

# MOVING LABORATORY PRACTICE AND SCIENCE FORWARD



THE SUCCESS OF THE APHL/CDC MASTER COOPERATIVE AGREEMENT



## ABOUT APHL

The Association of Public Health Laboratories works to strengthen laboratories serving the public's health in the United States and globally. A national nonprofit, the organization represents state and local governmental health laboratories in the US. These members, known as "public health laboratories," monitor and detect health threats to protect health and safety.

Founded over 50 years ago as a forum for state public health laboratory directors, APHL has expanded to encompass laboratories and staff from multiple disciplines, including public health, environmental, agricultural and food safety laboratories. APHL collaborates with laboratory and public health partners to assure effective surveillance, detection and response to health threats. During public health emergencies, APHL operates as a coordinating center for laboratory response. With experience in 31 countries on five continents, it is recognized internationally as a leader in laboratory science and practice.

*"The cooperative agreement improves efficiency for state labs — it enables APHL to be our voice and our coordinator. We benefited when APHL negotiated with manufacturers on our behalf, and developed a standardized job description for a biosafety officer. APHL's Emerging Leader Program also helped four of my staff step up to the next level of their careers — I needed to develop them, and APHL was an invaluable resource."*

— CHRISTINE L. BEAN, PHD, MBA, MT(ASCP)  
LABORATORY DIRECTOR, BUREAU OF LABORATORY SERVICES  
NEW HAMPSHIRE DIVISION OF PUBLIC HEALTH SERVICES,  
DEPARTMENT OF HEALTH AND HUMAN SERVICES

*"The cooperative agreement provides a flexible framework for responding to virtually any challenges facing public health laboratories. A critical need for our lab is the development of better information systems to support disease and environmental surveillance. The cooperative agreement allows us to keep pace with changes in state and national health systems."*

— CHRISTOPHER G. ATCHISON, DIRECTOR, STATE HYGIENIC  
LABORATORY AT THE UNIVERSITY OF IOWA



## FOREWORD

**H**igh-quality laboratory results drive planning, prevention and response. Yet the path from surveillance to outbreak response to policy development is not simple. Assuring quality laboratory results and their effective interpretation is increasingly complex, especially given the evolution of the private-public interface, healthcare reform and the interrelatedness of actors in global health.

This synopsis of the cooperative work by the Association of Public Health Laboratories (APHL) represents the capstone of a fundamental, critical relationship among the partners of the US public health laboratory network.

For APHL, assurance of high-quality results is built on the foundation of inclusive membership and sound governance. APHL has been a proactive innovator in the development of networks, including the Laboratory Response Network and specialized reference centers for influenza. Cooperative agreements from several federal agencies, including the Centers for Disease Control and Prevention, the Health Resources and Services Administration, the Food and Drug Administration and the Environmental Protection Agency — together with support from corporate and professional members — contribute to APHL's success in continually strengthening laboratory systems.

In 1989, the first agreement between CDC and APHL (then the Association of State and Territorial Public Health Laboratory Directors) established the National Laboratory Training Network, underpinning APHL's continued focus on workforce development and capacity. This agreement launched APHL as one of several nongovernmental organizations critical to public health progress in the United States. It was followed by many cooperative agreements with CDC. The most recent five-year agreement, concluded in June 2015, has contributed to improving the nation's health and global laboratory capacity, and marks another step in APHL's remarkable institutional maturity.

Organizationally, APHL has directly and materially advanced the capacity of clinical laboratory networks and public health research. APHL has pushed beyond its initial domestic US focus to drive progress in global public health and informatics. The hard work, professionalism and expertise of its members and staff have delivered on pressing as well as routine needs. From SARS to Ebola, from tuberculosis to newborn screening, APHL and its members respond whenever needed.

As we look ahead to the next set of public health challenges, we will build on this success. Together we will progress toward an even healthier 2020.

*Michael F. Iademarco*

**Michael F. Iademarco, MD, MPH**

*Captain, US Public Health Service*

*Director, Center for Surveillance, Epidemiology, and Laboratory Services*

*Office of Public Health Scientific Services*

*US Centers for Disease Control and Prevention*

*Department of Health and Human Services*





## INTRODUCTION DRIVING CHANGE IN PUBLIC HEALTH

It is our privilege to help CDC increase and improve the health security of our nation. Our collaboration on training programs in 1989 was the first sign that the whole of APHL and CDC working together was greater than the sum of our parts. This valuable partnership progressed and led naturally to the comprehensive APHL/CDC cooperative agreement in 2010.

At that time, public health labs were looking at large funding cuts, uncertain about the landscape of laboratory services under health reform and eyeing the reemergence of vaccine-preventable diseases. The H1N1 pandemic had spotlighted our abilities to quickly develop and implement testing in a crisis — and gave us a glimpse of the environment of public visibility now familiar to labs at all levels.

We knew the pace of change would not slacken. Our overarching goal for the ensuing five years was to get ahead of that change — to be its driver and shaper, to ensure that new ideas and technology could navigate the larger public health network, from CDC to a local public health lab to an agricultural partner to a global organization. We would be the nexus where research and development turns into public health action.



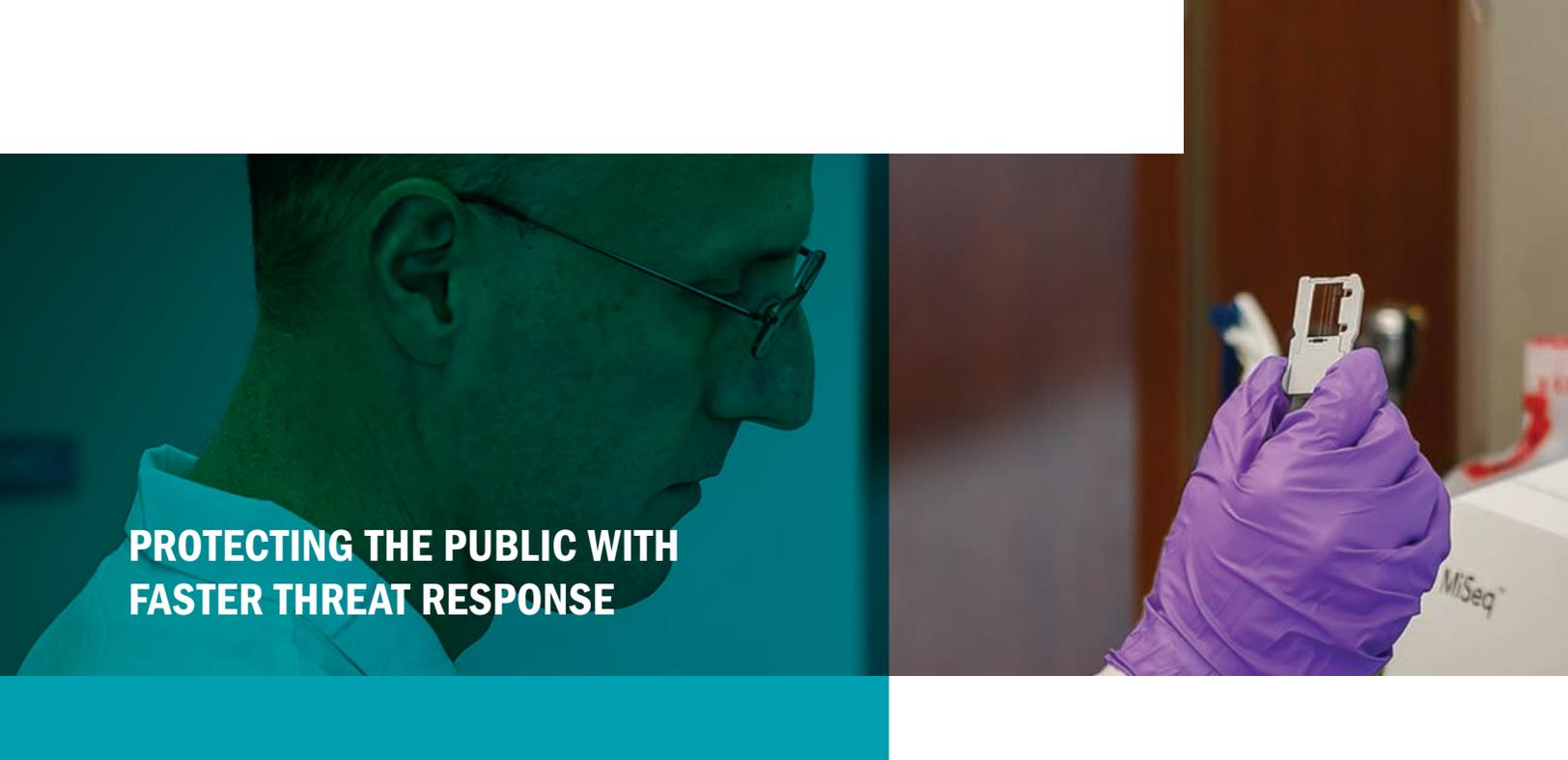
We went in with a vision to securely grow lab interoperability; we came out with that and more: the APHL Informatics Messaging Services (AIMS) platform for electronic exchange has improved data reporting times from weeks to minutes. We faced a shrinking lab leadership pool and out-of-date lab processes; by expanding our training and launching the Laboratory Efficiencies Initiative, we emerged with more leadership opportunities and stronger systems. In 2010, we were just beginning to see how the Laboratory Response Network could function beyond the context of terrorist incidents; by 2014 it was proving its value on a daily basis, had spun off and modeled global programs, and played a vital role in handling the Ebola threat.

