MITIGATION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL HAZARD MITIGATION

A Design For Decon

Sarah Katoski U.S. Army DEVCOM Chemical Biological Center **John Davies** U.S. Army DEVCOM Chemical Biological Center
Shawn Funk U.S. Army DEVCOM Chemical Biological Center

Automated contamination mitigation capabilities will enable the Joint Force to improve sustainability of operations in a CBRN hazard environment and rapidly recover for a return to operational tempo after enemy employment of CBRN weapons or hazardous material. This project explores a critical area (e.g., for APODs/SPODs) autonomous decontamination capability that reduces troop-to-task logistics and risk to Warfighters with a 'design for Decon.'
CBC is executing two efforts to address critical area contamination: 1) design and integrate a modular decontamination application payload for the Multi-Utility Tactical Transport eXpanded Mobility (MUTT-XM) that is suitable to demonstrate the concept of critical area decontamination. We have leveraged the modularity of the MUTT-XM to ensure interchangeability of solution, hardware, and operating procedures. 2) Development of a new decontaminant formulated from readily available commercial ingredients that can be mixed to address biological contamination. Variations of the mixture will produce a formulation that can be used for chemical contamination. Designing a formulation based on commercial ingredients could result in greater availability at lower cost, two significant factors when considering decontamination of large areas.

ATP 3-11.32 describes processes for Terrain Decontamination and Fixed Site Decontamination. The described processes are time consuming, highly resource intensive, and dependent upon available decontamination and/or emergency response equipment. Weathering or partial decontamination are often more realistic goals than complete area decontamination, given current capabilities. Because chemical or biological agents can persist in the heat, humidity, and shade, which are characteristics of multiple operational environments and terrains, weathering may not be sufficient for areas that impact mission execution or preparation. Therefore, weathering is not always a reliable means of biological decontamination, and a decontamination capability for mission-critical areas may be needed to ensure that the Joint Forces can continue the mission without an excessive risk to the personnel following an attack. This presentation will focus on the decontamination development effort.

We have employed a Design of Experiments (DOE) for the development, maturation, and evaluation of decontamination formulations to neutralize, destroy, or otherwise mitigate hazards associated with chem-bio agents. Due to the complex design space consisting of many factors and possible formulation components, we selected a DOE methodology as a means of efficiently exploring the entire design space. The starting statistical model contained main effects, squared effects and all interactions up to 3-way. The DOE used an I-Optimal design to minimize the number of combinations that would be required for laboratory execution. The response of interest will be log reduction for the agent being tested. Log reduction will be calculated relative to a daily "positive" dose control which will be an average of the agent count for the "positive" dose controls for the given test day. The DOE based fitted statistical prediction model will then be used to predict optimal formulations for maximum efficacy against the agents of interest. The current effort is aimed at determining laboratory efficacy of decontamination formulations on representative surfaces for two optimal formulations. The best formulation will proceed to larger scale chamber testing.

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