

PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Nerve Agent ChE Operational Impact From Dermal Exposures

Kevin Ulmes U.S. Army DEVCOM Chemical Biological Center **Terrence D'Onofrio** U.S. Army DEVCOM Chemical Biological Center

The Chemical and Biological Defense (CBD) program aims to protect the warfighter from chemical threats by developing better detection, protection, and decontamination methods. To achieve this goal, acquisition programs require testing and evaluating CBD solutions against health-based requirements. A crucial aspect of these evaluations is translating toxicological data on chemical agents into operational impact. For nerve agents, which cause health effects by depressing acetylcholinesterase, this translation is particularly challenging. A historical dataset of studies that measured acetylcholinesterase depression and symptomology in humans was curated and combined with medical guidelines on nerve agent symptom severity. This dataset was used to establish guidelines for evaluating acquisition program test data. The analysis found a correlation between cholinesterase levels and mild and severe symptomology. Specifically, it was demonstrated that if cholinesterase levels remain above 50%, severe health effects that would impact a warfighter's ability to perform the mission can be avoided in >99% of the population. These criteria have been reviewed and approved by service and joint, medical and Testing and Evaluation (T&E) offices across the Department of Defense. Multiple acquisition programs are currently applying these guidelines to evaluate performance, helping to define protection program requirements based on user and mission needs. Overall, this work provides a crucial link between toxicological data and operational impact, enabling the development of effective warfighter protection solutions against nerve agents.

This research is funded by DTRA JSTO projects CB11220, and 10705 Dr. Kendra McCoy and Ms. Sara Peacock.