Throughout the five-year agreement, we shared and continue to experience the frustrations of the funding “roller coaster.” Sudden infusions of crisis-precipitated support, followed by periods of fighting for the basics, challenge not only laboratory functions but also strategic planning and leadership development.

APHL is prepared to meet those challenges, offering leadership, guidelines and performance measures designed to function within this reality. We’re skilled in using resources efficiently to train future public health leaders; we emphasize systems thinking that prepares them for work inside the lab and for outreach to an increasingly aware public.

This report reviews the highlights of a five-year period marked by multiple changes and crises, from new technology to new disease threats. For every change or crisis, there was at least one instance of innovative thinking or agile action to meet it — and thanks to the partnership between CDC and APHL, those breakthroughs were shared and implemented to make the world a healthier place through quality laboratory systems.

Scott J. Becker, MS  
*Executive Director*  
Association of Public Health Laboratories



## PROTECTING THE PUBLIC WITH FASTER THREAT RESPONSE

*“We are living in an interconnected world where an outbreak of infectious disease is just a plane ride away — as we saw with Ebola. APHL’s work with CDC ensures that public health labs on the front lines are ready to respond to an infectious disease emergency at a moment’s notice.”*

— BETH BELL, MD, MPH  
DIRECTOR OF THE NATIONAL  
CENTER FOR EMERGING AND  
ZOOLOGICAL INFECTION DISEASES  
CDC

**T**hreat response is not merely a matter of acting when a danger is present — it is a constant challenge in preparedness and innovation. Through the APHL/CDC Cooperative Agreement, APHL helps the nation’s public health labs stay ready, act quickly and analyze responses in order to prepare us for the next threat to the public’s health. Over the past five years, public health labs were faced with the full diversity of emergencies: potential bioterrorism, natural disasters, environmental threats, emerging infectious diseases and food-borne illnesses.

Laboratory preparedness must be both constant and continually improving in speed and quality at every level: training in how to open a suspicious specimen, development of new rapid assays and guidance tools, creation of a new electronic data messaging service, and communicating with the public, among many other skills. APHL assists laboratories at every stage of the cycle, from growing their infrastructure to constantly improving training and integration of new technology to supporting innovation for future threat response.



## LRN: Partnership in preparedness

Each time a crisis hits, the Laboratory Response Network (LRN) proves its worth. It's a national network whose infrastructure and capacity empower our public health labs to rapidly detect biological, chemical, radiological and other threats, quickly communicate critical data, and respond.

Founded in 1999 by CDC, APHL, the FBI and the Department of Defense, this essential resource underwent a rapid and massive evolution over the course of the cooperative agreement, offering unequalled capabilities and strengthening threat response.

Partnerships have grown to include unprecedented links among state, local and regional laboratories, state public health departments, and law enforcement and military laboratories.

One vital aspect of that network: the LRN for Biological Terrorism Preparedness, which serves as a collaborative model for projects such as the African Public Health Laboratory Network. The LRN is also a valuable part of the Global Health Security Agenda, an international threat detection and response effort that includes partners such as the US departments of



**TOP:** Matt Shudt, research scientist at Wadsworth Center in Albany, New York, performs a run through the NextGen DNA sequencer. **ABOVE:** Texas Department of State Health Services' Erin Swaney reviewing the flowchart for Ebola sample inactivation while training Biothreat Team members Wanda Songy, Garrick Gillispie and Mark Mergen.

Health and Human Services, Agriculture, State, and Defense, and the US Agency for International Development.

In 2010, the LRN launched an effort toward faster and more secure electronic communication of biothreat data. This advance will be critical when processing the high volumes of data needed to combat future pandemics.

The LRN continues to yield results in other forms of preparedness. When the deadly MERS-CoV infection was first reported in 2012 in Saudi Arabia, CDC fast-tracked a rapid assay, and the LRN enabled

quick distribution of the test to public health labs across the US. In 2014, as the Ebola outbreak erupted in West Africa, the LRN deployed test kits even before the virus showed up in a US patient; as of early 2015, 56 US labs could test for Ebola. The innovations and infrastructure developed through the LRN make these kinds of rapid response possible.



## Prepared for the pressures of pandemics

When an infectious disease threat arrives, ramped-up capacity for testing must develop quickly. But if that happens everywhere, all the time, resources are used inefficiently on training and capabilities when they could instead be directed toward other public health challenges. With this in mind, APHL and CDC developed the Vaccine Preventable Disease (VPD) Reference Centers in response to the pressures on public health labs during the 2009 H1N1 pandemic.

