

Occupational Health Surveillance and Nanotechnology



Acknowledgments

- NIOSH Nanotechnology Research Center Surveillance Working Group
 - NIOSH representatives
 - Federal Partners
 - Dept. of Defense, Dept. of Energy, OSHA, EPA

Guidance Concerning Surveillance

Outline

I. Background and Rationale for Guidance

II. Framework

Needs Assessment

Hazard Assessment

Exposure Assessment

Risk Determination

Periodic Reassessment

Inputs for Consideration of Medical Surveillance

Situations where data are incomplete

Periodic Reassessment

III. Management, Coordination, and Integration

I. Background

Occupational Health Surveillance

- Occupational health surveillance
 - Ongoing systematic collection, analysis, and dissemination of exposure and health data on groups of workers for the purpose of preventing illness and injury
 - May aid:
 - Early recognition of exposure/disease relationship
 - Assurance of safety of new substances
 - Assessment of effectiveness of controls
 - Hazard Surveillance and Medical Surveillance

I. Background

Hazard Surveillance

- Periodic characterization of chemical and physical hazards in the workplace
- Two primary objectives
 - Aid in determining risk of occupational disease
 - Facilitate appropriate interventions

I. Background

Medical (Health Effects) Surveillance

- Targets health events or change in biologic function of exposed persons
- Prevention goals
 - Primary – preventing adverse events from occurring
 - Secondary – detecting adverse events at early stage
- Medical screening
 - One type of medical surveillance
 - Benefit
 - Individual persons
 - Groups of persons – evaluation of sentinel cases and aggregated data

I. Background

Medical Surveillance

- **Sentinel Event** – occupational
 - Disease, disability, or untimely death, which is occupationally related and whose occurrence may:
 - provide the impetus for epidemiologic or industrial hygiene studies; or
 - serve as a warning signal that materials substitution, engineering control, personal protection, or medical care may be required.

Occupational Health Surveillance

- Valuable tool for all occupational health programs
- Standard principles accepted in occupational medicine and public health communities
 - Stepwise approach to surveillance
 - Begins with a “needs assessment”
 - Purpose – make risk determination (by performing hazard and exposure assessments)
 - Where data are incomplete, determination may be qualitative
 - Periodic reassessment is important

Rationale for Surveillance Guidance - 1

- New challenges of nanomaterials
 - Unique physical/chemical properties
 - Information suggesting health risks to workers
- Inadequate data concerning hazard, exposures, and effects on human health
 - Needs assessment can and should be applied even in situations where data are lacking
 - NIOSH guidance recommends needs assessment
 - Framework for conducting needs assessment

