of control technology and PPE research \$ 2 million/yr
 - Conduct molecular epidemiologic studies of nanotechnology workers \$ 3 million/yr
 - Initiate research on applications of nanotechnology to occupational safety and health \$ 1 million/yr
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Total \$ 10 million/yr

Thank You

www.cdc.gov/niosh/topics/nanotech