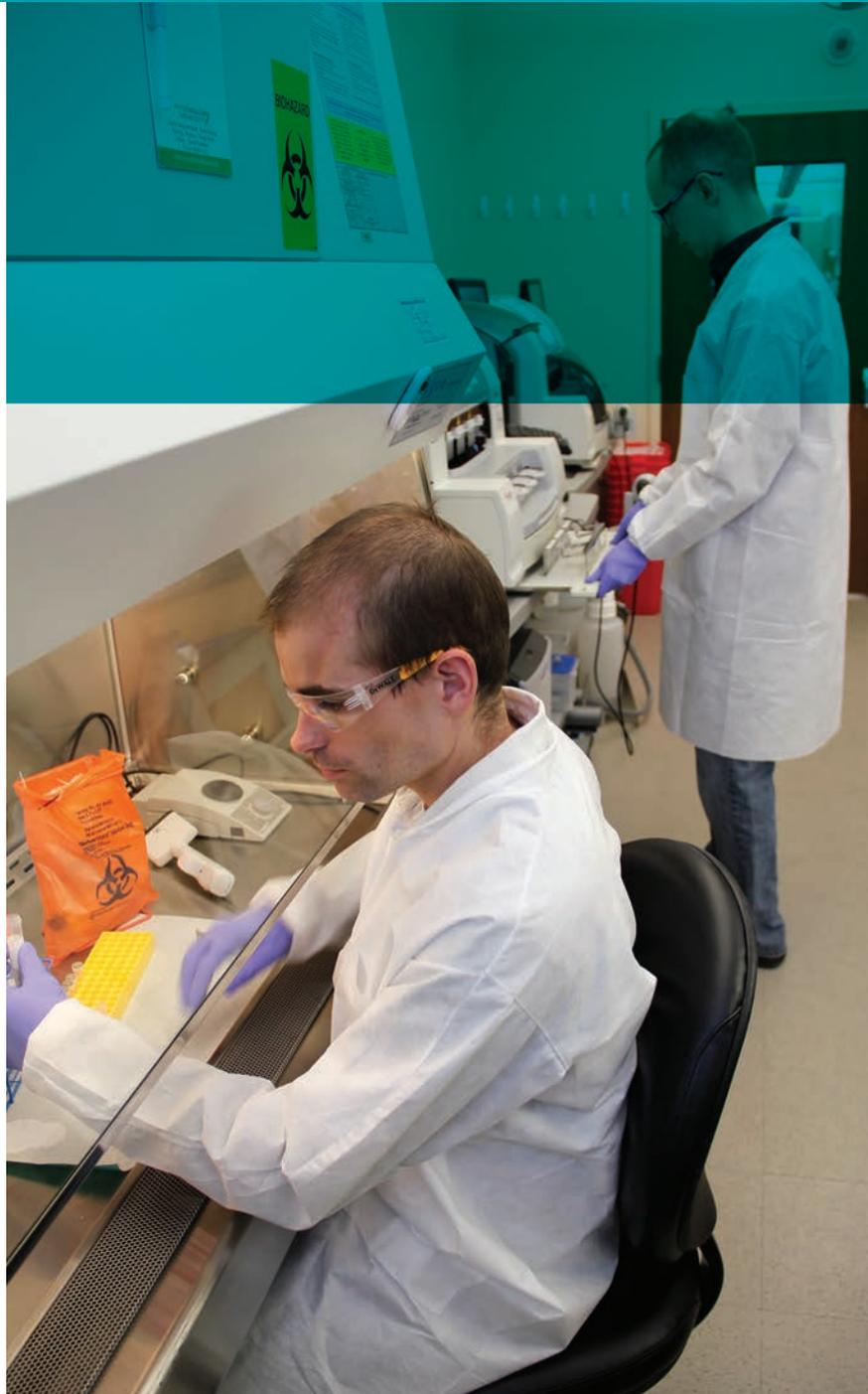
These centers, located in Wisconsin, Minnesota, California and New York, have made huge progress via molecular testing and genotyping, combined with the latest electronic messaging technology. If there's an obstacle at CDC, such as when the federal government shut down in 2013, these centers can fill the gaps. And when an outbreak hits, such as with measles and mumps in 2014, they provide essential surge capacity to handle these threats to public health. They join the country's three other reference center models: influenza (in three locations), HIV (two locations) and tuberculosis (one location).

Iowa's State Hygienic Laboratory was the first lab in the nation to identify the strain of *Cyclospora* that sickened more than 640 people in 25 states during the 2013 outbreak. Bacteriology supervisor Jaye Boman stacks containers of the thousands of specimens that the lab tested for *Cyclospora*.

## The Right Size response: better data, better surveillance

In an emergency, more information isn't always better — in fact, it can compromise effectiveness and efficiency. The key isn't more data; it is better data. The Right Size Influenza Virologic Surveillance Project was developed in 2012 by APHL, CDC and stakeholder partners because some labs performed more tests than were necessary during the H1N1 pandemic.

Laboratorians and epidemiologists looked at the big picture when comparing data gathered from historical disease patterns, geographic features, agricultural factors, animal variants and more — all to pinpoint the optimal number of specimens for providing statistically significant surveillance information. Armed with this information, labs nationwide can prioritize testing, getting to productive results faster and taking the burden off individual labs and CDC.



Clinical lab analysts Kris Eveland (foreground) and Erik Twait prepare specimens for influenza testing at Iowa's State Hygienic Laboratory. Lab analysis helps reveal prevalent strains of flu circulating in the state.

# APHL RESPONDS TO CRISES

During crises that affected public health, APHL's preparedness, innovation and collaboration supported faster resolutions and improved future responses



## 2010

### APRIL – JULY

**Deepwater Horizon oil spill** >> Convened expert polycyclic aromatic hydrocarbons chemical detection workgroup (public health labs, FDA, CDC, NOAA, EPA and AOAC) and surveyed needs. Actions led to new protocol, better results and formation of Gulf Seafood Safety Response working group

### MAY

**E. coli outbreak in lettuce** >> Set up multistate call alerting members prior to a further spread



## 2011



### MARCH

**Fukushima Daiichi nuclear disaster, Japan** >> Convened national conference calls to discuss radiation testing needs for food and environmental samples

### JUNE

**German E. coli outbreak** >> Coordinated with CDC on distribution of Immuno-Magnetic Separation beads to member labs to speed up detection

### AUGUST

**Listeria monocytogenes outbreak on cantaloupe traced to Colorado** >> Coordinated first-ever PulseNet MLVA multisite validation study for Listeria monocytogenes; supported CDC FoodCORE review and metrics

**Reports of hexavalent chromium in tap water in dozens of US cities** >> Partnered with industry for conference call on detection methodology; supported training courses at CDC; developed a template for standardized electronic messages conveying environmental laboratory data



## 2012

### OCTOBER

**Superstorm Sandy** >> Provided timely communication, coordination and technical assistance to help public health labs continue essential services

### NOVEMBER

**New Jersey train derailment and vinyl chloride vapor release** >> Developed biomonitoring capabilities list, CDC's first biomonitoring meeting and a revamped listserv to spread knowledge and best practices for response



## 2013

### MARCH – AUGUST

**Measles outbreaks** >> VPD reference centers provided advanced testing methods and faster turnaround time

### JUNE – AUGUST

**Cyclospora outbreak** >> Identified at Iowa public health lab; began 50-state knowledge-share effort that helped trace source to Mexican cilantro

### OCTOBER

**US government shutdown** >> Ensured continuity for essential services: supplemented the nation's foodborne illness skeleton crew; state public health labs performed national surveillance on influenza specimens; labs with PulseNet prepared for action



## 2014

### JANUARY – FEBRUARY

**MCHM spill in West Virginia's Elk River** >> Release of crude 4-Methylcyclohexyl Methanol led to prolonged cutoff of drinking water to nearly 300,000 nearby residents; LRN laboratory went into 24/7 operation, adapting CDC method that allowed it to report results three times faster than other responding laboratories

### JANUARY – MARCH

**Measles, mumps outbreaks** >> VPD reference centers tested hundreds of specimens; alerted states to group of unvaccinated people returning from charity work in Philippines

### APRIL

**Listeria outbreaks** >> Performed proof of concept for whole-genome sequencing; isolated strains

### MAY

**First US MERS case** >> Indiana public health lab confirms first case; promoted use of LRN, ensuring rapid rollout of assay

### JULY

**First US case of locally acquired Chikungunya virus** >> Distributed CDC molecular testing protocol to US public health labs; facilitated specimen exchange during CDC summer moratorium

### AUGUST – OCTOBER

**EV-D68 in 48 states affects children** >> Alerted member labs to send suspect specimens to CDC; assisted with molecular testing protocol deployment

### AUGUST

**Ebola outbreak in Africa** >> Supported deployment of a new assay to test for the virus, to a select group of public health labs

### SEPTEMBER

**First US Ebola case** >> Confirmed at Texas public health lab; facilitated rapid rollout of assay; issued guidance documents including the *APHL Template for Public Health Laboratory Risk Assessment for Ebola Virus Disease* and *APHL Guidance for Clinical Laboratories Using FDA Authorized Diagnostic Assays for Ebola Virus Detection*