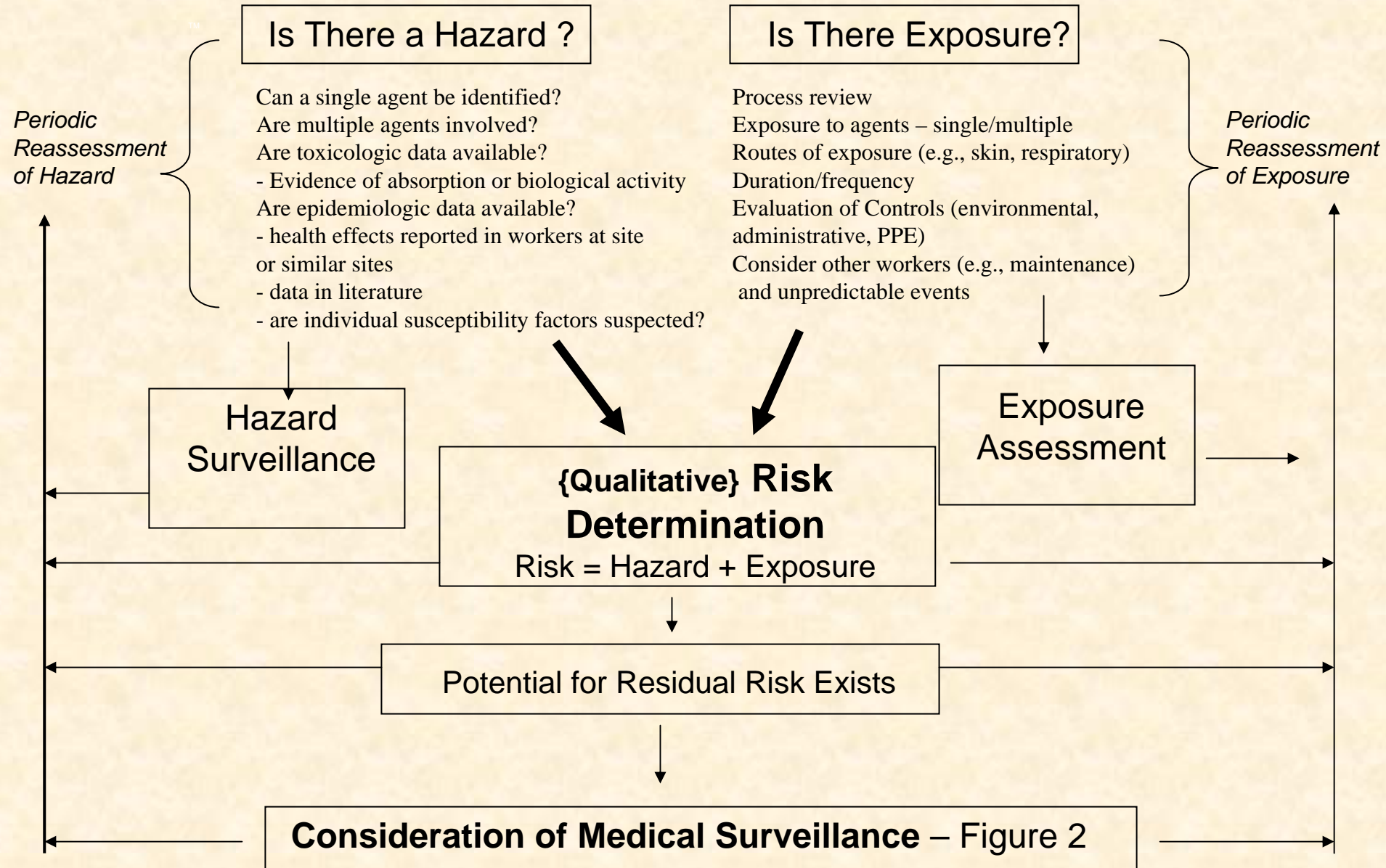
Rationale for Surveillance Guidance - 2

- Framework for consideration of medical surveillance
 - Inputs
 - ‘Basic’ medical surveillance could consist of periodic record or symptom review with attention toward possible sentinel events
- “Living” guidance
 - Limited available data
 - Draft guidance planned for availability for comment
- Small business play important role in nanotechnology
 - Beginning to develop expertise in occupational safety and health

II. Framework

- Figure 1 – Needs Assessment
 - Series of steps or evaluations to gather ‘basic’ information
 - In some situations, ‘basic’ information may not be available
 - Consists primarily of hazard and exposure assessments

