# NIOSH Nanotechnology Research Center Strategic Plan 2018-2025

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NSF Grantee's meeting
December 7, 2018

# Strategic Plan Contents

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- How Do We Get There?
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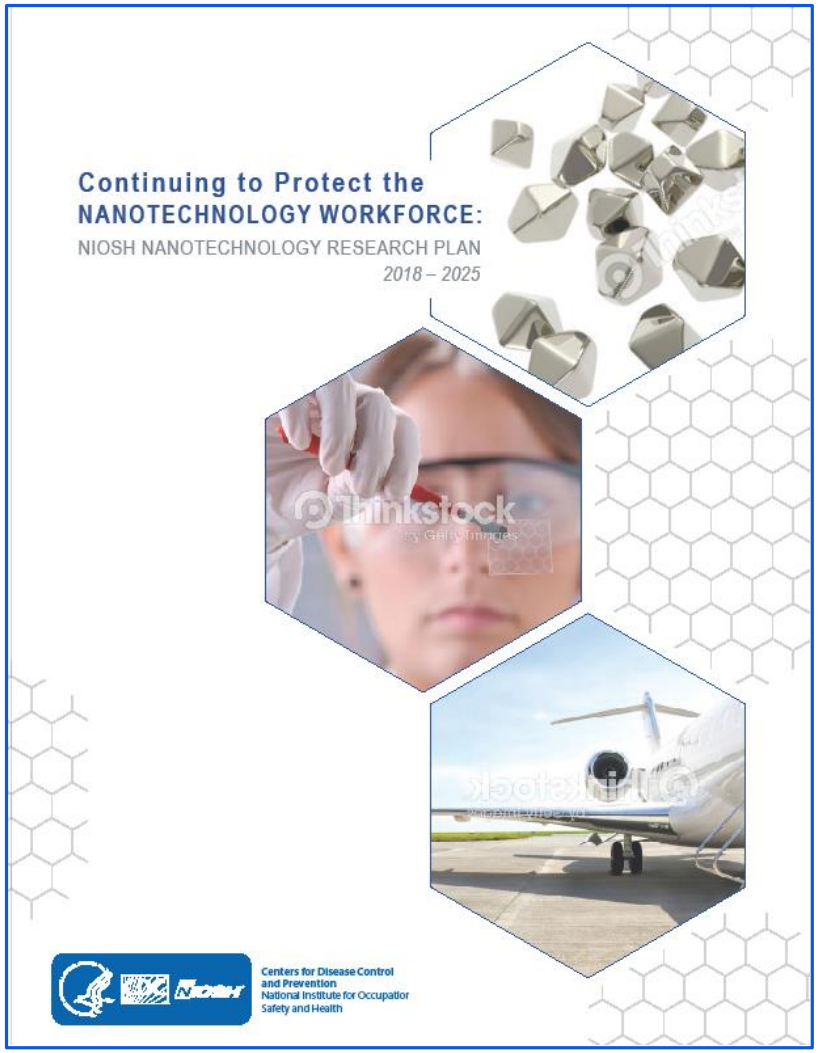


# Where are we now?

10 Research Areas

- **Toxicology and internal dose**
- **Measurement methods**
- **Exposure assessment**
- **Epidemiology & surveillance**
- **Risk assessment**
- **Engineering controls & PPE**
- **Fire & explosion safety**
- **Recommendations & guidance**
- **Global collaborations**
- **Applications & informatics**

**Collaborative research to answer questions:**

- **Is there a hazard?**
- **Is there exposure?**
- **How can risk be best managed?**

# Where are we now? 15 Years of Accomplishments

- Recommended Exposure Limits for CNT, CNF, nano $TiO_2$, nano Ag
- Guidance Documents (Approaches, Lab Safety, Small Biz, Eng Controls, Design Solutions, Workplace poster)
- >1,400 Peer reviewed articles
- Foundational and continued nanotoxicology research including an aerosol generation system
- Nanomaterial Exposure Assessment Technique (NEAT 2.0)
- International and National Collaborations with WHO, ISO, OECD, ASTM, academia, other government agencies and NGOs.
- Promotion of responsible development

