JSTO in the news

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International Partnerships Combat Global Threats

Biological threats—natural and enemy-driven—don’t respect borders. As a result, global cooperation is critical to combat these threats. Global cooperation builds capacity abroad, enlisting more expertise and resources into the fight and enabling new threats to be countered more quickly. It also increases the sphere of knowledge and ideas, helping us advance our scientific capacity to combat these threats. DTRA CB is working aggressively to build global capacity and networks.

For example, as part of The Technical Cooperation Program (TTCP), the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) hosted visits by a U.K. Defense Science and Technology Laboratory (DSTL) scientist.

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JSTO in the news

We invest in transformational technologies to save and improve lives.

Innovations in Simulations – All Reward, Low Risk

Simulations enable DTRA CB to test and develop countermeasures in real-world environments without the risks inherent in using the actual biological threat. Enhanced simulation capabilities, in effect, produce all-reward, no/low-risk testing.

ECBC simulation research resulted in two papers being accepted for publication in the Journal of Applied & Environmental Microbiology. The first, titled, “Genetic Barcodes for Improved Environmental Tracking of an Anthrax Simulant” by Patricia Buckley et al., describes the creation of a novel biological anthrax simulant. The

Bioscavengers Hunt for New Ways to Combat Nerve Agents

DTRA research is playing a critical role in developing new “bioscavengers” to combat nerve agent threats. The use of so-called “bioscavengers” is a relatively new approach to counteract nerve agents by reducing their toxicity.

Rather than fighting the symptoms of the nerve agent, which is the method for traditional treatments, the bioscavengers prophylactically inactivate the nerve agent before it can halt the victim’s nerve signals to the body’s organs and muscles. This approach has the significant benefits of avoiding the side effects associated with current antidotes and the requirement for the rapid administration of these countering agents.

A publication from a past DTRA-funded project on bioscavenger research was

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TTCP is an international organization that collaborates on defense scientific and technical information exchange, program harmonization and alignment, and shared research activities.

Dr. Sophie Jane Smither, a senior scientist in the Virology Group, Biomedical Sciences Department at DSTL, visited USAMRIID twice and was hosted by Dr. Gene Garrard Olinger, Jr., supervisory microbiologist in the institute’s Virology Division. The primary objectives for Dr. Smither’s visits were to train her to work in USAMRIID’s Biosafety Level 4 (BSL-4) laboratory wearing a fully enclosed positive pressure encapsulating suit and to begin technology transfer and comparison of the virus enumeration methods used at DSTL and USAMRIID. USAMRIID conducts BSL-4 research using enclosed cabinet systems, enabling Dr. Smither to gain valuable experience working in a suit and providing valuable insight on the institute’s safety, security and scientific procedures. She also demonstrated DSTL’s process for enumerating methodology for the Zaire strain of Ebola and Marburg virus while learning USAMRIID’s method for virus enumeration.

This sharing of techniques has an impact on the global filovirus research community, which traditionally has used a number of different virus enumeration methods, but is now trying to develop a more integrated and coordinated approach that can be used across multiple agencies. For both TTCP partners, these visits were significant in strengthening ongoing collaborative efforts between DSTL and USAMRIID while paving the way for advancing virus identification.

‘Hackathon’ Challenges

Experts

Novel and complex threats are often best solved through out-of-the box, innovative thinking. DTRA CB used a novel concept called a “Hackathon” to drive such thinking.

On September 10, 2012, DTRA CB’s Advanced and Emerging Threat Division sponsored the first ever, day-long hackathon within the federal government. The Bioinformatics Challenge Day Hackathon was an intense period of scientific collaboration built around using nontraditional technical teams to create novel solutions.

For the event, bioinformatics experts from MIT Lincoln Labs (MIT LL) and the Edgewood Chemical and Biological Center (ECBC) coached mathematicians and computer scientists through large data sets to facilitate the production of novel data analysis algorithms and visualization programs.

In preparation for the event, advisors from MIT LL, ECBC and DTRA crafted challenges around needs in analyzing the large amounts of data now produced in biological experiments. During the day-long event, the experts gave an overview of each challenge, and then participants teamed up to work with the expert

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barcoded bacterial cell line is derived from an off-the-shelf biopesticide strain commonly used in organic agriculture and is slated to be transitioned to the Army Test and Evaluation Command late next year where it’s expected to supplant the long used BG spore simulant. This will allow the specific tracking of the material in the environment through the use of a small DNA tag embedded inside each and every bacterial spore.

The second paper by Peter Emanuel et al. “Detection and tracking of a novel genetically-tagged biological simulant in the environment” describes the first outdoor large-scale testing of the new class of simulant. The successful outdoor biological test was conducted at the Edgewood campus with the cooperation of the JPEO-CBD which fielded air collectors and detection vehicles to demonstrate their utility during the nighttime dissemination.

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recently accepted in the Archives of Biochemistry and Biophysics. The paper “A role for His-160 in peroxide inhibition of S. cerevisiae S-formylglutathione hydrolase: Evidence for an oxidation sensitive motif” describes the oxidation of Cys-60 in an enzyme homologous to human esterase D and its link to ester hydrolysis. Oxidation of this residue led to the inhibition of hydrolyase activity. The authors found the same residue in the same position in two other D-type esterases, leading them to conclude that oxidation of this residue could serve as a switch to control activity of the esterase. This article provides insight into the mechanisms by which catalysis by serine hydrolases can be modulated or controlled. This knowledge is important in the development of nerve agent bioscavengers, many of which are based on serine hydrolases.

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leading the challenge of their choice. Participants ranged from statisticians to computer database experts. The open format allowed for nontraditional teaming and facilitated creativity.

The various teams successfully parsed through artifact and real signals in a clinical sample, created a workflow to compare datasets between diseased and healthy individuals, and proposed an analysis method to quickly simplify and analyze large genetic data sets. Apart from the technical accomplishments, the event also received extremely positive feedback from participants in a post-event survey, and the hackathon was deemed an all-around success.

MIT LL hosted the event in conjunction with the Institute of Electrical and Electronics Engineers’ (IEEE) Extreme Computing Conference near Boston, MA. Event details were published on the conference webpage: http://www.ieee-hpec.org.

Using lessons learned from this event, another challenge day is tentatively scheduled for January 2013 on the MIT campus.

The Defense Threat Reduction Agency (DTRA) is sponsoring an award for a project focused on biological or chemical detection in the Tri-State Open Science Challenge, a science competition open to citizen scientists and bioartists that turns ideas into reality. The award will be $5,000 in research funding and a one-year membership to Genspace, a community biotechnology laboratory located in Brooklyn, NY. In addition to the DTRA sponsored award, there is also an award open to any type of research project and an award for Art, Design, and Architecture projects involving biotechnology.

Applicants will submit a one to two page written proposal, a brief (less than five minutes) video or a five-slide presentation that explains their hypothesis and research plan. Deadline for submissions is October 19, 2012, with awards announced in November 2012. More information and submission guidelines are located at http://challenge.assaydepot.com/tri-state-open-science-challenge.

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