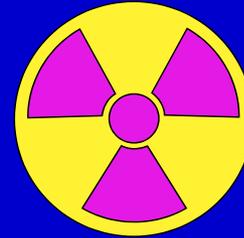


NBC Hazards

Implications for respiratory protection

- Nuclear/ Radiological



- Biological



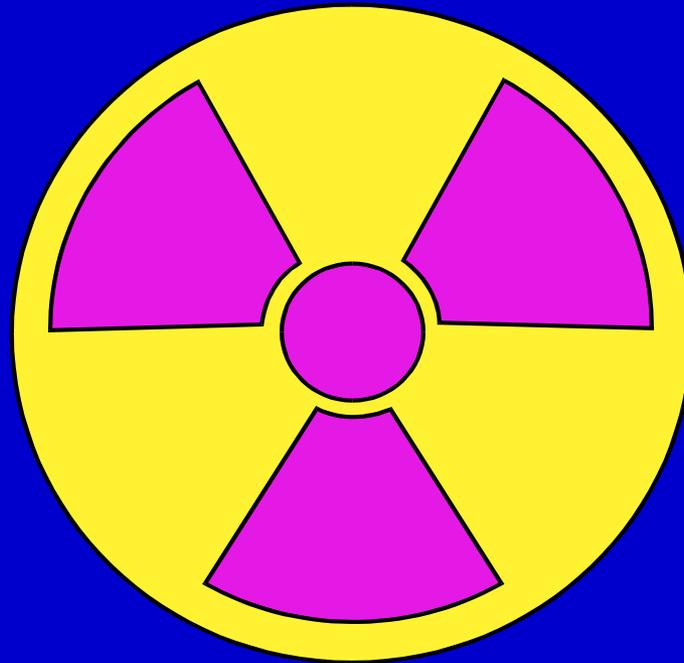
- Chemical



Presentation Goals

- Discuss potential terrorism hazards
- Implications for respiratory protection
- NOT discussion of:
 - Biological mechanisms of harm
 - Other PPE

Radiological Hazards



Radioactive particulate absorption
vs.
Ionizing radiation exposure

What Is Ionizing Radiation?

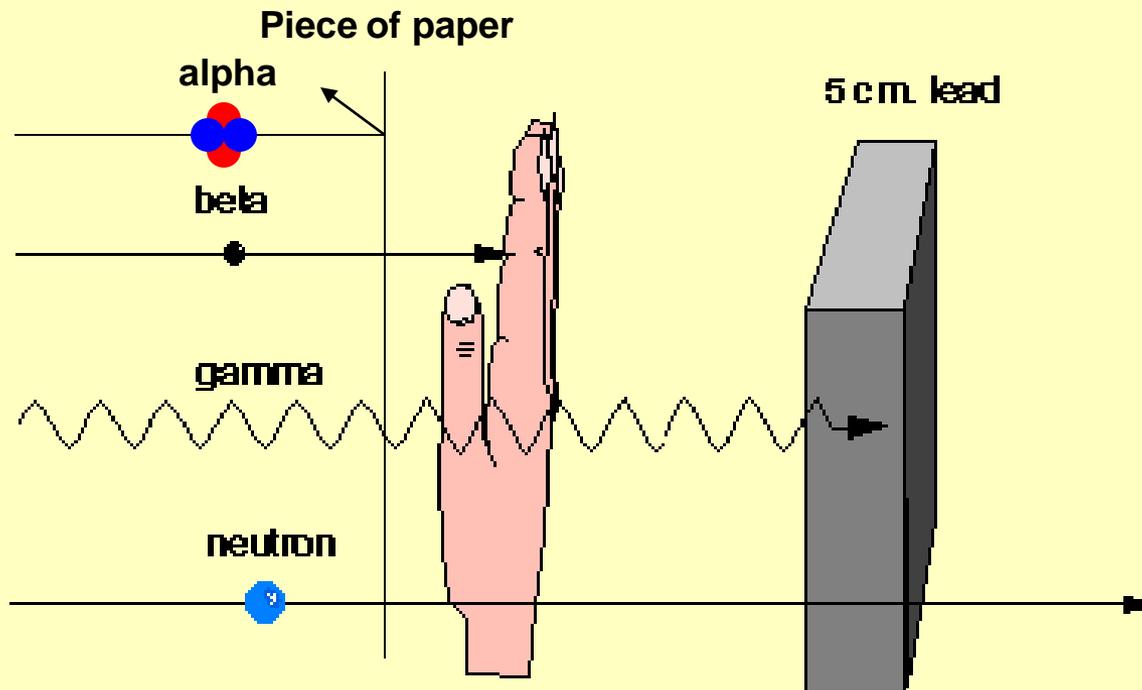
- radiation that can knock an electron out of an atom or molecule, forming an *ion* (an electrically charged particle)
- Radiation sources:
 - natural sources
 - manmade sources

Radiation Exposure Hazards

- External: Radiation from external sources
 - Respirators can not protect against this
- Internal: Radiation from sources taken into the body
 - Contaminated wounds
 - Ingested sources
 - Inhaled sources – *respiratory protection*

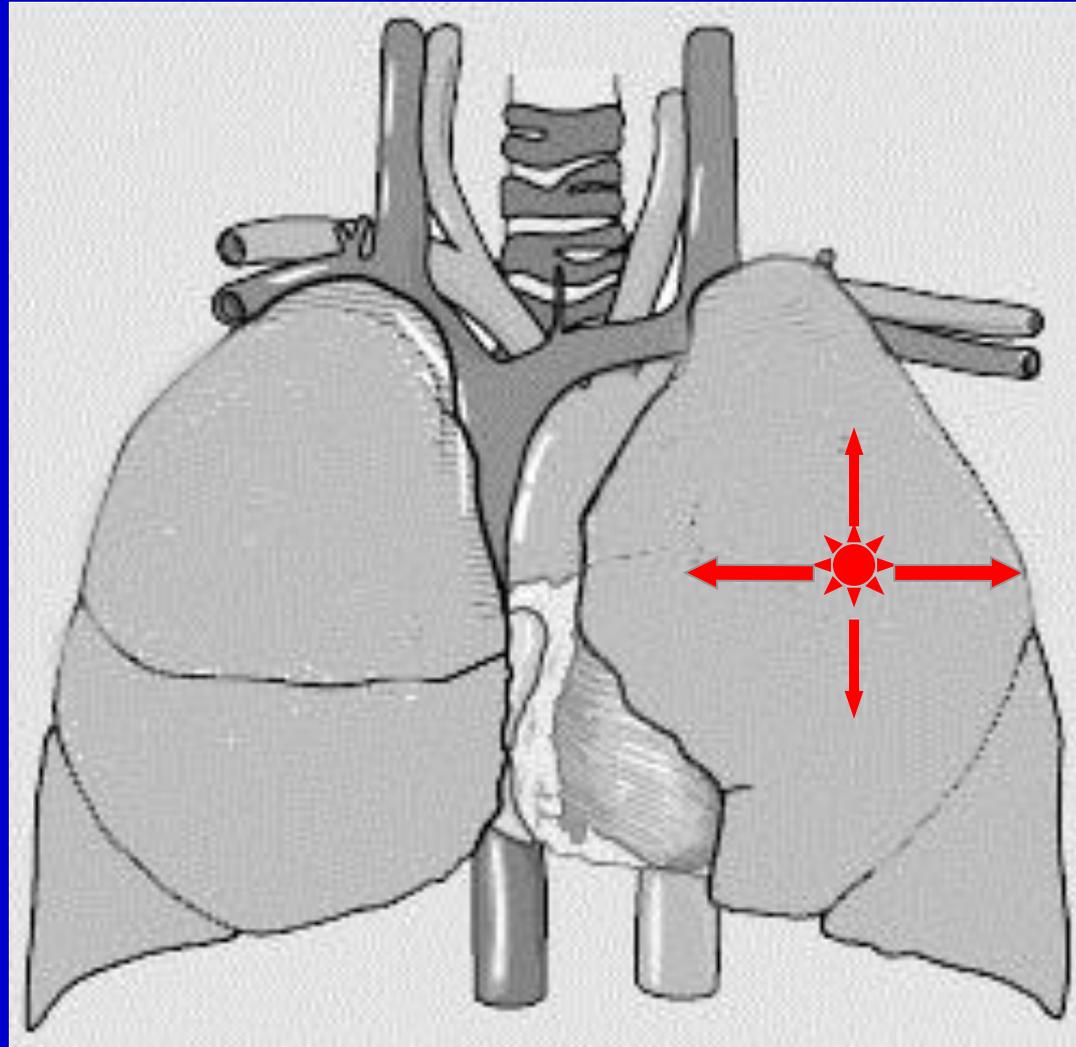
Radiation Penetration From an External Source

