/NEIDL **Boston University** National Emerging Infectious Diseases Laboratories

/EIDA2Z®

Annual Report
Fiscal Year 2017

Photo Credit: Bob Whitfield

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Boston University National Emerging Infectious Diseases Laboratories

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September 1, 2017

Letter from the Director

As members of a research center that supports the work that focuses on emerging and reemerging infectious diseases (EID), the scientists and staff of the NEIDL are engaged in a number of research programs that contribute to basic scientific knowledge about the pathogens that cause EID, while also developing the tools that advance our ability to diagnose and treat these diseases, or prevent them through vaccination. The public does not have to look too far to realize these diseases are all around us; some lead to small pockets of infections and disappear (like the most recent Ebola virus outbreak in the Democratic Republic of Congo), while others lead to larger outbreaks which are far more difficult to control (a good example is the ongoing Zika outbreak). Given the fact that we live in a highly globally connected community, what diseases emerge anywhere on the earth can be spread to the US. We saw this with last year's Zika outbreak in Brazil and elsewhere in the western hemisphere. In the US, we first experienced it in numerous travel related cases, and it was only a matter of time before the disease became locally transmitted by infected mosquitoes in Florida. The virus has all but disappeared from the continental US this year, but experience tells us it will almost certainly erupt again at some point in the future. As of this writing, other mosquito borne viruses of concern are circulating in Brazil, including Yellow Fever virus, and Chikungunya (CHIK) Virus. Travel related cases of CHIK have been reported in 13 states, and local transmission is occurring in Puerto Rico. Vector borne arboviruses, transmitted by mosquitoes or by ticks, will become a more serious threat as global warming continues and the natural habitats of these vectors change and increase in size. New strategies to stop transmission are sorely needed, and investigators within the NEIDL are working on this important problem, initially funded by the NEIDL. Other projects involving Zika have also been initiated, including important projects on the interplay between Zika viruses and human placental cells, and the impact of Zika on the developing brain. These projects are already supported by funding from the National Institutes of Health, but are possible only because we cast a wide net to identify the expertise needed for these studies. These projects remind us that emerging viruses are not only in the domain of microbiology and virology researchers, but require interdisciplinary teams, in this case including vector biologists, developmental neurobiologists, and physician scientists engaged in fetal-maternal health. A major mission of the NEIDL is to catalyze these types of scientific endeavors, and introducing scientists from other disciplines to the important questions in infectious diseases.

Our faculty (currently 14, and growing) continue to be productive and highly successful both in disseminating their work through invited talks at other institutions and in national and international symposia, and in competing for funding to support their work for the mission of the NEIDL. During this past year, NEIDL faculty have published 64 papers, given at least 24 invited talks, organized (and sponsored) international meetings, served on editorial boards, and were expert reviewers on study sections. They were also supported by over $21 million in funding for their work during FY17. By any measure these activities are solid evidence of our standing in the field of emerging infectious diseases research. This speaks well for the future success of the NEIDL, as we continue to strategically build the faculty. Recruiting new faculty truly "takes a village" and as of this writing we expect two new faculty to join us in the near future. Another faculty member, Rachel Fearns, has moved her laboratory into the NEIDL from other location on the medical campus in order for her lab to be closer to the RNA virologists in the NEIDL. New faculty, post-doctoral trainees, and students add to the "hum" in the building, making everyone feel that the NEIDL is really becoming an active, vibrant community of researchers. As one visual sign of this activity, we've already run out of -80^{o}C freezer space – a good problem to have! We are also having to reconfigure desk spaces for research staff and trainees to permit a higher density usage, also a great problem to have.

While these reports tend to focus on our scientific achievements, our everyday lives in the NEIDL demonstrate how important our staff in facilities operations, environmental health and safety, security, animal care, information technology and community relations are to the success of the NEIDL. A scientist cannot function without professionals

in each of these areas, and we have an experienced and fabulous staff who are equally committed to the success of the NEIDL. Without their involvement, we could not undertake the scientific mission of the NEIDL in a safe and secure environment, or communicate our work to the community, without their input, advice and guidance. It is truly a team effort. As one example, in May, 2017, a CDC team performed an unannounced inspection on our BSL-3 program. This 3 day "event" requires everyone that is part of the NEIDL team to participate and provide all required information. The inspection went extremely well, and is a reminder that for all aspects of emerging infectious disease research, everyone needs to be at the top of their game at all times.

We reached a major milestone this year (December, 2016) by obtaining our BSL-4 permit from the Centers for Disease Control (CDC). As of this writing, we are still awaiting permitting from the Boston Public Health Commission (BPHC). We look forward to completing this process (which will still require additional permits to be "fully open"), and are anxious to extend our research programs into pathogens that require BSL-4 containment.

The NEIDL, with generous support from Boston University, an alumni donor and a number of foundations, sponsored an "Inaugural Symposium" in September, 2016. The symposium, Emerging Infectious Diseases A to Z (EIDA2Z): Emerging Challenges and Opportunities, culminated 18 months of hard work and planning by a number of investigators. It began with a public session featuring the NIAID Director, Anthony Fauci, and noted author David Quammen as keynote speakers discussing the importance of scientific research and effective communication with the public. The next 2 days were scientific sessions structured to identify the gaps in our understanding of emerging infectious diseases. We hosted an international cadre of scientists that are among the world's experts in the field. By all measures it was a unique and highly successful event, as detailed in this report. The thematic logo for the symposium (the brainchild of Paul Duprex), EIDA2Z, used the A2Z as short hand for "**A**dvancing knowledge **to** (2) discover/understand/protect/collaborate/innovate to **Z**ero in on the gaps. Because the EIDA2Z theme (hashtag and all) was central to the symposium, we filed for Trademark of both the letters and the logo used in the symposium, and this trademark has now been granted for our exclusive use in education and scientific dissemination. More of this in the report. Next steps, continue to build the faculty and staff and continue to advance knowledge, and translate that knowledge for the public's health.

Ronald B. Corley, Ph.D.
Professor of Microbiology
Director, National Emerging Infectious Diseases Laboratories

Mission Statement and Strategic Plan

The Boston University National Emerging Infectious Diseases Laboratories (NEIDL) mission is: To generate and translate fundamental knowledge on high priority emerging infectious diseases for the benefit of the public health, locally, nationally and globally.

Emerging infectious diseases are defined as those that have newly appeared and been recognized in the population, or have existed but are rapidly increasing in incidence or in geographic range. To meet our missions the NEIDL will:

1. Perform innovative basic, translational and clinical research on emerging infectious diseases, especially those identified as high priority category A, B, and C agents (http://www.niaid.nih.gov/topics/biodefenserelated/biodefense/pages/cata.aspx), in order to develop diagnostic tests, treatments and vaccines to promote the public's health.
2. Provide education and training in these areas of research, in order to develop the next generation of scientists in this field, and to support a national response in the event of a biodefense emergency.
3. Establish a research facility with the highest attention to community and laboratory safety and security.

To successfully implement and achieve these goals, NEIDL has developed and is implementing a strategic plan to:

1. Partner with academic departments across the university to recruit a cadre of investigators, as well as to develop research staff with expertise in the scientific disciplines required to investigate the pathogenesis of emerging infectious diseases caused by category A, B and C agents. We encourage and support the development of national and international research collaborations in order to carry out our mission.
2. Develop physiologically relevant models for the comparative study of these pathogens, mimicking as closely as possible the human disease process. Not only does this require that we recruit faculty with expertise in animal modeling and veterinarian pathology, but also develop the needed services to support these investigations.
3. Move promising basic research as rapidly as possible to translational, preclinical and clinical research in animals and humans in partnership with appropriate collaborators.
4. Create and establish the methodologies needed to advance the development and testing of vaccines, therapeutics and diagnostics for these agents.
5. Train scientists and related support personnel in the requirements to perform maximum containment research in a safe and secure environment.
6. Maintain the flexibility needed to support a national response in the event of a biodefense emergency.
7. Ensure a "safety first" environment for the conduct of all activities in the NEIDL.

Faculty and Staff

Scientific Leadership

Ronald B. Corley, PhD
Professor and Chair, Department of Microbiology
Director, NEIDL
Director, Immunology Core

Dr. Corley's Research interests:

- *Innate and adaptive immunity to human pathogens*
- *Innate-adaptive interface*
- *Molecular pathogenesis of infectious diseases*

Gerald T. Keusch, MD
Professor of Medicine, Section Infectious Diseases
Professor of International Health
Associate Director, NEIDL
Director, Collaborative Research Core

Dr. Keusch's research interests:

- *Global science and health collaborations*
- *Global impact of infectious diseases*

Principal Investigators

Nahid Bhadelia, MD, MA
Assist Professor of Medicine
Section Infectious Diseases, BMC
Director, Infection Control, NEIDL

Dr. Bhadelia's research interests:

- *International pandemics strategy and policy*
- *Healthcare worker disaster preparedness*

John H. Connor, PhD
Associate Professor, Microbiology
Member, Bioinformatics Grad Prog.

Dr. Connor's research interests:

- *Virus-host interaction*
- *Viral domination of protein synthesis*
- *Novel approaches to virus detection*

Paul Duprex, PhD
Assoc Professor, Microbiology
Director, Cell & Tissue Imaging Core

Dr. Duprex's research Interests:

- *Paramyxovirus pathogenesis*
- *Virus-cell interactions*
- *Zoonosis; cross-species infection*

Rachel Fearns, PhD
Associate Professor, Microbiology

Dr. Fearns' research Interests:

- *Negative strand RNA virus nucleocapsid organization*
- *Negative strand RNA virus polymerase activities*
- *Mechanisms of action of polymerase inhibitors*

Principal Investigators (continued)

Horacio Frydman, PhD
Associate Professor, Biology

Dr. Frydman's research interests:

- *Niche tropism of insect endosymbionts*
- *Mechanisms of Wolbachia-insect interactions*

James Galagan, PhD
Assoc Professor, Biomedical Eng & Microbiology

Dr. Galagan's research interests:

- *Systems biology*
- *Inf Diseases; Tuberculosis*
- *Computational Biology and Genomics*

Tarik Haydar, PhD
Assoc Professor, Anatomy & Neurobiology

Dr. Haydar's research interests

- *Forebrain development and function*
- *Cellular and molecular determinants influencing cognition*

Thomas B Kepler, PhD
Professor, Micro, Math & Stats
Member, Bioinformatics Grad Program

Dr. Kepler's research interests:

- *Quantitative Systems Immunology*
- *Vaccine Development*

Igor Kramnik, MD, PhD
Assoc Professor, Medicine & Microbiology

Dr. Kramnik's research interests:

- *Genes controlling host resistance and susceptibility to Tuberculosis*
- *Biology of TB granulomas*
- *Mechanisms of macrophage activation & differentiation*

Elke Mühlberger, PhD
Assoc Professor, Microbiology
Dir, Biomolecular Prod Core

Dr. Mühlberger's research interests:

- *Host response to filovirus infection*
- *Molecular mechanisms of filovirus replication and transcription*

John R. Murphy, PhD
Adj Professor of Medicine, Sec. Infectious Diseases, &Microbiology

Dr. Murphy's research interests:

- *Recombinant biotherapeutic molecules to alter immune responses to infection, autoimmune diseases, & cancer*
- *Tuberculosis and TB therapeutics*

John C. Samuelson, MD, PhD
Professor, Molecular and Cell Biology
Professor of Microbiology

Dr. Samuelson's research interests:

- *Mechanisms of pathogenesis of protozoan parasites.*
- *Structures of parasite walls and glycoproteins*

Researchers and Laboratory Staff

Aquino, Patricia M
Postdoctoral Research Associate
Engineering, Galagan Lab

Bhattacharya, Bidisha
Postdoctoral Research Associate
Medicine, Kramnik Lab

Broos-Caldwell, Aditi *
Research Technician

Chatterjee, Sujoy
Postdoctoral Research Associate
Medicine, Kramnik Lab

Devaux, Alexander
Research Study Technician
Microbiology, Connor Lab

Dey, Bappaditya (Bappa) * *
Postdoctoral Research Scientist
Medicine, Kramnik Lab

Ho, Gregory *
Research Technician
Microbiology, Duprex Lab

Hume, Adam J PhD
Research Scientist
Microbiology, Mühlberger Lab

Killiany, Ronald PhD
Assc. Prof, Anatomy & Neurobiology
Director, Whole Animal Imaging

Koo, Bang Bon PhD
Postdoctoral Research Fellow
Whole Animal Imaging Core

Koster, Jacob
Senior NEIDL Core Technologist
Quality Control

Lei, Maohua Lei
Research Study Technician
Microbiology, Connor Lab

Murphy, Linda J. PhD
Senior Research Scientist
Microbiology, Duprex Lab

Nambulli, Shamkumar (Sham)
Research Scientist and Lab Manager
Microbiology, Duprex Lab

