

Decontamination of Hair and Related Issues Following a Mass Casualty CBRN/HazMat Incident

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Previous studies have demonstrated that the “triple protocol” comprising dry (DD), ladder pipe system (LPS) and technical decontamination is highly effective in removing chemicals from the skin of exposed casualties [1]. The purpose of this ex vivo study was to evaluate various strategies for hair decontamination and to investigate the fundamental interactions between chemicals and hair to underpin recommendations for managing casualties following decontamination. Three experiments were performed:

1. Evaluation of the efficacy of DD, LPS and TD, alone or in combination, on skin and hair contaminated with liquid droplets of methyl salicylate (MS), phorate (PHR), sodium fluoroacetate (SFA), or potassium cyanide (KCN).
2. Investigation of residual hair contamination following decontamination with the Triple Protocol (DD+LPS+TD) performed at regular intervals (0 – 240 minutes) post exposure.
3. Off-gassing of hair exposed to MS and PHR following Triple Protocol decontamination (performed 0 – 240 minutes post exposure) was measured at regular intervals over 5 days.

Decontamination protocols were highly effective in removing contaminants from the surface of skin and hair. However, up to 80% of the applied dose of the lipophilic compounds (MS and PHR) remained within the hair. This was tentatively ascribed to rapid partitioning of the contaminants into the lipophilic domains of the hair strands which consequently impeded the effectiveness of the decontamination protocols [2]. In the case of MS (a medium volatility chemical), this resulted in significant off-gassing over five days. The difference in cumulative off-gassing between control (untreated) and decontaminated hair decreased as the delay between exposure and decontamination increased.

These studies demonstrate that, unless performed immediately following exposure, current hair decontamination protocols are relatively ineffective in removing lipophilic contaminants from within the hair. Correspondingly, consideration should be given to removing hair following exposure to toxic chemicals [3,4].

[1] R.P. Chilcott et al., *Ann Emerg Med* (2018), DOI: 10.1016/j.annemergmed.2018.06.042

[2] H. Matar et al., *Sci Rep* (2018), DOI: 10.1038/s41598-018-35105-z

[3] R.P. Chilcott, J. Larner and H. Matar, www.medicalcountermeasures.gov/barda/cbrn/prism/

[4] M. Spiandore et al., *Chem Biol Interact* (2016), 267, 74-79.