1. Occupational Health Surveillance for Nanotechnology – Needs Assessment

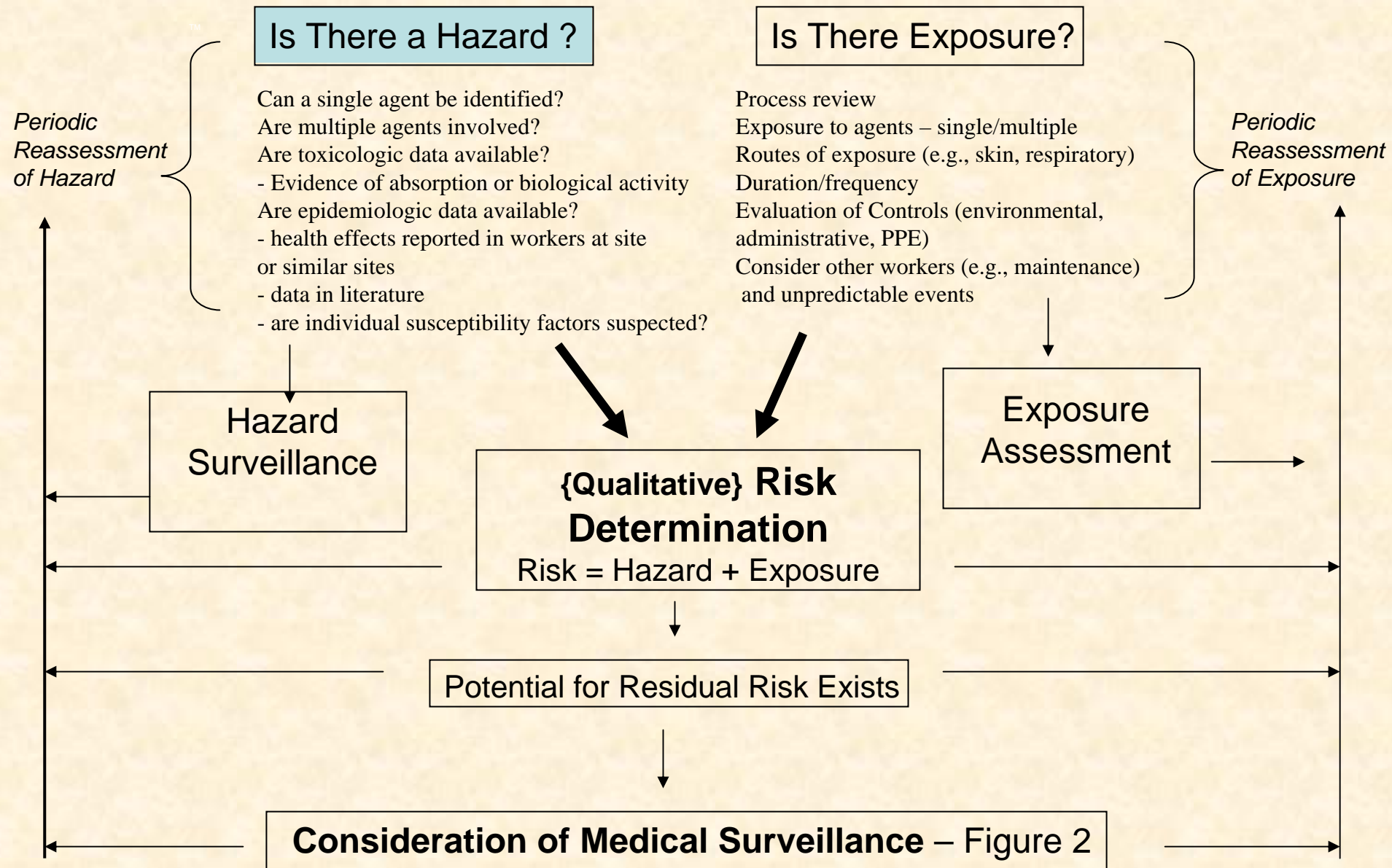


II. Framework

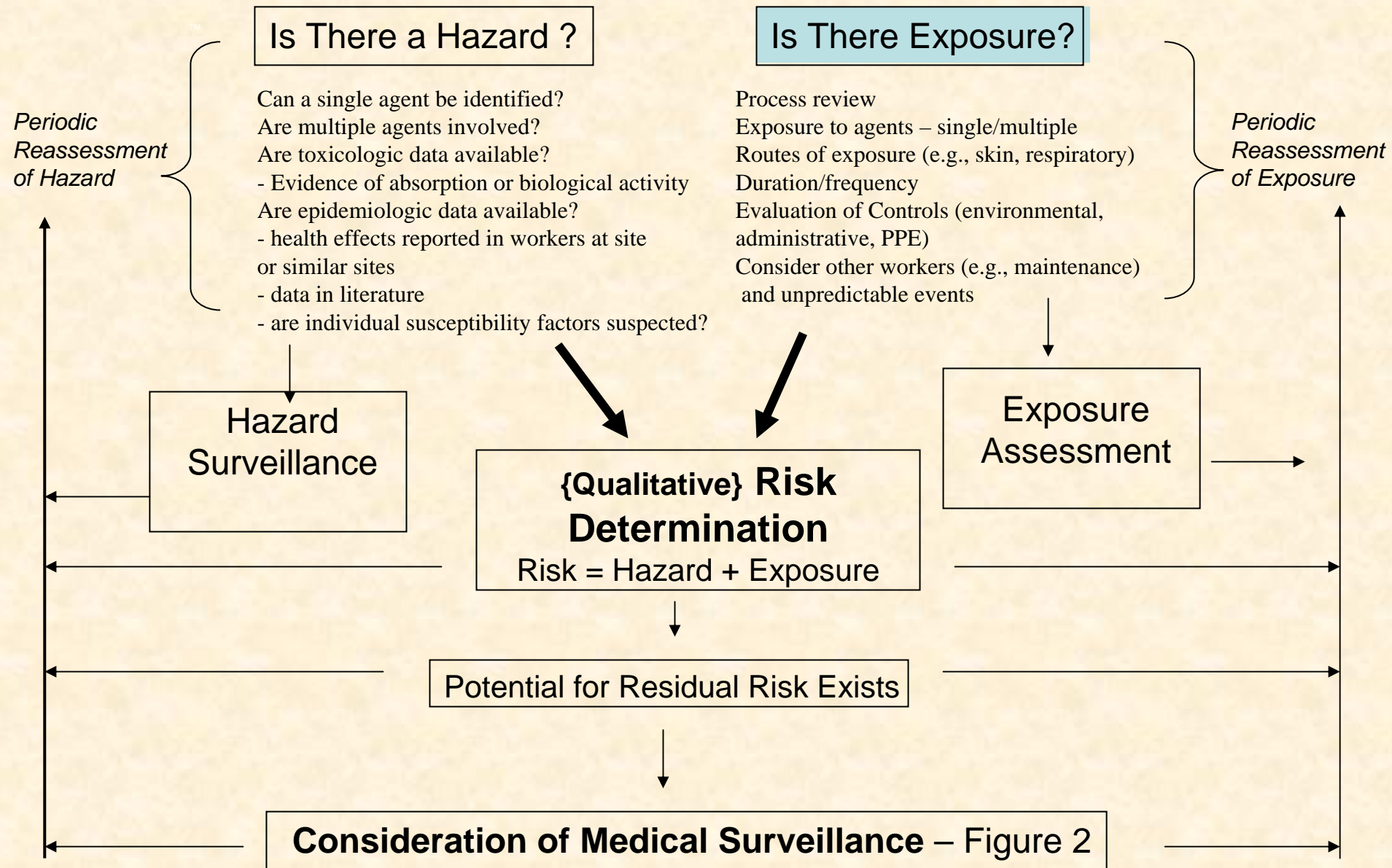
- Figure 1 – Needs Assessment
 - Workplaces dealing with engineered nanomaterials should conduct a needs assessment
 - First steps in surveillance program
 - Purpose:
 - {Qualitative}* risk determination
 - If health risk present – further consideration of medical surveillance