Nelson, Emily V *
Postdoctoral Associate
Microbiology, Mühlberger Lab

Olejnik, Judith PhD
Senior Research Scientist
Microbiology, Mühlberger Lab

Olsen, Michelle T.
Postdoctoral Research Assoc
Microbiology, Connor Lab

Pacheco, Jennifer R.
Research Technician
Microbiology, Mühlberger Lab

Peters, Kristen *
Postdoctoral Research Assoc
Microbiology, Connor Lab

Ruedas, John
Postdoctoral Research Assoc
Microbiology, Connor Lab

Soucy, Alexandra
Research Study Technician
Microbiology, Connor Lab

Tilston-Lunel, Natasha
Postdoctoral Research Assoc
Microbiology, Duprex Lab

Yen, Judy Yung-Ju
Senior NEIDL Core Technologist

Zhang, Xiaoman
Research Technician
Biomed. Eng, Galagan Lab

Students

Baer, RC
PhD Student
Microbiology, Galagan Lab

Breen, Michael *
Graduate Student
Microbiology, Connor Lab

Brownhill, Eric *
Graduate Student
Microbiology, Kramnik Lab

Cho, Peter * *
Undergraduate Student
Biomedical Engineering, Galagan Lab

Cressey, Tessa
PhD Student, Microbiology,
Mühlberger & Fearns Labs

Daftari, Rahul * *
Graduate Student
Biomed Engineering, Galagan Lab

Knoll, Susan *
Graduate Student
Medicine, Bhadelia Lab

Kuzmanovic, Uros *
Graduate Student
Engineering, Galagan Lab

Manhart, Whitney
PhD Student, Microbiology
Mühlberger & Mostoslavsky Labs

Martinsen, Melanie *
Undergraduate Student
Biomed Engineering, Galagan Lab

Olinger, Grace *
PhD Student
Microbiology, Duprex Lab

Smith, Michaela
Graduate Student
Biology, Connor Lab

Speranza, Emily
PhD Student
Bioinformatics, Connor Lab

Animal Research Support

Bishop III, Curry DVM DACLAM*
Director, ASC & Attending Vet

Diaz-Perez, Yulianela
Veterinary Research Technician

Furtado, Oscar M
Veterinary Research Technician

Gross, Sarah
Veterinary Research Technician

Hardcastle, Kath DVM DACLAM
Core Director, Animal Services

Harrington, Patrice *
Veterinary Research Technician

Jean-Baptiste, Marc *
Veterinary Research Technician

Nunes, Corey *
Operations Manager, NEIDL ASC

Sturgis, Johnathan *
Operations Manager, ASC/NEIDL

Vintinner, Larry P
Assist. Director of Operations, ASC

Varada, Rao DVM PhD*
Sr. Research Clinical Veterinarian

* Staff who joined during FY17
* Staff who left during FY17

NEIDL Operations Leadership

Thomas Daley
Director, NEIDL Operations

J Scott Rusk
Core Director, Facilities & Maintenance Ops

Kelly Nee
Core Director, Biosecurity
Chief, BU Police

Karon Floyd
Chief Safety Officer

NEIDL Administration

Corley, Ronald B PhD
Director, NEIDL

Daley, Thomas
Director, Operations

Durkop, Betina A
Executive Coordinator

Forman, Lora *
Administrative Manager, Operations

Trevino, Richard P MPH
Director, Finance & Research Administration

Community Relations

Valeda J Britton JD
Executive Director, Community Relations
Boston University Government Affairs

Chimel Idiokitas
Assistant Director, Community Relations
Boston University Government Affairs

Facilities Maintenance & Operations

Amadio, Paul *
Engineering Operations Manager

Ananian, David
General Mechanic

Baires, J Victoria
Custodian

Corbett, Joseph
Control Center Technician

Ercolino, Elijah
Director, Building Automation Services

Galloway, William S
General Mechanic

Gendron, Jonathan
General Mechanic

Kjersgard, Eric *
Control Center Technician

McCall, John
Director, Information Technology

Mosca, Derek
Maintenance Mechanic

Rarick, Matthew *
Director, Facilities

Rodriguez, Mario
Custodian

Rusk, Scott
Director, Facilities

Sousa, Daniel *
Shipping & Receiving

Tucker, Daniel *
General Mechanic

Walsh, James *
General Mechanic

Environmental Health & Safety

Banh, Daniel
Research Safety Specialist

Barbercheck, Joseph A *
Associate Director, Research Safety

Bastien, Tracy *
Executive Assistant

Floyd, Karon * *
Chief Safety Officer

Lowe, Andre *
Associate Director, Research Safety

Madico, Guillermo MD PhD
Scientific Safety Officer

Malmberg, Michael
Senior Research Safety Specialist

Morales, Ron L *
Core Director, EH&S

Morash, Stephen L *
Director, Emergency Response P

Olinger, Gene PhD
Associate Director, Training

Rogers, Martin *
Manager, Biocontainment Operations

Tuohey, Kevin M
Exec Director, Research Compliance

Vinson, Aron J
Prog Mgr, Emergency Planning

Public Safety

Annese, Rae T
Public Safety Officer

Barros, Christopher L
Public Safety Officer

Barros, Jeffrey P
Public Safety Officer

Elia, Robert W *
Systems Integrator

Gallivan, John
Public Safety Officer

Gibbons, William
Director, Biosecurity Core

Granados, David J
Public Safety Officer

Maldonis, Joseph
Public Safety Officer

O'Hara, Sean R
Public Safety Officer

Phelps, Justin
Public Safety Officer

Saad, Jacob
Public Safety Officer

Salhi, Adil
Public Safety Officer

Spellman, David F
Public Safety Officer

Taranto, Stephen L
Public Safety Operations Supervisor

Tupe, Michael T
Public Safety Officer

Wynne, Paul M
Public Safety Officer

Wynne, Sean C
Public Safety Officer

Zarth, Melody L
Personnel Suitability Specialist

* Staff who joined during FY17
* Staff who left during FY17

Research

The research activities of the NEIDL faculty focus on pathogenesis of emerging viral, bacterial, and protozoan parasitic pathogens and continue to be supported by significant external grant funding (see below). The faculty come from four Schools of Boston University (Medicine, Dental Medicine, Engineering, and Arts and Sciences), as is appropriate for a University Center. Most of these faculty have developed multidisciplinary programs that engage the expertise of faculty, staff and trainees with diverse backgrounds across the university. These collaborations include scientists not only in the faculty's home departments (Microbiology, Medicine, Molecular and Cell Biology, Biomedical Engineering, Biology, Anatomy and Neurobiology) but also from the Center for Regenerative Medicine, the Photonics Center, and from Engineering and Chemistry. Many NEIDL investigators collaborate actively with faculty external to Boston University, including from both US and international institutions. Research programs also engage a wide array of undergraduate and graduate students, including those from Graduate Programs in Microbiology (Host Pathogen Interactions), Immunology, Bioinformatics, MCBB (Molecular Biology, Cell Biology and Biochemistry) and Engineering. These types of collaborative programs and training activities exemplify the "research style" that has become a hallmark of the NEIDL.

NEIDL investigators have successfully competed for $21M in research and support during FY17 year. Funding comes from a variety of competitive sources, including the National Institutes of Health, the Department of Defense, the pharmaceutical industry, and private foundations, as well as subcontracts with faculty at collaborating institutions.

The funding diversity reflects the research mission of the NEIDL, which encompasses everything from basic research to understand the nature of pathogens and their interactions with a host during infection, to more translational and applied research to develop diagnostics, therapeutics and vaccines. These research programs continue to attract outstanding postdoctoral researchers and staff scientists into NEIDL faculty laboratories.

Publications resulting from our research efforts during this past fiscal year are detailed below.

Publications

Cancedda C, Davis SM, Dierberg KL, Lascher J, Kelly JD, Barrie MB, Koroma AP, George P, Kamara AA, Marsh R, Sumbuya MS, Nutt CT, Scott KW, Thomas E, Bollbach K, Sesay A, Barrie A, Barrera E, Barron K, Welch J, **Bhadelia N**, Frankfurter RG, Dahl OM, Das S, Rollins RE, Eustis B, Schwartz A, Pertile P, Pavlopoulos I, Mayfield A, Marsh RH, Dibba Y, Kloepper D, Hall A, Huster K, Grady M, Spray K, Walton DA, Daboh F, Nally C, James S, Warren GS, Chang J, Drasher M, Lamin G, Bangura S, Miller AC, Michaelis AP, McBain R, Broadhurst MJ, Murray M, Richardson ET, Philip T, Gottlieb GL, Mukherjee JS, Farmer PE. *Strengthening Health Systems While Responding to a Health Crisis: Lessons Learned by a Nongovernmental Organization During the Ebola Virus Disease Epidemic in Sierra Leone.* J Infect Dis. 2016 Oct 15;214 (suppl 3):S153-S163.

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Olsen ME, **Connor JH**. *Hypusination of eIF5A as a Target for Antiviral Therapy*. DNA Cell Biol. 2017 Mar;36(3):198-201.

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Fearns R, Deval J. New antiviral approaches for respiratory syncytial virus and other mononegaviruses: *Inhibiting the RNA polymerase*. Antiviral Res. 2016 Oct;134:63-76.

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Cover photograph (Copyright © 2016, American Society for Microbiology. All Rights Reserved.): Stress granule proteins are embedded in Ebola virus inclusions, where they form distinct aggregates. Shown are U2OS (osteosarcoma) cells infected with Ebola virus and analyzed by immunofluorescence and optical sectioning at 1 day post-infection. Green staining indicates the translation initiation factor and stress granule marker protein eIF3. During Ebola virus infection, large viral inclusions (red), which are key sites of viral replication and nucleocapsid assembly, are formed in the cytoplasm of the infected cells. eIF3 was the first of several stress granule proteins found to be embedded within the viral inclusions, where it forms distinct aggregates, as can be seen on the top and right *z*-axis panels. These inclusion-bound aggregates do not co-localize with viral proteins and are different from canonical stress granules.

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FY17 Funded Research

The work which resulted in the publications outlined above would not have been possible without the ability of our faculty to competitively seek funding to support their research activities. NEIDL faculty members received over $21 MM in funding in FY17 for the following projects:

PI	SCHOOL-DEPT	TITLE	SPONSOR	PROJECT PERIOD	FUNDS AWARDED IN FY17
The following are faculty whose work is carried out within the NEIDL facility:					
CONNOR	MED-MICRO	BIOMARKER DISCOVERY	JOHNS HOPKINS U	3/10/2015-12/31/2016	30,235.00
CONNOR	MED-MICRO	ELIMINATION OF PATHOGENIC IGE IN CYSTIC FRIBROSIS	BWH	8/1/2016-7/31/2017	85,562.00
CONNOR	MED-MICRO	ROLE FOR POLYAMINES IN EBOLA VIRUS REPLICATION	NIH/NIAID	2/1/2016-1/31/2018	205,625.00
CONNOR	MED-MICRO	INCLUSIVITY AND EXCLUSIVITY TESTING OF ADVANCED ASSAYS FOR FEVER OF UNKNOWN ORIGIN	BECTON DICKINSON	4/13/2017-4/12/2018	67,500.00
CORLEY	NEIDL	NATIONAL EMERGING INFECTIOUS DISEASES LABORATORIES OPERATIONS	NIH/NIAID	6/1/2016-5/31/2020	11,500,000.00
DUPREX	MED-MICRO	DISSECTING THE PATHOGENESIS OF FELINE MORBILLIVIRUS	ZOETIS, LLC	3/11/2016-3/10/2019	303,922.00
DUPREX	MED-MICRO	DIVA: VANQUISHING ACUTE VIRAL INFECTIONS BY FINDING THE TIPPING POINT	DOD/DARPA	3/1/2017-2/28/2019	999,992.00
DUPREX	MED-MICRO	SHIFTING A PARADIGM IN VACCINE SAFETY: FROM EMPIRICAL TO RATIONAL ATTENUATION	NIH/NIAID	6/1/2016-5/31/2018	409,250.00
GALAGAN	ENG-BIOMED	PREDICTIVE MODELING OF THE MYCOBACTERIUM TUBERCULOSIS REGULATORY AND METABOLIC NETWORKS	NIH/NIAID	8/20/2016-7/31/2017	411,250.00
GALAGAN	ENG-BIOMED	GLOBAL MAPPING AND ANALYSIS OF BACTERIAL TRANSCRIPTIONAL REGULATORY NETWORK	NIH/NIGM	6/1/2015-5/31/2018	552,812.00
HAYDAR & CONNOR	MED-ANAT	ASSESSMENT OF INFECTION ROUTE AND VULNERABILITY OF NEURAL PRECURSOR CLASSES TO ZIKA VIRUS	NIH/NIND	9/30/2016-8/31/2018	246,750.00
KRAMNIK	MED-PULMONARY	ABERRANT IMMUNE ACTIVATION IN THE TUBERCULOUS GRANULOMA: A PIVOTAL ROLE IN NECROSIS	NIH/NHLBI	7/15/2016-6/30/2020	753,536.00
KRAMNIK	MED-PULMONARY	NOVEL TB TREATMENT STRATEGY - OPTIMIZATION OF MACROPHAGE RESPONSIVENESS TO IFNY	NIH/NIAID	3/11/2015-2/28/2018	491,099.00

