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National Personal Protective Technology Laboratory

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

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CBRN Respirator Standards

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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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