*Situations for which data are incomplete

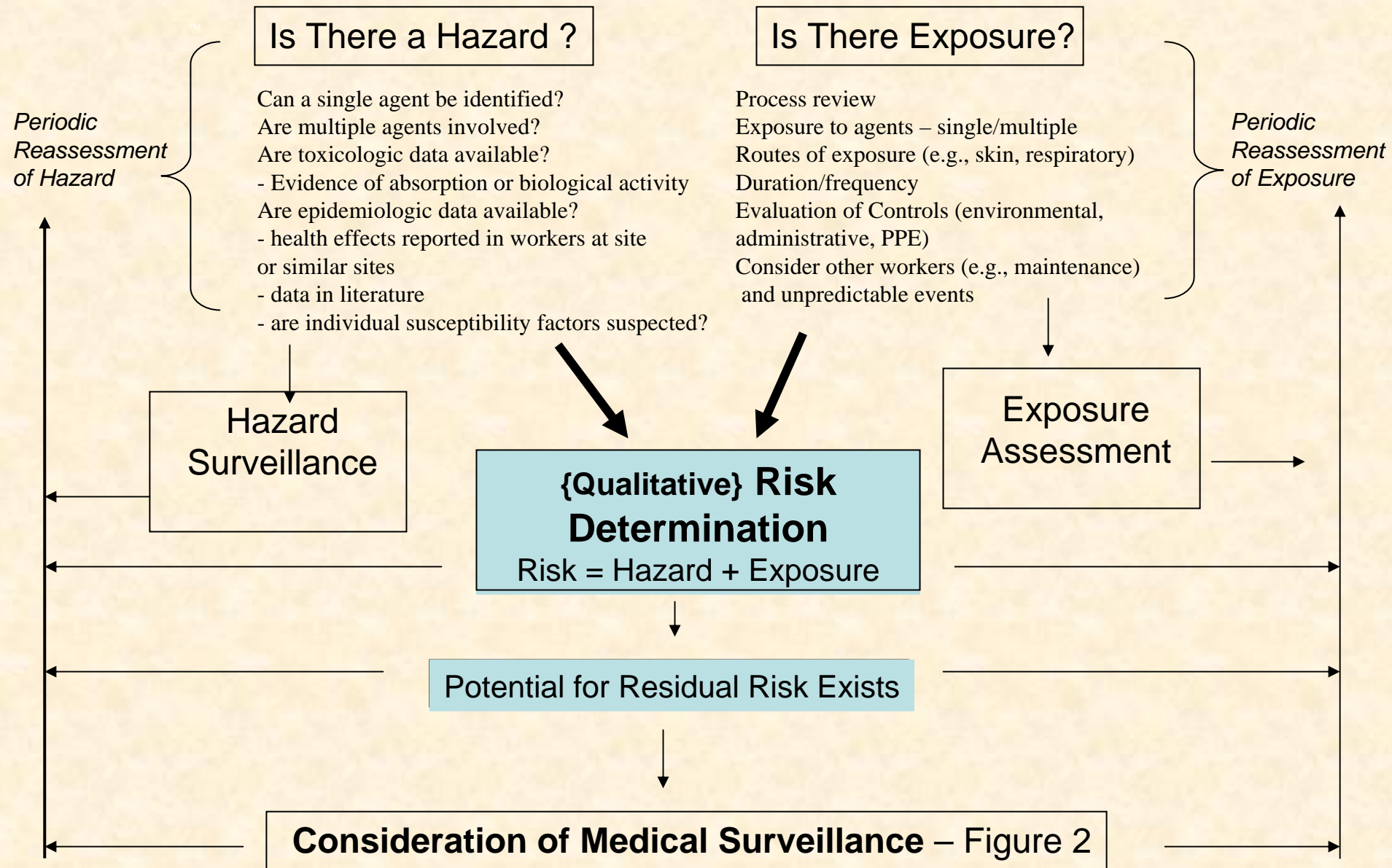
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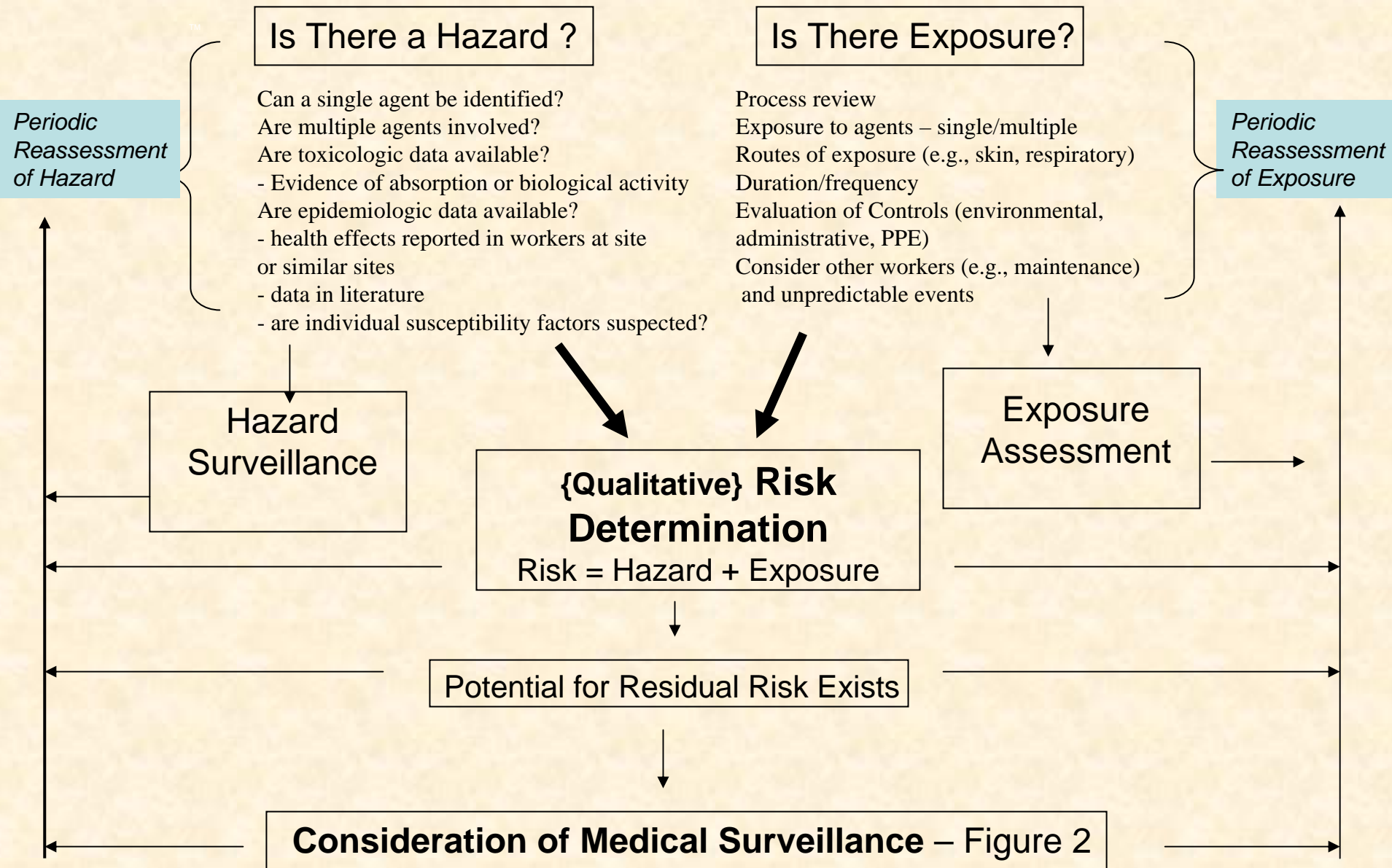
1. Occupational Health Surveillance for Nanotechnology – Needs Assessment



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1. Occupational Health Surveillance for Nanotechnology – Needs Assessment



II. Framework

Nanotechnology Needs Assessment

- Medical surveillance should be considered if potential for residual risk exists – Figure 2
- In many cases, information may not be available to make well-informed determination of risk
 - Periodic reassessment
 - Prudent occupational health practice calls for consideration of medical surveillance

2. Occupational Health Surveillance for Nanotechnology – Medical Surveillance

Medical Surveillance – Inputs for consideration of medical surveillance program

What is the Purpose/Objective?