PI	SCHOOL-DEPT	TITLE	SPONSOR	PROJECT PERIOD	FUNDS AWARDED IN FY17
KRAMNIK	MED-PULMONARY	NECROSIS IN PULMONARY TB GRANULOMAS: DYNAMICS, MECHANISMS, THERAPIES	NIH/NHLBI	5/1/2016-4/30/2018	711,270.00
KEUSCH	MED-ID	NEIDL INAUGURAL SYMPOSIUM - WELCOME TRUST	WELLCOME TRUST	5/1/2016-4/30/2017	70,000.00
KEUSCH	MED-ID	NEIDL INAUGURAL SYMPOSIUM - MERCK SHARP & DOHME CORP.	MERCK, SHARP & DOHME	5/1/2016-4/30/2017	10,000.00
KEUSCH	MED-ID	NEIDL INAUGURAL SYMPOSIUM - BILL & MELINDA GATES FOUNDATION	GATES FDN	5/1/2016-4/30/2017	55,000.00
KEUSCH	MED-ID	NEIDL INAUGURAL SYMPOSIUM - TAKEDA VACCINES CORP	TAKEDA	5/1/2016-4/30/2017	10,000.00
MUHLBERGER	MED-MICRO	DEEP CHARACTERIZATION OF ROUSETTUS AEGYPTIACUS IMMUNE SYSTEM: USE OF BATS/NONHUMAN PRIMATES TO COMPARE IMMUNE RESPONSES DURING (…)INFECTIONS	THE GENEVA FDN	1/15/2014-3/14/2018	155,000.00
MUHLBERGER	MED-MICRO	ANTIVIRAL RESPONSES IN IPSC-DERIVED HUMAN PRIMARY CELLS TO EBOLA VIRUS INFECTION	NIH/NIAID	6/30/2016-5/31/2018	210,375.00
MURPHY	MED-ID	DEVELOPMENT OF VLS-MODIFIED S-ONTAK: A SECOND-GENERATION, TREG-DEPLETING IMMUNOTHERAPY	JOHNS HOPKINS U	12/15/2016-9/14/2017	7,851.00
Total NEIDL investigators				**$ 17,287,029.00**	
The following are affiliated NEIDL investigators whose labs are located outside the NEIDL:					
FEARNS	MED-MICRO	INITIATION AND REGULATION OF RSV MRNA TRANSCRIPTION AND GENOME REPLICATION	NIH/NIAID	8/7/2014-7/31/2018	414,999.00
FEARNS	MED-MICRO	DEVELOPMENT OF A NON-RADIOACTIVE ASSAY FOR THE RSV POLYMERASE	MERCK, SHARP & DOHME	11/12/2015-11/11/2017	21,907.00
FEARNS	MED-MICRO	DEVELOPMENT OF AN IN IVTRO ASSAY FOR PARAMYXOVIRUS POLYMERASES	ALIOS BIOPHARMA	5/16/2014-5/15/2018	94,073.00
KEPLER	MED-MICRO	HIV-1 VACCINE-ELICITED ANTIBODIES TARGET ENVELOPE GLYCANS	DUKE U	6/1/2016-5/31/2017	18,071.00
KEPLER	MED-MICRO	NEISSERIAL PORINS AND ANTIGEN PRESENTING CELLS	BMC CORP	9/1/2016-8/31/2017	135,201.00
KEPLER	MED-MICRO	STATISTICAL ANALYSIS OF ANTI-TAU AND ANTI-INFLUENZA ANTIBODIES	JANSSEN VACCINES	9/1/2016-12/31/2016	7,916.00
KEPLER	MED-MICRO	CHAVI-SRSC J COMPUTATIONAL BIOLOGY	DUKE U	7/15/2012-6/30/2017	251,662.00
KEPLER	MED-MICRO	B CELL LINEAGE ENVELOPE IMMUNOGEN DESIGN FROM RV144 ANTIBODIES, PHASE 2	DUKE U	11/1/2014-10/31/2016	44,519.00

PI	SCHOOL-DEPT	TITLE	SPONSOR	PROJECT PERIOD	FUNDS AWARDED IN FY17
KEPLER	MED-MICRO	T AND B CELL MECHANISMS OF HIV CONTROL: IMPLICATIONS FOR VACCINE DESIGN	MGH	9/1/2016-5/31/2017	66,000.00
KEPLER	MED-MICRO	MODELING AFFINITY MATURATION AT MOLECULAR RESOLUTION	NIH/NIAID	4/15/2015-3/31/2018	1,572,725.78
KEPLER	MED-MICRO	THE B CELL REPERTOIRE AS A WINDOW INTO THE NATURE AND IMPACT OF THE LUNG VIROME	NIH/NLBI	5/1/2017-4/30/2018	284,750.00
KEPLER	MED-MICRO	RESEARCH TRAINING IN IMMUNOLOGY	NIH/NIAID	9/1/2014-8/31/2018	242,772.00
SAMUELSON	SDM-MOL & CELL BIO	STRUCTURE AND DEVELOPMENT OF OOCYST AND SPOROCYST WALLS	NIH/NIAID	8/1/2015-1/31/2018	407,250.00
SAMUELSON	SDM-MOL & CELL BIO	GENETIC MODIFICATION OF CULTURED CRYPTOSPORIDIUM TO TEST THE AUTOINFECTION MODEL	NIH/NIAID	2/1/2017-1/31/2018	246,750.00
Total NEIDL affiliated investigators			**$ 3,808,595.78**		
Total NEIDL and AFFILIATED investigators			**$ 21,095,624.78**		

Seed Funding, 2016 - 2017

The NEIDL is fortunate to be able to provide financial support for pilot programs to investigators to develop new innovative science initiatives to further the NEIDL mission, to support proof-of-principle studies, and to provide infrastructure support through new instrumentation. The expectation is that this funding will be leveraged to improve the research enterprise, promote multidisciplinary studies between NEIDL investigators and investigators across the institution, and/or to develop new programs within the NEIDL. The following programs received seed funding during this fiscal year.

NEIDL commitment to Zika virus researchLast year, we reported on the initiation of research into the Zika virus, a virus classified as an “arbovirus”. Arboviruses are viruses that are spread by vectors such as mosquitoes, ticks, or other insects. With the spread of Zika virus in South America and the now confirmed local transmission of the virus in Florida, the NEIDL provided funding to establish a core Zika virus laboratory to develop expertise in this virus, and use this expertise to enable other scientists around the university to develop collaborative research programs relevant to understanding Zika virus pathogenesis. Using these funds NEIDL investigator **John Connor** developed collaborative programs with a number of investigators, including Tarik Haydar (now a new NEIDL investigator from the Department of Anatomy and Neurobiology), Horacio Frydman (a NEIDL investigator from the Department of Biology), and Wendy Kuohung (a faculty member in Obstetrics and Gynecology) to develop new funded projects investigating Zika virus pathogenesis.

Establishment of a Microbial Pathogen Bank

During this past year, we invested in the personnel, resources, and tools needed to develop a secured freezer repository within the NEIDL to store viruses that could be of future interest to NEIDL investigators and their collaborators. The agents, when needed in research, would then be distributed to investigators with appropriate IBC clearance and training for their research. The rationale for developing this repository was to accelerate our ability to do research on emerging pathogens. We learned our lesson from the recent Zika virus outbreak: when our investigators tried to obtain samples of Zika virus last year, it took 4 months in order to get samples. The rationale for storage is to reduce this time in order to free investigators to pursue new research initiatives more efficiently. The agents we are importing are those that are generally present in the western hemisphere and are known or predicted to be concerns,

and/or are related to pathogens in the western hemisphere or are of more immediate interest to our faculty. The repository currently has 17 viruses in storage, many of them arboviruses. More are being added.

Other areas of Support

Other funds were used for proof of principal projects to help further the NEIDL mission. Funds have been committed to support travel expenses for **Nahid Bhadelia** in her efforts to develop a concept training program between NEIDL and investigators in West and Central Africa. The travel funds were committed in order for Dr. Bhadelia to apply for external funding. At the time of this writing it appears she will be approved for external funding, and thus these funds will become an important advantage in leveraging this concept funding in the development of a competitive full scale training program.

The NEIDL also purchased an Tecan Spark 20M multimode microplate reader, an instrument essential in live cell assays for understanding many aspects of viral, or bacterial, interactions with host cells and in pathogenesis studies, as well as for drug discovery in the development of therapeutics.

In addition to sponsoring the NEIDL Inaugural Symposium, the NEIDL provided financial support for the Northeastern World TB Day Symposium, held March 6 and 7 at BU's Charles River Campus. This symposium brought together scientists from 10 academic institutions and the National Institutes of Health to discuss progress and barriers to eradication of tuberculosis, which many consider the most successful human pathogen on the face of the earth. It is estimated that one third of the human population is infected with Mycobacterium tuberculosis, the causative agent of TB. While the majority of the infected persons have latent disease, in 2015, over 10 million people fell ill to TB, and almost 2 million died from this infectious disease. Thus, TB represents a significant public health problem, and symposia focusing on the gaps in eradication are important to support.

Update on FY2015 and FY2017 seed funding initiatives

Funding for Zika virus research has accelerated our ability to investigate many unexpected aspects of this virus and its interactions with mammalian in insect cells. During this year, in addition to several publications (documented in this report), **Tarik Haydar** and **John Connor** successfully competed for funding from the NIH to study the impact of Zika virus on neuronal precursor development (1R21NS101151-01, ASSESSMENT OF INFECTION ROUTE AND VULNERABILITY OF NEURAL PRECURSOR CLASSES TO ZIKA VIRUS). At the time of this writing it also appears that Wendy Kuohung's and **John Connor's** project, to study the interface between Zika virus and placental cells, will be funded by NIH as well. Drs. **Frydmann** and **Connor** have also submitted a grant application directed at developing better strategies to prevent the transmission of Zika virus by their insect vector.

James Galagan received funding to help perform the first whole genome sequencing and analysis of strains of Mycobacterium tuberculosis (MTB) from India. Through collaborative links between colleagues in India and the NEIDL, he gained access to DNA for over 100 strains of MTB from two different sites in South India. His analysis provided a detailed view of the genetic diversity of MTB in India, which is suffering the world's largest TB epidemic when measured by the number of infected patients. The analysis also revealed the genetic underpinnings of MTB drug resistance in India, and highlights the limitations of current sequence based diagnostics for drug resistance diagnosis. This important work has now been published (Manson et al.) as detailed in publications from the NEIDL in this report.

Elke Mühlberger received funding to support a graduate student (Whitney Manhart) to initiate a long-term collaborating project between the Mühlberger lab and the Center for Regenerative Medicine investigator Gustavo Mostoslavsky. The ultimate goal of the research is to learn how to establish inducible pluripotent stem cells from *Rousettus aegyptiacus* bats and other reservoir species to provide a source of different cell types for the study of virus-host interactions in reservoir species of Marburg and other filoviruses. This support has already permitted the funding of a related NIH grant (now in its second year). Ms. Manhart continues to develop the tools needed to achieve the ultimate goal of developing iPS cells from reservoir species.

NEIDL Faculty and Staff Recognition

An indication of the reputation of faculty is best exemplified by their selection as invited speakers in national and international forums, service on review panels and service on editorial boards of journals. Other forms of recognition include being sought after because of their experience and ability to use their expertise to explain a story to the news media about current events. NEIDL faculty continue to be recognized as summarized below.

Invited Speakers - National and International Forums

Nahid Bhadelia

- *Emerging Infectious Diseases Outbreaks and Research Capacity Building.* Belfer Center, Harvard Kennedy School, Managing The Microbe Speaker Series. January 25, 2017
- *Ebola Response: On The Ground Perspective*. McGill University, McGill Global Health Programs. October 2016

John Connor

- *Real-Time Visualization of Individual Hemorrhagic Fever Virions in Solution*. Viral Hemorrhagic Fevers conference, Santa Fe, NM. December 2016
- FANG/DHS Ebola clinical parameters meeting, Rockville, MD. May 2017

Ronald Corley

- *Safety, Security and the Public in Emerging Infectious Diseases Research.* Yale Harvard IBC Symposium, New Haven, CT. June 13, 2017.

Paul Duprex

- *Modeling the evolutionary trajectories of an ever expanding morbillivirus genus: getting in, getting about and getting out and about.* University of Maryland, University of California. (2017)
- *Delineating morbillivirus entry, dissemination and airborne transmission: in vivo competition of multicolor canine distemper viruses*. Gordon Research Conference, Il Chiocco, Barga, Italy. (2017)
- Session Chair, EIDA2Z. (2016). National Emerging Infectious Diseases Laboratories Inaugural Symposium, Boston, MA, USA.

Rachel Fearns

- *Initiation of paramyxovirus transcription and genome replication.* University of Rochester, School of Medicine and Dentistry, Rochester, USA. November, 2016.
- *Working with the pharma industry from the academic side of the fence*. University of Rochester, Graduate Women in Sciences, Rochester, NY. November, 2016.
- *Exploration of RSV polymerase activities using mutagenesis and small molecule inhibitors.* Alios Biopharma, San Francisco, USA . March, 2017.
- *Dissecting the initial steps of transcription and genome replication in the nsNSVs*. Microbiology Society Annual Conference 2017, Edinburgh, UK. April 2017.
- O*ne promoter, two processes: how polymerases of nsNSVs initiate mRNA transcription and genome replication*. Plenary Speaker, American Society of Virology Annual Meeting 2017, Madison, WI. June 2017.

Horacio Frydman

- *Wolbachia manipulation of gut microbiota*. 9th International Wolbachia Conference, Lamington Plateau, Queensland, Australia. July, 2016.
- *Wolbachia, a Bacterium Hitching a Ride in the Drosophila Stem Cell Niche*". Indiana University, Department of Biology, Bloomington, IN. September, 2016.