# Where do we want to be?

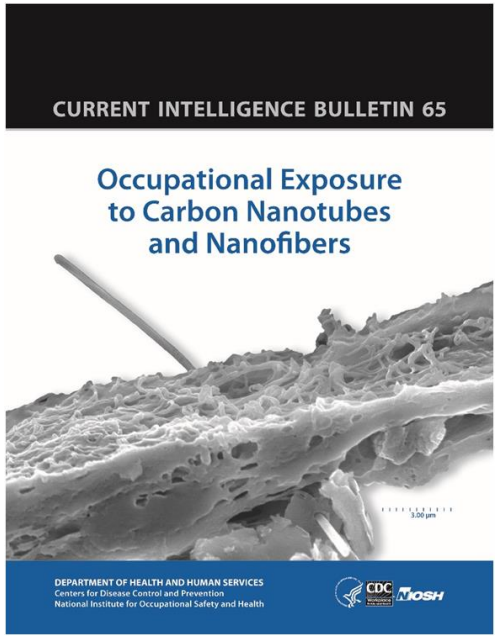
- Develop categorical and material specific exposure limits
- Continue to support the responsible development of nanomaterials and protect the nanotechnology workforce
- Apply the existing knowledge to advanced manufacturing such as additive manufacturing, biobased manufacturing & robotics so that these too are developed responsibly and with consideration for occupational health and safety.

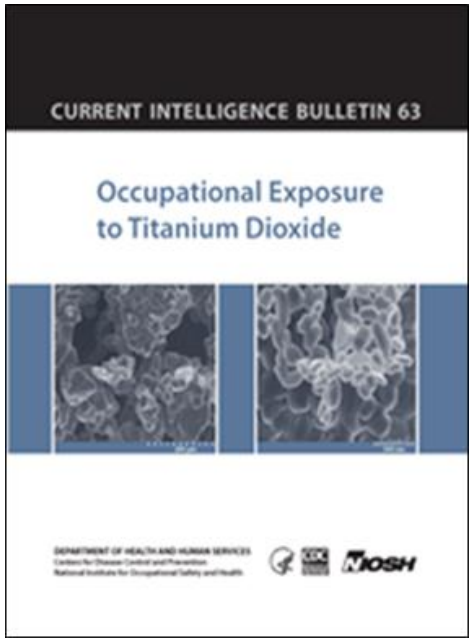
# Strategic Goal 1

- Increase understanding of new nanomaterials and related health risks to nanomaterial workers

# Strategic Goal 2

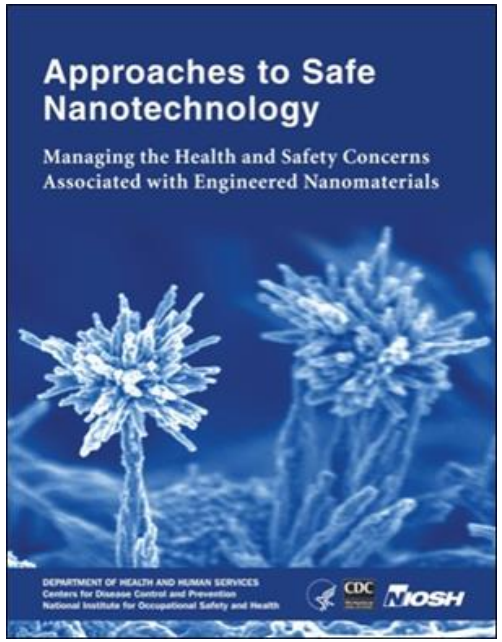
- Build upon initial data and information to further increase understanding of the initial hazard findings of engineered nanomaterials.

