Evidence-Based Mass Casualty Decontamination Strategies for Responding to Chemical Incidents

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New federal guidance (Primary Response Incident Scene Management; “PRISM”) emphasizes the rapidity of the initial operational response to improve casualty survival following a chemical incident [1]. The development of such guidance necessitates a robust evidence base. Here we summarize the outcome of a large-scale exercise [2] performed at the University of Rhode Island involving ~ 300 Fire Department, EMS and support staff to evaluate the “Triple Protocol” of dry, ladder pipe and technical decontamination. The exercise included a proportion of volunteers who self-identified as “non-ambulatory”, representing the 20% of the current U.S. population who have a disability.

Clinical efficacy was determined by recovery of a chemical warfare agent simulant from the hair, scalp and various skin sites of the volunteers (n=86). GPS trackers were used to provide information on casualty flow and provided an objective measure of operational effectiveness. Post-exercise questionnaires were used to collate information from the perspective of volunteers and incident response personnel.

The PRISM decontamination protocols were shown to be effective individually and were synergistic when performed in combination (Triple Protocol). The introduction of an immediate disrobe and dry decontamination stage for casualties waiting for wet decontamination offers a rapid and effective initial response with minimal operational impact. The effectiveness of dry decontamination was shown to be dependent on casualty compliance, highlighting the need for clear instructions from first responders. Processing of non-ambulatory volunteers through dry and LPS decontamination stages was significantly slower than ambulatory volunteers and potentially represented a bottle-neck, indicating a potential need for a revised response strategy for this group of casualties.

Overall, this large-scale exercise confirmed numerous laboratory and human volunteer studies and collectively represents a comprehensive body of evidence to support implementation of the PRISM federal guidance.

[1] R.P. Chilcott, J. Larner and H. Matar, www.medicalcountermeasures.gov/barda/ cbrn/prism/
[2] R.P. Chilcott, J. Larner, A. Durrant, et al., 2018. Ann Emerg Med. 73(6):671-684. doi: 10.1016/j.annemergmed.2018.06.042.