## MEETING THE CHALLENGE OF ADVANCED TESTING TECHNOLOGIES

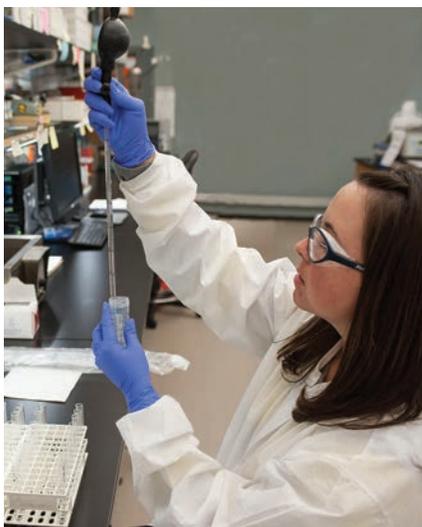
*“APHL has been a valuable partner in CDC’s efforts to ramp up Advanced Molecular Detection capacity in public health labs across the country. In addition, CDC and APHL have collaborated on the bioinformatics fellowship program, which is building expertise in this area of emerging importance to public health.”*

— GREG ARMSTRONG, MD  
DIRECTOR, OFFICE OF ADVANCED  
MOLECULAR DETECTION  
CDC

The test is the core activity and the heart of the public health lab, the function that the public and policymakers alike quickly grasp and understand. But what observers don’t always appreciate are the challenges of the rapidly changing testing environment — an increasing focus on antibiotic resistance, the re-emergence of a vaccine-preventable disease like measles, or a novel technology that demands new equipment or focused training.

With support from CDC, APHL helps public health labs meet these challenges. Whether it’s the development of an HIV testing algorithm that gives hope for early detection of acute cases or training for a new Severe Combined Immunodeficiency test that offers newborns not just hope but a cure, our member laboratories lead the advance guard of testing.

By establishing a climate that encourages continual innovation, APHL and its members assure efficiency and quality.



**CLOCKWISE FROM UPPER LEFT:**

A scientist prepares specimens for testing at the Minnesota public health lab; a scientist prepares a PFGE test in Virginia's public health lab; Stephany Cochran, a clinical lab analyst at Iowa's State Hygienic Laboratory, pipettes specimens for enteric serotyping. The lab performs serotyping for all *Salmonella* and *Shigella* isolates collected throughout the state.



## Fighting TB with faster testing

Tuberculosis is a killer, particularly in developing nations, and resistant strains pose a threat to people across the globe. Quicker detection and isolation of patients leads to better patient care and decreases the chance of an outbreak. Traditional testing can take up to three weeks to culture, creating a dangerous window. Fortunately, there's a new paradigm: nucleic acid amplification testing (NAAT), a form of molecular testing, takes 24 to 48 hours, and some types of NAAT can even detect mutations associated with drug resistance.

However, many labs were not equipped to perform NAAT. A survey performed by APHL and CDC showed that public health labs perform the vast majority of specialized TB testing in the US; supplying resources to them would have maximum effect. Using grants to upgrade or update molecular testing services, APHL helped increase access to molecular testing for TB by 50 percent in two years.

Another success had global reach: In rudimentary lab settings in some developing nations, lab workers are in danger of exposure to TB even as they perform testing. Through twinning and training programs supported by the cooperative agreement

and in partnership with industry experts including the Baker Company, Germfree and HDR, APHL led a work group to develop an inexpensive ventilated workstation for preparing TB samples. The workstation, and a user's guide created by APHL, are now helping lab workers stay safe.

## Combating foodborne illness

On a dinner table today, you might find sprouts from China, spinach from California and tomatoes from New Jersey. Our global tastes make it tougher — and more important — to have the fastest, most accurate capacity to stop any bacterium that causes foodborne illness.

In 1996, APHL helped establish the first foodborne illness surveillance network, PulseNet, which relied on pulsed-field gel electrophoresis (PFGE) to identify foodborne illness clusters. In 2014, APHL's proof of concept showed that whole genome sequencing (WGS) techniques are more discriminating, faster and more efficient — so APHL quickly supported hands-on training and five nationwide webinars to begin to get laboratorians and leaders up to speed on the best ways to use this approach.

*"We worked with APHL to increase utilization of molecular diagnostics for detection of *Mycobacterium tuberculosis* with an overall goal of decreasing delays in laboratory detection. It was an opportunity to capitalize on our existing partnership with APHL. This initiative allowed a rapid expansion of access and capacity to NAAT in public health labs. We saw in action the experience that APHL has in providing technical assistance and dissemination of funds. The effort not only strengthened the laboratory system for the diagnosis of TB but also strengthened our partnership in ways that have continued to benefit public health."*

— ANGELA M. STARKS, PHD  
CHIEF, LABORATORY BRANCH  
NATIONAL CENTER FOR HIV/AIDS, VIRAL  
HEPATITIS, STD, AND TB PREVENTION  
DIVISION OF TUBERCULOSIS  
ELIMINATION  
CDC

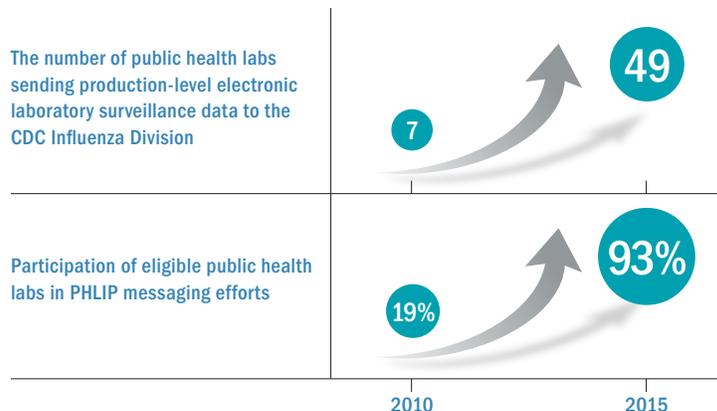
## DRIVING THE DATA TRANSFORMATION

*“APHL’s PHLIP team came down to Kentucky to help us implement electronic reporting for influenza. They got right to work, and within two weeks we were sending electronic data through the PHLIP network.”*

— STEPHANIE MAYFIELD GIBSON, MD,  
FCAP COMMISSIONER, KENTUCKY  
DEPARTMENT FOR PUBLIC HEALTH

Over the five years of the cooperative agreement, the revolutions of cloud computing and big data transformed daily life and public health on every level, from a laboratorian’s use of a mobile phone to the process of tracing a possible pandemic. The massive data capacity enabled by the cloud, when combined with new methods to trace and detect patterns in data, holds enormous promise in areas including surveillance and threat detection.

And during the course of the agreement, APHL helped public health labs keep pace with the changes in technology. We provided hands-on assistance and training, worked with partners for secure information exchange, and developed a new platform: APHL Informatics Messaging Services (AIMS). Each innovation built on the last with the intent to turn the vast amount of data generated in public health laboratories to actionable knowledge, giving full attention to security, accuracy and quality.





11,000+  
messages per month

AIMS is the future of public health data exchange and services, and we are just beginning to explore all of its possible uses.

### A platform that AIMS high

In 2009, the H1N1 pandemic spotlighted the gaping hole in US emergency preparedness: the general absence of systems for public health labs to report disease data to health authorities through a secure channel in near-real time. In 2010, CDC/APHL's Public Health Laboratory Interoperability Project (PHLIP) received a major funding boost. The vision behind PHLIP was to develop completely new, faster and better ways to share electronic information. Saving lives means sharing massive amounts of data quickly and easily; protecting people means doing so securely.

