DTRA-JSTO

INNOVATIVE CHEMICAL AND BIOLOGICAL, SCIENCE AND TECHNOLOGY EFFORTS FUNDED BY CARES ACT

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SUMMARY

The Coronavirus Aid, Relief, and Economic Security (CARES) Act was passed into law on March 27, 2020. This $2+ trillion economic relief package helps protect the American people from public health and economic impacts of COVID-19.

The CARES Act also provides $10.5 billion in supplemental appropriations to the Department of Defense (DoD) for procuring goods and services from federal contractors. The Defense Threat Reduction Agency's Chemical and Biological Technologies Department (DTRA CB), in its role as the Joint Science and Technology Office (DTRA-JSTO) supporting the DoD Chemical and Biological Defense Program (CBDP), received approximately $55 million in CARES Act funding to invest in vaccines, therapeutics, diagnostic tools, detection devices, computer modeling/disease spread projections and other efforts. Among the many DTRA-JSTO projects being funded by the CARES Act are:

Development of Medical Countermeasures Against Novel Entities

DTRA-JSTO is accelerating the implementation of the Development of Medial countermeasures Against Novel Entities (DOMANE) program to rapidly evaluate repurposed drugs for novel and emerging biothreats using COVID-19 as a proof of concept. To date, DOMANE has discovered five previously Food and Drug Administration (FDA) approved drugs that show promise in fighting COVID-19 by using biotechnology tools such as artificial intelligence and machine learning (AI/ML). Initial data suggests that using FDA approved drugs, such as famotidine, cetirizine, celecoxib, and montelukast, to modulate an immune response that dramatically improves COVID-19 outcomes.

VSVΔG SARS-CoV-2 Vaccine

DTRA-JSTO has numerous vaccine platform technologies which can swiftly pivot to address emerging biological threats. Platform technologies are considered a valuable tool to improve efficiency and quality in drug product development. One such platform is the VSVΔG that resulted in the first approved Ebola virus vaccine. This platform is being adapted and expedited through approval to Phase I clinical trial for a SARS-CoV-2 vaccine.

The non-clinical program includes traditional and novel formulations of the previously approved VSVΔG platform for Ebola, specifically as a novel mucosal vaccine. The mucosal form will be compared in efficacy studies to the intramuscular form, which will be entering clinical trials in October 2020. The importance of the mucosal route is that a boost in mucosal immunity may avoid a vaccine-induced disease, a previously established possibility that occurs in coronavirus vaccinology.

Highly Multiplexed Point-of-Care Digital Protein Assay Platform with Digital Molecular Capability

This technology allows for molecular and serological targets to be detected simultaneously at the point-of-care care level. Enabling syndromic diagnosis, the platform would allow for testing of diseases clinicians care about in one convenient test. CARES ACT funding are being used to incorporate SARS-CoV-2 to this rapid development diagnostic that tests for respiratory pathogens and guide clinical care.

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Detect the threats. Deter the actions. Defeat the enemy.

Multi-omic/Proteomic Biothreat Evaluation – Mapping Severe Acute Respiratory Syndrome Biomarkers to Define COVID-19

This effort leverages the pre-existing Multi-omic/ Proteomic Biothreat Evaluation (Multi-ProBE) effort already funded by the Defense Threat Reduction Agency (DTRA) to develop capabilities to address both emerging and enhanced biological threats. This specific study focuses on multi-omic (transcriptomic, proteomic, and lipidomic) characterization of host cellular response to coronavirus infection. Multi-omic data will be collected and analyzed by bioinformatic tools and machine learning approaches.

The results of this work will help accelerate capability development to address coronavirus, as well as other emerging and enhanced biological threats, by establishing the highly reproducible methods for characterization and enhanced understanding of biological threats/pathogens to counter threats and mitigate risk to warfighters and Public Health.

Lung Chip Technology to Characterize SARS-CoV-2

The organ-on-a-chip technology platform, a multi-channel 3-D microfluidic cell culture chip that simulates the activities, mechanics and physiological response of entire organs and organ systems, is now using the lung organ model to characterize the manner in which the SARS-CoV-2 virus develops.

Results of this effort will shed light on how COVID19 develops, answering key questions related to the emerging novel coronavirus outbreak.

Understanding critical components of COVID-19 infection will significantly increase the flexibility and speed by which the DoD and interagency perform threat assessments, develop medical countermeasures, and achieve detection of unknown pathogens.

Rapid Analysis of Threat Exposure Operational Assessment

DTRA-JSTO is rapidly operationalizing the Rapid Analysis of Threat Exposure (RATE) algorithm to help critical DoD personnel maintain mission capability during the COVID-19 pandemic.

The RATE algorithm can provide identification of a Hospital Acquired Infection 48 hours in advance of symptomatology and can potentially provide a screening capability to aid in reducing pathogen transmission thus reducing morbidity and mortality.

The aim of this effort is to collect asymptomatic / pre-symptomatic health data of COVID-19 positive individuals to improve the RATE algorithm and provide earlier identification of infection for future users.

Simulation Capability for Integrated Urban Outdoor and Indoor Hazard Prediction

This effort expands upon current indoor modeling capability to simulate the spread of COVID-19 particles in different airplane configurations when transporting infectious individuals.

This work involving airplane particle modeling will inform decisions when transporting infectious patients such as when mass evacuations from virus hotspots are necessary due to waning resources.