Rules of thumb for shielding against various types of radiation



Adapted from: **Ionizing Radiation and Radioactivity**, TRIUMF Safety Note No. 6.3.1; http://www.triumf.ca/safety/tsn/tsn_6_3/tsn_6_3.html

Ionizing Radiation in the Lungs



Respiratory Protection

The Department of Energy recommends full-face respiratory protection for entrance into a radiologically contaminated area. DOE/RW-0362 SR
Office of Civilian Radiological Waste Management

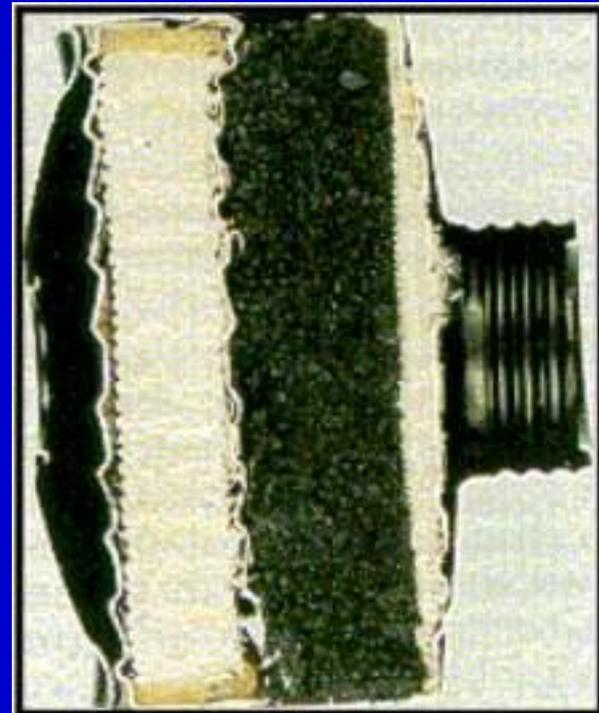
The respiratory threat can be eliminated by employing High Efficiency Particulate Air (HEPA) or P100 filters. Domestic Preparedness Technician-HAZMAT Course