By 2014, APHL had released AIMS, a fast, secure, cloud-based environment that simplifies the validation, translation and routing of electronic public health data. While the architecture is shareable and open source — which keeps costs down — security meets federal compliance standards, and APHL maintains the security certificates.

The value is clear: When measles and mumps each made a resurgence in 2014, reports were sent directly to CDC from two VPD reference centers, helping speed the emergency response.

Every week, CDC's FluView surveillance report uses AIMS data as its base and the platform provides critical surge capacity in the event of pandemic influenza. AIMS supports epidemiologists through Electronic Lab Reporting, hosts the Informatics Self-Assessment and Visualization Tool, and, through its security features, serves as a vehicle to transport messages about possible bioterrorism threats.

### Transforming data to improve PHL services

How do labs across the country measure up? What are the greatest public health challenges? How are public health labs using resources? The answers are in the APHL Survey Resource Center, thanks to the ongoing efforts of the Institutional Research (IR) Program, which serves the APHL mission to collect and disseminate data to improve PHL services nationwide.

APHL fields up to 20 surveys per year on a wide range of topics such as:

- Laboratory bioterrorism preparedness
- Newborn screening practices
- Next-generation sequencing capabilities

The repository of years of collected survey information from state, regional and local public health labs allows searching for and comparing data among labs. The wealth of data helps labs with decision-making, justifications for state and federal funding, and benchmarking of their successes.

The IR team of experts is constantly working with all APHL programs to collect, process and transform data to make useful information available to all members.



APHL staff and contractors form a Technical Team to support our data initiatives.



## ENHANCING LAB SYSTEMS AND LEADERSHIP FOR THE FUTURE

*“APHL and CDC worked together to strengthen PHL sustainability through systematic approaches to workforce in the form of competencies, improving informatics capabilities with self-assessed metrics, and increased data for decision-making with a shared database and national test directory.”*

— JOHN RIDDERHOF, DRPH, HCLD (ABB)  
ASSOCIATE DIRECTOR,  
LABORATORY INTEGRATION UNIT  
CENTER FOR SURVEILLANCE,  
EPIDEMIOLOGY, AND  
LABORATORY SERVICES  
OFFICE OF PUBLIC HEALTH  
SCIENTIFIC SERVICES  
CDC

Public health, environmental and agricultural laboratories have been in the throes of a workforce crisis as an entire cohort of senior scientist-managers retires. Our 2011 survey of 79 APHL member labs — with responses from directors and nearly 2,000 employees — quantified additional challenges:

- Respondents said training opportunities were important/very important to recruiting qualified staff (54%) and retaining them (64%)
- Half of responding lab directors (51%) reported no, minimal or only partial capacity to provide education and training to their workers
- Respondents self-evaluated no or low competence in many important areas, including data handling (42%) and emergency preparedness (54%)

In addition, the survey revealed no standard set of core competencies for lab workers and no standard method for a lab to self-assess or have its performance evaluated by stakeholders. APHL was the key to a web of initiatives that addressed these complex issues, transforming the landscape from one of crisis to one of breakthrough solutions.



**LEFT:** Participants at the Milwaukee public health lab's first L-SIP assessment show their ratings for an essential service.  
**BELOW:** Our emerging leaders become members of NOLLA, the Network of Laboratory Leadership Alumni.



A scientist at the Virginia public health lab prepares specimens for testing.

## Reimagining lab efficiencies

In 2011, CDC director Thomas Frieden called for reimagining the way labs function, seeking to make their operations sustainable in the face of increasingly scarce resources. The resulting Laboratory Efficiencies Initiative (LEI) creates a network that accomplishes “what more than 100 individual labs cannot accomplish by working alone.” This CDC/APHL partnership sparks vibrant collaborations among stakeholders and laboratory leaders, and teaches the best management science about efficiency, including:

- Sharing of testing services across states (e.g., the Northeast Environmental and Public Health Laboratory Directors Consortium)
- Adoption of standardized testing platforms
- Optimum models of service organization
- Generation of new revenue sources
- Application of informatics solutions
- Savings and/or efficiencies in procurement

In support of LEI, APHL's National Center for Public Health Laboratory Leadership (NCPHLL) hosted forums by its certified LEAN assessors, and developed the first comprehensive set of Public Health Laboratory Core Competencies — a significant leap forward that has vast applications for professional development.

## Cultivating a community dialogue

APHL offers the lab community more than a dozen listservs that house lively discussions of current issues. One of the most popular is the forum on quality assurance, where members share questions, concerns, best practices and advice. A typical day's posts include technical issues, queries about policy, management concerns, news from publications and links to additional resources.

To meet members' needs, the forum also sponsors training webinars. Among these are discussions of biosafety, leadership and workflow efficiency, as well as talks by nationally renowned speakers on quality assurance management.

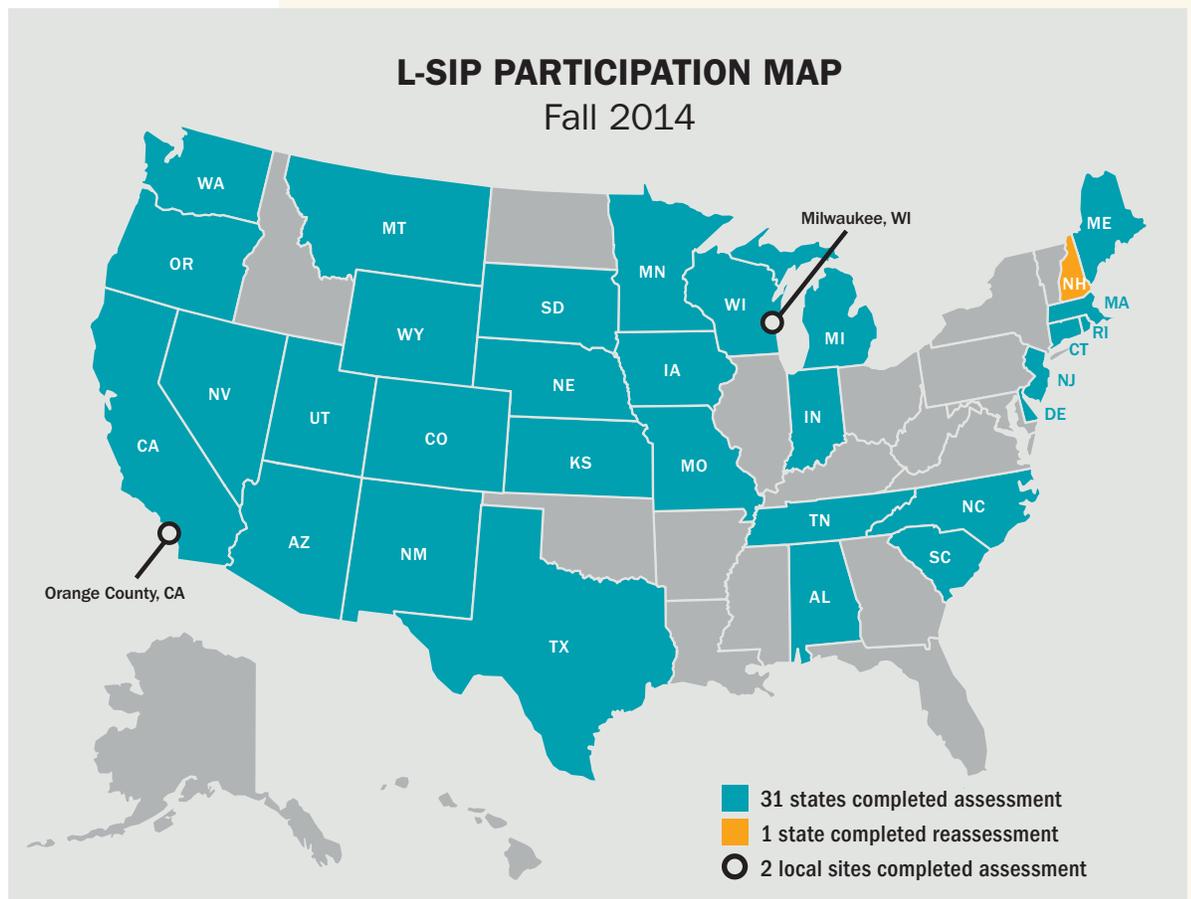
## The gold standard for lab best practices

Knowledge is power. That's the value of APHL's Laboratory System Improvement Program (L-SIP), which increases the effectiveness of state and local public health laboratory systems via 360-degree assessments by their community partners. L-SIP gives labs resources and technical assistance while guiding them through a process of performance evaluation, system improvements and periodic reassessment.

