

4TH ANNUAL

June 27 - 29, 2018 | Hyatt Regency Bethesda | Bethesda, MD



BIODEFENSE WORLD SUMMIT 2018

Empowering the biodefense community to recognize, assess and act on biological threats



26TH

BIODETECTION TECHNOLOGIES:

Biothreat and
Pathogen Detection



26TH

BIODETECTION TECHNOLOGIES:

Point-of-Care
for Biodefense



7TH

BIOSURVEILLANCE INTEGRATION

KEYNOTE SPEAKERS



BioWatch: Technology, BioAlliance, Testing and Reoptimization of the Network

Michael Walter, PhD, BioWatch Program Manager, Office of Health Affairs, US Department of Homeland Security



The Application of Point-of-Care Laboratory Testing for Pathogen Detection and Patient Management

Kent Lewandrowski, PhD, Director of Clinical Laboratories, Pathology, Massachusetts General Hospital



The Next Generation of Deployable Biodefense Capabilities for the Warfighter

C. Nicole Rosenzweig, PhD, BioSciences Division Chief, Edgewood Chemical Biological Center, US Army



Sampling: The Forgotten Part of Microbiological Testing

Robert L. Buchanan, PhD, Professor, Department of Nutrition and Food Science and Center for Food Safety and Security Systems, University of Maryland



Applying Strategy and Analysis to the Biodefense Enterprise

Susan Collier Monarez, PhD, Deputy Assistant Secretary for Strategy and Analysis, Office of Strategy, Policy, and Plans, US Department of Homeland Security



CO-LOCATED WITH



Cambridge Healthtech Institute's 5th Annual

RAPID DETECTION FOR FOOD SAFETY

Advances in Sampling, Sample Preparation, Stress and Infectivity



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Exhibitors will enjoy facilitated networking opportunities with qualified delegates, making it the perfect platform to launch a new product, collect feedback, and generate new leads. Exhibit space sells out quickly, so reserve yours today!

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For more information, please contact:

Sherry Johnson

Business Development Manager

781-972-1359 | sjohnson@healthtech.com

HOTEL & TRAVEL

Conference Venue and Hotel:

Hyatt Regency Bethesda
1 Bethesda Metro Center
Bethesda, MD 20184
Phone: 301-657-1234

*Please visit the travel page of
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Reservations: Go to the travel page of
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Discounted Room Rate: \$255 s/d
Discounted Room Cut-off Date: May 29, 2018





SC1: RAPID SAMPLE PREP FOR PATHOGEN DETECTION

Instructors:

Dave Alburty, CEO, InnovaPrep LLC

Byron Brehm-Stecher, PhD, Associate Professor, Rapid Microbial Detection and Control Laboratory, Iowa State University

This short course will discuss sample preparation technologies for detection, identification and analysis of biomedical, biological and chemical agents, biothreats in point-of-care, laboratory and field settings. It will review the novel and rapid technologies for sample preparation, application of analytical strategies and automation in biodetection.

Topics to be Covered Will Include:

- Sampling and Analysis Strategies
- Sample Prep Advantages
- Some Lessons learned the Hard Way
- Successful Case Study – Environmental
- Automation for Biodetection
- Have a Clear Goal and a Plan
- Choose your Gear with the End in Mind



SC2: BIO RECOVERY: MITIGATING RISKS TO PUBLIC HEALTH & SAFETY

Instructor:

Thomas Licker, CBRM, CEICR, President, American Bio Recovery Association

The purpose of this short course is to educate public entities on the resources available to mitigate risks to public health. This short course will provide some guidance to those who may be expected to respond in the event a release of (Other Potentially Infectious Materials) OPIM or biological hazards during a trauma event or other public health emergency.

Topics to be Covered Will Include:

- Biosafety Risk Assessment - Rapid Field Assessment
- Field Decontamination
- Risk to first responders
- Risk to the Remediation Crew
- Training and Educational Opportunities
- Recognition of third party certified professionals in Bio Recovery
- Insurance Coverage
- Public/Private partnerships

** Separate registration required for dinner short courses*

MEDIA PARTNERS



TOP REASONS TO STAY AT THE HYATT REGENCY BETHESDA

- Complimentary internet in guest rooms
- 24 hour Gym
- No commute as conference takes place in hotel
- Hotel is located just a couple blocks from top shopping centers: Bethesda Row, Chevy Chase Pavilion and Mazza Gallerie



BIODETECTION TECHNOLOGIES:

Biothreat and Pathogen Detection

WEDNESDAY, JUNE 27, 2018

7:30 am Registration and Morning Coffee

8:25 Chairperson's Opening Remarks

David Ussery, PhD, Helen Adams & the Arkansas Research Alliance Chair in Biomedical Informatics, Director, Arkansas Center for Genomic Epidemiology & Medicine, Department of Biomedical Informatics, University of Arkansas for Medical Sciences

8:30 KEYNOTE PRESENTATION: BioWatch: Technology, BioAlliance, Testing and Reoptimization of the Network

Michael Walter, PhD, BioWatch Program Manager, Office of Health Affairs, US Department of Homeland Security

The US Department of Homeland Security (DHS) Office of Health Affairs BioWatch Program is the only federally-managed, locally-operated, nationwide biosurveillance system designed to detect the intentional release of select aerosol biological organisms. The program operates in more than 30 high-threat metropolitan areas across the country and supports national events such as the Super Bowl, national party conventions and the Presidential Inauguration. The program is pursuing several technology updates to improve IT security, the user experience and BioWatch Actionable Result (BAR) response, all of which are expected to be rolled out or completed during the first half of CY18. Updates include rebuilding the sample tracking tool (STT), launching the decision support tool (DST) and laboratory information management system (LIMS) upgrades.

9:00 CBRNE Abroad: Operating a Deployable Lab Overseas to Counteract Biological Threats

Rebecca Lewandowski, PhD, Microbiologist, CBRNE Analytical and Remediation Activity, US Army 20th Command

Logistical and operational barriers for deploying and operating mobile lab units are both numerous, unique to the territory, and unpredictable. Thoughtful adaptations are required to successfully complete a mission while maintaining best lab practices possible and ensuring sample integrity. The Army CBRNE Analytical and Remediation Activity Mobile Expeditionary Units provide insight into navigating the many unexpected obstacles. Here we present a success story that is informative, insightful, and encouraging as we continue to support our troops and monitor biological threats abroad.

