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About the APHL-CDC Laboratory Fellowship Programs

The Association of Public Health Laboratories (APHL) and the US Centers for Disease Control and Prevention (CDC) partner to offer a variety of laboratory fellowship programs to train and prepare scientists for careers in public health laboratories and support public health initiatives.

There are currently five APHL-CDC fellowship programs:

- Antimicrobial Resistance Fellowship Program,
- Bioinformatics Fellowship Program,
- Ronald H. Laessig Memorial Newborn Screening Fellowship Program,
- Infectious Diseases Laboratory Fellowship Program and
- Environmental Public Health Laboratory Fellowship Program (which did not place any fellows during 2017 and so is not included in this compilation).

Fellowships range from one to two years, depending on the fellowship and funding availability. While each has a specific focus, these experiential programs also offer a competency-based core curriculum.
Fellowship Programs Include Core Competency Training
In addition to laboratory-specific work, all APHL fellows participate in distance-based training and learning activities to achieve proficiency in select public health laboratory core competencies.

The competencies covered in the APHL-CDC fellowship program curriculum include:

- Management and Leadership
- Communications
- General Laboratory Practice
- Research
- Surveillance
- Ethics
- Safety
- Emergency Management and Response
- Quality Management Systems

This curriculum provides a well-rounded introduction to public health laboratory science to all fellows, and provides them with the knowledge, skills and abilities to enter and advance in the public health laboratory workforce.

What Are Core Competencies?
The Public Health Laboratory Competencies outline the knowledge, skills and abilities necessary for public health laboratory professionals to deliver core services efficiently and effectively. As part of a two-year project co-sponsored by CDC and APHL, competencies were developed for 15 domain areas by a diverse group of over 170 experts, representing state and local public health laboratories, clinical laboratories, academic institutions, laboratory professional organizations, CDC and APHL.

View the complete document, Competencies Guidelines for Public Health Laboratory Professionals, to learn more.
Antimicrobial Resistance (AR) Fellowship Program
AR testing in public health laboratories (PHLs) for nationwide capacity is new and, therefore, a new class of well-equipped and dedicated scientists is required to address this growing threat. The AR Fellowship provides training in AR laboratory activities—such as advanced molecular methodologies, surveillance and research—as well as communication and outreach. The program is open to master’s- and doctoral-degree level scientists.

Right: Locations of the 2017-2018 AR Fellows
Jennifer L. Dale  
**PhD (Microbiology and Molecular Genetics),**  
*The University of Texas Health Science Center*  

**WORKING WITH:** Paula Snippes Vagone, MT(ASCP),  
Minnesota Dept. of Health Public Health Laboratory  

**PROJECT:** Develop experimental methods that enable reliable and efficient identification of carbapenemase-producing *Acinetobacter baumannii*, which is a growing clinical concern; investigate the impact of *A. baumannii* OXA genes in regard to antibiotic susceptibility to carbapenems and the potential for horizontal gene transfer. These projects will enable a better understanding of *A. baumannii* antibiotic resistance and will allow rapid identification of clinically important isolates.

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Marisabel O. Etter  
**PhD (Molecular, Cell and Developmental Biology),**  
*University of California—Los Angeles*  

**WORKING WITH:** Edward Desmond, PhD and Grace Lin, MS,  
Microbial Diseases Laboratory, California Dept. of Public Health Laboratory  

**PROJECT:** Use the BD mycobacterial growth indicator tube (MGIT) system to establish a culture-based drug susceptibility test for linezolid and determine the minimal inhibitory concentration range for ethambutol in susceptible and resistant strains of the *Mycobacterium tuberculosis* complex; participate in outreach projects with leaders of local laboratories to discuss proper use of molecular tests.

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Kelsey Florek  
**PhD (Microbiology),**  
*University of Wisconsin—Madison*  

**WORKING WITH:** David Warshauer, PhD,  
(ABMM), Wisconsin State Laboratory of Hygiene  

**PROJECT:** Develop and validate molecular assays to detect resistance mechanisms and enterotoxigenic *Escherichia coli*; construct a next generation sequencing data analysis pipeline to aid in the surveillance and discovery of antibiotic resistance mechanisms.