Gerald Keusch

- *Clinical Trials During the West Africa Ebola Outbreak.* White House Office of Science and Technology Policy, Washington, DC. May 30, 2017.

Igor Kramnik

- *Necrotic granuloma-directed therapies for TB: optimization of macrophage responses to interferons*. ID Section, Boston University School of Medicine. October 22, 2016.
- *Maladaptive macrophage activation in chronic inflammation: origins, consequences and therapeutic approaches*. John Hopkins University TB Center, Baltimore, May 17, 2017.

Elke Mühlberger

- *BSL-4 work is fun!* Yale Harvard IBC Symposium, New Haven, CT. June 13, 2017.
- *A rose is not a rose in ebolavirus infection.* Microbiotix, Inc. Worcester, MA, April 19, 2017.
- *Silence is Golden - Distinct Host Responses in Human Macrophages Infected with High or Low Pathogenic Ebolaviruses.* Keystone Symposia on Hemorrhagic Fever Viruses, Santa Fe, NM. December 4-9, 2016.
- *Silence is Golden – How Macrophages Respond to Ebola Virus Infection.* Department of Veterinary and Biomedical Sciences, Pennsylvania State University, University Park, PA, November 30, 2016.

International Meeting Organizers/Chairs

- **Paul Duprex** . 2016: National Emerging Infectious Diseases Laboratories Inaugural Symposium, Boston, MA, USA
- **Paul Duprex** . 2017: New Horizons for Measles-based Vaccines and Therapies: Making and Regulating, Themis LLC, Vienna, Austria
- **Rachel Fearns**. 2016 Convenor, American Society of Virology Meeting Workshop
- **Rachel Fearns**. 2017 Convenor American Society of Virology Plenary Session
- **Tarik Haydar**. 2016 *Measuring the extent and rationale of neocortical precursor heterogeneity*. Boston University, Program in Biomolecular Pharmacology, Sterling Drug Lecturer
- **Gerald Keusch**. Co-Chair of the Committee on Clinical Trials during the 2014-2015 Ebola Outbreak, National Academies of Sciences, Washington, DC
- **Gerald Keusch**. 2016: Chair of the National Emerging Infectious Diseases Laboratories Inaugural Symposium organizing committee, Boston, MA

Honors

- **John Connor**. Nanoview diagnostics, a company that spun out of an R01 research project on which Dr. Connor was PI, successfully completed Series A financing in the spring of 2017. http://nvdx-platform.launchrock.com/
- **James Galagan.** Distinguished Faculty Fellow, College of Engineering, Boston University, 2016

Editorial Boards

John Connor

- Journal of Virology (2011-2020)

Paul Duprex

- Senior Editor: mSphere, American Society for Microbiology.
- 2017-present: Deputy Editor-in-Chief: Journal of General Virology, Society for General Microbiology

Study Sections and Grant Review Panels

John Connor

- Reviewer NIAID international grant panel November 2016
- Reviewer NIAID SRG DDR study section 2016
- Reviewer Zika R21 study section 2016 and 2017

Ronald Corley

- National Research Foundation Singapore, Competitive Research Program, September 2016

Paul Duprex

- National Institutes of Health (NIH), Vaccines against Microbial Diseases (VMD): Non-HIV Microbial Vaccines SBIR (2 day meeting) 2016
- National Institutes of Health (NIH), Vaccines against Microbial Diseases (VMD): Non-HIV Microbial Vaccines SBIR (1 day meeting) 2017

Rachel Fearns

- 2016 Member Deutsche Forschungsgemeinschaft (DFG) grant review panel, Germany
- 2016 Member NIAID review of exploratory Zika applications ZAI1 EC-M, NIH
- 2017 Ad hoc grant reviewer for The Royal Society, UK
- 2017 Member Ad Hoc NIH Virology A study section
- 2017 Ad Hoc grant reviewer for the Leibniz Competition, Germany

James Galagan

- 2017 Appointed reviewer, NIH, Prokaryotic Cell and Molecular Biology Study Section [PCMB]
- 2016 Appointed Reviewer, NIH, Modeling and Analysis of Biological Systems Study Section [MABS]
- 09/2016 Department of Energy, Office of Biological and Environmental Research, SFA

Tarik Haydar

- 11/2016 NIH: ZAI BLG-M (J2) 1, Human Tissue Models U19 review
- 11/2016 NIH: BBS CHHD-H
- 9/2016 NIH: ZAI BLG-M (J1) 1, Human Tissue Models U19 review

Igor Kramnik

- 3/30/2017. ZRG1 AARR-M (57) Mycobacterial induced immunity in HIV-infected and uninfected individuals.
- 6/29/2016. U.S. South Africa program for collaborative biomedical research. The special emphasis panel ZRG1 AARR-K(52).

John Samuelson

- NIH Director's New Innovator Award Review December 2016

Advisory Council and Program Memberships

Nahid Bhadelia

- Filovirus Animal Non-Clinical Group (FANG), Bethesda, MD
- FANG Human Clinical Data Subgroup, US Government Interagency
- Infectious Diseases Society of America (IDSA) (Member, Publications Committee member, Author, SHEA Online Journal Club)
- Society of Healthcare Epidemiology of America (SHEA0

Paul Duprex

- 2010-2016 European Society for Virology Advisory Council
- 2015- 2018 American Society of Virology (Scientific Programs Committee Member)
- 2016-2020 American Society for Virology Communications Committee (Chair)
- 2017-2020 ZikaVAX consortium (a public private partnership of European Vaccine Initiative, Institut Pasteur, Themis Bioscience and Commissariat à l'Energie Atomique et aux énergies alternatives). Supported by a 10 million Euro grant from Horizon 2020 Research and Innovation Programme of the Europeans Commission.

Rachel Fearns

- 2016-2019 Member ASV Education and Career Development Committee

James Galagan

- 2016-2017 Philips Genomics for Infectious Disease Advisory Board Member

Tarik Haydar

- Co-Chair, Session on Neural Development, American Society of Neurochemistry, San Antonio, TX

Committee on Clinical Trials during the 2014-2015 Ebola Outbreak

In late 2015, Gerald T. Keusch, MD, Director of the NEIDL Collaborative Research Core, was named Co-Chair of the Committee on Clinical Trials during the 2014-2015 Ebola Outbreak, by the National Academies of Science, Engineering and Medicine (NSF).

The NSF was commissioned to conduct a study by a joint group of government agencies comprised by National Institute of Allergy and Infectious Diseases (NIAID), the Food and Drug Administration (FDA), and the Office of the Assistant Secretary for Preparedness and Response (ASPR) at the Department of Health and Human Services. The goal of the study was to review the clinical research on therapeutics and vaccines conducted in Guinea, Sierra Leone and Liberia during the 2014-2015 Ebola virus disease (EVD) outbreak, in order to "explore and analyze the scientific and ethical issues related to clinical trial design, conduct, and reporting to draw conclusions and make recommendations on how to be better prepared in the future". You can obtain further information about the committee via this link.

According to Dr. Keusch, it was, to say the least, an interesting challenge for the committee, and an exercise that might in fact have some future benefits by taking an objective look back to identify lessons learned, including what to do and what not to do, and provide guidelines to improve the process from design to implementation and engage local professionals, the community, and community based organizations in the process. It was also clear this was no simple assignment; that getting clinical research up and running during a humanitarian disaster with products somewhere in the preclinical research phase, and little in the way of resources in place to care for patients and conduct clinical trials was an unparalleled challenge.

The committee, was comprised of 16 respected U.S. and international colleagues and had their first meeting at the National Academies in Washington DC. Since then the committee met in London, again in Washington DC, and Liberia.

Nahid Bhadelia, who is also a member of the NEIDL Collaborative Research Core, provided her perspectives on the integration of clinical research and patient care in maximum containment to the committee at the June meeting, based on her experiences working in Sierra Leone during 2014-2015, an important theme to address and gain insights for improvement so that we are all better prepared the next time such a situation occurs.

In late September of 2016, the committee met again in Boston, here at the NEIDL, to query and analyze the lessons learned from information gathered, and sort this massive amount of information into findings leading to conclusion, and from this derive recommendations for the future that will help advanced preparations, build human skills and infrastructure capacity, and better organize global governance and identify funding sources to be able to make the process of developing and implementing clinical trials in the course of outbreaks more efficient, effective and able to generate interpretable data on drugs and therapeutics without compromising clinical care and public health interventions. After the meeting, the final report was written, reviewed, edited during over several months and was released in the spring of 2017.

While NEIDL research priorities are largely at the earlier research stages of R&D for emerging infections, this assignment is relevant to our work and will surely provide insights for us that will help to shape our research agenda. It is central to our mission and role as an important component of a global research network to address EIDs, and to our efforts to reach out to colleagues around the world in different laboratories and hot-spots for disease emergence. It is directly related to the work our colleagues did during the West Africa Ebola outbreak during 2014-2015, and to the role of the Collaborative Research Core at NEIDL.

Promotions and Professional Accreditations

Tarik Haydar, MED professor of anatomy and neurobiology

On the faculty since 2010, Haydar is known for his pioneering research in brain development in Down syndrome and for his research explaining how neural progenitors generate the variety of neurons within the developing neocortex. His publications include invited editorials and critical reviews in *Science*, *Cell*, *Neuron*, *Nature Neuroscience* and other journals. Haydar has served on several dozen NIH review committees and recently chaired the Neural Cell Fate NIH Study Section. He is primary investigator on four active grants.

Note added to this announcement: We are pleased to now have Dr. Haydar's expertise as a NEIDL investigator, working with virologists to determine how Zika virus interferes with the developing brain.

NEIDL ABSL4 Animal Core Technicians Pass AALAS Certification Exams

Our three NEIDL ABSL4 Animal Core technicians all passed American Association of Laboratory Animal Science (AALAS) certification exams. The AALAS Technician Certification Program sets professional standards for the advancement of laboratory animal science. This program was developed to recognize professional achievement and provide an authoritative endorsement of a technician's level of knowledge in laboratory animal technology. The technician certification designations of ALAT (Assistant Laboratory Animal Technician), LAT (Laboratory Animal Technician), and LATG (Laboratory Animal Technologist) are well known and widely used throughout the varied fields of laboratory animal care. In fact, these certifications have come to be a common requirement for a lab animal care position,

Please join us in congratulating our committed technicians who have worked hard to help us reach some experimental mile stones this year!

Achievements:
Yuli Diaz-Perez: LAT
Sarah Gross: LAT
Oscar Furtado: ALAT

Animal Services Core Director Passes ACLAM Boards

Please join us in congratulating Kath Hardcastle for passing the American College of Laboratory Animal Medicine (ACLAM) boards! ACLAM Diplomates are certified specialists in the field of laboratory animal medicine. They provide medical care and management to a wide variety of animal species used in medical, veterinary medical, and biological research and testing. They have unique qualifications which enable them to serve as valuable members of the research team. ACLAM is recognized officially by the American Veterinary Medical Association (AVMA) as the certifying organization for laboratory animal medicine.

Research in the News

Has The World Learned The Wrong Lessons From The Ebola Outbreak?

Original article from National Public Radio: Goats And Soda. Online.
by Nahid Bhadelia, July 19, 2016.

When a country is declared Ebola-free — like Sierra Leone last November — the mood is upbeat. But that doesn't mean the virus is vanquished, as Sierra Leone learned this month. Aurelie Marrier d'Unienvil/AP

Last Thursday, the World Health Organization declared the end to two horrific years of the West African Ebola epidemic.

Later on the same day, the Ministry of Health in Sierra Leone announced that a patient with Ebola died in the Tonkilli region of that country.

Perhaps the most disconcerting aspect of the new case in Sierra Leone was not that it occurred so soon after WHO's proclamation, but that Ebola wasn't diagnosed until after the patient died.

The patient was a young woman who developed symptoms at the beginning of the year after traveling to an area in that country that was one of the last hotspots to be declared disease-free. When she came to a local hospital for care, she had classic symptoms of Ebola, such as vomiting and diarrhea. Yet she was not diagnosed with the disease.

What's more, the health care worker who drew her blood did not wear the appropriate personal protective equipment and the woman's blood sample may not even have been tested for Ebola. She was eventually discharged to die at home rather than being isolated, and dozens of other people have been exposed. Currently, some 100 people who may have had contact with her are under quarantine.

The juxtaposition of the upbeat announcement and the sad news is a reminder of how difficult it is to bring an epidemic to an end — and what we need to keep in mind about this particular epidemic and any future outbreaks of other diseases.

How and why do human epidemics end? There are several reasons. Cases drop when there are no more susceptible humans left to infect, when we get better at controlling the spread, when the organism that causes the disease mutates to be less lethal, or when one of the conditions that allowed the disease to survive in nature changed — perhaps an animal that carries the disease moved or died off or there was a change in weather conditions that had been favorable to the spread.

In most cases, a combination of these factors plays a role. So predicting the end of an epidemic can be a difficult endeavor because it requires perfect knowledge of all of the above factors. That's simply not possible. Hence, the best public health officials can say is that there is no more evident human-to-human transmission noted. And to be fair, this has been WHO's message after each country ends its surveillance period.

Some scientists believe the end of the wide-scale epidemic marks the beginning of recurrent small groups of cases in this region for months and potentially years. The virus can take months to clear completely from the body of a survivor. There are nearly 17,000 Ebola survivors in West Africa. They can transmit the infection to those around them — although the frequency of such transmission is low. The transmission may be possible with sexual contact. It can also occur if the patient's immune system is depressed for other reasons, and dormant Ebola virus is able to start replicating more actively.

To halt future cases, health workers must provide care, counseling and surveillance of symptoms that may represent Ebola reactivation among survivors. How long should such surveillance continue — in other words, how long will it take for the immune system to clear out the last remnants of the virus? The answer is we don't know. The leading theory suggests this should be in the order of months rather than years.

There are, however, other reasons for continued concern about Ebola in West Africa. The conditions that allowed this virus to jump to the human population and spread so quickly have not all changed. We have not run out of people who are susceptible to being infected, although the pool is smaller after accounting for those who developed immunity to the virus naturally after contracting the disease. We have also made strides to shrink this pool even further with the success of one of the Ebola vaccine candidates, Merck's rVSV-ZEBOV. Given immediately after exposure, it was shown to all but remove the chances of developing Ebola.

We have still not definitively proved where this virus lives in nature when it is not infecting humans. Fruit bats are the leading contenders, but more research and surveillance of the natural world are needed. More research is also needed to understand what exact conditions allow the virus to jump from animals to humans. Hence we are a long way from being able to prevent these phenomena from happening.

And the case in Sierra Leone last week brings up another point: The systemic weaknesses in public health infrastructure that allowed the virus to spread like wildfire still exist. If we were able to stop this epidemic, it was not because we rebuilt the public health systems in West Africa but because massive resources were poured into immediate response and heightened surveillance, with an immense amount of education and policies that echoed wartime precautions, like roadblocks that restricted the movement of entire countries.

Having worked for months in Sierra Leone over the past two years, I can bear witness to the toll this epidemic has taken on affected communities. Nothing could be more tempting than to put this behind us.

Despite WHO's caution that there could be flare-ups, the declaration of the end to the epidemic may signal that the behavioral changes and the heightened surveillance in West Africa are no longer necessary. This is particularly true when the entire enterprise was built on sheer will and very little permanent scaffolding to ensure that positive changes to the health care system stick.

So it is important to have continued vigilance in West Africa. But that is not the only lesson to come out of this Ebola outbreak. By focusing on the end of the epidemic, we miss the larger point. We cannot live as a world that moves from responding to one epidemic after another. Rather than thinking of beginnings and ends, we need continuous surveillance for threatening infectious diseases that are both known and yet to be discovered. We need to move from a culture of outbreak response to one that focuses on prevention. Small clusters of infectious disease cases are inevitable, but outbreaks and epidemics are preventable.

A stitch in time, though, is a hard sell. This past week also marked the release of a National Academy of Medicine sponsored commission's report on the Global Health Risk Framework, which addressed why epidemics are an immense and inevitable threat to our global security. The report outlined the responsibility of individual nations and the global community to invest in systems that can rapidly pick up new threats and be nimble enough to respond to them quickly. Per the report, it would take a $4.5 billion annual commitment to make these changes a reality. Although a daunting number, this investment is nowhere near close to the expected $60 billion in annual losses from pandemics.

At the launch event for the report, the economist and president emeritus of Harvard University Larry Summers noted that the 1918 flu pandemic affected 7,000 times more people than the recent Ebola outbreak, striking a third of the world's population and killing 50 million to 100 million people — 3 to 5 percent of everyone on earth.

We have made significant scientific advancements since 1918, but we also now live in a world where contagions move at the speed of modern travel and trade. And there are billions more of us, living in large crowded cities. In a study by Dr. Larry Brilliant, the epidemiologist and director of Skoll Global Threats Fund, 90 percent of epidemiologists polled said they expect a large pandemic in their children or grandchildren's lifetime, one that could affect over a billion people and cause global recession. In many ways, how we handled the Ebola crisis was a litmus test for our response to a large flu pandemic. And keep in mind that Ebola is much harder to spread over large geographical areas than respiratory viruses are.

WHO has a difficult balance to strike between celebrating the hard work of stopping Ebola and continuing to urge a need for vigilance. As Albert Camus said in the novel *The Plague*, "There have been as many plagues as wars in history; yet always plagues and wars take people equally by surprise." The best way to keep new cases of infectious diseases from causing epidemics is to expect them and to invest in public health and research during "peace time" as much as we do during an outbreak.

Nahid Bhadelia is an infectious disease physician at Boston Medical Center and the director of Infection Control at National Emerging Infectious Diseases Laboratory.

A New Lead on Treatment for Ebola

By understanding how Ebola virus hijacks and infects human cells, University researchers are paving a path to potential new therapies

Original article by The Brink, By Elizabeth Dougherty, September 30, 2016

In the book *The Hot Zone*, author Richard Preston called viruses like Ebola “molecular sharks”—mindless attackers made of almost nothing. Ebola virus, which causes often-fatal hemorrhagic fevers, carries just seven genes, none of which can do much without first stealing the smarts inside a host cell.

Virologists in the lab of John Connor have recently discovered one previously unknown way that Ebola hijacks a cell’s machinery and uses it to replicate and spread. When the virus invades, it takes over a pathway that normally helps the host cell turn its own genes into proteins. The virus uses this pathway—in particular, an activated form of a protein called eIF5A—to turn its own viral genes into proteins. When those viral proteins accumulate, the virus is able to unleash the rest of its deadly viral proteins.

Virologists John Connor and Michelle Olsen work with disabled forms of Ebola virus to understand how the virus hijacks and infects cells. Their findings are pointing a new way to stop the deadly infection.
Connor photo by Mark Fleming. Olsen photo by Cydney Scott

By figuring out how the virus hijacks a host cell, Connor and his team have found a new lead for the treatment of Ebola infections, though more research is required to pinpoint a treatment strategy. “My lab tries to shine light on underlying mechanisms,” says Connor, associate professor of microbiology at Boston University’s National Emerging Infectious Diseases Laboratories (NEIDL). “Once you understand the different parts of a cell the virus is using, you can come up with ways to stop it.”

The findings were published in the American Society for Microbiology’s *mBio* journal in July 2016. Funders of the research include the National Institutes of Health and the US Department of Health and Human Services.

The team began the project by working with a disabled form of Ebola called a minigenome system. This system, originally developed by BU School of Medicine associate professor and NEIDL microbiologist Elke Mühlberger, includes the four Ebola genes that get a foothold in the cell. A gene that codes for a luminescent marker that glows upon a chemical reaction has replaced the rest of the viral genes.

“It’s a little different from the virus, but it allows us to do the work at a Biosafety Level 2 laboratory,” says Michelle Olsen (GRS’15), a postdoctoral fellow in Connor’s lab and lead author on the study. Work on the actual Ebola virus can only be done in a lab designated by the Centers for Disease Control and Prevention as meeting the much stricter Biosafety Level 4 standards.

Olsen began by looking at how the Ebola minigenome depends on tiny molecules in host cells called polyamines, which help replicate other viruses. Using an inhibitor, she blocked the creation of the polyamine that activates eIF5A. This, in turn, blocked the Ebola minigenome system. The disabled virus wasn’t able to replicate its glowing stand-in for an infection.

Further testing with different inhibitors showed that specifically blocking the polyamine’s activation of eIF5A blocks viral replication by interfering with the creation of VP30, one of the four viral proteins required for the virus to replicate itself. “This data says that eIF5A functions somewhat like a gate,” says Connor. “If you inactivate eIF5A, that gate is closed and there isn’t enough VP30 created to drive the virus.”

It isn’t known yet exactly what causes VP30 to stop accumulating. So far, Olsen has shown that the viral gene for VP30 is still being transcribed into RNA instructions used to build the protein. But then the production line falters. “Somewhere along the line the protein is either not being produced or it’s disappearing because it’s not stable,” says Olsen.

Once the details are fleshed out, the finding could point to a clear therapeutic strategy. But before digging into those details, Connor, Olsen, and co-lead author Claire Marie Filone, a former postdoctoral fellow in Connor’s lab, wanted to make sure that their method for stopping infection using a minigenome system also worked on live Ebola virus.

They tapped Chad Mire and colleagues at the University of Texas Medical Branch, who run a Biosafety Level 4 lab and have access to Ebola. Mire and Filone tested one of the small molecule inhibitors used at BU, ciclopirox, against live Ebola virus and against the closely related Marburg virus, another “molecular shark” in the filovirus family that also causes deadly hemorrhagic fevers. The drug decreased viral infections in cultured cells by approximately 2.5 orders of magnitude in both viruses, a notable effect, according to Mire.

“This was a really interesting result because it worked against Ebola and against another very important virus called Marburg,” says Mire, who works with many labs to test antivirals against live virus. “What we have here is a positive first step toward a broad-spectrum filovirus antiviral.”

Connor and Olsen are already working toward the next step of understanding what is happening to VP30 when the eIF5A gate closes. “This pathway is important,” says Connor. “The question is why. Understanding that can be critical to knowing how to effectively target it to treat Ebola.”

Blood Test May Predict Who Lives or Dies with Ebola

Aggressive immune response signals poor outcome

Original article by The Brink, By Barbara Moran, January 17, 2017

In 2014, Ebola exploded across western Africa. It was the worst outbreak of the virus in recorded history, killing more than 11,000 people before it sputtered out in early 2016. In the Republic of Guinea, the epicenter of the epidemic, around 60 percent of people infected with Ebola died.

NEIDL researchers John Connor and Emily Speranza analyzed blood samples from the 2014 Ebola epidemic and discovered a biomarker that may help predict whether a person will survive the disease. Speranza photo by Cydney Scott

While the outbreak taught physicians and scientists much about Ebola, many questions remain. Foremost among them: why do some people survive an infection, while others die? Researchers know that some obvious factors, like supportive hospital care, improve prognosis. They also know that high viral load—the amount of virus present in the body—is frequently associated with death. But these factors alone didn't account for all those who survived or succumbed to the disease, and they didn't always predict who would live or die.

Now, a team of researchers led by Boston University, the University of Liverpool, Public Health England, and other international agencies has discovered a biomarker that can help predict the progression of the disease: a handful of genes that are over-activated in patients who succumb to the disease. These genes indicate an overly aggressive primary immune response, which can damage organs—particularly the liver—and paradoxically, may hamper a more targeted immune response. The research, funded by the United Kingdom's National Institute for Health Research and the US Food and Drug Administration, and published on January 19, 2017, in the journal *Genome Biology*, suggests a new type of blood test that while still in the preliminary stages of development, might be useful in future outbreaks to steer patients to the best treatment.

"The study suggests that something about the way people respond to infection affects their chance of survival," says John Connor, a School of Medicine associate professor of microbiology at BU's National Emerging Infectious Diseases Laboratories and corresponding author on the study. "We can get a sense of who will survive and who won't, and we can get it earlier," he adds. "This is the first study of this type ever done on this scale."

Connor and Emily Speranza (ENG'18), a PhD candidate in bioinformatics and a National Science Foundation Graduate Research Fellowship Program fellow at BU, became involved with this research when scientists in England contacted Connor's lab, asking for help interpreting data. The Liverpool scientists, in conjunction with Public Health England, had been analyzing blood samples from Ebola victims that had been collected and preserved during the outbreak. They had a wealth of data from the samples, including measurements of mRNA in patients' blood—a good indicator of gene activity.

The English scientists, who noticed that the mRNA produced by Ebola victims corresponded to genes involved with the human immune response, contacted Connor's lab because he had studied the same immune response in monkeys. "We were excited to be part of the analysis team," says Connor.

Speranza, working in parallel with colleagues in England, correlated the mRNA in 128 samples to 10 genes, all of which were activated in patients who had died. When they looked for the biomarkers in an unrelated set of blood samples, they found the test to be 70 percent accurate—in other words, 70 percent of the patients were correctly predicted to survive or succumb to the disease based on the biomarkers.

She also found evidence of activation in genes that make albumin and fibrinogen, indicators of severe liver damage. "Albumin and fibrinogen are only produced in the liver, so the mRNAs for those proteins are usually only found in the liver," she says. "When you see really high levels of those in the blood, that means that the liver cells are busting open and spilling their contents into the bloodstream." Because the liver produces many critical molecules for the body, including proteins that allow blood to clot, says Connor, the liver's demise may be what gives the virus the upper hand in some patients.

Connor believes that while this study used samples from the 2014 outbreak, which involved only the Makona strain of the virus, the same or similar biomarkers are likely to appear with other strains of Ebola. Overall, he says, the research gives more insight into who the disease kills and who it spares. "The nature of the victim's immune response has something to do with it, but the information we got from these samples is a one-time snapshot," he says, noting that the blood samples show victims at both early and late stages of the disease, so they may not give a full picture of the immune response. "This study gives us an important piece of information, but it doesn't solve the whole puzzle."

Silence is golden: Suppressing host response to Ebola virus may help to control infection

Original article by Science Daily, March 22, 2017

The Ebola virus causes a severe, often fatal illness when it infects the human body. Initially targeting cells of the immune system called macrophages, white blood cells that absorb and clear away pathogens, a new study has found a way to potentially 'silence' these Ebola virus-infected macrophages.

Research conducted in the Mühlberger laboratory could lead to new treatment options for the Ebola virus disease. The findings, which appear in the *Journal of Virology* (Accepted manuscript posted online 22 March 2017) have been selected as an article of significant interest to be featured in the Spotlight section of the Journal upon publication (Journal of Virology, Vol.91, Issue 11).