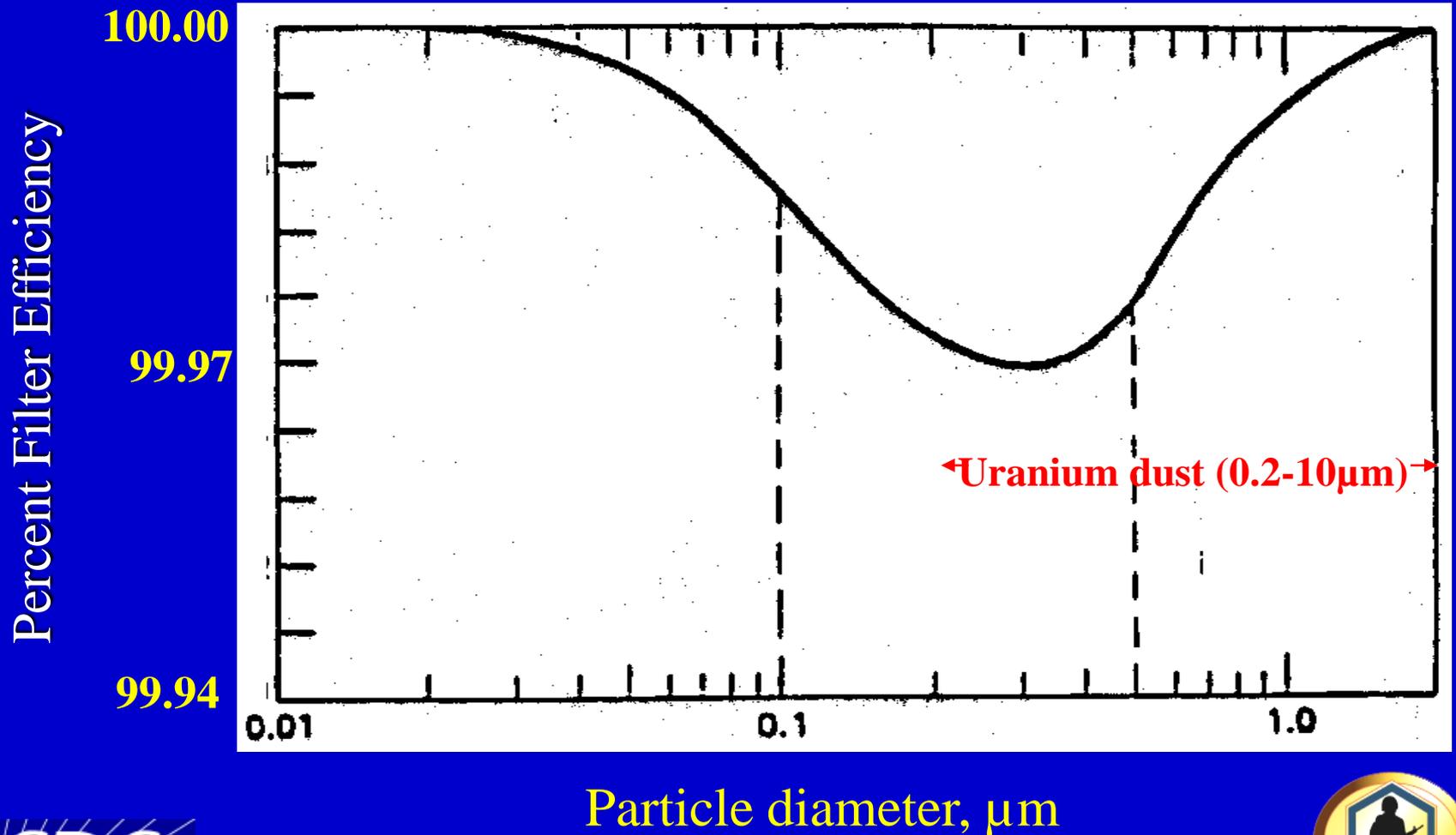
Military RN Respiratory Protection

Two-element canister

- (HEPA) filtration media
- ASC Whetlerite Carbon filtration media.



HEPA/P100 Filters for RN Particles



Biological Agent Particulate Exposures



Biological Exposure Scenarios

- Response to a discovered device or source (real or hoax)
- Occult release resulting in disease outbreak – exposure comes from transporting patients
- Likelihood of each?