L-SIP produces a range of benefits by:

- Supplying a benchmark for public health laboratory system practice improvements — setting the gold standard to which public health systems can aspire
- Building a foundation for the accreditation of state and local public health departments
- Improving communication and collaboration among partners (first responders, key constituencies, academia, school nurses and others)

L-SIP unveils the needs of public health labs and makes their systems stronger. During the New Hampshire lab's reassessment, for example, the lab earned high marks for its enhanced outreach and training for diagnostic laboratorians — practices that were improved after its original L-SIP assessment.



## Improving the quality of lab practices

The National Laboratory Training Network (NLTN)<sup>™</sup>, a joint program of APHL and CDC, develops and delivers education programs for professionals in both public and private sector laboratories. The convenient, affordable, high quality training includes hands-on workshops, teleconferences, on-demand online courses, podcasts and seminars.

Such training has a crucial role in strengthening the quality of laboratory practice and the skills of laboratorians. For example, in 2013, 47 state training coordinators attended the National Laboratory Training Conference VII; 95% of participants reported that their learning objectives were met, and all of the states met their milestone deliverables.

In the past five years, 500 NLTN<sup>™</sup> courses trained more than 45,000 laboratory professionals from every state, several US territories and 14 other countries. Pre- and post-course testing showed gains in knowledge, such as a 28% average increase after Biosafety/Biosecurity workshops, and a 17.4% average increase after a Methods for Detecting Rabies Virus course.



NLTN offers an array of training sessions, including the ones in these photographs. **ABOVE:** “Laboratory Identification of Emerging Pathogenic Molds,” a three-day course hosted by NLTN and CDC.



**ABOVE:** Thelma Deguzman setting up influenza subtyping PCR at the San Diego County Public Health Laboratory.

**BELOW:** Advanced chemist Susan Percy pipettes samples for ICP-MS testing in the Wisconsin State Laboratory of Hygiene's Trace Elements Clean Laboratory. ICP-MS can test clinical and environmental samples for a variety of elements, including toxic metals at very low levels.

## Meeting community health needs

APHL's director of environmental health, Dr. Megan Latshaw, heard the question at a conference: Why was it legal to burn pesticides in this state when it was illegal a few miles away in the neighboring state? Every morning, the attendee explained, trucks would bring pesticides over the border for disposal by burning, and every day the ash would settle over her town. "What are these chemicals doing to us and how can we stop it?" she asked. No local officials could give the answer.

Dr. Latshaw was determined to get answers. She was instrumental in building the National Biomonitoring Network, which connects programs measuring chemicals in human samples so that states and localities can track their constituents' exposure to potentially harmful chemicals. The network helps to connect communities to public health labs, helps doctors uncover patterns of problems and enables leaders to answer urgent questions. Over the coming year, the network will adopt a formal structure, as its members begin to standardize methods, share best practices and expand their surveillance.



## Molding future public health laboratorians

Success is where preparation and opportunity meet. That happens daily at the APHL-CDC Public Health Laboratory Fellowship program, where scientists train for careers in public health labs and support public health initiatives related to infectious disease research. In the past five years, APHL has supported 78 fellows in two programs:

- The Emerging Infectious Disease (EID) Advanced Laboratory Training Fellowship, for bachelor's or master's level scientists, focuses on the practical application of technologies, methodologies and practices.
- The EID Laboratory Research Fellowship, for doctoral level scientists, focuses on high priority research in infectious diseases. These projects range from surveillance testing for dengue to improving specificity of Lyme disease testing.

"The Fellowship Program and the Orange County laboratory met and exceeded all of my expectations," said Jennifer Faulwetter, PhD. After she completed her fellowship, she accepted a Public Health Microbiologist III position at the Alaska State Public Health Laboratory.



Kayleigh Jennings, who was an Emerging Infectious Disease Laboratory Fellow at the Florida Bureau of Public Health Laboratories – Tampa.

**The APHL Emerging Leader Program**  
Developing the Public Health Laboratory Leaders of the Future

### What does it take to run a public health laboratory?

The complex issues involved in leading a state or local laboratory can challenge even the most skilled of today's laboratorians. In addition to being a subject matter expert in laboratory science, directors must also be able to manage a budget, motivate staff, advocate for funding, build relationships with external partners and understand legislative processes. The Emerging Leader Program, or ELP, sponsored by APHL's National Center for Public Health Laboratory Leadership (NCPHLL), provides mid-level public health laboratory professionals with opportunities to acquire these skills, preparing them to advance into managerial and supervisory positions.

Each year the ELP Program accepts six to ten public health laboratory professionals from across the US to collaborate on a yearlong group project and attend three workshops on topics in leadership and management. By joining a geographically diverse team to address real-time challenges, participants enhance their career potential and build a personal network of laboratory professionals.

## A forum for future lab leaders

Exemplary laboratory leaders are developed through the Emerging Leader Program (ELP) at the National Center for Public Health Laboratory Leadership. This arm of APHL brings together promising US public health lab scientists in an intensive, year-long development program that includes one-on-one coaching. ELP graduates automatically become members of NOLLA, the Network of Laboratory Leadership Alumni, which helps them blossom.

Surveys of graduates showed the results of their increased skills:

- Nearly 33% received a promotion after their participation in ELP
- 15% are now laboratory directors
- Fewer than 10% have left the PHL system
- 70% became more active in the profession, serving on APHL committees or workgroups

Building on this success, ELP teamed up with APHL's Global Health Program in 2014 to launch its first international cohort with 10 laboratorians from Lesotho.

ELP is a proven ladder to achievement. "The training I've received has launched my career and made me a better leader," said Pam Mollenhauer, a Governmental Relations Officer. "I'm able to take the skills I've learned and apply them."

Another participant, Lyndsey Caulkins, said, "ELP made me think more about where I'm going in five to ten years." She's an Environmental Scientist III, and added, "I'm not just going to work every day — it's made me think bigger, made me more ambitious. Why can't I be a lab director when someone retires?"

# EDUCATING THE PUBLIC ABOUT PUBLIC HEALTH ISSUES

*“APHL’s partnership with CDC demonstrated national leadership and influence through the 50th Anniversary of Newborn Screening campaign and events, engaging and educating broad audiences about the importance of newborn screening.”*

— CARLA CUTHBERT, PHD, FACMG, FCCMG  
CHIEF, NEWBORN SCREENING AND  
MOLECULAR BIOLOGY BRANCH  
NATIONAL CENTER FOR  
ENVIRONMENTAL HEALTH  
CDC

Five years ago, public health labs were all but invisible to the very people they serve.

Today, that has changed. Health crises have thrust our nation’s public health labs into a far more visible role. As the voice for these labs, our Communications Department has ramped up outreach to policymakers, the media and the public to explain how governmental health labs protect Americans from health threats.

We equip our members with the tools necessary to strongly articulate their value and impact to decision makers and reporters. In addition, we develop scientific publications to strengthen public health laboratory practice, and deliver just-in-time information to members during health crises.