The Ebola virus is transmitted to people from wildlife, potentially bats, and spreads in the human population through human-to-human transmission. Currently there are no licensed Ebola virus vaccines but two potential candidates are undergoing evaluation.

Prior studies by others have shown the Ebola virus activates a defense program in macrophages through a process normally used by bacteria, but not by viruses. The Ebola virus activates the macrophages through Toll-like receptor 4 (TLR4). Macrophages use TLR4 to sense bacterial infections and then activate a defense program evolved to fight bacteria. Unfortunately, activation of TLR4 by Ebola virus may lead the macrophages in the wrong direction and they mount an inappropriate immune response. This leads to the production of immune modulators that may be harmful and deteriorate Ebola virus disease.

Using the Reston virus, a cousin of the Ebola virus, that does not cause disease in humans, researchers at Boston University School of Medicine (BUSM) examined how macrophages responded to Ebola compared to the Reston virus. Surprisingly and in contrast to Ebola virus, Reston virus-infected macrophages were not activated. In addition, the researchers found by using drugs that inhibit TLR4 activation, it was possible to keep macrophages that are exposed to Ebola virus silent.

"We used transcriptomics analysis performed by our collaborators at the University of Washington, Seattle, and other assays to look specifically at the inflammatory response in infected macrophages," explained corresponding author Elke Mühlberger, PhD, associate professor of microbiology at BUSM. "This lack of activation in human macrophages might be one of the reasons why Reston virus does not cause disease in humans. More importantly, it showed that it is possible to keep macrophages that are exposed to Ebola virus silent by using drugs that inhibit TLR4 activation. This could be a promising treatment option for Ebola virus disease."

The researchers hope this study will allow for new insight for treating other hemorrhagic fever viruses in addition to Ebola virus.

Education

The NEIDL participates in a number of educational opportunities for the broader community. It sponsors a seminar series for the scientific community, continues to sponsor its Biosafety & Biosecurity Grand Rounds, to promote the culture of safety, and sponsors symposia.

FY17 Emerging Infectious Diseases Seminars

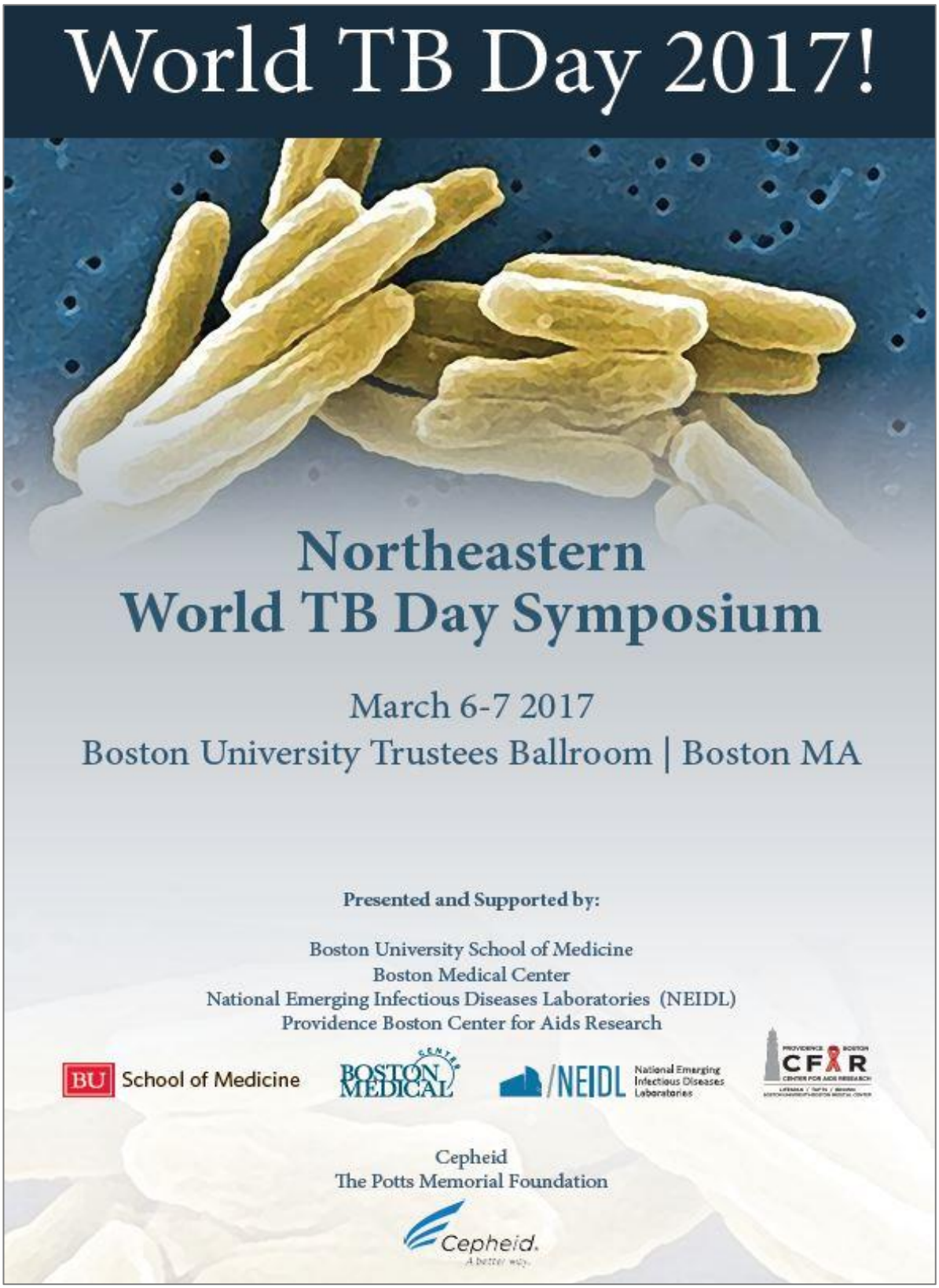
Date	Speaker	Title
8/31/16	**Alyson A. Kelvin, Ph.D.** Immune Diagnostics and Research	"Comparative Immunology of High-Consequence Zoonotic Viruses: Reservoirs vs. Disease Models"
9/6/16	**Michael Holbrook, Ph.D.** Integrated Research Facility NIAID, NIH	"Evaluation of Aerosol Models of Nipah Virus Infection"
9/8/16	**David Safronetz, Ph.D.** University of Manitoba	"Field and Laboratory Investigations on Lassa Virus"
10/5/16	**Jeremy Luban, Ph.D.** University of Massachusetts Medical School	"Molecular Characterization of Clade-Defining Mutations from the 2013-2016 Ebola Virus Disease Epidemic"
11/2/16	**Anthony Griffiths, Ph.D.** Texas Biomedical Research Institute	"Advanced Development of Filovirus Countermeasures Yields Insights into Viral Pathogenesis"
11/16/16	**Arturo Casadevall, M.D., Ph.D.** Johns Hopkins School of Medicine	"Thoughts into the Origin of Microbial Virulence"
11/8/16	**Estefania Rodriguez Burgos, Ph.D.** Heinrich Pette Institute	"Humanized Mice to Study Viral Persistence and Pathogenesis"
12/17/16	**Charles Shoemaker, Ph.D.** Tufts University Cummings School of Veterinary Medicine	"Camelid VHH-Based Neutralizing Agents (VNAs) as Unconventional and Versatile Disease Therapeutics"
1/11/17	**Juan Fuxman Bass, Ph.D.** Boston University	Protein-DNA Interaction Networks to Study Function and Disease
2/1/17	**Christine Cheng, Ph.D.** Boston University	"Epigenetic Variability from Individuals to Single Cells"
2/15/17	**Robert Davey, Ph.D.** Texas Biomedical Research Institute	"Ebola Virus Teaches Autophagy New Tricks"
3/7/17	**Tony Wang, Ph.D.** SRI International	"Coming from the Blood: Unraveling the Mystery of Zika Virus Dissemination"
3/13/17	**Julian Hiscox, Ph.D.** University of Liverpool	"Delineating the Role of the Host and Co-infections in Ebola Virus Disease and its Outcome"
4/4/17	**Tonya Colpitts, Ph.D.** USC School of Medicine	"Discovery of Arbovirus Transmission Factors & Vector-Virus Host Interactions"
4/12/17	**Kartik Chandran, Ph.D.** Albert Einstein College of Medicine	"Unraveling and Inhibiting the Cell Invasion Mechanism of Ebola Virus"
5/17/17	**Brett Lindenbach, Ph.D.** Yale School of Medicine	"The Machinery of Flaviviridae Replication, Assembly, and Pathogenesis"
5/24/17	**Gerald T Keusch, M.D.** Boston University	"National Academy of Medicine Report on Therapeutic and Vaccine Clinical Research during the West Africa Ebola Outbreak: What went wrong and What went right"

6/15/17	**Uriel Blas Machado, D.V.M. Ph.D** University of Georgia	"Efficacy Assessment of a Canine Influenza Virus H3N2/H3N8 Combination Vaccine in Dogs"
6/20/17	**Nicholas Crossland, D.V.M, Dip. ACVP** Tulane University	"From Pigs to Primates: Insights into Porcine Circovirus Type 2 pathogenesis and a Non-Human Primate Model on Chronic Lyme Disease"
6/29/17	**Michael Kurilla, M.D., Ph.D.** DMID, NIAID, NIH DHHS	"Infectious Disease Outbreak Response: Reactive, Proactive, Hyperactive, and Mostly Unattractive"

Biosafety & Biosecurity Grand Rounds

Date	Speaker(s)	Topic
11/16/16	**ROHP Staff**	**Outcome of the independent environmental review conducted on the BSL-3 spaces and exhaust system.**
12/21/16	**Aron Vinson** Program Manager, Emergency Management, EHS	**NEIDL Emergency Response Refresher**
1/18/17	EHS Core Staff	**Chemical Safety and Hazardous Waste** The presentation encompassed proper disposal of hazardous waste, updates with the Globally Harmonized System, and sought to provide staff with the resources to maintain compliance with specific hazardous chemical regulations. The main content is illustrated through the BU EHS Chemical Safety website
2/15/17	**Stephen Taranto, Bill Gibbons, Melody Zarth**	**NEIDL Public Safety** Public Safety reminders presented at this grand rounds: • Important phone numbers • NEIDL Guest/visitor escort responsibilities • Recognizing indicators of potential insider threats. • Reporting unusual activity
3/22/17	**Francine Montemurro, JD** BU Ombudsman	**Meet the Boston University Ombuds** The BU Office of the Ombuds is a confidential and off-the-record resource for the BU community. Francine discussed her role and spoke about how the office works with the BU community to help address problems and conflicts.
4/19/17	**Nahid Bhadelia, MD, MALD** Director, Infection Control **Tara Kileen, NP** ROHP	**BSL-4 Medical Response Policies and Procedures** A refresher of the BU BSL4 medical response process.
5/17/17	**Scott Rusk** NEIDL Director of Facilities **Paul Amadio** NEIDL Facilities Engineering Ops Manager	**Ventilation Performance and Safety Features for Biocontainment** Attendees learned about basic design features that include redundant back-up equipment and system capabilities along with fail-safe automation features and alerts that maintain safe conditions in the laboratories. Paul also discussed general sequence of operation for the HVAC systems for BSL2, BSL3, and BSL4 and how the design of the systems allows for the control of inward directional airflow as required for high containment facilities.
6/28/17	**John McCall** Director of Information Technology	**Cybersecurity and the new NEIDL** Palo Alto Firewall Solution Architecture

Other NEIDL Educational Contributions



International Visits: South Korea and Japan

NEIDL continues to be viewed as a resource for other institutions and scientists worldwide who are developing their own Emerging Infectious Diseases Research facilities. Last year a group of scientists at the **Centers for Disease Control and Prevention of Korea** reached out to Dr. Ronald Corley, expressing interest in receiving training from NEIDL staff in safe and secure BSL-4 operations and management. Specifically, their training needs evolved around community outreach and public safety; facilities maintenance and operations; environment/waste management; and BSL-4 training.

In early December, four members of the Korea CDC visited the NEIDL for three full-day sessions. This group of scientists, who are part of the Division of Bioterrorism Preparedness and Response, are in charge of a new and recently commissioned BSL-4 facility located about 29 miles south of Seoul. NEIDL scientists and staff members from all science and operations cores participated in these sessions.

One of the main interests of KCDC was to gain insights on how our institution dealt with public opinion and gaining the trust of the public. Unlike the NEIDL, which focuses on academic research, the Korean CDC is a government agency and as such needed to evaluate the pros and cons of being transparent with the public.

Another topic of interest to our visitors was emergency planning and response. They were impressed with the emergency drills that we have been conducting and our cooperative relationship with local government agencies like the Boston Fire Department and the Boston Police. Our staff stressed the importance of having clear roles and responsibilities in the process of emergency response planning.

Other topics discussed were tools and technologies employed at the NEIDL for communication, work scheduling, and SOP management, as well as BSL-4 simulation work and the weekly follow-up discussions.