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All fellows are encouraged to attend APHL’s Annual Meeting and submit posters on their projects.
Lisa M. Leung
PhD (Microbiology),
University of Maryland—Baltimore

**WORKING WITH:** Robert A. Myers, PhD, Maryland Public Health Laboratory

**PROJECT:** Use MALDI-TOF system to validate Neisseria gonorrhoeae and non-Neisseria species and elucidate drug resistance phenotypes; analyze proteins and other molecular biomarkers in Candida auris to determine underlying resistance mechanisms versus other Candida species; and research the multi-mechanistic resistance of Pseudomonas aeruginosa to colistin.

Ideally, I would undertake a second postdoc, in an academic setting this time, and these combined experiences would prepare me to be a lead researcher/scientist at an institution studying the environmental and public health impacts of antibiotic-resistant bacteria.

Eric Ransom
PhD (Microbiology), University of Iowa

**WORKING WITH:** Jean Patel, PhD, D(ABMM), Antimicrobial Resistance Coordination and Strategy Unit, Division of Healthcare Quality Promotion, CDC

**PROJECT:** Develop and validate antibiotic resistance diagnostic methods; implement public health data to determine antibiotic susceptibility breakpoints; and utilize whole-genome sequencing to identify and combat antibiotic resistance threats.

I plan to work in a clinical or public health laboratory.

I would like to focus on disease prevention, surveillance and outbreak investigation.

Mimi R. Precit
PhD (Microbiology),
University of Washington

**WORKING WITH:** William A. Glover II, PhD, D(ABMM), MT(ASCP), Washington State Dept. of Health Public Health Laboratories

**PROJECT:** Develop and improve molecular assays to better detect mechanisms of antibiotic resistance in Carbapenem-resistant Gram-negative bacteria; use next next-generation sequencing methods to conduct metagenomic identification of pathogenic organisms and characterize resistance mechanisms, particularly of Neisseria gonorrhoeae; and develop comprehensive reference databases combining microbiological, clinical, epidemiological and genomic or metagenomic data to create actionable data to aid in proper control practices and stop transmission.

I plan to complete a CPEP-accredited fellowship in clinical/medical microbiology. [Then I will] take the ABMM certification exam, with the ultimate career goal to direct a clinical or public health laboratory.

Ayodele (Ayo) Ojebode
MPH, MLS(ASCP), Des Moines University

**WORKING WITH:** Sudha Chatuvedi, PhD, Wadsworth Center, New York State Dept. of Health

**PROJECT:** Validate Candida auris (an emerging multi-drug resistant organism) rt-PCR assay in blood matrix. This assay, aimed at direct detection of C. auris in blood samples will considerably improve patient care and reduce the laboratory diagnosis turn-around-time.

I plan to work in a clinical or public health laboratory.
Emily Snavely  
PhD (Molecular Genetics and Microbiology), Duke University  
WORKING WITH: Kimberlee Musser, PhD, Wadsworth Center, New York State Dept. of Health  
PROJECT: Contribute to Antibiotic Resistance Laboratory Network (ARLN) activities for the Northeast region and train in all antimicrobial resistance detection methods used at Wadsworth Center. Validate colonization culture methods for carbapenem-resistant organisms and develop, validate, and implement methods to detect emerging antimicrobial resistance mechanisms.

I want to start a career in public health. My graduate research also focused on antibiotic resistance and infectious disease, and I hope to use the skills and knowledge that I’ve gained over the years to help protect the public.

Alesha Stewart  
PhD (Pharmaceutical Sciences), The University of Texas—Austin  
WORKING WITH: Elizabeth Delamater, PhD, Texas Dept. of State Health Services Laboratory  
PROJECT: Rotate through the different labs to gain experience working with the various organisms and testing methods of the ARLN project, complete MALDI validation for panels of carbapenemase-resistant Enterobacteriaceae (CRE) and GC isolates, use whole genome sequencing (WGS) to perform Salmonella serotype prediction and cluster analysis for foodborne and healthcare associated infectious disease outbreaks, and gain experience in bioinformatics while analyzing WGS data.

I hope to further my training by completing a clinical laboratory program and becoming board certified for continued work in the public health field.