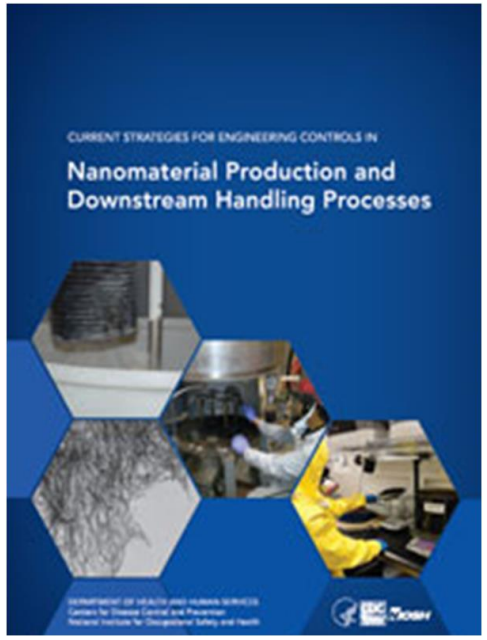


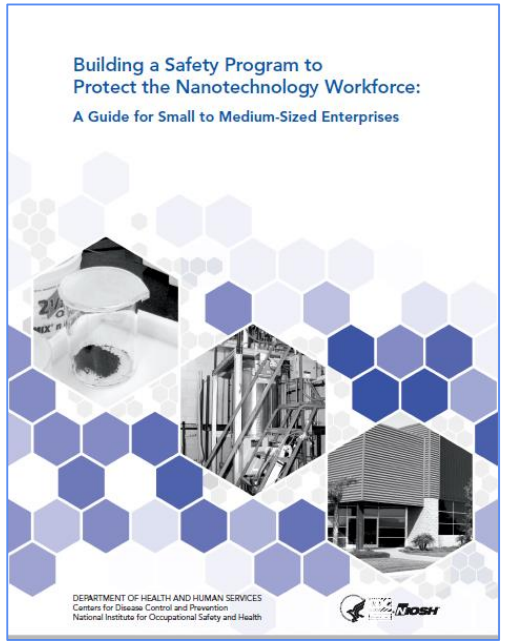



# Strategic Goal 3

- Build upon initial guidance materials to further inform nanomaterial workers, employers, health professionals, regulatory agencies, and decision-makers about hazards, risks, and risk management approaches.



# Strategic Goal 4

- Support epidemiologic studies for nanomaterial workers, including medical, cross-sectional, prospective cohort, and exposure studies.

# Strategic Goal 5

- Assess and promote national and international adherence with risk management guidance.


# How do we get there?

- NIOSH conducts intramural and extramural research
- NIOSH intramural proposals are scored by a group of scientists
- Intramural and extramural research should address the Strategic Goals
- NIOSH intramural projects are prioritized by Burden, Need and Impact
- Extramural programs → CDC Office of Extramural Programs
  - NIOSH does write letters of support

# Burden, Need and Impact Criteria

- **Burden** may be defined as risks from exposure to work-related hazards; occurrence of injuries, illnesses, and deaths due to work-related factors; and broad economic and social impacts including well-being.

- **Need** places emphasis on research methods and approach. NIOSH has a comparative advantage if it can produce something at a lower opportunity cost or more efficiently than another organization.

- **Impact** criteria assesses *likelihood of research to reduce burden*. Impact is a measure of the potential contributions of the project to worker health and safety on the basis of evident or anticipated end outcomes or well-accepted intermediate outcomes.

# Outputs and outcomes, how these relate to impact

- Outputs - NIOSH research activities
- Intermediate Outcomes - What employers and industry do with NIOSH outputs
- End Outcomes – Improvements in safety and health in the workplace

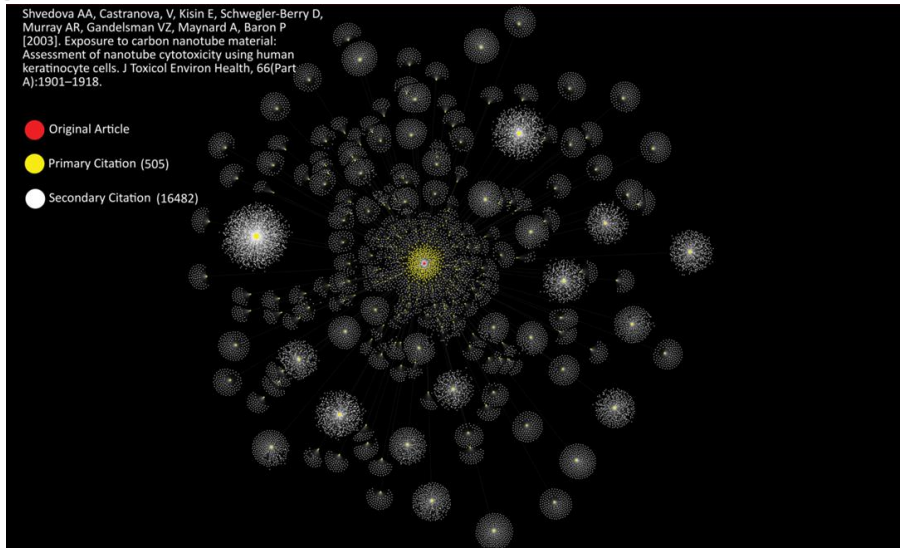
# Example Generic Burden & Need statements for nanomaterial research

- **Burden:** Some nanomaterials are 10 times more potent than their bulk materials. Animal studies show some nanomaterials can affect the lungs and cardiovascular systems, and contribute to neurological changes. There are more than 1,800 consumer products.

