INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

A Field-reprogrammable Toxin Detection Platform

Daniel Phillips U.S. Army DEVCOM Chemical Biological Center **John Biondo** Excet, A Precise Systems Company **Caitlin Sharpes** Excet, A Precise Systems Company **Rebecca Kang** Boston University **Carina Yan** University of Toronto **Katherine Rhea** U.S. Army DEVCOM Chemical Biological Center **Alexander Green** Boston University **Keith Pardee** University of Toronto **Aleksandr Miklos** U.S. Army DEVCOM Chemical Biological Center

Lateral flow immunoassays (LFIs) enable rapid detection and diagnostic capabilities with relatively little training required. Antibody-based affinity capture reagents are the current gold standard for LFIs, but traditional LFIs have a shelf life dependent upon the date of manufacture, aren't reprogrammable, and frequently only target one antigen per test. By exploiting cell-free expression systems (CFEs) to produce our affinity reagents for a bioidentification device on demand, we can remove these potential disadvantages and bolster device designs for ease of use by the Joint Force. Within the Dial-a-Threat: Antigen device, lyophilized CFE lysates are rehydrated with nucleic acids encoding the individual components of a detection assay, allowing a stockpiled "blank" device to be functionalized at echelon. This strategy could facilitate detection capabilities during a distributed operation by lowering the logistical burden of manufacturing, storing, and shipping a new sensor or diagnostic device. Here, we demonstrate proof-of-concept by using this system to detect a non-mammalian protein toxoid, but the device could be readily reprogrammed to detect additional threats or diagnostic targets by changing the input nucleic acid "instructions".

This research is funded by DTRA JSTO project CB11133, Dr. Stephen Francesconi.