Victoria N. Stone  
PhD (Microbiology & Immunology), Virginia Commonwealth University  
WORKING WITH: Xiaorong Qian, PhD, HCLD(ABB), Tennessee Dept. of Health: Laboratory Services  
PROJECT: Validate next generation sequencing protocols for the detection of antibiotic resistance genes in Neisseria gonorrhoeae; construct a strategy for the utilization of MALDI-TOF as a potential tool for rapid, culture-independent antibiotic susceptibility profiling; and perform PCR validations for the detection of antibiotic resistance mechanisms in CRE and Pseudomonas aeruginosa.

My goal is to direct a diagnostic or public health microbiology laboratory that fosters a collaborative environment between the laboratory, health care professionals and basic scientists.

LEARN MORE ABOUT THE AR FELLOWSHIP:  
www.aphl.org/fellowships/Pages/ARLNFellowship.aspx
The Bioinformatics Fellowship Program aims to train and prepare bioinformaticians to apply their expertise within public health and design tools to aid existing public health personnel in the use of bioinformatics. The program is a year-long, full-time working fellowship for master’s- and doctoral-level bioinformaticians; some fellowships may be extended for an additional year, as funding allows. Fellows are placed in state, local and federal public health laboratories throughout the US.
Dane Kania
MS (Molecular Medicine), University of Maryland—Baltimore

WORKING WITH: Michael Weigand, PhD, Pertussis and Diphtheria Laboratory, CDC/OID/NCIRD/MVPDB

PROJECT: Develop whole genome Multi-Locus Sequence Typing (wgMLST) of infectious disease Bordetella pertussis; curate a wgMLST reference database to be used in tracking outbreak populations in the United States; create a bioinformatic approach to the traditional PCR-based B. pertussis MLVA typing scheme.

Brian Mann
PhD (Experimental Pathology), University of Texas Medical Branch

WORKING WITH: John Barnes, PhD, Influenza Genomics Team, CDC/OID/NCIRD/ID/VSD

PROJECT: Develop an automated, computational framework, integrating antigenic cartography to cross-reference antigenic data with genomic sequence and identify real-time shifts in the molecular determinants of antigenicity. Correlate detected phenotypic changes with specific nucleotide substitutions and further genotypic inferences.

Arunachalam Ramaiah
PhD (Bioinformatics), jointly from Manonmaniam Sundaranar University, Tirunelveli, India and Abo Akademi University, Turku, Finland

WORKING WITH: Gregory A. Dasch, PhD, Biotechnology Applications Laboratory, Rickettsial Zoonoses Branch, CDC/NCEZID/DVBD

PROJECT: Optimize pipelines for reference based and de novo assembly of genomes and plasmids of Coxiella, Francisella, and Rickettsia agents present in metagenomics sequence data from ticks obtained on several platforms. Conduct deep downstream physical and functional analyses and comparisons of these data with related sequences available at NCBI. Predict T-cell epitopes and deduce the evolution of surface antigens of Rickettsia and Orientia.
Logan Fink

MS (Biological and Medical Informatics), South Dakota State University

**WORKING WITH:** Joel Sevinsky, PhD, Colorado Dept. of Public Health and Environment

**PROJECT:** Aid in the detection and classification of outbreaks of enteric disease, develop pipelines to help characterize the molecular profile of isolates, work on characterization of *Y. pestis* and *F. tularensis* strains endemic to Colorado.

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Julie Shay

MSc (Molecular Biology), Simon Fraser University, Burnaby, BC, Canada

**WORKING WITH:** Andrew Huang, PhD and Heather Carleton, PhD, MPH, Enteric Diseases Laboratory Branch, CDC/NCEZID

**PROJECT:** Test taxonomic binning methods using existing shotgun metagenomic data from *Salmonella* outbreaks in Colorado and Alabama and compare results with the outbreaks’ corresponding epidemiological and isolate genomic data. Catalogue information about organisms found in healthy stool, creating in silico mock metagenomic data sets with the catalogue, and use these data sets to further test taxonomic binning methods.

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Xiong (Sean) Wang

PhD (Virology and Bioinformatics), University of Minnesota—Twin Cities; DVM, Jilin University, Changchun, China

**WORKING WITH:** Dave Boxrud, MS, Minnesota Dept. of Health Public Health Laboratory

**PROJECT:** Build and maintain the bioinformatics infrastructure, implementing analyses pipelines (whole-genome SNP phylogeny, serotyping, antibiotic resistance prediction, etc.) for various pathogens. Standardize internal and regional bioinformatics training and analyses.