9:30 Diagnostics in Resource-Limited Environments – How the Real World Differs from the Laboratory

Chris Taitt, PhD, Research Biologist, United States Naval Research Laboratory

In many developing countries, there is a lack of reliable diagnostic tests that have been adequately characterized for use in austere environments. We are collaborating with clinical researchers in Sierra Leone, West Africa, to characterize a number of diagnostic platforms ranging from simple lateral flow tests to multi-step PCRs. We will discuss challenges inherent in resource-limited environments and describe our own experiences with test performance (and failure) and information management, a critical aspect of any diagnostic or clinical lab. Support for this work was provided by the Defense Threat Reduction Agency.

10:00 Networking Coffee Break

10:30 Preservation and Detection of Biothreat Pathogens Using Nanotraps

Monique van Hoek, PhD, Professor, School of Systems Biology, National Center for Biodefense and Infectious Diseases, George Mason University

In this work, we extend the use of Nanotraps to preservation and detection. We have tested the capacity of Nanotraps particles to preserve and detect

biothreat bacteria (*Francisella*) and viruses (VEEV) in whole blood. *Francisella tularensis* is a biological threat agent bacterium that is the causative agent of the disease tularemia. Venezuelan equine encephalitis virus (VEEV) is an encephalitic alphavirus. We have used Nanotraps to preserve and detect *Francisella* and VEEV from complex biological solutions and have determined that *Francisella* and VEEV specific antigens are captured by the Nanotraps.

11:00 Biothreat and Pathogen Diagnostics: Current Technology, Regulations, and Challenges with Accelerated Assay Development
Chitra Edwin, PhD, Senior Vice President, Regulatory Affairs & Compliance, Regulatory Affairs, Spotlight Innovation

The recent NIH reversal (12/19/17) of the ban on conducting germ warfare experimentation underscores the dire need and urgency for technological preparedness to address urgent bioterrorism threats. The immediate availability of validated diagnostic tests to accurately identify the pathogen would be the first critical line of defense. The regulatory agencies in recognition of effective tools for emergencies have developed fast track guidelines to enable diagnostic developers to generate tests that meet performance parameters that meet regulatory expectations.

ADVANCES IN NUCLEIC ACID TECHNOLOGIES & NEXT-GENERATION SEQUENCING

11:30 USAMRIID's Ability to Go from Novel Pathogen Characterization through the Evaluation of Medical Countermeasures

Michael Smith, Chief Business Innovation and Plans Division, US Army Medical Research Institute of Infectious Diseases (USAMRIID)

Application of established business strategies, e.g. complementary product development and linkage management, to the DoD's investment in biological defense would significantly enhance the return on investment. The United States Army Medical Research Institute of Infectious Diseases (USAMRIID) is uniquely positioned to facilitate the introduction of these practices into the Chemical and Biological Defense Program's (CBDP) Medical Countermeasure (MCM) development efforts. The collocation of primary data sets and materials (e.g. pathogens, pathogen characterization data and multiple levels of MCM development) fosters economies of scope in resource constrained environments, allowing for the generation of multiple products in parallel.

12:00 pm Luncheon Presentation (Sponsorship Opportunity Available) or Enjoy Lunch on Your Own

1:55 Chairperson's Remarks

Rebecca Lewandowski, PhD, Microbiologist, CBRNE Analytical and Remediation Activity, US Army 20th Command

2:00 A Mixed Microbial Pathogen Reference Material: Ground Truth for Assessing Sensitivity and Specificity of NGS-Based Pathogen Detection

Scott A. Jackson, Leader, Complex Microbial Systems Group, Biosystems and Biomaterials Division, National Institute of Standards and Technology

Metagenomic sequence data obtained from complex samples is able to provide a qualitative and quantitative understanding of the individual components of the original complex sample. Ideally, NGS technologies in the not-so-distant future will allow point-of-care diagnoses of infectious disease; going from sample-to-answer in under an hour. NIST is developing a complex mixture of pathogen DNA to serve as a standard for assessing the analytical sensitivity and specificity of NGS-based pathogen detection assays/devices.

2:30 Rapid Sequencing of RNA and DNA Viromes

David Ussery, PhD, Helen Adams & the Arkansas Research Alliance Chair in Biomedical Informatics, Director, Arkansas Center for Genomic Epidemiology & Medicine, Department of Biomedical Informatics, University of Arkansas for Medical Sciences



We describe a pipeline and experimental results for using third-generation sequencing methodologies for direct sequencing of viromes - that is, all the viral genomes from a metagenomic sample. We present preliminary results from a sample of respiratory viruses. By splitting the samples into two aliquots, and using a combination of direct RNA sequencing and DNA sequencing, it is possible to get full length reads for most viral genomes. Comparison against a database of more than 5000 reference viral families in RefSeq, and more than 2 million known viral genomes currently in GenBank allows for rapid identification of the samples community structure, in terms of viral families.

3:00 Opening Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Leveraging Genomic for Microbial Detection in Combat Injuries

Nicolas Be, PhD, Staff Scientist, Lawrence Livermore National Laboratory

The increasing incidence of severe, survivable combat injuries necessitates new approaches to managing battlefield wounds. Novel prognostic tools are urgently needed for guiding and personalizing treatment. Genomics-based techniques that characterize predictive microbial signatures could provide indicators that support care of these injuries. Our studies have applied several such platforms for analysis of combat wounds, including a microbial detection microarray capable of detecting 3,000+ microbial species, whole-metagenome sequencing, and targeted amplicon sequencing for antimicrobial resistance profiling.

RAPID AND FUTURE TECHNOLOGIES FOR BIODETECTION

4:30 RIGEL: Analytical System for Known and Unknown Biothreat Assessment

Willy A. Valdivia-Granda, Founder and CEO, Orion Integrated Biosciences, Inc.

