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 *not* 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
Description Continued

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, NO₂, etc.) is not a hazard
Description Continued

- **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 calculated average of Maximum Number of Patients an ED can serve per Hour per Square Foot from the 5 or more typical hospitals
Description Continued

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

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

1. **Confirmed Event – EMS Transported:** Victims have undergone partial decontamination; ED staff implements CBRN protocol procedures and don PPE: lock-down of facility

2. **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
Description Continued

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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