

Concepts for Developing NBC Respirator Requirements



PROJECT STATUS

NBC Requirements Specific Tasks

NIST-NIOSH-SBCCOM Strategic & Operational Plan

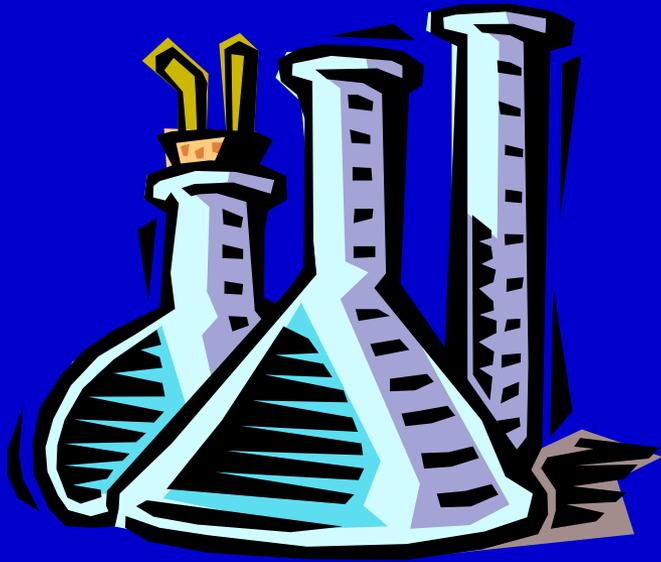
- Assess threats and vulnerability
- Develop NBC respirator requirements using threats
- Develop & validate test methods
- ___ Conduct applied laboratory research to fill gaps
- ___ Qualify collaborating laboratories
- ___ Establish application procedures and processes
- ___ Issue NIOSH NBC respirator approvals

NBC Respirator Requirements Process

**Step 1: Conduct hazard and vulnerability
assessments to learn:**

- Most probable agents**
- Most probable delivery scenarios**
- Emergency responder service requirements**