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I hope to continue on in the public health sector, as I have found the work diverse, exciting, challenging and rewarding.

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Utilize cutting-edge technology and ‘big data’ concept to promote public health at all levels, including more comprehensive characterization of infectious pathogens, faster infectious disease outbreak identification and more accurate newborn screening.

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2017-2018 FELLOWS
Kevin Libuit  
**MS (Biology), James Madison University**  
**WORKING WITH:** Lauren Turner, PhD, Virginia Division of Consolidated Laboratories Services  
**PROJECT:** Develop and implement bioinformatics quality control workflows to ensure accurate and actionable data are being provided to the lab’s external partners on foodborne pathogen surveillance.

Tiffany Hsu  
*PhD (Biological and Biomedical Sciences), Harvard University*  
**WORKING WITH:** Sandra Smole, PhD, Massachusetts State Public Health Laboratory  
**PROJECT:** Characterize pathogens in unexplained respiratory disease outbreaks by designing primers to amplify specific pathogens, such as the *Bordetella* species and enterovirus. Incorporate primers onto the Wafergen SmartChip™ for massively parallel target enrichment, sequenced on the Illumina MiSeq. Develop bioinformatics workflows for primer design, selected for specificity, limit of detection and taxonomic classification, using a k-mer approach.

Su Bin Park  
*MS (Bioinformatics), Georgia Institute of Technology; MS (Medicine), Seoul National University, Korea*  
**WORKING WITH:** Brian Raphael, PhD, Pneumonia Response and Surveillance Laboratory, CDC/OID/NCIRD/DBD/RDB  
**PROJECT:** Improve the whole genome MLST (wgMLST) for *L. pneumophila* allele database and develop bioinformatic workflows for automated analysis of wgMLST data.

Bioinformatics fellows are encouraged to attend the annual Advance Molecular Detection (AMD) Day Conference. At AMD Day 2017, 13 fellows—both past and present—presented posters on their projects.
Sarah Schmedes  
**PhD (Biomedical Sciences—Molecular Genetics), University of North Texas Health Science Center**

**WORKING WITH:** Venkatachalam (Kumar) Udhayakumar, PhD, Malaria Genomics Laboratory, Laboratory Research and Development Unit, CDC/CGH/DPDM/MB  

**PROJECT:** Focus on molecular surveillance for drug resistance and integrating population-based genetic markers for genotyping *Plasmodium falciparum* isolates to infer recrudescent versus new infections. Use next generation sequencing tools and bioinformatics analysis to investigation outbreaks, such as developing a bioinformatic pipeline and implementing machine learning techniques to generate prediction models to infer geographical origin of *Plasmodium* isolates.

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Erik Van Roey  
**MS (Genetics, Genomics and Bioinformatics), University at Buffalo**

**WORKING WITH:** Richard Bradbury, PhD, Parasite Reference Diagnostic Laboratories, CDC/CGH/DPDM/PDB  

**PROJECT:** Provide bioinformatics support to PDB’s attempt to create a genetic typing marker for *Cyclospora cayenensis* outbreak investigations; perform PCR-based sequencing on published genetic markers for *Strongyloides stercolaris*, establish their usefulness and evaluate the global variation of *S. stercolaris*.

I plan to continue working in bioinformatics, either in academia or a public health setting, and eventually return to school to get a PhD.

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Sara Zufan  
**MPH (Environmental Health Sciences), Columbia University**

**WORKING WITH:** Shannon Whitmer, PhD, Research Diagnostics and Development Team, CDC/OID/NCEZID/DHCPP/VSPB  

**PROJECT:** Enhance and explore sample preparation methods for next generation sequencing; deep sequence archived clinical material to construct detailed phylogenies; and investigate bioinformatics methods to improve the pathogen detection pipeline and phylogenetic analysis with the purpose of enhancing the detection of high consequence pathogens and novel pathogens that cause viral hemorrhagic fever-like symptoms.

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I hope to pursue opportunities to continue bioinformatics research in public health, focusing on outbreak investigations and biosafety and biosecurity, and to pursue a path to leadership roles within the public health laboratory setting.