Soon after, in early 2017, the NEIDL hosted a group of scientists and engineers from **Nagasaki University**. The purpose of their visit was to learn innovative ideas from our NEIDL experience in the construction and safe operation of a BSL-4 laboratory. The government of Japan recently approved a budget for the construction a new state of the art BSL-4 laboratory with the aim of conducting basic research to develop new treatments and vaccines for containing outbreaks of highly contagious and deadly diseases. With the cooperation of local authorities, this new facility will be built on the university's School of Medicine campus in the City of Nagasaki and would be the first of its kind in Japan. Their training needs, similar to those of the Korean CDC, revolved around four topics: (1) Safe operation and maintenance of a BSL-4 facility; (2) Development of standard operational procedures; (3) Emergency preparedness training; and (4) Community relations.

Both visits were productive and generated additional topics of discussion to follow up on in the near future. We look forward to continue discussions about operations and research with the Korean CDC and Nagasaki University and forming an international cooperation network of BSL-4 labs.

MRI Remote Manipulator

Members of the BU College of Engineering, along with NEIDL researcher, Dr. Bang-Bon Koo and NEIDL Director of IS&T, John McCall, have been engaged in a project with the goal of developing a means to adjust the position of a sedated animal within an MRI. The critical requirements for this project are to develop two degrees of freedom (lateral and rotational) with the provided range and accuracy, operation of the device within the imaging field of an MRI machine, compatibility with the existing animal test chamber, and remote operation.

The existing process requires a technician to manually reposition the animal chamber according to instructions from a scientist outside of the room of containment. The automated system should permit the scientist to directly adjust the animal chamber without assistance from the technician. Elements from the existing system that will be crucial for the redesign are: the animal test chamber, the Bruker MRI machine, and the existing table in the room which utilizes a track and slider to move the position of the animal chamber.

During research, the group discovered commercial competitors, and investigated several MRI-compatible actuation methods. After determining engineering specifications, a functional decomposition is proposed after several brainstorming sessions. The group then evaluated various methods used to achieve linear motion and rotational motion. Ultimately, pneumatics was chosen as the method of actuation for both types of motion.

EIDA2Z Symposium:
Emerging Challenges and Opportunities

Background

The NEIDL inaugural symposium was planned to 1) discuss key issues in emerging infectious disease (EIDs) research to the general public; 2) connect NEIDL scientists to a leading edge cohort of researchers from around the world, and 3) identify the knowledge gaps that limit the pace of progress in finding diagnostics, therapeutics, and vaccine candidates. Finally, a major emphasis was to focus on the importance of communication of science to the public.

The symposium was planned in two parts:

1. *an opening session*, designed for the general public to focus on the scientific challenges of emerging infectious diseases and the challenge of conveying complex scientific information to the general public. In addition to two keynote talks and a panel of experts, an hour was devoted to questions from the audience.
2. *two days of scientific sessions* among 150 leading-edge scientists and public health professionals who were specifically invited to discuss four topics: To Discover, To Understand, To Protect, To Collaborate. The overarching goal of these sessions was to identify critical gaps in knowledge that limit progress in control of emerging infectious diseases.

The symposium would not have been held without the generous support from a number of donors and foundations, including Boston University. These include: Shirley P. Horlick Klein, MD (BUSM '68) in memory of Joel David Klein, MD; Wellcome Trust; Bill and Melinda Gates Foundation; Skoll Global Threats Fund; Burroughs Wellcome Fund; Merck; Takeda Pharmaceuticals; New England BioLabs; ThermoFisher.

Conference Report

Opening session

Approximately 425 people, the majority from the general public, attended the opening session, which was also live webcast. Opening remarks by Boston University President Robert A. Brown, PhD, and NEIDL Director Ronald B. Corley, PhD, were followed by two outstanding keynote talks by Anthony Fauci, MD, Director of the NIH National Institute of Allergy and Infectious Diseases, and noted science writer David Quammen.

Dr. Fauci discussed the historical record of outbreaks and plagues from the time of the Black Death in Europe to today, and the breathtaking transformation in disease dynamics as a result of scientific investments in understanding these diseases. Instead of inexorably increasing morbidity and mortality, science has driven the rate of some infectious diseases down, ultimately to elimination.

Mr. Quammen said that to communicate this science it's important to tell a story and elaborate on three principles:

1. Everything comes from somewhere.
2. Viruses are not extraordinary, they are just viruses.
3. This year's menace is not the last to be faced.

The subsequent panel included Trevor Mundel, MD, PhD, President of Global Health at the Bill and Melinda Gates Foundation; George Church, PhD, Professor of Genetics at Harvard Medical School and the Broad Institute at MIT; Lawrence Altman, MD, senior science and health reporter for the *New York Times*; and Nurith Aizenman, science and health reporter for National Public Radio. The panel discussion can be viewed at here.

Among the many questions from the audience during the hour of Q&A were:

- *How can we better share resources, such as pathogens, for research on EIDs?*
- *How can we promote a more engaged and scientifically literate citizenry by enhancing the teaching of robust 21st century science to primary and secondary students?*
- *How we can improve the discussion of science through social media?*

The full Q&A discussion and response to these questions can be found here.

Scientific sessions

The following two days of scientific sessions, attended by approximately 150 scientists from 16 countries, focused on identifying the most critical gaps in knowledge in these domains in order to help prioritize the research agenda for the short- and mid-term. Each segment of discussion opened with 4 brief presentations by topic experts to summarize current knowledge and highlight key gaps in knowledge. The remainder of the time was devoted to a moderated discussion among the participants. An active whiteboard was used to collect ideas and issues for further consideration during the sessions.

During dinner on the first day of the scientific program, Mark Smolinski from Skoll Global Threats Fund provided an introduction to the work of SGTF on emerging infectious diseases and initiated a discussion on the importance of surveillance.

During lunch on the final day of the symposium, the American Society for Microbiology's This Week in Virology (TWiV) Vincent Racaniello, Columbia University; Paul Duprex, Boston University; and Alan Dove, freelance science journalist hosted a livestream discussion of the key findings from the scientific sessions, with Ralph Baric, Felix Drexler, Marion Koopmans, and Stacy Schultz-Cherry. This TWiV netcast conversation is scheduled for release on October 30, 2016.

Post-conference comments

Unlike many scientific conferences, the Emerging Infectious Diseases from A to Z (EIDA2Z): Emerging Challenges and Opportunities *event was open to the public, and the presence of concerned citizens brought a level of passion and curiosity to the discussion that kept everyone engaged… BU thought to add another important dimension to the panel discussion, bringing in journalists Nurith Aizenman, who reports on global health for National Public Radio, and New York Times medical reporter Dr. Lawrence K. Altman. Journalists play a key role in shaping public opinion on critical issues at the intersection of science and public policy, and a focus of our discussion was how media can drive popular engagement with key issues in global health…. When urgent problems are brought to attention in the right way, we can mobilize the public will, media resources and scientific skills required to tackle them. Together, we can make a difference in the fight against the world's emerging and persistent infectious diseases.*

Trevor Mundel, President, Global Health, Bill and Melinda Gates Foundation

You and your team merit all congratulations for the excellent symposium you organized. Relaxed and productive atmosphere, lots of interactions and networking and a great support from all participants to NEIDL.

Carlos Morel, Director, Center for Technological Development in Health, Fundacao Oswaldo Cruz

Thank you for having invited me to the meeting this week. I learned much about the tremendous work of those who spoke in a great meeting format.

David Heyman, Chairman, Public Health England

It was a wonderful meeting, thought provoking and well run. I wish all meetings were as enjoyable. Let's hope there will be some follow on.

David Morens, Senior Advisor to the Director, National Institute of Allergy and Infectious Diseases

Bravo and thank you to each of you for putting on such an engaging event! I liked the 15 minute format very much; it made things move along quickly and highlighted more ideas than would otherwise have been possible. I was glad to finally see the NEIDL as well - you've built a wonderful facility from which great insights will continue to come.

Erica Ollmann Saphire, Professor, Immunology & Microbial Science, Scripps Research Institute

I want to thank you for the invitation to attend EIDA2Z. I enjoyed the meeting, always great to meet old friends and make new ones...I hope that we will be able to finalize the NEIDL investigator agreement, and look forward to become actively involved in future experiments.

Rik de Swart, Professor of Viroscience, Erasmus Medical Center

The NEIDL symposium went off super well. There was far more virology that I am used to hearing, but good though. But there were a number of really super talks. I received far more new information than I transmitted. I also made some contacts, which will likely turn into collaborations, admittedly with people working with bacteria. Thank you for inviting me and twisting my arm (to attend).

Bruce Levin, Samuel Candler Dobbs Professor of Biology, Emory University

Additional Products from the Symposium

Trevor Mundel has shared a thoughtful reflection on the conference and the relevant programs at the Bill and Melinda Gates Foundation with his LinkeIn community. The title of this piece is "EIDA2Z opens eyes and minds to the persistent problem of infectious disease."

NEIDL has posted the opening keynote talks by Anthony Fauci and David Quammen on its website (www.bu.edu/neidl/), as well as links to interviews with symposium participants recorded by TWiV and the Microbiology Society. Interviews with Dr. Fauci and Mr. Quammen have also been published in BU Today, the daily news and information Website of Boston University, and BU Research respectively.

TWiV (This Week in Virology) recorded several additional programs during the symposium.

This Week in Virology: Boston Quammens

Four years after filming 'Threading the NEIDL', Vincent Racaniello and Alan Dove return to the National Emerging Infectious Diseases Laboratory BSL4 facility at Boston University where they speak with science writer David Quammen.

This Week in Virology: Partnerships Not Parachutes

From the EIDA2Z conference at Boston University: a conversation about discovering, understanding, protecting, and collaborating on emerging infectious diseases.

Hosts: Vincent Racaniello, Alan Dove, science journalists at This Week in Virology, and Paul Duprex, Professor of Microbiology at Boston University School of Medicine

Guests: Ralph Baric, Professor of Epidemiology at UNC School of Public Health, Felix Drexler, from the Institute of Virology at the University of Bonn, Marion Koopmans, Head of the Virology Department at Erasmus Medical Center, and Stacey Schultz-Cherry, Deputy Director, World Health Organization Collaborating Center for Studies on the Ecology of Influenza in Animals and Birds at St. Jude's Children's Research Hospital.

The American Society of Microbiology recorded **Zika virus in Nicaragua with Eva Harris, PhD, at EIDA2Z 2016**

Eva Harris, PhD, University of California, Berkley, is interviewed by Vincent Racaniello, PhD, Columbia University, New York, about the status of Zika virus in Nicaragua. Harris has developed a multidisciplinary approach to study the molecular virology, pathogenesis, immunology, epidemiology, clinical aspects, and control of the mosquito-borne diseases dengue, Zika, and chikungunya. Her work investigates viral and host factors that modulate disease severity and immune correlates of protection and pathogenesis, using in vitro approaches, animal models, and research involving human populations.

In addition, mSphere, an open source journal from the American Society for Microbiology, will publish four articles to summarize the findings in the four symposium sessions, and an editorial about the symposium itself, including the goals, participants, and outputs.

Finally, the Microbiology Society (Europe) posted the following interviews conducted during the NEIDL symposium.

How do We Deal with Unknown Diseases? - Dr. Dennis Carroll

Dr. Dennis Carroll is Director of the Emerging Threats Program at the U.S. Agency for International Development. We spoke to him at EIDA2Z about the current approach to tackling emerging diseases – and how we need to change it.

How would we deal with a global outbreak? – Sir Roy Anderson

Sir Roy Anderson is a Professor at Imperial College London and the Director of the Centre for Neglected Tropical Disease Research. He told us about the need for an institute combining governments, scientists and industry for rapid action in the case of a global pandemic.

Tuberculosis: A leading cause of death – Prof William Bishai

Professor William Bishai is co-Director of the Johns Hopkins Center for Tuberculosis Research. He spoke to us at EIDA2Z about the importance of global action on tuberculosis – which, despite being the leading infectious cause of death in the world, rarely makes the headlines

Disease Surveillance in Uganda – Dr Julius Lutwama

Dr Julius Lutwama is a virologist at the Uganda Virus Research Institute. We spoke to him at EIDA2Z about studying viruses and diagnosing disease in the countries where they emerge.

Developing local capacity to study emerging viruses – Prof Ian Goodfellow

Ian Goodfellow is a Professor of Virology at the University of Cambridge. We spoke to him at EIDA2Z about the importance of building local capacity in low- and middle-income countries, so that emerging viruses can be identified and studied at their source.

Medical Guidelines for Emerging Pathogens – Dr Nahid Bhadelia

Dr Nahid Bhadelia is Director of Infection Control at the National Emerging Infectious Disease Laboratories in Boston. We spoke to her at EIDA2Z about the importance of providing patients with the best quality of care during disease outbreaks, and how medical care can inform public health policy and future clinical protocols.

"Every emerging disease begins as a mystery story." – David Quammen

This week, we went to the 'Emerging Disease A2Z' meeting in Boston to speak to some of the delegates about their work. Science writer David Quammen, author of 'Spillover' and 'Ebola', told us the challenges of writing about emerging diseases.

Because the EIDA2Z theme (hashtag and all) was central to the symposium, we filed for Trademark of both the letters and the graphic. This trademark has now been granted for our exclusive use as visual identity to guide those with interest to information resources on the key topics surrounding emerging infectious diseases.