Most of all, we focus on meeting people where they are — primarily on social media — with compelling stories, visuals and interactive approaches that not only separate fact from rumor but also offer context for how these issues affect our lives.

The collage features three distinct pieces of digital communication:

- Blog Post:** A screenshot of a blog post titled "The Diseases of The Oregon Trail" from the APHL Blog. The post is dated February 7, 2012, and is categorized under "Historical Health".
- Social Media Post:** A Facebook-style post from the Association of Public Health Laboratories (APHL) dated July 20 at 2:32pm. The text reads: "We want her to know that PKU doesn't define her, but it will always be a part of her." with a link to a video.
- Facebook Post:** A Facebook post from APHL dated 7:51 PM - 30 Sep 2014. The text reads: "When Ebola \*doesn't\* rip through Texas the way it has ripped through nations in W. Africa, you'll know our public health system is working." It shows 15 likes and 13 comments.



## Celebrating a half-century of screening newborns

It's been more than 50 years since the first state-mandated newborn screening test. Today, this one simple test detects heritable and congenital disorders in more than 12,000 babies in the US each year, minimizing severe complications and ensuring immediate access to life-saving treatment.

In 2013, APHL launched a year-long campaign to celebrate this milestone. It featured everything from a Jumbotron public service announcement in Times Square to an educational exhibit that toured 15 states, as well as a special event and panel discussion on Capitol Hill.

The celebration also included publication of a book, *The Newborn Screening Story: How One Simple Test Changed Lives, Science, and Health in America*. This is a heartrending account of families affected by a service that now screens a baby's blood for up to 50 conditions.

Our efforts culminated in 2014 when Congress passed the Newborn Screening Saves Lives Reauthorization Act, which channels vital federal assistance to states for screening, laboratory quality assurance and follow-up systems for screen-positive infants and their parents.

## Communicating the value of labs in new ways

MOOCs. Reddit. Blogs. Tweets. These are among the many tools APHL is utilizing to share public health lab information and engage with an informed public.

How worried should parents be about enterovirus D68? Check out our blog. What happens when you feature APHL environmental health experts and food safety committee members in Reddit's "Ask Me Anything" forum? More than 1,800 concerned questions ("How serious is the problem of blanket use of antibiotics in the meat/dairy industry?"), countless informative answers and plenty of lively discussion.

When Ebola came to the US, our tweets were a source for facts, countering the hyperbole found elsewhere. *The New York Times* used our information to create its Ebola Fact Sheet. And when Dr. Megan Latshaw, APHL's director of environmental health, worked with Johns Hopkins University to create a massive open online course (MOOC) on "Chemicals and Health," more than 30,000 people enrolled. People are hungry for up-to-the-minute information, and we're feeding them accurate data.

## Giving voice to our perspective

APHL exists to strengthen labs serving the public's health. And we work hand-in-hand with agencies like CDC and FDA to make that happen. But sometimes bureaucracy can get in the way.

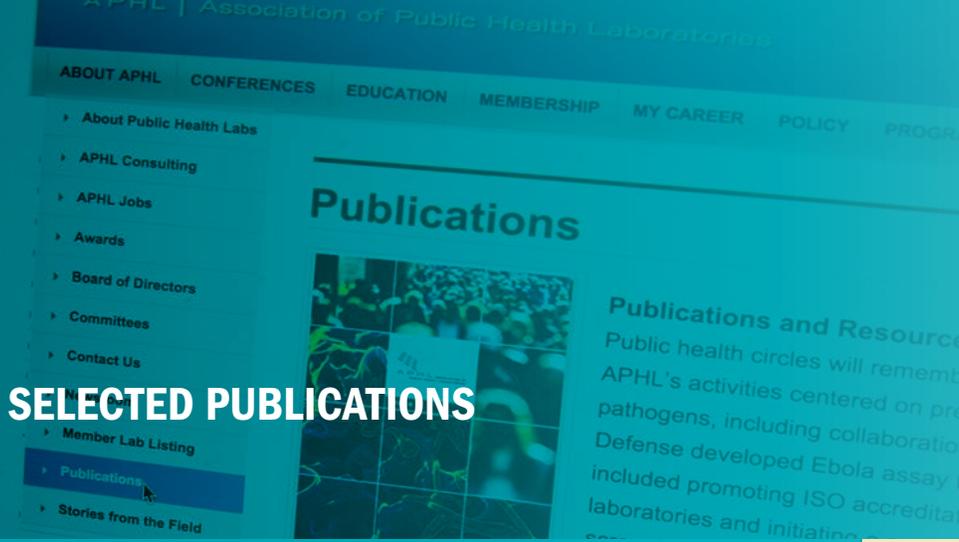
Case in point: In October 2014, FDA released a draft regulatory framework for the oversight of laboratory developed tests (LDTs) that requires notification, pre-market review and medical device testing. And while the action was well-intentioned, we believe it has the potential to tie scientists' hands when Ebola, MERS or another infectious disease strikes. LDTs aimed at



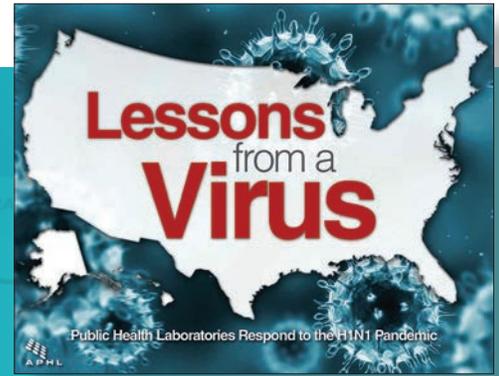
This panel was part of the 15-state exhibit for the 50th Anniversary of Newborn Screening.

emerging pathogens — developed on the front line at public health labs and CDC — allow for swift response because they free laboratories to capitalize on innovative assays and cutting-edge technologies to protect public health.

We felt it was important to make this distinction in the regulation, so we testified at a public meeting held by FDA in January 2015, advocating for greater flexibility for public health labs. When a crisis strikes, they need the freedom to respond in the most effective ways.



## SELECTED PUBLICATIONS



The five-year cooperative agreement helped to fund more than 145 publications by APHL, alone and with CDC and other partners. Formats range from books to presentations to posters, with many accessible online. Whether the audience is the public, laboratorians, public health professionals, or policymakers and public officials, the goals are sharing knowledge and tools that strengthen both public health lab systems and overall public health. The following are some examples intended to showcase the diversity of these offerings.

### Public Health Reports Supplements (2010, 2013)

Sponsored by CDC and APHL, these supplements to the journal *Public Health Reports* focused on public health laboratory systems and included editorials, commentaries and manuscripts.

### Lessons from a Virus book (2011)

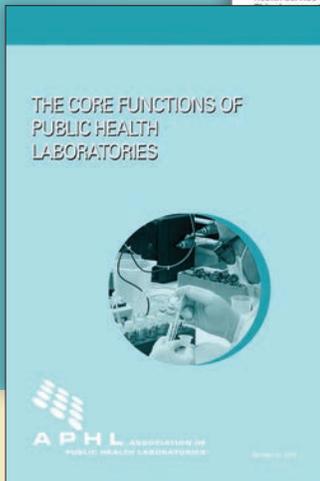
Many people name the H1N1 pandemic as the greatest challenge and finest moment in laboratory science. This book showcases the response of public health laboratories and draws out the meaning of their experiences.

### Public Health Laboratory Informatics and the LRN-C: Electronic Data Transfer Critical to LRN-C Success (2012)

APHL helped those in the Chemical Laboratory Response Network identify barriers to integrating laboratory information management systems and assisted these labs with navigating data transfer.

### A Practical Guide to Moving to a New Site for Public Health Laboratories: Making a Smooth Lab Move (2012)

As new labs are built and others consolidate and add capacity, the challenge of safely and efficiently getting into a new space becomes more common. This guide included expert advice from lab leaders as well as tools and templates.



### Biomonitoring: An Integral Component of Public Health Practice (2013)

This fact sheet gives those working with policymakers and legislators a tool and knowledge points needed to raise understanding of the crucial role of biomonitoring.

### Public Health Laboratories Leveraging Partnerships to Strengthen Preparedness & Response: APHL All-hazards Laboratory Preparedness Report (2013)

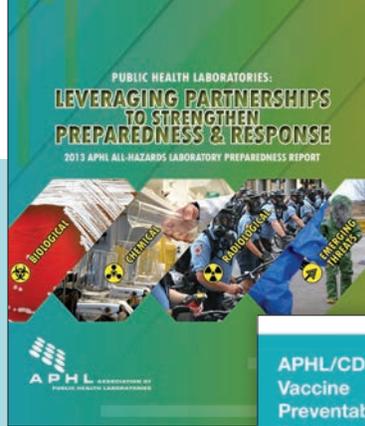
A brief, useful check-in on how the Laboratory Response Network has progressed to become the nation's premier system for identifying, testing and characterizing potential agents of biological and chemical terrorism.

### Developing a Doctoral Program in Public Health Laboratory Science and Practice (2013)

In recognition of the changing needs and increasing complexity of public health, APHL's workforce group surveyed the field and issued recommendations for developing doctoral programs.

### The Core Functions of Public Health Laboratories (2014 revision)

First adopted and published by APHL in 2000, the Core Functions standardized the state public health environment and provided an essential framework. Recognizing the importance of local labs, the 2014 revision broadened the scope to include core functions as they apply to all public health labs.



### Biothreat Agent Bench Cards for the Sentinel Clinical Laboratory (2014)

A concise and authoritative reference guide for preparedness and response, designed for use by Sentinel Clinical Laboratories and created with partners including the American Society for Microbiology.

### The LEI Policy Guide for Public Health Laboratory Test Service Sharing (2014)

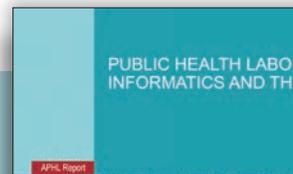
Covering issues from liability to contracts, the Policy Guide is a useful tool for state laboratories exploring test service sharing.

*“What a useful document! I’ll be sharing the LEI Policy Guide with colleagues in the national Network for Public Health Law, since the information and potential legal issues are applicable to many types of shared services.”*

— Denise Chrysler, JD, Director, Mid-States Region, Network for Public Health Law

### Health Information Technology Survey for Newborn Screening Programs, Summary Data Report (2014)

This survey and report looked at gaps and barriers to health information technology implementation in newborn screening programs — and began to shape the resources and tools that could help to close the gaps.



### In Transition: A Practical Guide to Navigating Leadership Changes in the Public Health Laboratory (2014)

With the generational change in public health laboratory leadership, labs need guidance on knowledge transfer, hiring and shifting positions. This concise booklet and online toolkit provides practical details from experts, including the Emerging Leaders Alumni community.

### APHL/CDC Vaccine Preventable Disease Reference Centers, A Year in Review (2014)

The VPD reference centers were developed to maximize efficiency for routine VPD testing in an environment affected both by increased molecular testing methods and re-emergence of these diseases. These reports look at the details and the big picture, including next steps for the centers.

### Utilization of CDC Recommendations for Good Laboratory Practices in Biochemical Genetic Testing and Newborn Screening for Inherited Metabolic Diseases: Current Status, Lessons Learned and Next Steps to Advance and Evaluate Impact (2014)

How did CDC 2012 recommendations fare in practice in US labs? This report gathered and analyzed the feedback from two discussions among key professionals.



## AFTERWORD

# BUILDING BRIDGES TO TOMORROW'S NEEDS

**W**hat will be the next threat? And where will it originate? No one has a definitive answer. That's the nature of preparedness — taking strong and sensible action with the full knowledge of what we don't know. We build bridges to an uncertain future, and these bridges function because of our agility and experience.

The LRN is one of these bridges. It was built to address bioterrorism. Recently, it was used to help handle the Ebola outbreak. Five years from now, it will be the bridge to the next level of public health needs — one we can't predict. As a result, we're monitoring some important factors: climate change and chikungunya; workplace changes and bio-safety training; chemical threats and vaccine-preventable diseases.

Regardless of which needs emerge, APHL knows its role and expertise. Our members, from laboratorians to corporate managers to clinicians, serve as guardians of quality and safety, but above all, we're bridge builders. We work across groups and spheres of interest, connecting those who need to understand the role of public health laboratories in a system that saves lives. Even when health systems aren't fully prepared, or when we're faced with a new health threat, the APHL/CDC partnership responds. When issues, threats or changes occur, we convene the experts, develop a tool or create a community of practice. In short, we take action.

As the next five-year cooperative agreement moves forward, I know I'll hear often about progress, breakthroughs and new partnerships. APHL looks forward to checking in often with all our partners and stakeholders to share what we've achieved together; continuously improving systems and practice is embedded in our mission. Thank you for this life-saving collaboration, which I hope will continue to be as healthy and productive as the past few decades of our partnership.

**Judith Lovchik, PhD**

President

Association of Public Health Laboratories

## ACKNOWLEDGMENTS

The Association of Public Health Laboratories gratefully acknowledges the support of the dedicated public health professionals at the Centers for Disease Control and Prevention who have shaped and sustained this cooperative agreement. Our collaboration relied on the hard work and creative thinking of CDC project officers, technical monitors, grants management officials and the many others who work behind the scenes to ensure APHL's success. Their efforts underlie all our achievements.

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*"I have learned what an important void APHL fills and what amazing support we receive through it. I have no doubt that the Public Health Laboratory System is better off every day due to the continuous role that APHL performs in the areas of public advocacy, training, education, workforce development, quality improvement and policy development."*

— RON PAUL, PHD  
LABORATORY SERVICES BUREAU CHIEF  
DPHHS/PUBLIC HEALTH AND SAFETY  
DIVISION, MONTANA

*"APHL contributes to a solid foundation for meeting new technical, testing and accreditation requirements, even with reduced funding and a decreased number of laboratory staff."*

— MARTINA MCGARVEY, DM  
DIRECTOR, BUREAU OF LABORATORIES  
PENNSYLVANIA DEPT. OF ENVIRONMENTAL  
PROTECTION

### PHOTOS:

Cover (main image): Graduate PhD students in an atomic absorption spectrometry room, as other PhD students (in blue anti-static lab coats) prepare their samples in a class 100 clean room (photo reprinted with permission of Wadsworth Center, New York State Department of Health, which also supplied the photo on p. 6–7); p. 2–3: Lori Dunmire, Chemist III, Environmental Services Program, Missouri Department of Natural Resources, performs an extraction in preparation for a haloacetic acid (HAA) analysis; p. 4–5: Clinical lab analyst Anna Yakos tests specimens for influenza at the State Hygienic Laboratory at the University of Iowa (photo by the State Hygienic Laboratory at the University of Iowa, which also supplied the photos on p. 8, 9, 12 and 26); p. 10, top: photo by EPA; p. 11, first column: photos by NOAA; p. 13, right, and p. 17, bottom: photos by Walter P. Calahan; p. 20, bottom: photo by Bob Rashid; p. 26: Michael Last, clinical laboratory technical specialist at the State Hygienic Laboratory at the University of Iowa, identified the first cases in the Cyclospora outbreak; Back cover: Pam Colarusso, at the Jacksonville public health lab, loads the MagNA Pure LC.



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