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I plan to continue research at the intersection of molecular evolution and public health. Specifically, I am interested in the population genomics of zoonotic pathogens across space and time, and how that information can be applied to improve surveillance.

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**LEARN MORE ABOUT THE BIOINFORMATICS FELLOWSHIP:** [www.aphl.org/fellowships/Pages/Bioinformatics.aspx](http://www.aphl.org/fellowships/Pages/Bioinformatics.aspx)
The Ronald H. Laessig Memorial Newborn Screening Fellowship Program prepares laboratory scientists for careers in newborn screening and/or genetics research while also strengthening local, state and federal public health infrastructures to support surveillance and implement prevention and control programs. The program is a two-year, full-time post-doctoral fellowship that accepts one applicant per fellowship cycle.

Ellen V. Stevens  
PhD (Pharmacology), University of North Carolina  
WORKING WITH: Sara Beckloff, PhD, North Carolina State Laboratory of Public Health  
PROJECT: Optimize and implement the Illumina’s MiSeqDx Cystic Fibrosis (CF) 139-Variant screening methodology to allow for the rapid detection of CF disease-causing mutations in North Carolina newborns during the routine screening process, and work collaboratively with partner agencies (CDC and RTI) to develop, optimize and implement novel molecular assays to detect mutations associated with lysosomal storage disorders in newborns.

[Ellen plans] to continue to perform research that will ultimately improve the overall well-being of babies being born with life-threatening disorders by guiding earlier diagnosis and treatment options.

LEARN MORE ABOUT THE NEWBORN SCREENING FELLOWSHIP:  
www.aphl.org/fellowships/Pages/PHL-NBS.aspx
The Infectious Diseases Laboratory Fellowship Program is a year-long, full-time working fellowship for master's-degree level scientists. Fellows are placed in local and state public health laboratories (PHLs), where they receive training in bench-level laboratory skills and methods, and assist with high-priority infectious disease testing, surveillance and control measures.

Right: Locations of the 2017-2018 Infectious Diseases Fellows

Infectious Disease Fellows visit CDC in Atlanta, GA. (Left to Right) Dana Woell, Thomas Moore, Caitlyn Daron, Mia Warlick, Michael Mash, and Chelsea Carman.
Chelsea Carman  
*MPH, University of Vermont*  
**WORKING WITH:** Tracy Stiles, MS, Massachusetts State Public Health Laboratory  
**PROJECT:** Develop, optimize, validate, and implement an assay to detect norovirus in oysters, and then develop an application to manage the data generated from testing.

I am using this year of fellowship to assist me in determining what I would like to do in the future: pursue a higher degree, secure a position in a public health laboratory, or return to more basic research to answer public health questions.

“I spent three weeks training at the lab of a leading researcher in norovirus detection in oysters...at Ifremer in Nantes, France. Her lab is both a national reference lab and a research lab, so it was a great opportunity to learn about the ISO testing methods used for norovirus detection, as well as the direction of current research.”  
- Chelsea Carman, MPH

In the short-term I will continue to expand my knowledge, expertise and laboratory technical skills by pursuing career opportunities at a state public health laboratory or a clinical laboratory at a major hospital. My long-term goals include working at CDC and/or WHO to conduct infectious disease research and investigate and respond to disease outbreaks.

Caitlyn Daron  
*MS (Microbiology), North Carolina State University*  
**WORKING WITH:** Susan Orton, PhD (ABMLI), North Carolina State Laboratory of Public Health  
**PROJECT:** Use MALDI-TOF to identify/verify the presence of highly infectious and atypical organisms often associated with disease outbreak response; determine baseline levels of Cryptosporidium and Giardia parasites in stool specimens from migrant field workers in North Carolina in collaboration with the Brody School of Medicine at East Carolina University; and work with the biosafety/biosecurity officer on revising the infection control manual with an emphasis on biosafety and risk assessment of laboratory procedures.

“...”  

Michael A. Mash  
*MS (Biotechnology), University of Nevada—Reno*  
**WORKING WITH:** Denise Pettit, PhD, North Carolina State Laboratory of Public Health  
**PROJECT:** Develop and implement a plaque reduction neutralization test protocol, optimized under BLS-3 conditions, to facilitate diagnoses of known and emerging viral pathogens; conduct rotations in virology/serology, reference microbiology and molecular epidemiology to obtain a comprehensive experience in public health laboratory practices.

