Advanced Diagnostic and Sample Preparation Platform for Early Threat Surveillance
158814

Year 2 of 3
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Project Purpose:
Emerging infectious diseases present a profound threat to global health, economic development, and political stability, and therefore represent a significant national security concern for the U.S.   The increased prevalence of international travel and the increase in globalized trade further amplify this threat.   The key to preventing an outbreak before it goes global is to establish a biosurveillance network that effectively reaches even the most remote regions and provides a network-integrated, location-appropriate diagnostic capability.   At present, the two main factors that prevent the extension of biosurveillance activities beyond centralized laboratory facilities are the lack of a deployable rapid-response diagnostic platform and a method to safely and consistently process infected samples in the field for analysis.

To minimize serious global outbreak events, modern surveillance requires both coordination and investment in infrastructure at the international level to enable rapid response to pathogens as they emerge.   The first critical steps in the surveillance process (clinical observation, sample collection, preliminary diagnosis) typically fall to first responders around the world.   However, the facilities, technology, and protocols they use can vary widely depending on the available infrastructure, which complicates efforts for a globally coordinated biosurveillance scheme.   This project proposes to address this identified capability gap by delivering an automated clinical sample processing platform integrating a universalsample collection and preparation protocol with a comprehensive diagnostic strategy.   This will require 1) the creation of a fieldable Advanced Diagnostic and Sample Preparation platform to safely and cost-effectively automate the extraction of pathogenic genomic nucleic acids (NA) from potentially infectious clinical samples for analysis, 2) the on-platform integration   of a multiplex polymerace chain reaction (PCR) array for initial point-of-care diagnostic screening and the implementation of on-platform NA formatting for subsequent off-platform microarray or next generation sequencing analysis, and 3) the transfer of the ADSP technology to identified biosurveillance collaborators for testing and integration into real-world pathogen detection and surveillance workflows.

Refereed Communications: