

INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

Genomic Non-specific Operational Matchmaking Enabled Systems (G-NOMES): Innovative Acquisition For Low-SWAP, Modular, Automated Biological Sample Preparation For Field Forward Agnostic Sequencing For Emerging Biological Threats

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Warfighters need situational awareness of potential unknown and emerging biological threats in far forward and austere environments. Current far-forward biological identification technologies (HHA and PCR) can only detect a small number of known biological threats. Non-targeted DNA/RNA sequencing technology is needed for fully agnostic biological identification. Current methods for preparation of sequencing-ready DNA/cDNA require lengthy multi-step regimens; a process too cumbersome in time to carry out in austere, hostile environments. Thus, there is an unmet need for streamlined, low SWAP next generation modular and automated biological sample preparation for field forward nucleic acid sequencing.

G-NOMES, a collaboration lead by scientists and engineers from the US Army DEVCOM CBC Accelerator for Innovative Minds (AIM) and warfighters from USSOCOM, with input and support from key DOD stakeholders including JPEO-CBRND and DTRA JSTO, is bringing together the best solutions from industry and academia to solve this complex problem set.

Steps required of the technology include lysis of cells, extraction of nucleic acids (DNA and RNA), and library preparation resulting in sequencing ready DNA. While the initial version of the technology solution will utilize samples of high abundance biological material with low background, future versions are envisioned to accept multiple types of field-collected samples. The system must be able to perform in hot and cold outdoor environments and be easily cleaned with a decontamination solution such as bleach to ensure safety of operators. The system must be able to heat to 80oC for one of the necessary steps, be self-contained, and battery powered, yet also be optimized for a low size, weight, and power (SWaP) profile. The goal is for the automated sample preparation system to be one-person carried, ideally fitting in a cargo pocket.

The initial product prototype is expected to participate in one or more warfighter experiments (e.g., RDAX, CBOA, etc.) in FY25. Additional refinement is expected to stem from those results and warfighter feedback. This program and resulting technology will greatly benefit the DTRA JSTO mission to equip the warfighter with the best materiel to counter the threat of unknown and emerging biological materials.

G-NOMES effort appreciates the support of the DEVCOM CBC AIM Program and its other DOD stakeholders*

*At the writing of this abstract, G-NOMES does not have a DOD Stakeholder Program # associated with it.