- **Need:** Potential for workers to be exposed. Need information on all steps of risk management from hazard identification to control approaches across life cycle. Is NIOSH the best place for the research?

# Impact: Tracking progress of NIOSH outputs and intermediate outcomes


- Bibliometric analysis (1° and 2° citations)
- Social media metrics (Alt Metrics)
- Adoption of NIOSH guidance by NGOs or government agencies
- Numbers of field research partners
- Impact stories
- Number of web page users
- User survey



# Where to find information on extramural funding:
# https://www.cdc.gov/niosh/oep/default.html

The NIOSH extramural research and training programs include diverse portfolios of investigator initiated research, mentored research scientist career development awards, training programs, and small business innovation research projects. Multidisciplinary education and research centers, state surveillance programs, and global occupational health initiatives complement the breadth and depth of extramural research and training at NIOSH.

A description of these portfolios is available along with links to current performance data. Extramural performance data includes a listing of all active awards, extramural funding summary by activity and year, and research funding success rates. A link to the NIH Research Reporting Online Reporting Tools (RePORT) provides access to reports, data and analysis of all NIH research. NIOSH participates in this program and you can search NIOSH funded reports by selecting CDC-NIOSH in the Agency /Institute/Center field on the query page.

The peer review and program management of the NIOSH extramural research and training program portfolios is managed by the scientific program officials in the Office of Extramural Programs (OEP). The OEP also manages the extramural portfolio of cooperative agreements for the World Trade Center Health Program (WTCHP). This portfolio includes the WTCHP Registry, research projects, and outreach activities. Please see funding opportunities for current grant opportunities at NIOSH.

Research Impact Stories


Funding Opportunities


Grant Process


Research, Training Grants & State Surveillance

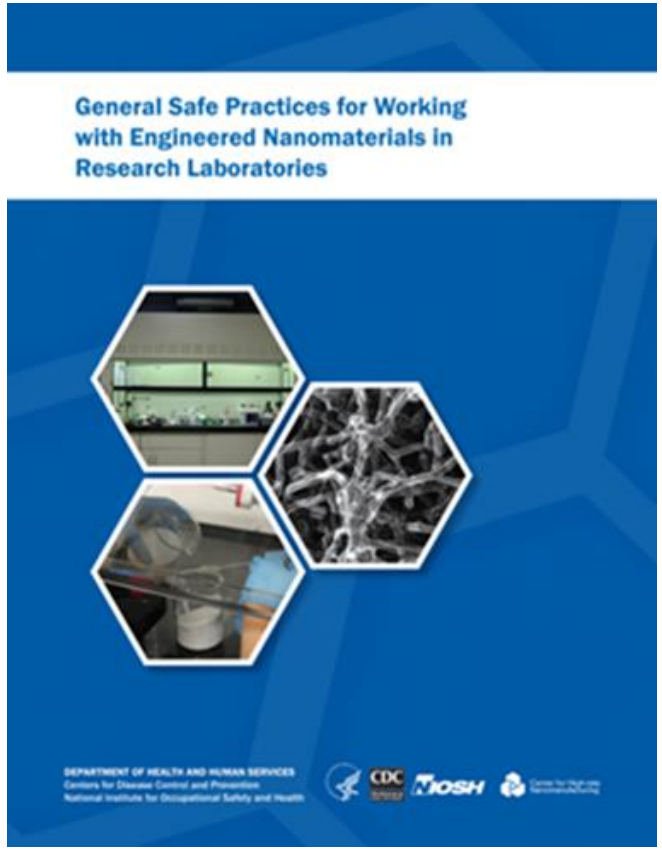
Performance Data & Reports

About OEP

Expanding Research Partnerships:
Webinar Series 2018

Expanding Research Partnerships

# Safety in your laboratory
# www.cdc.gov/niosh/topics/nanotech/pubs.html




NANOTECHNOLOGY

## Guidance & Publications

### Guidance

[Workplace Design Solutions: Protecting Workers during Nanomaterial Reactor Operations]

DHHS (NIOSH) Publication No. 2018-120

The controls described in this document include enclosures for large and small reactors during harvesting as well as an ap controlling exposures during reactor cleaning.

[Workplace Design Solutions: Protecting Workers during the Handling of Nanomaterials]

DHHS (NIOSH) Publication No. 2018-121

The controls described in this document include chemical fume hoods, nanomaterial handling enclosures, biological safety and glove boxes.

