INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

Olfactory Science: Asymmetric Threat Detection

Jenna Gadberry DEVCOM-CBC **Michele Maughan** Excet Inc **Shawna Gallegos** DEVCOM-CBC/ORISE **Lillian Kerns** DEVCOM-CBC/ORISE **Dakota Discepolo** DEVCOM-CBC/ORISE **Caitlin Sharpes** Excet Inc **Aleksandr Miklos** DEVCOM-CBC

The detection and identification of chemical, biological and explosive (CBE) threats are paramount capabilities needed to counter the Global War on Terror. Asymmetrical warfare continues to dominate the defense landscape, bringing with it the tactics and strategies of unconventional warfare, such as the use of CBE weapons and materials. In order to protect the Warfighter, development of technologies through the research and development pipeline is needed to aid in the search for, detection, and identification of CBE agents. Most of the current technologies in the detection and identification realm do not provide timely answers in the field and are inherently high-visibility, both of which are counterproductive to our operators. Also, the ability to search for biological weapons (BW) is a need currently unmet by any existing technologies. The use of autonomous terrestrial sensors (canines) will address the capability gap to help search for, detect, and identify threats and materials.

Canines are excellent anomaly detectors. In addition to searching for trained odors they have an established ability to identify 'abnormal' odors that are similar to trained odors, a capability lacking in most other sensing systems. The US Department of Defense is on the frontlines of our nation's biodefense strategy and yet we are woefully unprepared for the next pandemic disaster, natural or man-made. However, canines represent a detection technology platform that are threat-agnostic, meaning that if the threat material has an odor, canines can detect it and there are tools that enable them to do so safely and effectively like no other detection technology in existence. During the recent COVID pandemic a rapid study with UPENN, DEVCOM CBC employed the traditional medical detection canine approach. Eight (8) canines were trained using clinical samples from COVID positive and negative patient volunteers collected over an eight-month period. The overall results of the study were 90.8% specificity and 81.9% sensitivity with a 9.2% false positive rate. The detection canines demonstrated superior specificity and sensitivity than currently fielded antigen-based diagnostics. Another recent study using ink jet printed trace explosives, it was proven that Military Working Dogs were able to successfully find explosives at 0.2mg levels. Further development and refinement of this novel CBE detection approach could lend to a scalable operational capability.

This research was partially funded by the Department of Homeland Security.