# National Personal Protective Technology Laboratory

# Hazard Assessment of First Receivers in Medical Facilities Responding to a CBRN Terrorist Incident

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#### Issues

- What degree of individual protection is required for First Receivers (FR) in the Emergency Department (ED) following a Chemical, Biological, Radiological and Nuclear (CBRN) terrorist incident?
- What is the extent of Chemical and Biological (CB) secondary hazard in an ED during treatment of contaminated casualties?





#### **Definitions**

- First Receivers (FR):
  - Emergency Department (ED) staff to include:
    - Emergency Physicians, Emergency Nurses, Patient Care Associates, Clerical Staff and Security Staff
- Secondary hazard:
  - Residual contamination from chemical or biological agents on the clothing and bodies of casualties/victims of CB incident







### **Background**

- Chemical and biological agents are orders of magnitude more toxic than Toxic Industrial Chemicals (TIC)
- FR have suffered effects of secondary exposures in previous CB terrorism event responses (e.g., Tokyo and Matsumoto sarin incidents) and following some TIC HAZMAT responses
- The potential level of contamination and hazard that might be encountered by FR in terrorism scenarios has not been determined







### **Objectives**

- Identify potential CB hazards inside a typical emergency medical facility
- Estimate level of respiratory protection required to enable development of standards for NIOSH CBRN Non-Tight Fitting PAPR appropriate for EDs





#### **Planned Effort**

- Conduct research and a hazard assessment to estimate the CB concentrations that can be attained in medical facility EDs resulting from secondary hazards of a potential terrorist CB attack.
  - Note: The medical facility is <u>not</u> the primary attack point (ground zero): Contamination source is from incoming victims







# **Description of Hazard Assessment**

- Perform a hazard analysis and modeling on:
- Biological agents
  - Anthrax (bacteria)
  - Smallpox (virus)
  - Botulinum (toxin)
- Chemical Warfare Agents
  - Sulfur Mustard (HD) blister agent
  - Sarin (GB) nerve agent
- Five (5) Toxic Industrial Chemicals (TICs)
  - TBD from chemicals on the current NIOSH CBRN hazard list
  - Based on toxicity, persistency and availability







Evaluate 46 of the chemicals from the NIOSH List to determine if they pose a respiratory hazard to the FR in the ED scenario

- 32 Acid gases, 5 Nitrogen oxides, 4 Base gases, 4 Hydrides and 1 Formaldehyde
- Evaluate toxicity, physical/chemical characteristics such as vapor pressure and time from the incident (10 minutes)

#### Purpose:

 To reduce the number of Test Representative Agents required in the NIOSH CBRN Non-Tight Fitting PAPR standard for gas life testing by first ensuring that a chemical family (acid gas, NO<sub>2</sub>, etc.) is not a hazard







- Venue of Modeling:
- Representative Hospital
  - Determined from evaluating the characteristics of 5 or more typical hospital EDs
  - The amount of contamination entering the ED will be based on the Maximum Number of Victims entering the ED
  - The Maximum Number of Victims entering will be determined based on the <u>calculated average</u> of Maximum Number of Patients an ED can serve per Hour per Square Foot from the 5 or more typical hospitals



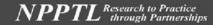




- Two (2) Hospital ED Venues to be Modeled:
  - 1. Center Console Room
  - 2. Individual Patient Room







#### Effects on the ED of the four (4) Scenarios:

- Confirmed Event EMS Transported: Victims have undergone partial decontamination; ED staff implements CBRN protocol procedures and don PPE: lock-down of facility
- Confirmed Event Self-Referred: Same as above, but victims will not be Warm Zone decontaminated and arrive by private or public transportation or ambulatory
- 3. Unannounced Event: Generally biological event; victims will arrive days after the event and not have undergone pre-entry decontamination; First Receivers will not have implemented CBRN protocol procedures







#### Effects on the ED of the four (4) Scenarios:

4. Unannounced Event: Victims arrive at ED contaminated with a CWA (GB or HD) or a TIC and will not have undergone pre-entry decontamination; FR will not have implemented CBRN protocol procedures

**Note:** Considered to be worst case condition and the parameters of this scenario will be used in the computational modeling







#### **Research Status**

- On-going collaboration with U.S. Army Edgewood Chemical and Biological Center
- Contract negotiation in-process with OptiMetrics, Inc. for technical support in evaluating CB threats and computational modeling of indoor scenarios
  - OptiMetrics partnered with NIOSH and ECBC on previous research and the information was used to support the development of NIOSH CBRN respirator standards
  - Five month anticipated period of performance







# **Questions?**

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