

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

A Binding Solution To A Lethal Problem, Chemical Defense Wound Bandage Incorporating PTE-CBD

Stephen Kirby U.S. Army Medical Research Institute of Chemical Defense **Carolina Lee** USAMRICD **Sophia Pittman** USAMRICD **Shaley Nolan** USAMRICD **Anthony Bui** USAMRICD **Rohit Nagarimadugu** USAMRICD

Traditional wound dressings are good at preventing contamination to kinetic and thermal battlefield wounds, but they can also trap contaminants. In a situation where chemical warfare agents (CWAs) like organophosphorus compounds (OPs) are present, entry of the agent into the body from the wound may be accelerated when wound dressings are applied. Current pharmaceutical treatments for OP toxicity can prevent death if given in a timely manner, however novel treatments like catalytic bioscavengers which continuously destroy OPs offer an alternative treatment. Phosphotriesterase (PTE) mutants have some of the highest catalytic efficiencies for CWAs reported in the literature. One drawback is their rapid clearance by the mammalian immune system minimizing their effectiveness in vivo. To combine bandage reliability and catalytic scavenger effectiveness, we have fused PTE mutants to cellulose binding domains (CBDs), which can attach to cellulose based bandages creating our SMART (Special Matrix Applied Reactive Treatment) bandages. Currently we have fused PTE to the CBDs CeL7A-CBM1, EHUX2, and EHUX4. PTE-CeL7A-CBM1 was expressed and purified, and a cellulose binding assay was attempted to evaluate the fusion protein adherence to cellulose as well as its ability to maintain PTE hydrolase activity. The resulting SMART bandages will be a powerful tool for Army medics to mitigate agent-contaminated wounds, preemptively detoxifying agent in the wound before it can enter the body.

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