Personnel Decontamination: Understanding the 90% Solution

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Chemical and biological attacks, while uncommon, are possible in the modern world. After a chemical mass casualty incident, decontamination of people, equipment, and the environment is critical in order to prevent deleterious effects and secondary contamination of first responders and bystanders. The first step in personnel decontamination is considered to be disrobing, which is stated to remove between 70-90% of contamination. This assumption of 90% removal is the basis for disaster response and decontamination guidelines throughout both the military and civilian sectors, although a scientific basis is lacking. Intuition suggests that this is likely a reasonable assumption, however there are many other factors which would affect this statistic. These include the population targeted, the characteristics of the chemical agent used, and the disrobing and decontamination procedures followed. If the target of an attack is a military group, then 90% may be much closer to the true removal than it would be for a civilian population. However, even if 90% removal is achieved, chemical warfare agents can cause significant injury or mortality at very low concentrations so 90% may not be sufficient to consider a person fully decontaminated. This research aims to establish a scientific basis for this assertion by quantifying whole body contamination of a mannequin before and after a decontamination procedure. In order to accomplish this goal, this work aims to translate the traditional research methods from small skin swatches to an entire mannequin. An aerosol chamber was built and characterized for this purpose. A mannequin clothed in JSLIST suit will be contaminated inside this chamber. The contaminant used will contain an ultraviolet fluorescent tracer. The mannequin will be photographed under UV light before and after disrobing or other decontamination procedures and these images will be analyzed to quantify the percent of body surface area contaminated. This research aims to develop a new decontamination research methodology as well as validate the 90% solution.