My goal is to pursue a PhD focusing on arbovirology, the molecular mechanisms associated with pathogenesis, and characterization of hosts that transmit these pathogens to unsuspecting populations... I will pursue a career in the diagnosis, prevention and control of vector-borne diseases working in a state, national or international agency committed to protecting citizens from emerging and zoonotic infectious diseases.
Thomas Moore
MS (Global Health), Duke University

WORKING WITH: Abelardo Moncayo, PhD, Tennessee Dept. of Health, Laboratory Services

PROJECTS: Study Bourbon Virus and Heartland Virus Sero-prevalence among domestic and wild animals across Tennessee and molecular testing of human samples for Heartland Virus; develop and implement *Rickettsia* multiplex assay to determine true distribution of *Rickettsia* spp. pathogen across Tennessee; assist with Tennessee’s West Nile Virus (WNV) surveillance system through weekly mosquito processing and molecular testing for WNV; and assist with the vector-borne disease epidemiologist with case investigation for Rocky Mountain Spotted Fever.

I plan to pursue a doctorate investigating infectious disease in the public health setting. My future goal is to work for the CDC where I can study vector-borne and zoonotic disease both nationally and globally.

Mia Warlick
MS (Biomedical Engineering), University of Florida


PROJECT: Research efforts on developing and validating an assay for detecting Zika nonstructural protein 1 (NS1) after rotations through the virology, bacteriology, serology, biological defense and epidemiology departments. The proposed assay seeks to address sensitivity and specificity limitations of current serologic tests, which detect antibodies against nonspecific-Zika structural proteins.

I plan to pursue a career as an infectious disease epidemiologist... [focusing on] the molecular epidemiology of emerging viral infections... I hope to enhance my understanding of viral pathogenesis in order to develop better diagnostic tools and therapeutics for detecting and combating viral infections. My ultimate goal is to work for CDC.

Dana Woell
MPH, University of Pittsburgh

WORKING WITH: Thomas Kirn, MD, PhD, New Jersey Division of Public Health and Environmental Laboratories

PROJECT: Improve performance in the mycobacteriology laboratory by focusing on turnaround time, data quality, and incorporating new technology into the lab to better support the NJ state tuberculosis (TB) control program; update and optimize laboratory testing algorithms to ensure timely provision of diagnostic data; coordinate with critical partners in clinical sites and local public health departments to better achieve the state’s TB control goals.

I plan to pursue a public health career in the public sector, focusing on emerging infectious diseases... I am interested in the interface of laboratory capacity building with public health program management, as well as emergency preparedness.

LEARN MORE ABOUT THE INFECTIOUS DISEASE FELLOWSHIP:
www.aphl.org/fellowships/Pages/Infectious-Diseases-Laboratory-Fellowship-Program.aspx
About APHL
APHL works to strengthen laboratory systems serving the public’s health in the United States and globally. APHL represents state and local governmental health laboratories in the United States. Its members, known as “public health laboratories,” monitor, detect and respond to health threats.

APHL works closely with federal agencies to develop and execute national health initiatives. During public health emergencies, it operates as a coordinating center for laboratory response. APHL also works internationally to build effective national laboratory systems and expand access to quality diagnostic testing services. With over 20 years’ experience in 31 countries on five continents, APHL is recognized internationally as a leader in laboratory science and practice.

APHL’s core membership is comprised of state, local and territorial laboratories and includes environmental, agricultural science and food safety laboratories. Representatives from federal agencies, nonprofit organizations, corporations and interested individuals also participate in the association. International participation is expanding in response to the globalization of disease and APHL’s active global health program. Total APHL membership numbers over 800.

About CDC
CDC is one of the major operating components of the US Department of Health and Human Services. CDC works 24/7 to protect America from health, safety and security threats, both foreign and domestic. Whether diseases start at home or abroad, are chronic or acute, curable or preventable, human error or deliberate attack, CDC fights disease and supports communities and citizens to do the same.

CDC increases the health security of our nation. As the nation’s health protection agency, CDC saves lives and protects people from health threats. To accomplish our mission, CDC conducts critical science and provides health information that protects our nation against expensive and dangerous health threats, and responds when these arise.