The rapid progress and decreasing cost of high throughput DNA sequencing is resulting in the exponential accumulation of billions of DNA fragments that can provide clues of the genomic characteristics of microorganisms. Because of their open nature, reference biological databases can be purposely manipulated to affect their integrity and usefulness for attribution and bioforensics. To address some of these challenges we introduce a unique operational approach integrating disparate data sources into a biodefense enterprise to support known and unknown biothreat detection, characterization and to generate assessments. This system named RIGEL includes a genomic-database that dwarfs by twenty times the world's largest repository of genomic information (GenBank). Billions of records from hundreds of dimensions are corrected, disambiguated, consolidated and integrated with scientific information, aerial, land and marine transportation patterns. Efforts of our work using portable DNA sequencing for novel pathogen discovery will be highlighted.

5:00 Portable Sequencing for Infectious Disease Detection, Diagnosis, Discrimination, and Discovery

James Brayer, Associate Director, Market Development, Oxford Nanopore Technologies, Inc.

5:30 Welcome Reception in the Exhibit Hall with Poster Viewing

6:30 End of Day

THURSDAY, JUNE 28, 2018

8:30 am Morning Coffee

IDENTIFICATION & MANAGEMENT OF EMERGING AND RE-EMERGING PATHOGENS

8:55 Chairperson's Remarks

Willy A. Valdivia-Granda, Founder and CEO, Orion Integrated Biosciences, Inc.

9:00 Sequence-Based Method to Predict Host-Pathogen Interactions between Group IV Viruses and Various Hosts

Patricia Legler, PhD, Research Biologist, Naval Research Laboratories

The alphaviral nonstructural protein 2 (nsP2) cysteine proteases (EC 3.4.22.-) are essential for the proteolytic processing of the nonstructural (ns) polyprotein. A common secondary role of these proteases is in interferon (IFN)-antagonism. Here we identify a new host substrate of the nsP2 protease, human TRIM14, a component of the mitochondrial antiviral-signaling protein (MAVS) signalosome. At least eight other Group IV (+)ssRNA viral proteases have been shown to cleave host proteins involved in the innate immune response and the antagonistic strategy may be akin to those of CRISPR/Cas9 and RNAi/RISC, but with a protease recognizing a cleavage site common to both host and virus.

9:30 Use of IFN-Expressing Vectors in Control of Ebola Virus Disease in Swine

Chandrika Senthilkumaran, PhD, Research Scientist, National Center for Foreign Animal Disease, Canadian Food Inspection Agency

Ebola virus (Kikwit) can replicate in domestic pigs. Infected pigs shed the virus as early as 3 days post infection (dpi) and transmit the virus to animals including non-human primates cohabiting with them. In the event of an intentional or accidental exposure of pigs, delaying or preventing the spread of infection in pigs by preventing the shedding of virus is an absolute necessity. In our study we proved that the Porcine Interferon alpha delivered with a replication defective human adenovirus (Ad5-porIFN α) is an effective biotherapeutic agent to prevent shedding of Ebola virus from infected pigs.

10:00 Sponsored Presentation (Opportunity Available)

10:30 Coffee Break in the Exhibit Hall with Poster Viewing

11:15 Microbial Contamination in Surface Water – Challenges and Scope

Pramod Pandey, PhD, Assistant Specialist CE, Department of Population Health and Reproduction, University of California, Davis

While decreasing water levels in rivers has been a major concern for many countries, contamination in surface water, particularly microbial contamination in streams is a serious issue. Solving the problems requires improved understanding of associated source of pollutions. This research is focused on understanding the effects of land uses on microbial contamination in streams, and developing mathematical tools for rapid detection of microbial pathogens in rivers.

11:45 A Cost Effective Method for Surveillance of Influenza Viruses A, B, C and D in Swine Oral Fluid Using Newly Developed Multiplex rRT-PCR Assays

Johnny Callahan, MT(ASCP), PhD, Veterinary Diagnostics Business Development Manager, APHIS/CVB Liaison, Tetracore, Inc.

The objective of this study was to develop cost effective methods for respiratory disease surveillance in swine oral fluid and respiratory swab samples, specifically for various types of influenza viruses. Here, we report on the development of a panel of multiplex rRT-PCR assays that detect the conserved regions of all four types of influenza viruses. This panel of novel assays was designed to provide cost efficient testing to the producer and promote the continued surveillance for influenza viruses. Screening for various types of influenza viruses by rRT-PCR is a first but vital step in surveillance. The producer will see cost savings when using the multiplex testing versus the singleplex. In conclusion, having well validated and rapid diagnostic tools such as these new multiplex rRT-PCR assays will be vital for continued swine health and production while enhancing the One Health Initiative.

12:15 pm End of Biodefense Technologies: Pathogen and Biothreat Detection



BIODETECTION TECHNOLOGIES: Point-of-Care for Biodefense



THURSDAY, JUNE 28, 2018

12:30 pm Registration

ABERRATION DETECTION

1:25 Chairperson's Opening Remarks

David L. Hirschberg, PhD, Lecturer and Scientist, Department of Interdisciplinary Arts and Sciences and the Institute of Global Engagement, University of Washington, Tacoma

1:30 Technological and Scientific Gaps in Biosurveillance and BioDetection

David R. Hodge, PhD, Program Manager, Chemical Biological Defense Division, US Department of Homeland Security (DHS)

2:00 BioWatch at Age 15: Maturing or Arrested Development?

Tom Slezak, PhD, Program Leader Informatics, Lawrence Livermore National Laboratory

Even within the Biodefense domain, many people are not very familiar with the BioWatch program: a nation-wide collection of aerosol collectors run 7x24x365 and tested daily for evidence of a wide-area bio-aerosol attack. As the nation's bio-disaster early-warning insurance policy, it involves collaboration between DHS, the CDC, and state and local public health agencies. LLNL has been involved in developing, maintaining, and enhancing multiple aspects of both BioWatch (launched in early 2003) and its predecessor system, BASIS (2000-2003). The talk will provide insider historical context and discuss some of the technical, social, and political challenges BioWatch faces today.

2:20 Coastal Viral Communities and the Human and Ecosystem Implications

Lisa Zeigler Allen, PhD, Assistant Professor, J. Craig Venter Institute

Research exploring ocean and human interactions is advancing our understanding of anthropogenic influences and disease-causing organisms in coastal ecosystems, which are potential threats to the long-term sustainability of the system. With approximately 40% of the world's population estimated to be residing within 100 km of the coast, identifying the impact humans have on these natural habitats as well as the role that the coasts play in human wellbeing is of great importance.

2:40 Early Notification through Electronic Disease Surveillance

Wayne Loschen, Software Engineer, Johns Hopkins University Applied Physics Laboratory

This presentation will discuss the capabilities of ESSENCE, how it has evolved to be the civilian (CDC) and military (DoD) national syndromic surveillance system, and future directions to include advanced visualization, analytics, and predictive capabilities.

3:00 Sponsored Presentation (Opportunity Available)

3:30 Refreshment Break in Exhibit Hall with Poster Viewing

TOOLS AND TECHNOLOGY AT THE POINT-OF-CARE

4:15 PANEL DISCUSSION: Impact of Diagnostic POC Technology

Moderator: Joany Jackman, PhD, Senior Scientist, Johns Hopkins University Applied Physics Laboratory

Point-of-care (POC) technology is a game changing development in the field of medicine. It is potentially disruptive technology in that it has the potential to change the way that care is delivered to patients and in the way that clinicians and patients interact. In this panel we will discuss the impact of POCT, how should it be determined, what benefits are yet to be realized and what other impacts need to be evaluated. Please join the panel of experts to discuss the application of POCT and the metrics used to determine its value.

5:15 End of Day and Dinner Short Course Registration*

6:00 SC1: Rapid Sample Preparation for Pathogen Detection

SC2: Biorecovery: Mitigating Risks to Public Health & Safety

*See page 3 for details, separate registration required.

FRIDAY, JUNE 29, 2018

8:00 am Morning Coffee

OPTIMIZING PERFORMANCE OF TRADITIONAL POINT-OF-CARE DETECTION

8:25 Chairperson's Remarks

Joany Jackman, PhD, Senior Scientist, Johns Hopkins University Applied Physics Laboratory

8:30 KEYNOTE PRESENTATION: The Application of Point-of-Care Laboratory Testing for Pathogen Detection and Patient Management

Kent Lewandrowski, PhD, Director of Clinical Laboratories, Pathology, Massachusetts General Hospital

9:00 Integrated Droplet Based Microfluidic Platform for Rapid Antimicrobial Susceptibility Testing and Bacterial Growth Analysis

Tania Konry, PhD, Assistant Professor, Department of Pharmaceutical Sciences, Northeastern University

The rapid emergence of antibiotic resistance presents an alarming challenge for management; it is now increasingly likely that many patients will be treated with inactive therapy, leading to adverse outcomes. Here, a novel technology called ScanDrop that incorporates a bead-based assay and microfluidics device will address the shortcomings of current diagnostic technologies. As conceived, ScanDrop provides ultrafast (< 20 min), highly sensitive, direct-from-patient sample diagnostics for UTI pathogens without the need for culture pre-amplification, and provides AST results within 15 min of specimen acquisition.

9:30 Implications of Infectious Virus in Exhaled Breath and Next Steps in Defining the Role of Airborne Transmission in Influenza

Donald K. Milton, MD, PhD, Professor, Environmental & Occupational Health Medicine, Maryland Institute for Applied Environmental Health, Department of Epidemiology & Biostatistics, School of Public Health, University of Maryland

Lack of human data on influenza virus aerosol shedding fuels debate over the importance of airborne transmission. We provide overwhelming evidence that humans generate infectious aerosols and quantitative data to improve mathematical models of transmission and public health interventions. We show that sneezing is rare and not important for - and that coughing is not required for - influenza virus aerosolization. Our findings, that upper and lower airway infection are independent and that fine-particle exhaled aerosols reflect infection in the lung, opened a pathway for a deeper understanding of the human biology of influenza infection and transmission.

10:00 Networking Coffee Break



TOOLS AND TECHNOLOGY AT THE POINT-OF-CARE

10:30 Universal Point-of-Care Diagnostics for All Bacterial Pathogens

Harshini Mukundan, PhD, Team Leader, Chemistry Division, Los Alamos National Laboratory

Our innate immune system is able to detect all pathogens and discriminate bacterial and viral pathogens to mount a timely response. Mimicking this recognition in the laboratory can provide rapid, universal and agnostic strategies for point-of-care detection for all pathogens. Our team had utilized this core inspiration to develop and validate a diagnostic tool kit for Gram-positive, negative and indeterminate pathogens. The concept, development of the approach and validation in blinded clinical samples in resource poor nations will be shown.

11:00 Radiation Biodosimetry: A Mass Screening Tool for Radiological/Nuclear Events

Mary Sproull, PhD, Biologist, National Institutes of Health, National Cancer Institute

There has been great advancement within the field of radiation biodosimetry in the last decade in response to the need for development of new medical countermeasures for radiological and nuclear events. Our work has centered on development of new dose prediction models for unknown received radiation dose using a proteomic approach. Our current work expands on these previously characterized models to test their application for mass screening utility using a variety of murine strains. Our findings indicate that these dose prediction models have potential utility for mass population screening.

11:30 Sponsored Presentation (Opportunity Available)

12:00 pm Luncheon Presentation (Sponsorship Opportunity Available) or Enjoy Lunch on Your Own

NEXT GENERATION RESOURCES FOR BIODETECTION AT THE POINT-OF-CARE

1:40 Chairperson's Remarks

Harshini Mukundan, PhD, Team Leader, Chemistry Division, Los Alamos National Laboratory

1:45 Facilitating the Path to Commercialization via Resources Provided by Centers for Point-of-Care Technology

Joany Jackman, PhD, Senior Scientist, Johns Hopkins University Applied Physics Laboratory

Starting in 2007, the National Institute of Biomedical Imaging and Bioengineering (NIBIB), established a network of centers to enhance the progression of promising technologies to the commercial market. The Johns Hopkins Center for Point of Care Tests for Sexually Transmitted Diseases is one of those centers. It provides resources to industry and organizations at no charge to speed the progression of promising technologies to commercialization. These resources include technology comparisons, access to physicians and other end users, de-identified clinical samples, implementation guidance, critical path funding and other resources to help companies reach the market faster.

2:15 Bringing Precision Medicine to the Point-of-Care

Joel Diamond, MD, CMO & Co-founder, 2bPrecise, LLC

Barriers exist in the clinical workflow; the gap between genomic information and its timely, meaningful application at the point of care. Today, the science of genomics occurs in labs (blood, tissue testing), research facilities (omics, sequencing), pharmaceutical companies (biomarkers for specific drug efficacy) and clinical trial programs. But, it's not accessible in actionable, meaningful clinical terms; nor is it structured and harmonized with the clinical context of the patient. And it is not available in the current workflow of the clinician. For the first time, we're seeing some alignment on the importance of precision medicine. These stakeholders are coming together to help realize the promise of genomic knowledge. When delivered at the point-of-care, precision medicine will have the greatest impact.

2:45 Networking Refreshment Break

ADVANCES IN FIELDABLE TECHNOLOGIES AND ASSAYS

3:00 Rethinking Our Approach to Fieldable Infectious Disease Diagnostics

Charles Young, PhD, Chief Scientist, Applied Biology Group, Johns Hopkins University Applied Physics Lab

Current approaches to fieldable infectious disease diagnostics are based simply on reducing the size and logistical burden of standard methods currently used in hospital laboratories. Many of the challenges faced in fielding systems to austere environments have not been addressed and some of the issues may simply prove too difficult to overcome. Perhaps it is time to reassess our current efforts and work to introduce new, novel approaches that may be more amenable for disease diagnosis under field-forward, austere conditions.

3:30 Immune Profiling to Identify Exposure to Infectious Agents

Richard DiPaolo, PhD, Associate Professor, Molecular Microbiology & Immunology, Saint Louis University School of Medicine

Our lab is developing a diagnostic assay to diagnose previous exposure to a vaccine (smallpox vaccine) or infectious agent (monkeypox). The assay was developed by performing large scale sequencing of immune receptors (T cell receptors) in vaccinated and infected individuals, identifying vaccine and infectious associated receptors, and developing the diagnostic assay based on the absence or presence of these receptor sequences in a small sample of blood.

3:50 Bacteria-Specific Tracers as Imaging Biomarkers to Diagnose and Monitor Infections

Alvaro Ordoñez, MD, Post-Doctoral Fellow, Johns Hopkins University

The talk summarizes our efforts to develop rapid, noninvasive, whole-body imaging technologies that can localize bacterial infections with specificity and provide a quantitative readout of disease burden in response to treatment.

4:10 Digital Assay Solutions and Global Spatiotemporal Surveillance System

Onur Mudanyali, PhD, Director, Engineering, Cellmic

We have introduced a universal point-of-care platform for high-performance immunoassay analysis with trans-visual sensitivity and secure cloud services for global spatiotemporal surveillance to address the rapidly evolving needs of the national security, the public health, and the emergency services. Our universal platform includes software packages and mobile optical readers that can analyze any immunoassay with exceptional sensitivity and accuracy beyond the ability of human vision and other commercially-available instruments, therefore, enabling rapid, point-of-care diagnostics of various biological and chemical threats and diseases markers using inexpensive and disposable tests in the field.

4:30 Close of Conference



BIOSURVEILLANCE INTEGRATION

Integrated Management of Threats to Public Health & Safety

THURSDAY, JUNE 28, 2018

12:30 pm Registration

ABERRATION DETECTION

1:25 Chairperson's Opening Remarks

David L. Hirschberg, PhD, Lecturer and Scientist, Department of Interdisciplinary Arts and Sciences and the Institute of Global Engagement, University of Washington, Tacoma

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TOOLS AND TECHNOLOGY AT THE POINT-OF-CARE

4:15 PANEL DISCUSSION: Impact of Diagnostic POC Technology

Moderator: Joany Jackman, PhD, Senior Scientist, Johns Hopkins University Applied Physics Laboratory

The definition of point-of-care (POC) technology simply means that the diagnostic test can be performed at or near the patient's bedside rather than in a central laboratory. The global market for point-of-care tests is expected to reach almost \$40B (USD) by 2021 in a steady rise from \$17B in recorded sales in 2014. POCT has the ability to be "disruptive" to many aspects of health care. Potentially, POCT has the ability to change the way that patients use medical resources. Join our panel of experts to discuss the critical issues at the point-of-care and how POCT is positioned to change this landscape.

5:15 End of Day and Dinner Short Course Registration*

6:00 SC1: Rapid Sample Preparation for Pathogen Detection

SC2: Biorecovery: Mitigating Risks to Public Health & Safety

**See page 3 for details, separate registration required.*

FRIDAY, JUNE 29, 2018

8:00 am Morning Coffee

RISK ANTICIPATION

8:25 Chairperson's Remarks

Luther Lindler, PhD, Senior Scientist (ST), Biological Programs, Chemical and Biological Defense Division Science and Technology Directorate, US Department of Homeland Security

8:30 KEYNOTE PRESENTATION: Applying Strategy and Analysis to the Biodefense Enterprise

Susan Collier Monarez, PhD, Deputy Assistant Secretary for Strategy and Analysis, Office of Strategy, Policy, and Plans, US Department of Homeland Security

This presentation will focus on the strategic environment (threat actors, emerging infectious diseases, budget constraints, complex mission ownership across the FSLTT enterprise, etc.) and how the USG needs to improve strategic planning, management oversight, accountability, and transparency to take meaningful steps in addressing the global biorisks.

9:00 KEYNOTE PRESENTATION: The Next Generation of Deployable Biodefense Capabilities for the Warfighter

C. Nicole Rosenzweig, PhD, BioSciences Division Chief, Edgewood Chemical Biological Center, US Army

The Department of Defense has fielded very few substantively improved biodetection capabilities over the past decade. Major improvements for fielded technologies depend heavily on commercial and academic technology breakthroughs. With the explosion of DIY synthetic biology as well as the miniaturization of mass spectrometers, Edgewood Chemical Biological Center is now developing a new generation of biodetection capabilities: synthetic biology to create ruggedized reagents capable of performing rapid, complex, and cheap detection; phage for tailored biodefense applications; mass spectrometers to identify toxins in the environment. This talk will highlight the tide of new biodetection capabilities and the importance of leveraging the development occurring in the academic and industrial sectors.



9:30 Biodefense to Support the Homeland Security Enterprise

Luther Lindler, PhD, Senior Scientist (ST), Biological Programs, Chemical and Biological Defense Division Science and Technology Directorate, US Department of Homeland Security

The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) Chemical and Biological Defense Division (CBD) performs research and development for DHS and the Homeland Security Enterprise. Detection and surveillance research includes the Sensenet project and wearable sensors for monitoring human physiology. S&T CBD is also investing in a test beds in specific locations as a proving ground for current and future detection technologies. Finally, S&T has contributed to the response and recovery area by performing clean up and modeling testing for underground transportation. All of these programs will be discussed in the presentation to introduce the audience to the critical mission DHS S&T performs within the area of biodefense.

10:00 Networking Coffee Break

THREAT IDENTIFICATION & CHARACTERIZATION

10:30 Redefining the Term and Approach to Bioterrorism: Emerging and Re-emerging Infectious Diseases

Jeffrey Stiefel, PhD, Executive Coordinator, Climate Change and Health Resilience, US Department of Homeland Security

10:50 Web Based Visual Analytics for Infectious Disease Surveillance

Alina Deshpande, PhD, Group Leader, Biosecurity and Public Health, Bioscience Division, Los Alamos National Laboratory

Situational awareness is important for both early warning and early detection of an infectious disease outbreak, and analytics that furnish information on how an infectious disease would emerge, re-emerge or spread provide enhanced situational awareness for decision makers/analysts/public health officials, and support planning for prevention or mitigation. In this presentation, I will describe two analytics developed at Los Alamos National Laboratory (LANL) that provide actionable information at varying spatial and temporal scales. Analytics for Investigation of Diseases Outbreaks (AIDO) can be used during investigations of unfolding infectious disease outbreaks.

11:10 Applications for Next-Generation Sequencing in Public Health

Martina Siwek, PhD, Program Manager, Health Surveillance, National Health Mission Area, Johns Hopkins University – Applied Physics Lab

This talk will discuss how JHU APL is leveraging our expertise in the areas of next-generation sequencing and public health practice to develop methods and insights into applying genomic information to augment and enhance public health awareness and response.

11:30 Sponsored Presentation (Opportunity Available)

12:00 pm Luncheon Presentation (Sponsorship Opportunity Available) or Enjoy Lunch on Your Own

1:40 Chairperson's Remarks

C. Nicole Rosenzweig, PhD, BioSciences Division Chief, Edgewood Chemical Biological Center, US Army

1:45 Development of Portable and Wearable Platforms to Detect Threats and Measure Human Performance in Resource Limited Environments

David L. Hirschberg, PhD, Lecturer and Scientist, Department of Interdisciplinary Arts and Sciences and the Institute of Global Engagement, University of Washington, Tacoma

2:15 Biosurveillance of Infectious Diseases at US Ports of Entry

Alena James, Chemical & Biological Defense ORISE Fellow, DHS Science and Technology Directorate
With more than one million travelers processed for entry into the United States on a daily basis, the integration of biosurveillance methods and detection technologies enables The Department of Homeland Security (DHS) to protect the US against new and emerging diseases that would otherwise compromise the nation's public health security. This presentation will shed light on the current biosurveillance technologies and methods used to strengthen US border security and discuss the needs for new and updated technologies to improve infectious disease surveillance quality.

2:45 Networking Refreshment Break

INFORMATION INTEGRATION, ANALYSIS & SHARING

3:00 Agro-Defense - A Holistic, All of Enterprise Approach

Tammy R. Beckham, DVM, PhD, Dean, Professor, College of Veterinary Medicine, Kansas State University

The ability to protect our agricultural industries, food supply, and public health sectors from natural introductions of biological agents, agro-terror threats, and emerging and re-emerging diseases is heavily dependent on an organized, strategic, and well-funded approach. This approach should institutionalize the "One Health" concept, be highly collaborative in nature, leverage all available resources and encompass an international, global health component. The One Health concept must be understood, adopted and become part of the fabric of the way in which we approach biodefense.

3:30 Immunology & Surveillance and Preparedness Plans

Ivana Haluskova Balter, PhD, Medical Advisor for R&D and Science, French Society of Immunology

Recent outbreaks like Ebola but risk of reemerging old diseases and those where current tools inaccurate require complex and multifaceted approach.

4:00 Improved Physician Participation in Mass Casualty Management of Radiological Internal Contamination by Use of the CDG

Albert Wiley, Senior Medical Advisor, REACTS and Professor Emeritus, University of Wisconsin, REACTS, ORAU

Currently there is unnecessary difficulty in allowing physicians to directly manage radiological internal contamination, but this is a barrier which can be eliminated by physician use of CDG.

4:30 Close of Conference



RAPID DETECTION FOR FOOD SAFETY

Advances in Sampling, Sample Preparation, Stress and Infectivity

WEDNESDAY, JUNE 27, 2018

7:30 am Registration and Morning Coffee

THE FUNDAMENTALS OF RAPID METHODS

8:25 Chairperson's Opening Remarks

Byron Brehm-Stecher, PhD, Associate Professor, Rapid Microbial Detection and Control Laboratory, Iowa State University

8:30 KEYNOTE PRESENTATION: Sampling: The Forgotten Part of Microbiological Testing

Robert L. Buchanan, PhD, Professor, Department of Nutrition and Food Science and Center for Food Safety and Security Systems, University of Maryland

9:00 Rapid Methods - Where They Come from and How They Have Impacted Food Testing

Peter Feng, PhD, Research Microbiologist, Center for Food Safety and Applied Nutrition, US Food and Drug Administration

The FDA is responsible for ensuring the safety of foods that enter into "interstate" commerce. The assessment that foods are free of pathogens relies heavily on testing hence method development tends to evolve parallel to food safety regulations. Rapid methods are more sensitive than conventional assays, but the increased sensitivity has also created interesting challenges and problems for the regulatory agencies and the food industry.

STRESS, INFECTIVITY AND SAMPLE PREPARATION

9:30 Impact of Stress on Detection of Pathogens

Arun Bhunia, PhD, Professor of Food Microbiology, Department of Food Science, Department of Comparative Pathobiology, Purdue University

For microbial pathogen detection, biosensor platforms rely on antibodies, nucleic acids or aptameric probes for capture and detection. However, microbes or microbial biofilms originating from food or environmental sources are often pre-exposed to various physical and chemical stressors, which alter microbial growth, morphology, and physiology and virulence protein expression. Therefore, stressors can significantly affect biosensor performance thus may yield false-negative results. Strategies to overcome such shortcomings of biosensor performance in relation to pathogen's growth and behavior under various stressful conditions will be discussed.

10:00 Networking Coffee Break

10:30 Generation of VBNC Pathogens While Maintaining Infectivity during Food Processing

Bill Keevil, PhD, Professor, Centre for Biological Sciences, University of Southampton, UK

We have developed a sensitive direct qPCR methodology without pre-enrichment for foods and growing media. Moreover, it is now recognized that during the biofilm mode of growth a sub population of cells become quiescent and resilient to antimicrobial treatment. They spontaneously enter a reversible dormant state which is refractory to antibiotic treatment that usually relies on active growth of bacteria to be effective. Persistence occurs through toxin-antitoxin modules and other dormancy pathways which are now proving amenable to the development of new classes of antibiotics. This presentation will explore this important and rapidly developing area of microbial dormancy to understand microbial survival mechanisms during food processing while maintaining their disease potential using suitable animal models.

11:00 Genome-Scale Identification of Essential Genes in Salmonella Tennessee Required for Infection of Human Macrophages - Linking Biomarkers of Relevance to Food Safety Risk

Seamus Fanning, PhD, Professor, Food Safety and Zoonoses, School of Public Health, University College Dublin

Transposon Directed Insertion Sequencing (TraDIS) is a powerful, high throughput genetic screening technique in functional genomics which combines signature-tagged mutagenesis with novel sequencing-based approaches for transposon mutant identification enabling genome-scale assaying of fitness in selection experiments. It can be applied to large pools of mutants allowing the simultaneous assay of every single gene in the isolate. Here, we describe the analysis of TraDIS data following the infection of human THP-1 macrophages with a high-density library of *Salmonella Tennessee CFSAN001387* (*S. Tennessee CFSAN001387*). From recovering viable intracellular bacteria during infection, we measured the cumulative fitness requirement of the bacterial genome for up to 5 days post infection. TraDIS identified genes that effect the survival of *S. Tennessee CFSAN001387 ex vivo* when compared with *in vitro* laboratory growth conditions.

11:30 Advances in Pre-Analytical Sample Preparation: Unclogging the Bottleneck from Sample to Answer

Byron Brehm-Stecher, PhD, Associate Professor, Rapid Microbial Detection and Control Laboratory, Iowa State University

Successful detection of pathogens in foods involves the seamless integration of three interdependent steps: 1) statistically validated sampling, 2) pre-analytical sample preparation and 3) detection. Weak links in any of these three steps will propagate through the system and degrade the end result. In a worst-case scenario, this could lead to false-negative results. "Upstream" methods for sampling have long been established, and the past decade has seen a revolution in development of the hardware and reagents needed for truly rapid detection of pathogens. However, even the most sophisticated detection methods cannot reach their full potential without next-level advances in pre-analytical sample preparation, which is still the key bottleneck in getting from sample to answer when detecting pathogens in foods.

12:00 pm Luncheon Presentation (Sponsorship Opportunity Available) or Enjoy Lunch on Your Own

SPECTRAL METHODS, COLORIMETRIC AND ELECTROCHEMICAL DETECTION, MICROBIOMICS

1:55 Chairperson's Remarks

Arun Bhunia, PhD, Professor of Food Microbiology, Department of Food Science, Department of Comparative Pathobiology, Purdue University

2:00 Spectral Imaging Technologies for Food Safety Evaluation of Agricultural Products

Moon Kim, PhD, Research Physicist, Environmental Microbial and Food Safety Laboratory, Agricultural Research Service, USDA

Researchers at the Beltsville Agricultural Research Center have developed spectral-imaging-based techniques that target the reduction of food safety risks in post-harvest production and processing. Objectives of the current research include comprehensive safety and quality inspection for online processing of fresh fruits and leafy greens, authentication of food ingredients and detection of food contaminants, and improvement of cleaning and sanitation efficacies in food processing facilities. The current states of the above spectral imaging technologies are presented.

2:30 Rapid Process-Inline Pathogen Detection Using AI-Driven Low-Cost Optics

Kantha Shelke, PhD, Adjunct Faculty, Johns Hopkins University; Principal, Corvus Blue LLC

Harjeet Bajaj, President & CEO, Executive, Savormetrics

Produce handlers and processors are a hotspot for microbial contamination leading to foodborne illnesses which in turn can lead to severe health ailments including deaths. The economic costs include health care costs, wasted food costs, and PR costs associated with recalls and damaged reputations. Implementing ultra-affordable indicator based technologies, IoT connected to QA/QC protocol monitoring systems, and installed inline at various stages of the food processing wash process, can help mitigate these costs substantially. The technology can help identify pathogens on produce as



well. Policy makers and regulators will value the opportunity to implement protocols and enforce them without the barriers of enforcing changes to processes and extensive capital outlay requirements.

3:00 Opening Refreshment Break in the Exhibit Hall with Poster Viewing

4:00 Rapid Detection of Salmonella in Large Volume Samples Using a Flow-Through, Enzyme-Amplified Immunochemical Biosensor

Andrew Gehring, PhD, Research Chemist, Lead Scientist, United States Department of Agriculture, Agricultural Research Service, Eastern Regional Research Center

Enzyme-based immunoassays are highly desirable for the detection of foodborne pathogens as they offer shorter response times compared to traditional culture-based methods. Biosensors employing the electrochemical detection of a substrate oxidized by horseradish peroxidase (HRP) have been used to successfully detect biomolecules; however, their inability to handle large sample volumes severely limits their application to food safety despite their accuracy and reliability. Here, we describe a biosensor with the capacity to process a large sample volume by utilizing a porous working electrode made from carbon coated with antibodies specific for Salmonella common structural antigens. This design allows samples to flow-through the electrode while capturing target pathogens. The low cost of the sensor allows for incorporation into disposable detection devices while its design not only broadens its applicability in sample processing but also permits the detection of various microbes by simply exchanging the antibodies.

4:30 Colorimetric and Electrochemical Bacteria Detection Using Printed Paper- and Transparency-Based Analytic Devices

Bledar Bisha, PhD, Assistant Professor of Food Microbiology, University of Wyoming

The development of transparency-based electrochemical and paper-based colorimetric analytic detection platforms is presented as complementary methods for food and waterborne bacteria detection from a single assay. A colorimetric paper-based well plate system was developed from a simple cardboard box and smart phone for the detection of PNP and ONP. Colorimetric detection limits were determined to be 81 μM and 119 μM for ONP and PNP respectively. While colorimetric detection methods gave higher detection limits than electrochemical detection, both methods provided similar times to positive bacteria detection. Alfalfa sprout and lagoon water samples served as model food and water samples, and while water samples did not test positive, sprout samples did test positive within 4 h of pre-enrichment. Positive detection of inoculated (2.3×10^2 and 3.1×10^1 CFU/mL or g of *E. coli* and *E. faecium*, respectively) sprout and water samples tested positive within 4 and 12 h of pre-enrichment, respectively.

5:00 Applications of Food Microbiomes for Food BioDefense: Lessons from Spoiled Foods

Gregory Siragusa, PhD, Senior Principal Scientist, Microbiology, Eurofins Microbiology Laboratories

For the food microbiologist, cultural microbiology of unknowns has always been a cat-and-mouse game of aligning cultural media requirements with atmosphere, temperature, pH, redox, etc. However, once the microbiologist has even a minimal indicator of the target's identity, culture is often straightforward, albeit time consuming. The advent of microbiomics (discussed at this meeting) has provided means to resolve unknown mixtures of microorganisms without culture. Where large viable numbers of intentionally spiked pathogenic bacteria are used in food or water in an offensive mode, a major advantage of this approach is that no prior knowledge of bacterial type is needed. The process of performing a microbiome also takes advantage of large differences in the ratio of target to background. Here is presented examples of chronic spoilage issues that have proven recalcitrant to standard cultural microbiology.

5:30 Welcome Reception in the Exhibit Hall with Poster Viewing

6:30 End of Day

THURSDAY, JUNE 28, 2018

8:30 am Morning Coffee

IDENTIFICATION & MANAGEMENT OF EMERGING AND RE-EMERGING PATHOGENS

8:55 Chairperson's Remarks

Willy A. Valdivia-Granda, Founder and CEO, Orion Integrated Biosciences, Inc.

9:00 Sequence-Based Method to Predict Host-Pathogen Interactions Between Group IV Viruses and Various Hosts

Patricia Legler, PhD, Research Biologist, Naval Research Laboratories

The alphaviral nonstructural protein 2 (nsP2) cysteine proteases (EC 3.4.22.-) are essential for the proteolytic processing of the nonstructural (ns) polyprotein. A common secondary role of these proteases is in interferon (IFN)-antagonism. Here we identify a new host substrate of the nsP2 protease, human TRIM14, a component of the mitochondrial antiviral-signaling protein (MAVS) signalosome. At least eight other Group IV (+)ssRNA viral proteases have been shown to cleave host proteins involved in the innate immune response and the antagonistic strategy may be akin to those of CRISPR/Cas9 and RNAi/RISC, but with a protease recognizing a cleavage site common to both host and virus.

9:30 Use of IFN-Expressing Vectors in Control of Ebola Virus Disease in Swine

Chandrika Senthikumar, PhD, Research Scientist, National Center for Foreign Animal Disease, Canadian Food Inspection Agency

Ebola virus (Kikwit) can replicate in domestic pigs. Infected pigs shed the virus as early as 3 days post infection (dpi) and transmit the virus to animals including non-human primates cohabiting with them. In the event of an intentional or accidental exposure of pigs delaying or preventing the spread of infection in pigs by preventing the shedding of virus is an absolute necessity. In our study we proved that the Porcine Interferon alpha delivered with a replication defective human adenovirus (Ad5-porIFN α) is an effective bio therapeutic agent to prevent shedding of Ebola virus from infected pigs.

10:00 Sponsored Presentation (Opportunity Available)

10:30 Coffee Break in the Exhibit Hall with Poster Viewing

11:15 Microbial Contamination in Surface Water – Challenges and Scope

Pramod Pandey, PhD, Assistant Specialist CE, Department of Population Health and Reproduction, University of California, Davis

While decreasing water levels in rivers has been a major concern for many countries, contamination in surface water, particularly microbial contamination in streams is a serious issue. Solving the problems requires improved understanding of associated source of pollutions. This research is focused on understanding the effects of land uses on microbial contamination in streams, and developing mathematical tools for rapid detection of microbial pathogens in rivers.

11:45 A Cost Effective Method for Surveillance of Influenza Viruses A, B, C and D in Swine Oral Fluid Using Newly Developed Multiplex rRT-PCR Assays

Johnny Callahan, MT(ASCP), PhD, Veterinary Diagnostics Business Development Manager, APHIS/CVB Liaison, Tetracore, Inc.

The objective of this study was to develop cost effective methods for respiratory disease surveillance in swine oral fluid and respiratory swab samples, specifically for various types of influenza viruses. Here, we report on the development of a panel of multiplex rRT-PCR assays that detect the conserved regions of all four types of influenza viruses. This panel of novel assays was designed to provide cost efficient testing to the producer and promote the continued surveillance for influenza viruses. Screening for various types of influenza viruses by rRT-PCR is a first but vital step in surveillance. The producer will see cost savings when using the multiplex testing versus the singleplex. In conclusion, having well validated and rapid diagnostic tools such as these new multiplex rRT-PCR assays will be vital for continued swine health and production while enhancing the One Health Initiative.

12:15 pm End of Rapid Detection for Food Safety



BIODEFENSE WORLD SUMMIT 2018

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Wednesday - Thursday June 27-28	Thursday - Friday June 28-29
C1: Biodetection Technologies: Biothreat & Pathogen Detection	C3: Biodetection Technologies: Point-of-Care for Biodefense
C2: Rapid Detection for Food Safety	C4: Biosurveillance Integration

SHORT COURSES

One short course	\$549	\$299
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Tuesday, June 28, 2018 6:00 - 9:00PM (Dinner Provided)
SC1: Rapid Sample Preparation for Pathogen Detection
SC2: Bio Recovery: Mitigating Risks to Public Health & Safety

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