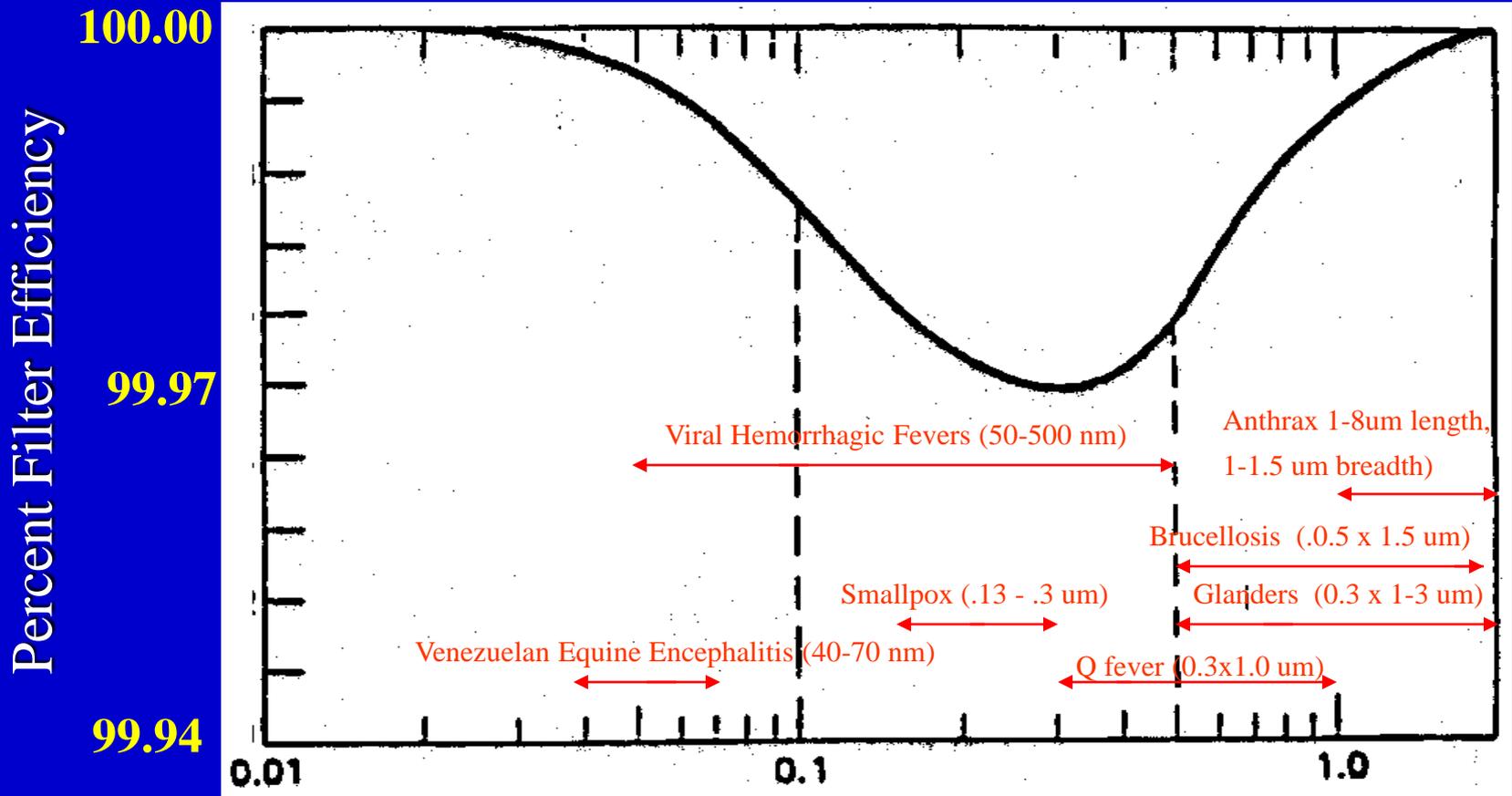
Portals of Entry

- Inhaled
- Mucous membrane (eye, nose, mouth)
- Break in skin (cut, wound, etc)
- Portals of entry differ by disease!
- Biological weapons primarily inhalation exposures

Biological Agents (USAMRIID or CDC Lists)

- Anthrax
- Brucellosis
- Glanders
- Pneumonic Plague
- Tularemia
- Q Fever
- Smallpox
- Venezuelan Equine Encephalitis
- Viral Hemorrhagic Fevers
- T-2 Mycotoxins
- Botulism
- Ricin
- Staphylococcus Enterotoxin B