Who is the Target Population?

What are the Available Tools to interpret data that are collected?

- Prevalence of condition/symptoms/disease
- General health surveillance data
- Sensitivity/specificity/PPV of proposed tests
- Reliability/validity of tests

Periodic Reassessment



Do Factors Support Proceeding with Medical Surveillance?

NO



YES



Periodic Reassessment



Develop Appropriate Program

Examples: Questionnaire Administration, Physical Examinations, and/or Medical Testing

Data Analyses and Interpretation

Adverse Symptoms/Outcomes?

NO



YES

More Frequent/Detailed
Data Collection



Additional Steps:

- Hazard Training
- Diagnostic Evaluation
- Treatment/Medical Removal (if appropriate)
- Intervention
- Communication
- Program Evaluation

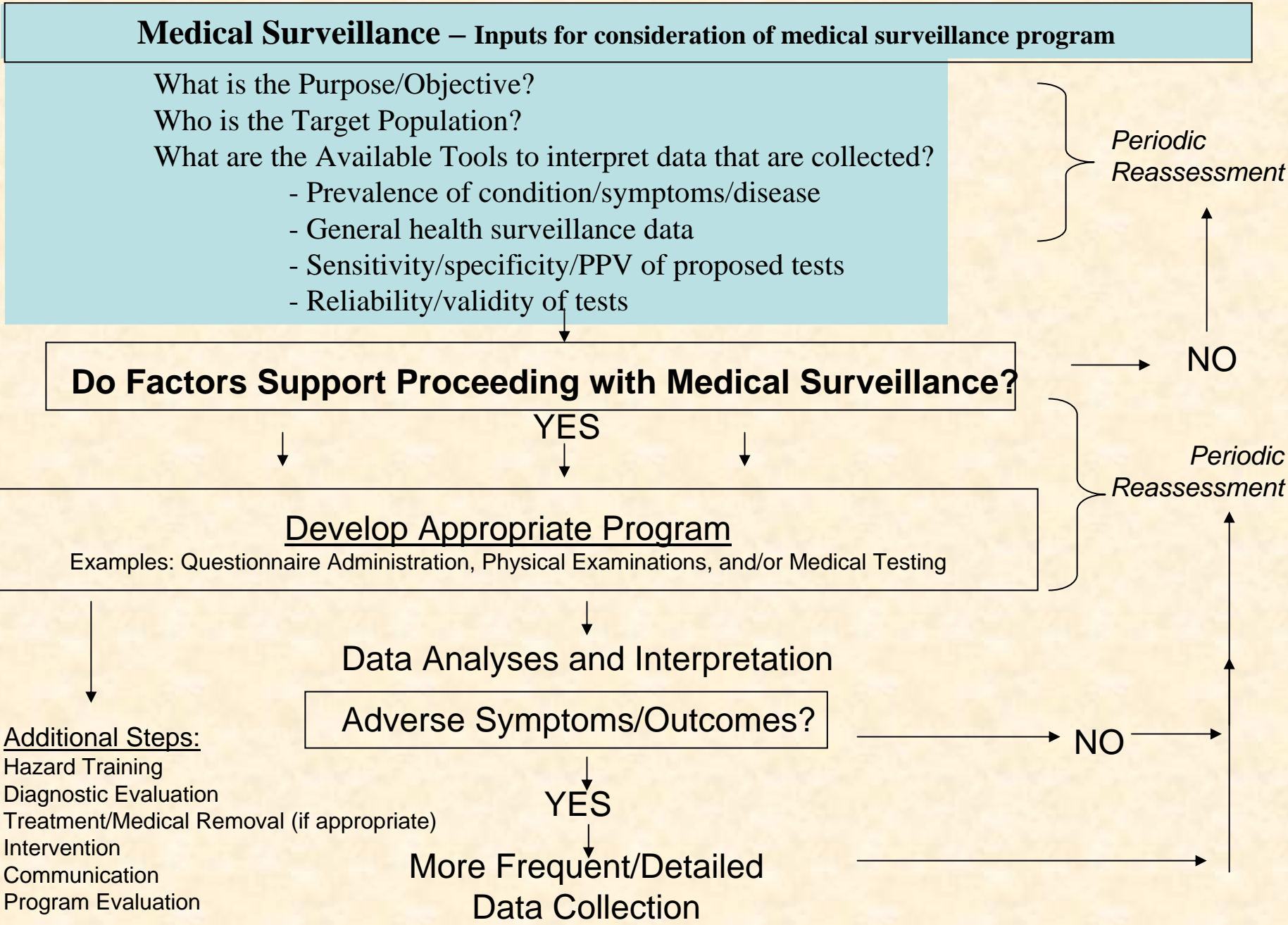


II. Framework

Inputs for Consideration of Medical Surveillance Program

- Medical surveillance should be considered if potential for residual risk exists
- Assessment prior to initiating medical surveillance
 - Purpose and Objective
 - Target population
 - Testing modalities

2. Occupational Health Surveillance for Nanotechnology – Medical Surveillance



2. Occupational Health Surveillance for Nanotechnology – Medical Surveillance

Medical Surveillance – Inputs for consideration of medical surveillance program

- What is the Purpose/Objective?
- Who is the Target Population?
- What are the Available Tools to interpret data that are collected?
 - Prevalence of condition/symptoms/disease
 - General health surveillance data
 - Sensitivity/specificity/PPV of proposed tests
 - Reliability/validity of tests

Periodic Reassessment

Do Factors Support Proceeding with Medical Surveillance?

NO

YES

Periodic Reassessment

Develop Appropriate Program
Examples: Questionnaire Administration, Physical Examinations, and/or Medical Testing

Data Analyses and Interpretation

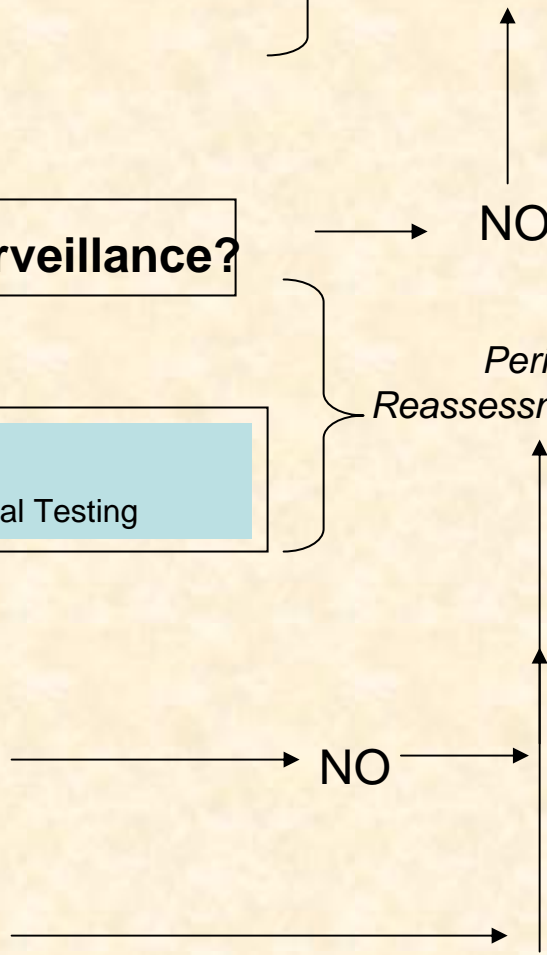
Adverse Symptoms/Outcomes?

NO

YES

More Frequent/Detailed Data Collection

- Additional Steps:
- Hazard Training
 - Diagnostic Evaluation
 - Treatment/Medical Removal (if appropriate)
 - Intervention
 - Communication
 - Program Evaluation



II. Framework

Medical Surveillance

- Planning prior to program initiation
 - Interpretation of results
 - Communication of findings to workers and management
 - Intervention(s) based on data
 - Program Evaluation