[Workplace Design Solutions: Protecting Workers during Intermediate and Downstream Processing of Nanomaterials]

DHHS (NIOSH) Publication No. 2018-122

The controls described in this document include local exhaust ventilation (LEV) such as annular exhaust hoods, enclosures emission points, and down flow booths for larger scale processes.

NTRC NANOTECHNOLOGY RESEARCH CENTER

# Controlling Health Hazards When Working with Nanomaterials: Questions to Ask Before You Start

Here are some questions you should ask yourself before starting work with nanomaterials.

Here are some options you can use to reduce exposures to nanomaterials in the workplace. These options correspond with the questions on the left.

## (1) FORM

Have you done a job hazard analysis? What is the physical form of the nanomaterial? How much are you using? Can you reduce exposure to the nanomaterial by changing its form (for example, putting powder into a solution) or reducing the amount you are using?

### DRY POWDER
(typically highest potential for exposure)

### SUSPENDED IN LIQUID

### PHYSICALLY BOUND/ ENCAPSULATED
(typically lowest potential for exposure)

## (2) WORK ACTIVITY

How are you using the nanomaterial? Could the work activity cause exposure? Is the likelihood of exposure low or high? Can you change the way you do the activity to reduce the exposure?

**Applies to Dry Powder Nanomaterials**

- Higher potential for exposure: Dumping bags of powder, bagging or sieving of products
- Lower potential for exposure: Scooping/weighing of product, transporting containers with light surface contamination or closed barrels/bottles/bags

**Applies to Nanomaterial Suspended in Liquids**

- Higher potential for exposure: Spraying, open top sonication, producing a mist
- Lower potential for exposure: Cleaning up a spill, pipetting small amounts, brushing

**Applies to Physically Bound/Encapsulated Nanomaterial**

- Higher potential for exposure: Cutting, grinding, sanding, drilling, abrasive blasting, thermal release
- Lower potential for exposure: Manual cutting and sanding, painting with a roller or brush

## (3) ENGINEERING CONTROLS

Based on the form and the work activity, what engineering controls will be effective? What are the key design and operational requirements for the control? How does the non-nanomaterial base material or liquid affect exposure?

**Applies to Dry Powder Nanomaterials**

- Chemical fume hood
- Glove box
- Nanomaterial handling enclosure
- Ventilated bagging or dumping stations
- High-efficiency particulate air (HEPA)-filtered local exhaust ventilation

**Applies to Nanomaterial Suspended in Liquids**

- Chemical fume hood
- Glove box
- Nanomaterial handling enclosure
- Local exhaust ventilation
- Ventilated spray booth

**Applies to Physically Bound/Encapsulated Nanomaterial**

- Chemical fume hood
- Glove box
- Local exhaust ventilation
- Downdraft table
- Wet cutting/machining
- Ventilated tool shroud
- Blasting cabinet

## (4) ADMINISTRATIVE CONTROLS

Have you considered the role of administrative controls? Have you set up a plan for waste management? Have you considered what to do in case of a spill or how you will maintain equipment?

**Applies to All Nanomaterial Forms**

- Establish a chemical hygiene plan
- Perform routine housekeeping
- Train workers
- Use signs and labels
- Restrict access to areas where nanomaterials are used
- Handle and dispose of all waste materials (including cleaning materials/gloves) in compliance with all applicable federal, state, and local regulations
- Use sealed/closed bags or containers, and secondary containment
- Label containers, such as "contains nanoscale titanium dioxide"
- Wet wipe or use a HEPA-filtered vacuum
- Do not dry sweep or use compressed air
- Incorporate nanomaterial safety into existing programs such as hazard communication

## (5) PERSONAL PROTECTIVE EQUIPMENT

If the measures above do not effectively control the hazard, what personal protective equipment can be used? Have you considered personal protective equipment for the non-nanomaterial base material or liquid?

**Applies to All Nanomaterial Forms**

- Nitrile or chemical resistant gloves
- Lab coat or coveralls
- Safety glasses, goggles, or face shield
- Respiratory protection when indicated and engineering controls cannot control exposures, and in accordance with federal regulations (29 CFR 1910.134)
- NIOSH guidance on respirators can be found at www.cdc.gov/niosh/topics/respirators/
- Use personal protective equipment during spill cleanups and equipment maintenance

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

Are you interested in learning more about how you can safely work with nanomaterials or want to stay up-to-date on nanotechnology safety? See the NIOSH NTRC website for more information and links to guidance documents: www.cdc.gov/niosh/topics/nanotech/

DHHS (NIOSH) Publication No. 2018-103 | February 2018
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# Thank you for your interest.

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For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov