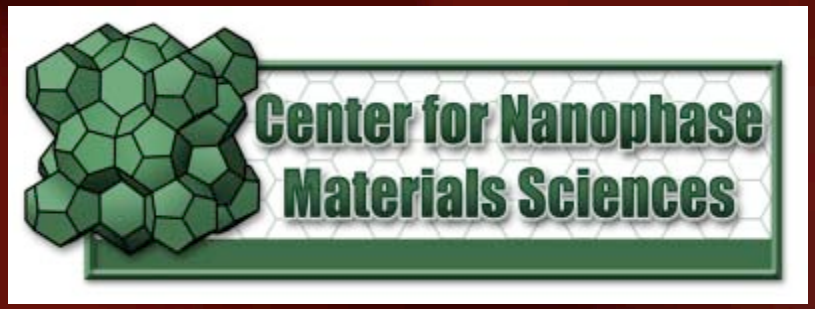


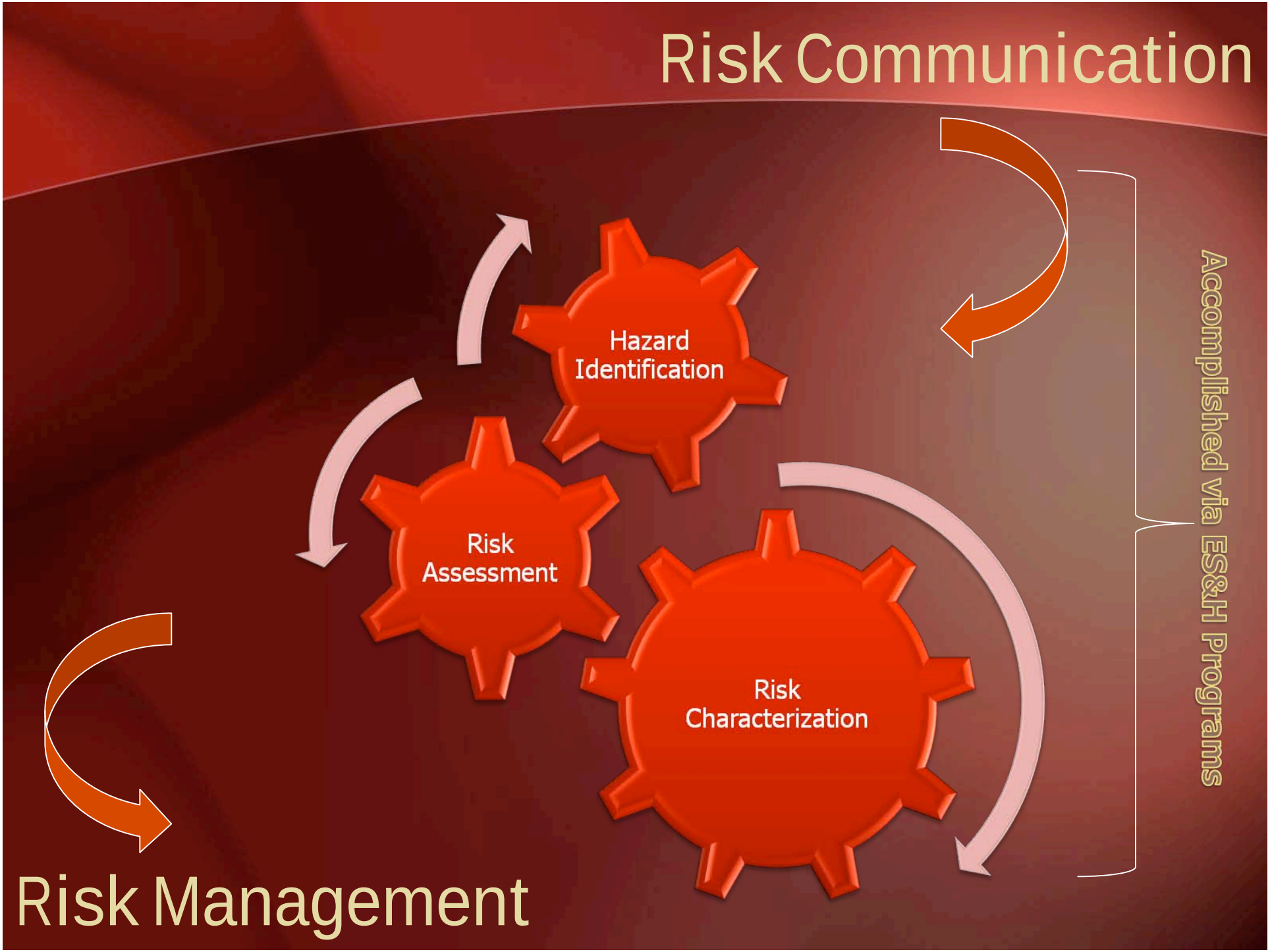
Nanoscale Materials and Risk Communication

Burton Ogle, Ph.D., CIH, CSP

Risk Communication

"Good risk communication can not always be expected to improve a situation but poor risk communication will nearly always make it worse."

The National Resource Council


Risk Communication
Hazard Identification
Risk Assessment
Risk Characterization
Accomplished via ES&H Programs
Risk Management

Applying Risk Management to your Workplace

Applying A Risk Matrix Table to Reduce Risk Probability

Severity → / Frequency ↓	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	Shut down immediately; correct problem	Shut down immediately; correct problem	Correct ASAP	Correct sometime
Probable (B)	Shut down immediately; correct problem	Correct ASAP	Correct soon	Correct sometime
Occasional (C)	Correct ASAP	Correct soon	Correct sometime	Correct sometime
Remote (D)	Correct sometime	Correct sometime	Correct sometime	Correct sometime
Improbable (E)	Correct with preventative maintenance	Correct with preventative maintenance	Correct with preventative maintenance	Correct with preventative maintenance

Source: Ohio State University

Are we spending too much time down here?

What is Risk?

The probability that we will lose something that we value

- **Science-based Risk**
- **Virtual Risk**
- **Intuitive Risk**

Risk Communication

A "science-based" approach for communicating effectively in situations that are:

- **High Stakes**
- **Emotionally Charged**
- **Often Controversial**

To some extent, nanoscale materials science R & D meets all three of these criteria.

Source: Vincent T. Covello

Source: Vivian Krause

Goals of Risk Communication

Provide your stakeholders with increased knowledge and understanding

Develop enhanced trust and credibility with your stakeholders

Develop enhanced dialogue with your stakeholders

Risk Communication Myths

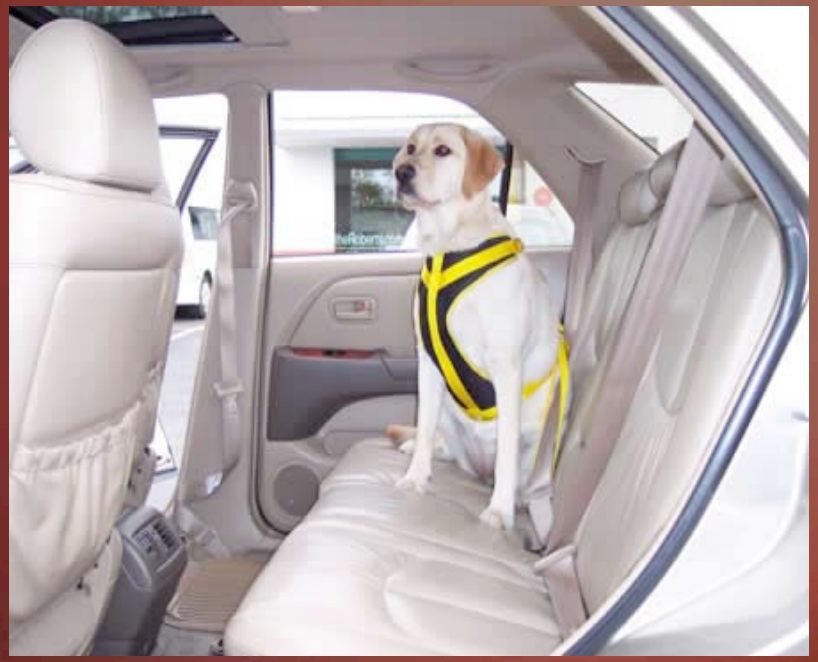
Risk Communication - Premises

There is virtually no correlation between the ranking of hazards by experts and the ranking of those same hazards by the public.

In other words, there is a huge difference between fact and perception.

Risk Perception

Rodeo competition versus riding in a car w/o Seat Belt



According to the OSU Medical Center research, every hour someone dies in the US because they were not wearing a seat belt during an automobile accident.

Risk Perception

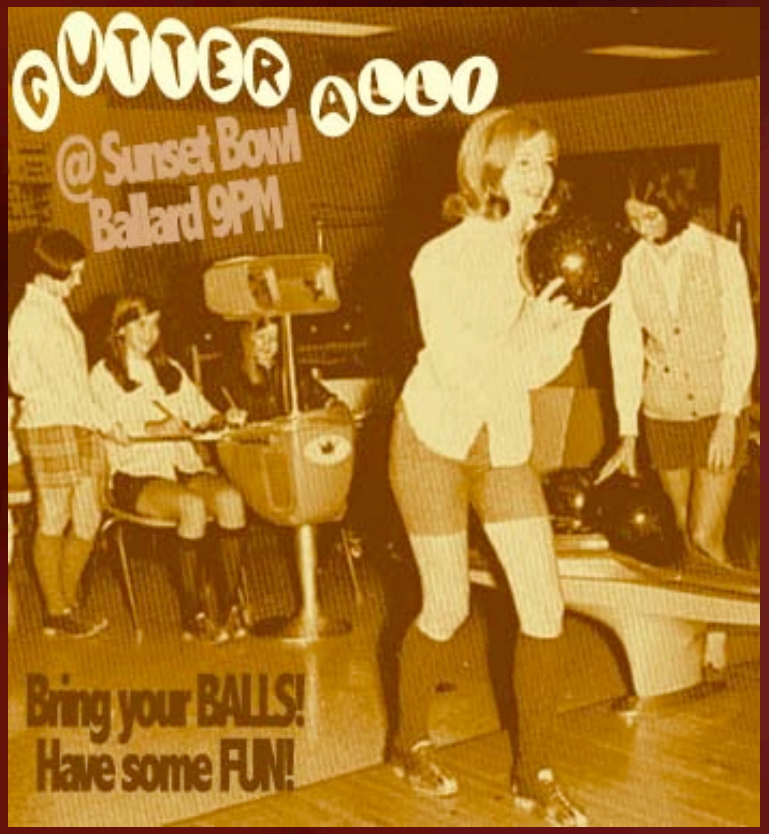
Smoking versus Hang Gliding

Smoking is the number one cause of preventable death and disease in the U.S.

Risk Perception

Motorcycle Riding versus Handguns

Bowling versus Scuba Diving



Risk Communication

When communicating risk, individuals want to know that you care before they care what you know.

Psychologists tell us that our empathy is judged by others within 9 to 30 seconds, that is, you have less than a minute to demonstrate your concern for someone else's situation.

Avoid the Negatives

Psychological studies tell us that it takes 3 positive events to equal 1 negative event.

3 Positives = 1 Negative

Avoid Spin

- "…making things appear to be that which they are not."

Risk Communication - Approaches

Anticipate

Risk Communication Approaches

Prepare accurate, well crafted, well delivered messages.

Risk Communication - Approaches

Effective Communication

Risk Communication – The Message

The problem then *simply* becomes a matter of gathering data on exposures and hazards – typically accomplished through:

- **Hazard Identification**
- **Dose-Response Assessment**
- **Risk Characterization**
- **Exposure Assessment**

The problem with nanoscale risk assessment is that we don't have this data to gather…..it just doesn't exist or we can't seem to agree on what does exist

How Do We Communicate Risk for a Hazard that has so many Unknowns?

- **Make good, sound assumptions**
- **Using the best science available, make leaps of logic that are defensible**
- **Rely on the "Precautionary Principal" or "Prudent Avoidance"**
- **Be open and honest with your audience – tell them what we know, what we think, and what we believe about the risk.**

Risk Communication

Learn from historical mistakes – don't make nanoscale science the new asbestos or lead.

Gather data as you proceed. Baseline data will be tomorrow's reference points for everything we know about nanoscale risk assessment.

Prevention – Know that preventing nanoscale exposures will ultimately be the most effective, efficient ways to control potential harm.

Risk Communication

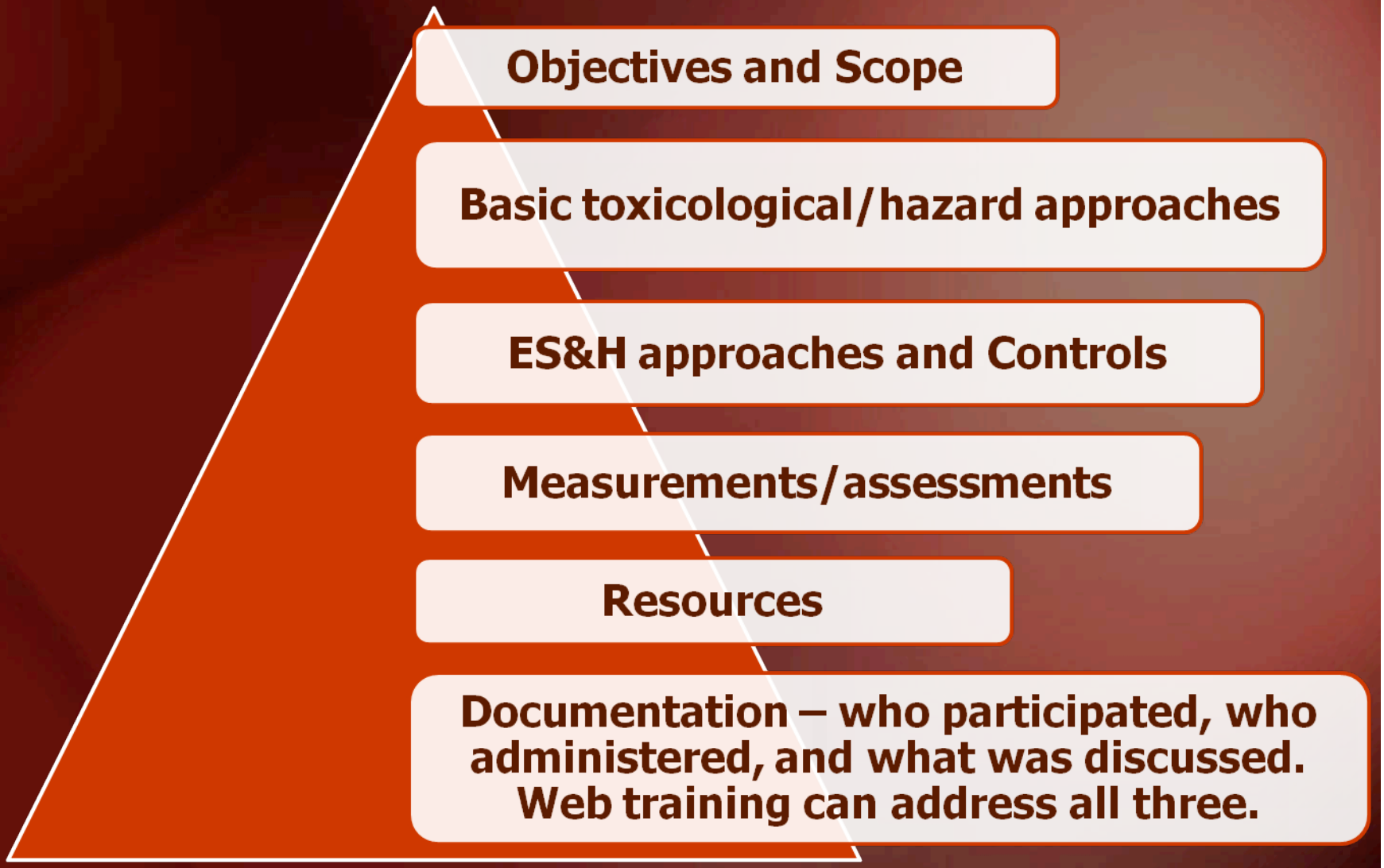
As with any occupational/environmental hazard, we have an obligation to provide education to all those who work in our R&D facilities – not just the researchers and technicians, but everyone in the facility (don't forget our experience with CBD and beryllium?).

Dissemination Techniques

Use whatever is most effective and efficient for your facility

- **Web-based Training** – works best for CNMS because of the wide variety of workers: staff, users, students, and visitors
- **Face-to-face** – necessary to gain/maintain credibility – may be formal lecture-style, Socratic, or "toolbox talks"
- **Literature** – least useful – best if used to supplement

What to Include in your Training



What not to include

Reference to fringe studies that indicate nanoscale threats that have no foundation in reality.

Don't combine other ESH topics such as cryogens or carcinogens in this training – participants may not be able to separate in their mind which hazards go with which exposures.

Listen to your audience

Being an excellent teacher/trainer requires that you be an excellent listener.

Don't anticipate all of the concerns your constituency may have – ask them and listen to what concerns them.

Be *Socratic* in your teaching style – start the dialog, ask open-ended questions and be prepared to give honest, thorough answers – this approach will give you the highest degree of credibility ("street credit") possible.

For example

Rather than give an example of a laboratory problem – ask your audience if anyone has experienced the type of problem you wish to address.

Begin your training with large bullets/concepts and let the discussions "fill in the blanks"

Keep the discussion moving along – if someone wants to dominate the conversation, politely involve others into it.

Components of Training
1. Nanoscale Particle Hazards

Address the "scale" of nanoscale material research. Don't assume that everyone knows range of size.

Properties of nanoscale materials that could affect the body, including nanoscale coatings that are commonly used in your facility.

Discuss the known effects to animals and humans. For example, you may choose to discuss lung inflammation (granuloma) and lung fibrosis as likely health effects.

Components of Training
2. Potential Exposures

Differentiate between natural and anthropogenic nanoscale particles.

Discuss the three routes of entry into the body:

- **Inhalation**
- **Ingestion**
- **Skin absorption**

Factors that influence toxicity

- **Concentration, duration and frequency of exposure**
- **Physical form of nanoscale particles, including coatings**

Components of Training
3. Controls

Engineering controls – HEPA exhaust ventilation (controlling at the source); gas cabinets; glove boxes and lab hoods; etc.

Administrative controls – SOPs and other planned procedures designed to lessen exposure frequency, concentration and/or duration.

Personal Protection Equipment – the use, care, storage and limitations of PPE for controlling nanoscale particle exposures.

Components of Training
4. Restrictions and Limitations

Restricted behavior/activities

- i.e., Eating, drinking, smoking, cosmetic use, etc. that may influence unintentional exposures

Restrictions on laboratory procedures

- i.e., prohibition of open-bench use of engineered nanoparticles – particularly dry powders or airborne sprays

Restriction of mechanical (drilling, sanding, cutting) and thermal procedures (welding, burning) that could release uncontrolled nanoscale particles.

Limitations of I.H. controls

- i.e., hood failures, glove failure, etc.

Limitations of our knowledge of the hazards

Components of Training
5. Good Laboratory Practices

- **Techniques that minimize handling**
- **Clean-up and disposal practices**
- **Labeling and other forms of hazard communication**

Components of Training
6. Nanoscale particle measurement

Baseline monitoring of all occupied areas – not just laboratories

Monitoring (TEM and direct reading instrumentation (i.e. CPC, Aerosol Spectrometry)) of all distinct laboratory procedures.

Data collection and reporting

Components of Training
7. Resources

- **Provide recent, competent documentation of nanoparticle research**
- **Provide open-door access to ESH personnel**
- **Provide reference web sites for additional information.**

Thank you – Questions??

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