Potential Terrorism Agents vs NIOSH Approvals



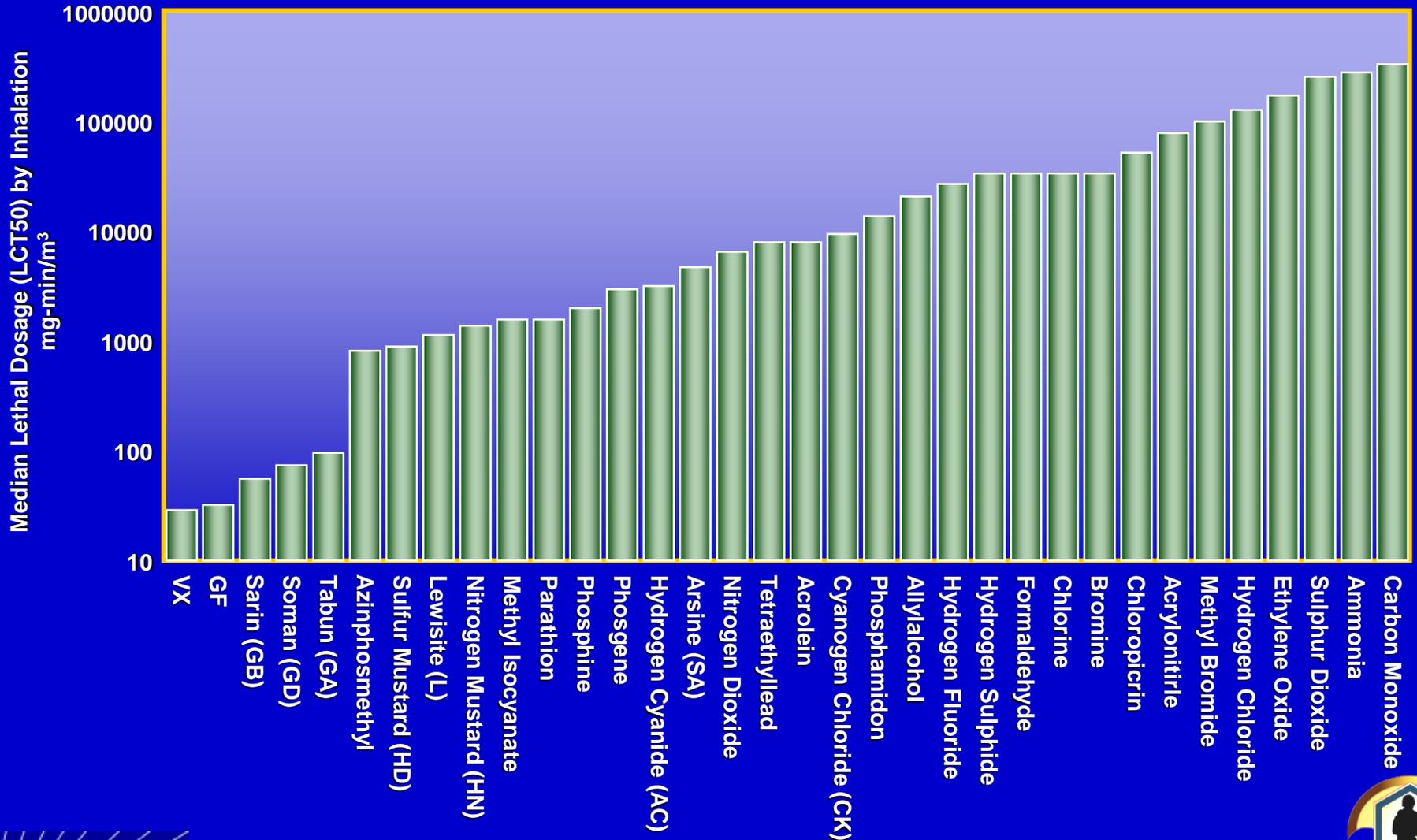
20 NIOSH Chemical Gases & Vapors

Ammonia Chlorine	Chlorine Dioxide	
Methylamine	Carbon monoxide	
Chloroacetophenone	Organic vapors	
Chlorobenzylidene malonitrile	Formaldehyde	
Ethylene Oxide	Mercury vapor	Nitrogen dioxide
Hydrogen Chloride / Cyanide/ Fluoride/ Sulfide		
Phosphine	Sulfur dioxide	
Vinyl chloride	Acid gases	

158 Terrorism Chemicals

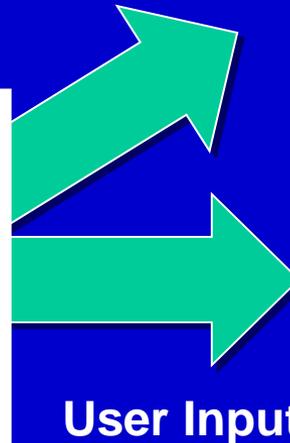
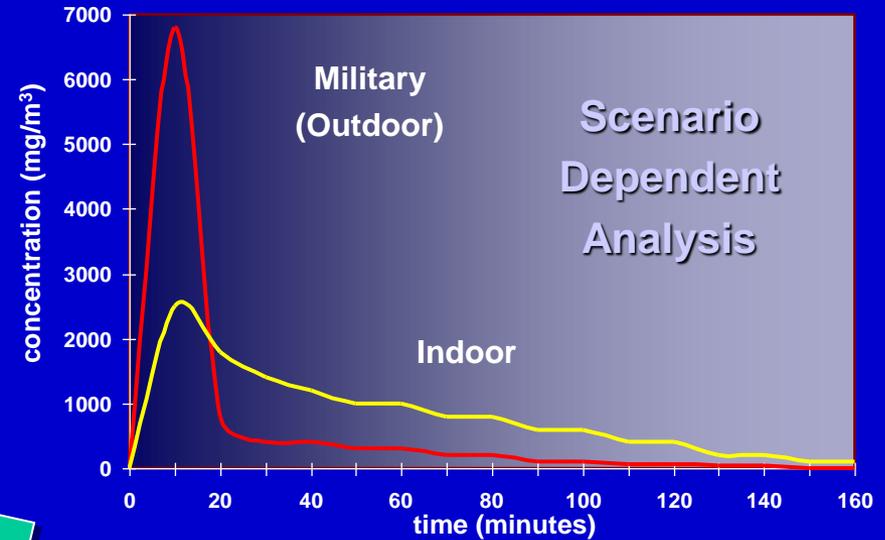


Relative Inhalation Toxicities



Hazard & Vulnerability Assessment

- ◆ Analyze available Threat/Vulnerability Data
- ◆ Develop Time-Phase/Location-Phase Hazard Profile
 - Indoor Location
 - Outdoor Location
 - CWA, BWA, and TICs
- ◆ Determine Health/Safety Standards Needs
- ◆ Overlay Hazard Assessment Data with Concentration/Time Profile and Health Standards Data to assess Personnel Vulnerabilities



User Input

HEALTH STANDARDS

IDLH
WPL
AEGL
GPL

STEL
AEL

Daily Operation
Single Exposure
How Long
Acceptable Risk



NBC Respirator Requirements Process

Step 2: Determine appropriate performance standards:

- Evaluate current respirator standards
- Determine applicability, adequacy, limitations, and gaps in current standards
- Propose a comprehensive battery of performance and design requirements for each respirator class
- Develop and publish NIOSH Standard Testing/Operating Procedures to measure compliance

NBC Respirator Standard Development

**Review all potential test standards for applicability
(Military & Civilian)**

- ◆ **Select appropriate “Family” of tests**
- ◆ **Determine performance standards to be met**
- ◆ **Determine test parameters**
- ◆ **Public involvement with process & procedures**

**Respirator Protection CWA, BWA, TIC
Performance Standards**

Domestic Standards Evaluation

ACGIH – American Conference of Governmental and Industrial Hygienists

ANSI – American National Standards Institute

ASAE or SAE – American Society of Automotive Engineering

ASME – American Society of Mechanical Engineers

ASTM – American Society for Testing and Materials

EPA – Environmental Protection Agency (USA)

MIL – U.S. Department of Defense

NFPA – National Fire Protection Association (USA)

NIOSH – National Institute for Occupational Safety and Health

OSHA – Occupational Safety and Health Administration

International Standards Evaluation

AFNOR – France

BS or BSI – United Kingdom

CEN or EN – European Community

CNS – China

CSA – Canada

DIN – Germany

GOST-R - Russia

ICONTEC – Columbia

MODUK – United Kingdom

NATO – North Atlantic Treaty Organization

Israel

JISC – Japan

KNITQ – Korea

SAA – Australia

SABS – South Africa

SNZ – New Zealand

Preliminary Assessment

- NIOSH standards based on general industry and mining
- No NIOSH approvals for CWA or BWA
- Military standards based on open battlefield BWA & CWA
- Military masks are not evaluated against TICs
- Need NBC respirator requirements specific to terrorism
- NIOSH and SBCCOM working on new NBC respirator approval procedures

NBC Requirement Adjustments

- Neither NIOSH nor U.S. military mask standards address terrorism:
 - in small enclosed spaces
 - in large enclosed arenas
 - with many TICs/TIMs
- NIOSH industrial respirator test standards may need concentrations adjusted for terrorism
- SBCCOM military mask test standards may need concentrations adjusted for terrorism

Operational & Scientific Issues

- ◆ For SCBA
 - system and component permeation and penetration
 - fit characteristics
- ◆ For air-purifying respirators (all above plus)
 - realistic exposure estimates for challenge concentrations
 - breakthrough and end-point concentrations
 - breathing flow rates
 - carbon dioxide buildup and oxygen depletion
 - hot and cold temperature function
 - human wear factors
(drinking, fogging, communications)
- ◆ For assessment of future respirator technologies

NBC Respirator Standards Process

Step 3: Test Method Development and Validation:

- Evaluate existing NIOSH & SBCCOM procedures
- Adjust for NBC terrorism threat levels
- Develop new procedures for new agents
- Validate accuracy, precision, reproducibility
- Publish NIOSH Standard Testing/Operating Procedure

Test Method Development & Validation

- ◆ Establish test procedures
- ◆ Develop test protocol
- ◆ Validate test method/procedures
- ◆ Document
- ◆ Public involvement with process & procedures



Approved and Validated Test Methods

NIOSH Respirator Certification Program

- ◆ **7172 Certificates of Approval Issued since 1972**
 - 453 - 13F - Self-contained breathing apparatus**
 - 178 - 14G - Gas masks**
 - 340 - 19C - Supplied-airline respirators**
 - 4133 - 21C/84A - Particulate respirators**
 - 2068 - 23C - Chemical cartridge respirators**

- ◆ **62 Manufacturers - 42 Domestic**



- **20 Foreign, 16 Countries**
- **85 manufacturing sites**

CBRN Future Activities

- ◆ NIOSH-SBCCOM Joint NBC Respirator Standards Development Team progressing well
- ◆ CDC support and National Personal Protective Technology Laboratory in process
- ◆ NIST-NIOSH-SBCCOM Public Meeting on “Standards for Respiratory Devices Used to Protect Workers Against Chemical, Biological, Radiological, and Nuclear Agents” April 17-18, 2000
- ◆ NBC Requirements for SCBA in FY 2001
- ◆ NBC Requirements for other respirator classes FY02-03
- ◆ NIOSH-NIST laboratory qualifications program will follow