Community Engagement

Engaging and sharing information with the community remains an important component of the NEIDL's mission. To succeed in this endeavor, the Community Relations Core ensures that the local community is informed in a timely, transparent and ongoing basis about the operations, safety, research and expertise of NEIDL personnel. We must continue and improve our efforts to inform and educate the community about what we do and why, while at the same time building and sustaining community trust about the NEIDL and its mission. Below are the highlights from this past year's activities.

Web Site

The first place where the community can find the latest information on the NEIDL is the website, which provides up-to-date information on the facility and the activities of NEIDL staff and researchers (www.bu.edu/NEIDL). Plans designed to support the culture of safety at the NEIDL and throughout the University are posted, as is the Incident Report for the NEIDL, which is posted quarterly. There is also a link to the Institutional Biosafety Committee (IBC) and its public minutes. These postings are just one way we can increase transparency with the community. Press releases, BU Today communications and articles from local newspapers with information about the NEIDL and its faculty are posted on the website as are the minutes of our Community Liaison Committee.

Community Liaison Committee (CLC)

The CLC continues to be an important group for promoting public participation and transparency at the NEIDL. Meetings are open to the public and provide an opportunity for key NEIDL personnel and researchers to provide regular updates on operational, regulatory, and scientific matters impacting the NEIDL. Community Relations has been actively involved in expanding the CLC to increase diversity and depth of expertise. Last year, we solicited applications in several local newspapers and our CLC recommended candidates as well. There are now eighteen (18) CLC members from a variety of different professions and neighborhoods. Some of our members have scientific and medical backgrounds. Others have financial and technical training. By taking advantage of the CLC's input, talents and expertise, we hope to ensure more effective communication and collaboration on engagement activities and programs involving the NEIDL and the community. In March, CLC members came forward to give oral and written testimony in support of the NEIDL's request for permission to conduct BSL-4 research.

To ensure that community representatives continue to be involved in vetting research protocols before research is permitted, two members of the CLC sit on the IBC. Three members of the CLC volunteer their time and expertise to the Boston Biosafety Committee, the advisory group to the Boston Public Health Commission with respect to the BSL-4 permit and have agreed to continue to be resources as the need arises. As the CLC expands, other oversight groups will be interested in their knowledge and experience as additions to these committees.

Further, it should be noted that CLC members are invited, attend and participate in both tabletop and active simulated emergency response planning drills and exercises for the NEIDL with first responders (emergency, medical and other public safety personnel) to enable them to understand how emergency response procedures for incidents affecting the NEIDL are designed, implemented, evaluated, and improved. This year they were involved in simulations involving responses to an inventory discrepancy involving a select agent pathogen and transport of an injured NEIDL staff member to the Patient Isolation Unit at BMC.

Community Meetings

Representatives from the Community Relations Core are active in the community and serve as the face of Boston University in neighborhood and local business meetings as well as community events on a regular basis. We serve as members of various neighborhood business, safety and development committees. We sponsor and fund community activities either by the contribution of cash or through provision of University resources. We continuously seek and take advantage of opportunities to provide information on the NEIDL and the Medical Campus as appropriate and to be regularly seen in the community as a resource. In addition, this presence allows us to answer questions and identify and understand issues of neighboring residents in a timely manner.

Tours

The Community Relations team plans, provides, and coordinates NEIDL tours both to the internal BU community (alumnae, faculty, staff and BU students) as well as external communities (local public health, regulatory officials, elected officials, business organizations, nonprofit community agencies, residents, and middle and high school students). These tours are beneficial in introducing these stakeholders to the NEIDL and giving them a first-hand view on how it functions and why. The addition of post docs as tour guides has proven informative and beneficial for both the guides and the attendees. It should be noted that as part of a summer tour with a group of teenage girls interested in STEM, we asked a female researcher and a vet tech to describe their career paths. This led to a very lively and frank discussion. From youth to retirees, all have been impressed with the facility and our willingness to answer questions and share information.

In the past year, we have given over 24 official tours to a number of local community organizations such as South End Business Alliance, St. Stephen's, and Camfield Estates. Over three hundred and fifty-eight people (358) have visited the NEIDL this year. In addition, students and faculty with varying research and academic interests, such as Harvard Institute for Learning in Retirement, BU Global Health, Cumberland High School, Bioscience Academy, Greater Boston Area Research Opportunities for Young Women, Boston Area Health Education Center, BU Alumni Relations, BU Faculty Council, BU School of Medicine, BU School of Public Health, BU Program in Biomedical Sciences, and Summer Training as Research Scholars Program have toured, as have visitors from Boston Police, Boston Biosafety Committee, Boston Public Health Commission, BMC Compliance, Tufts School of Medicine, Harvard University, and international visitors from fifteen (15) countries. Since January 2012 we have given one hundred and ninety tours (190) to over two thousand three hundred and seventy (2370) visitors.

NBL-RBL Network Coordination

The NBL (National Biocontainment Laboratories) - RBL (Regional Biocontainment Laboratories) network is an organization of the NIAID funded centers from 13 academic research institutions which promotes sharing of practices for improving the operations and safety of these biocontainment facilities. The NEIDL Community Relations staff collaborates regularly with other members of the NBL/RBL network via meetings, conferences and teleconferencing for the purpose of sharing information on community activities of each member and adopting best practices learned during these interactions.

This May, NEIDL personnel visited our sister institution, Galveston National Laboratories which hosted the **9th Annual NBL-RBL Networking Meeting**. This events brings together NIH/NIAID funded biocontainment labs from all over the country. The general format divides attendees into their areas of key responsibilities including: facilities/operations, EHS, directors and lab animal subgroups. Members spent most of the time engaged in discussions within their subgroups. In this way, the time allowed for a great deal of relevant information exchange in a supportive, informal setting where issues could be thoroughly tackled. In addition, there were general speaker sessions which drew on subject areas of importance to all such as regulatory and funding representatives.

There were great benefits from meeting with colleagues from the regional and national labs. For Dr. Kath Hardcastle, NEIDL Animal Core Research Clinical Veterinarian, this year included hearing the results and feedback from the Science and Technology Policy Institute (STPI) on their in-depth assessment of the costs involved in operating a biocontainment facility. There were colleagues in attendance from the Australian ABSL4 facility whom she had not met before. And of course, Galveston provided some timely sunshine when emerging from a Boston winter!

Educational Programs: Infectious Disease and Career Development

Identifying Infectious Diseases (ID2) is an infectious disease/public health educational program developed in partnership with NEIDL researchers and the School of Education to deliver a hands-on, participatory class to Middle School students. It is focused on infectious diseases and answers a variety of different questions. The ID2 class, taught by NEIDL researchers and post docs has been well received by both faculty and students.

In this fun and informative course, students perform hands-on work with the researchers, putting on personal protective gear (masks, goggles, gloves and coats), using pipettes, building biosafety cabinets, and answering important questions about infectious diseases: What do infectious diseases look like? How are they identified? What are their components? How are they transmitted? How is the research of infectious disease done in safe laboratory environment?

This year, we presented five (5) classes to 7th grade students in three local diverse schools (pilot, Catholic and total immersion Spanish); the Lila Frederick Pilot Middle School, Cathedral School, and the Joseph J Hurley School. In addition, we brought the St Stephen's After School Program to the NEIDL for ID2. Since December 2014, ID2 has been held thirteen (13) times at five (5) schools and after school programs, impacting approximately two hundred (200) students thus far in the South End and Dorchester.

Below are a few quotes from the students:

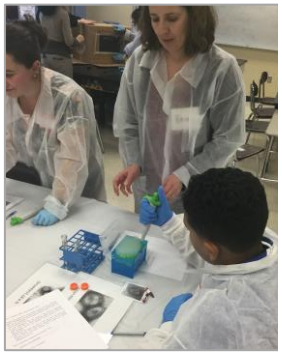
"The part I enjoyed the most about ID2 was the high energy and the new things I was able to learn." – Jomari, Grade 7, Cathedral School

"You guys don't need to improve anything about ID2. Just keep doing what you're doing!" – Kshawn, Grade 7, Cathedral School

"One thing I liked is the candy and the different experiments on the viruses." – Wilson, Grade 7, Hurley School

"I really enjoyed learning things about poop, and each station was actually cool." – Tiffany, Grade 7, Hurley School

Special thank you to all ID2 volunteer instructors: Adam Hume, Andre Lowe, Emily Speranza, Ian Francis, John Connor, Judith Olejnik, Kate Sawatzki, Kath Hardcastle, Ludy Registre, Matthew Gagne, Mike Breen, Molly Braun, Rachel Fearns, Sara Gross, Tessa Cressey, and Yulianela Diaz-Perez.

Career Development

In connection with the NEIDL's mission to educate and train the next generation of scientists and in collaboration with BU's School of Medicine's STEM efforts, the NEIDL provided scholarships for two females from a local vocational high school to attend an eight week BU program that met on Sundays called Introduction to Careers in Medicine. Students had presentations and hands on activities in the fields of Anatomy, Physiology, Microbiology, Surgery, Emergency Medicine and Infectious Diseases. As part of the hands on/field training, they took a tour of the NEIDL. Also, we offered scholarships to six high students from schools near us to participate in a BU program called Summerlab. Summerlab allowed these students to have a hands-on experience participating in a "mock" clinical trial of a new sickle cell drug. We volunteered with other City agencies to participate in "job interviews" during Career Day at Madison Park Technical Vocation High School, the largest vocational high school in Roxbury. Last, but not least, we collaborated with the School of Medicine, Boston Public Health Commission (BPHC) and the Boston Area Health Education Center (BAHEC) in planning efforts for the BAHEC six-week summer program which is aimed at increasing diversity among Boston's healthcare workers. The BAHEC students spent their mornings delving into science and math. Afternoons were devoted to electives, demonstrations in brain.

NEIDL Researchers in the Community

BU Annual Giving Society Webinar: A Conversation with Dr. Ronald Corley

June 9th, 2017

Every year the BU Alumni Relations offers members of the Annual Fund Leadership Giving Society exclusive access to a webinar featuring a member of the BU Faculty/Staff they are interested in hearing from. Last spring, it was Dr. Corley's opportunity to present to this select group of donors. Dr. Corley spoke about the importance of studying emerging infectious diseases, the role of the NEIDL and the unique advantages that position Boston University as a leading global institution for the study of emerging infectious diseases. (https://www.bu.edu/campaign/ways-of-giving/annual-fund/loyalty-society/bu-webinars/)

You Can't Bomb Ebola'': How Nations Should Respond To the Next Pandemic

Time Health, by Alexandra Sifferlin
May 03, 2017

The Ebola outbreak of 2014 infected more than 28,000 people in West Africa and killed more than 11,000. It also exposed gaps in the world's ability to respond to epidemics of infectious diseases.

Are we more prepared now to respond to future emerging disease outbreaks? Experts say countries are better positioned, but there's still a lot of room for improvement. "[Ours] is not a culture of outbreak prevention," said Dr. Nahid Bhadelia, medical director of the Special Pathogen Unit at the Boston University School of Medicine, during a panel at Fortune's Brainstorm Health Conference on Wednesday. Bhadelia worked as an Ebola treatment unit clinician on four different trips to West Africa during the outbreak. "We chase one pathogen after another." Read full article in Time Health.

How to succeed as a Woman in Academia

Association for Women in Science
November 9, 2016

In an era when women are increasingly prominent in medicine, law, and business, women continue to be severely under-represented in STEM professorships. Associate Professor of Microbiology and NEIDL Investigator **Rachel Fearns, PhD** was part of a panel of successful female professors sharing their insights and advice at an event entitled: "How to Succeed as a Woman in Academia". The event was held at the Children's Hospital Auditorium in Boston, and sponsored by the Association for Women in Science and Future of Research, Boston.

I Don't Feel So Good: New Approaches for Diagnosing Infection at the Point of Need

Wicked Local University
October 8, 2016

John Connor, PhD, Associate Professor of Microbiology and NEIDL investigator, participated in Wicked Local U on Sat., Oct. 8, 2016, for a free and exciting day of learning. It was held at the Boston Marriott, Newton, between 8:30 AM – 1:30 PM. John's presentation was entitled: "I Don't Feel So Good: New Approaches for Diagnosing Infection at the Point of Need." A variety of topics discussed by other experts – there were no prerequisites, homework or finals - just a day of learning.

SPILLOVER - ZIKA, EBOLA & BEYOND | Healthcare Workers | PBS

August 8th, 2016

Dr. Nahid Bhadelia, Director of Infection Control, talks with PBS about her experiences as a Healthcare worker in Sierra Leone battling Ebola. View video.

Elke Mühlberger and Nahid Bhadelia Participate in "Lifesavers Speak Series: Unseen Enemy"

Elke Mühlberger and Nahid Bhadelia participated in an interactive program with Janet Tobias, documentary filmmaker, that explores the roots and emergence and re-emergence of viruses and bacteria. The program was held as part of the Lifesavers Speaker Series: Unseen Enemy, on Thursday, Oct. 27, 2016, at 7:00 PM at Vilna Shul, Beacon Hill. In addition to the discussion, clips from the film "Unseen Enemy" were shown. CNN Films released the documentary *Unseen Enemy* for World Health Day on April 7 with limited commercial interruptions. The documentary was written and directed by Janet Tobias, who embedded with some of the world's top pathogen hunters and medical professionals for more than three years, tracking outbreaks of Zika, Ebola and influenza worldwide. It should be noted that some of the filming for the documentary took place in the NEIDL.

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