HEPA/P100 Filters for Biologicals



Particle diameter, μm

Biological Incident Responses

- A respirator will reduce but may not entirely prevent exposures
 - Depends on concentration, exposure time, fit
- Respirators are part of a response plan
- Other elements:
 - Infection control practice: barrier precautions, handwashing, disinfection
 - Immunization or post-exposure antibiotics for workers likely to be exposed
 - Work with your health department on planning

Identifying Chemical Warfare Agents and Toxic Industrial Chemicals

U.S. Domestic Concerns



Process

- Contact key agencies
- Obtain Hazard/Vulnerability Assessments
- Evaluate relevance of lists
- Develop “customized” criteria
- Apply criteria to original databases
- Overcome security sensitivities
- Release preliminary report

Contacted Agencies

- Department of Defense: DTRA, AFMIC, TSWG
- Department of Justice: NIJ, FBI, OJP
- Environmental Protection Agency
- Agency for Toxic Substances and Disease Registry
- Department of Energy
- General Accounting Office
- CDC: Bioterrorism Committee, National Centers for Environmental Health



NIOSH/SBCCOM EVALUATED the Following Assessments:

- Department of Defense reports of toxic industrial chemicals (TIC)
- National Institute of Justice/Federal Bureau of Investigation/Technical Support Working Group (NIJ/FBI/TSWG), Threat Assessment, Draft
- Agency For Toxic Substances and Disease Registry (ATSDR/CDC)
 - ✓ Industrial Chemicals as Weapons of Mass Destruction
 - ✓ Hazardous Substances Disaster Assessment and Assistance
 - 1999 CERCLA List of Priority Hazardous Substances
- Environmental Protection Agency (EPA)



DoD TIC LISTS

of Toxic Industrial Chemicals

- OBJECTIVES: Determine which industrial chemicals are most likely to pose a hazard to military personnel
- CRITERIA:
 - Inhalation toxicity
 - Vapor pressure
 - Acute hazard effects
 - Large production quantity (# of Producers)
 - World-wide production by (# of Continents)

Draft NIJ/FBI/TSWG Report

- Focused on C/B agents that may be more likely to be used in domestic terrorism
- Aid to law enforcement in addressing needs for better NBC detection and Personal Protection Equipment (PPE)
- Selection criteria: Availability, history of use and toxicity



Draft NIJ/FBI/TSWG Chemical/Biological List of Concern

- Threat Watch List:

- Based on Availability, History of Use, Ties to Terrorist Literature, Physical and Chemical Characteristics and Toxicity
- Represents those C/B materials that may be more likely to be used in domestic terrorism

ATSDR Lists

1. Industrial Chemicals as Weapons of Mass Destruction
 2. Hazardous Substances Disaster Assessment and Assistance
-
- Emphasis on industrial chemicals as weapons
 - Gathered information on past use as weapons

“Customized” Criteria for Selecting Toxic Industrial Chemicals (TIC)

- Inhalation toxicity
- Respiratory hazard
- Accessible
- Acute effect
- Used previously by terrorist
- Chemicals that are produced in or are imported into the United States

Chemical Warfare Agents (CWA) and Riot Control Compounds

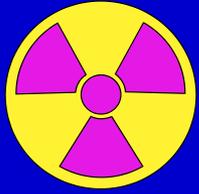
- For Chemical Warfare Agents, we selected blister, choking, blood, and nerve agents
- For Riot Control Compounds, we selected vomiting and tear agents

Tentative Chemical List

- 126 TIC
- 32 CWA and Riot Control Compounds
- Segregate chemicals into families based on common factors
- From each family, determine representative test substances using a multi-criteria weighting method

Summary

- Focused on U.S. domestic terrorism
- NIOSH/SBCCOM list now contains 158 chemicals: CWA, TIC and Riot Control Compounds
- Segregate into families based on a common factor
- From each family, determine representative test substances using a multi-criteria weighting method



NBC Hazards Conclusion



- Identified the NBC Hazards that we feel pertain to U.S. domestic terrorism
- Must identify new hazards by monitoring new threat assessments and by keeping in contact with law enforcement agencies
- Develop new respirator test standards as needed depending on the emerging threat