II. Framework

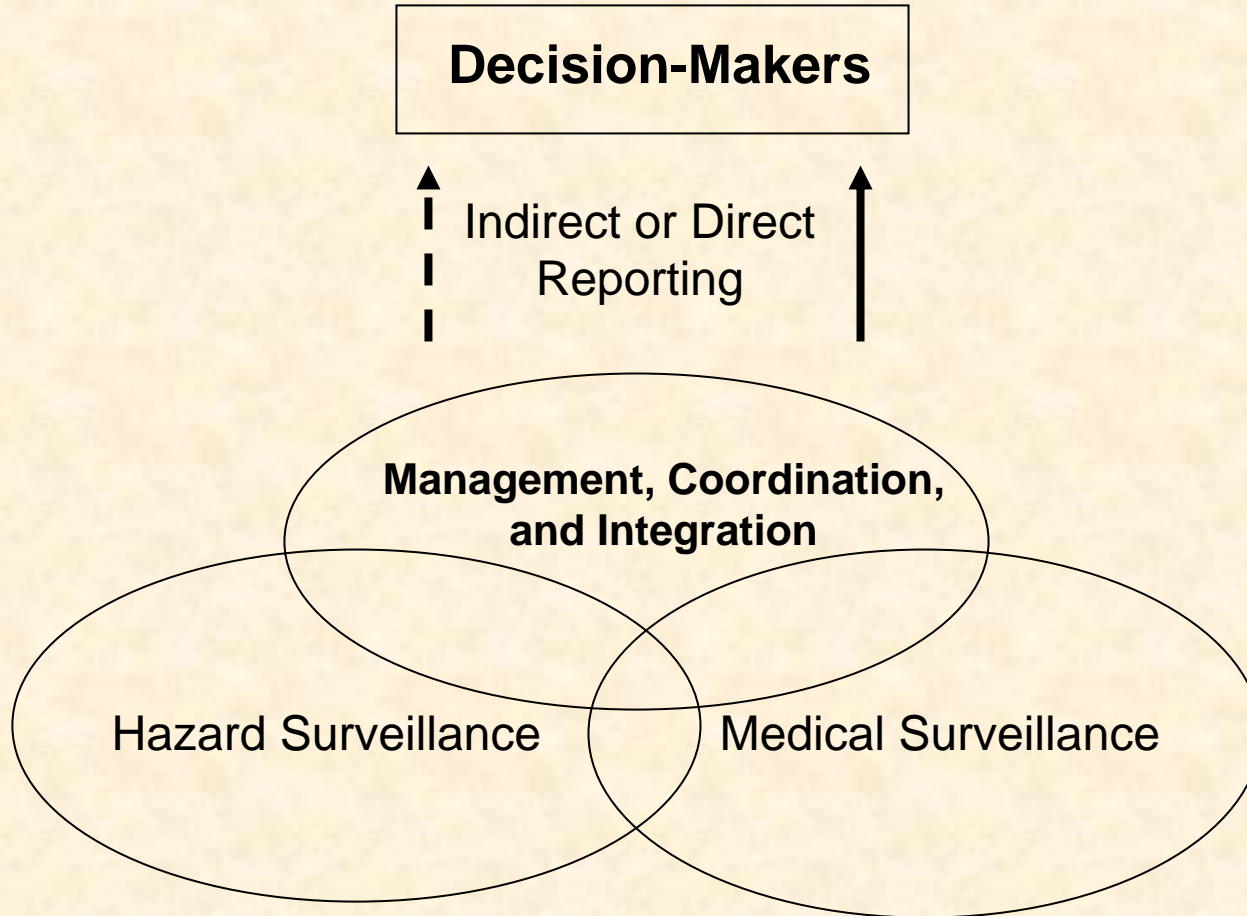
Medical Surveillance

- Qualitative risk may be present yet tools/information for medical surveillance not well developed
 - Objective and target population clear
 - Application of medical testing poorly understood
- Consider initiation of basic medical surveillance by periodic collection of medical history or symptom information
 - Baseline data important to aid in interpretation
 - Practitioners aware of “sentinel events”
 - Balance – detection of common illness/symptoms warranting follow-up vs. those of multi-factorial etiologies

III. Management, Coordination, Integration

- Need for Program Manager
- All aspects of an occupational health surveillance program must be coordinated (Figure 3)
- Most basic level:
 - Hazard and medical (health effects) surveillance must be managed as a program
- Multiple levels of coordination – depending on size of organization

3. Occupational Health Surveillance for Nanotechnology – General Oversight



Summary

- Occupational health surveillance for nanotechnology workers
 - Unique physical/chemical properties of nanomaterials
 - Information suggesting nanomaterials pose safety and health risks
- First step in surveillance program is needs assessment
 - Hazard and exposure assessments
 - Data needed for assessment may be lacking – periodic reassessment
 - Qualitative risk determination
- Evaluate need for medical (health effects) surveillance

QUESTIONS?

- **Douglas Trout, MD, MHS**
- **dt trout@cdc.gov**
- **513.841.4558**



Disclaimer: 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.



“Appendix Slides”

"Because nanotechnology is a way of doing or making things rather than a discrete technology, there will never be a one-solution-fits-all approach for nanotechnology and nanomaterials workplace safety"

Andrew Maynard, Chief Science Advisor for the Project on Emerging Nanotechnologies, Woodrow Wilson Institute for International Scholars, 2006

- {Surveillance programs are generally secondary prevention efforts, but should be designed to support primary prevention programs}
- 3 types of surveillance programs
 - Medical screening
 - Healthcare provider reporting
 - Employer case reporting

1. Occupational Health Surveillance for Nanotechnology – Needs Assessment

