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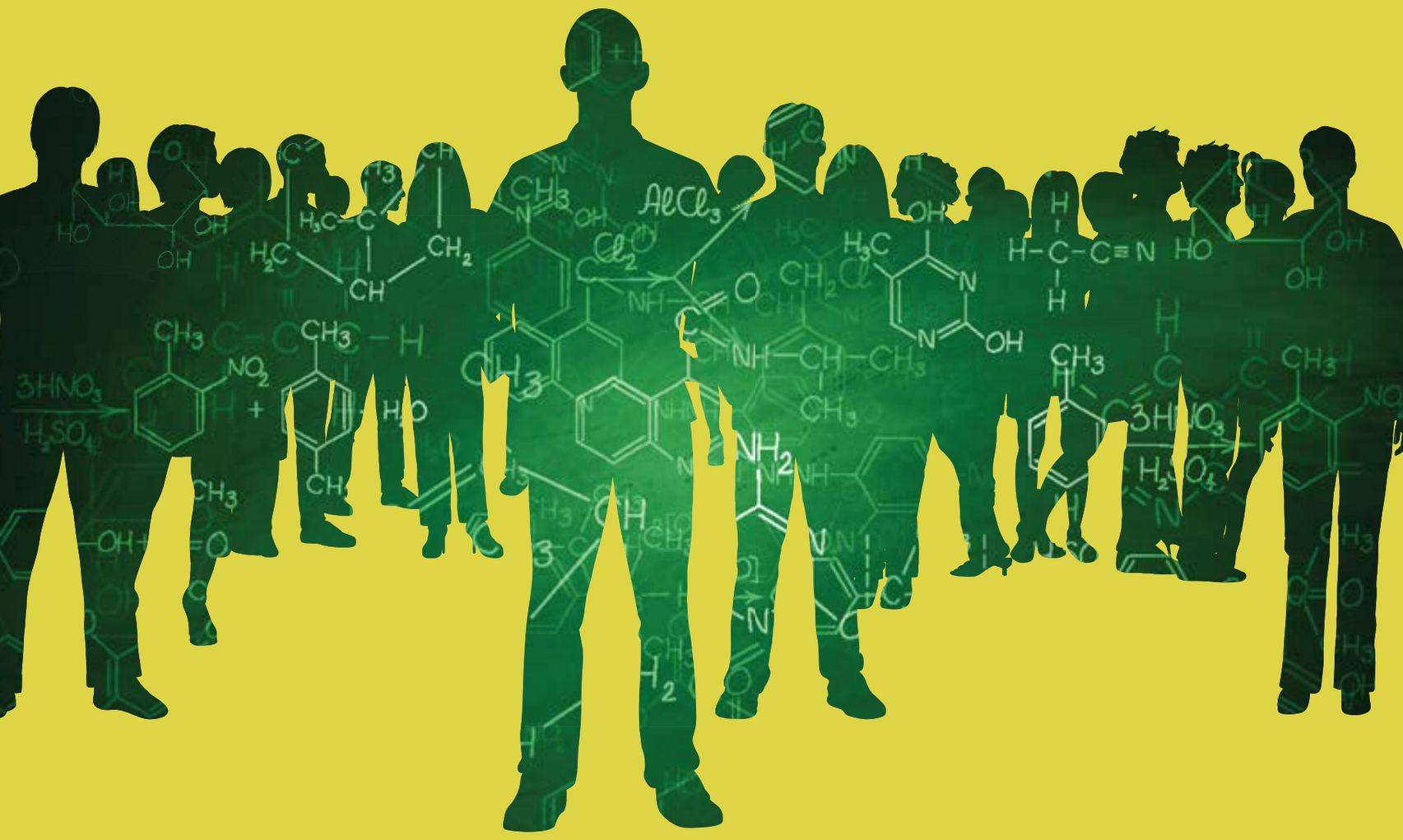

BIOMONITORING

Protecting Communities from Chemicals of Concern

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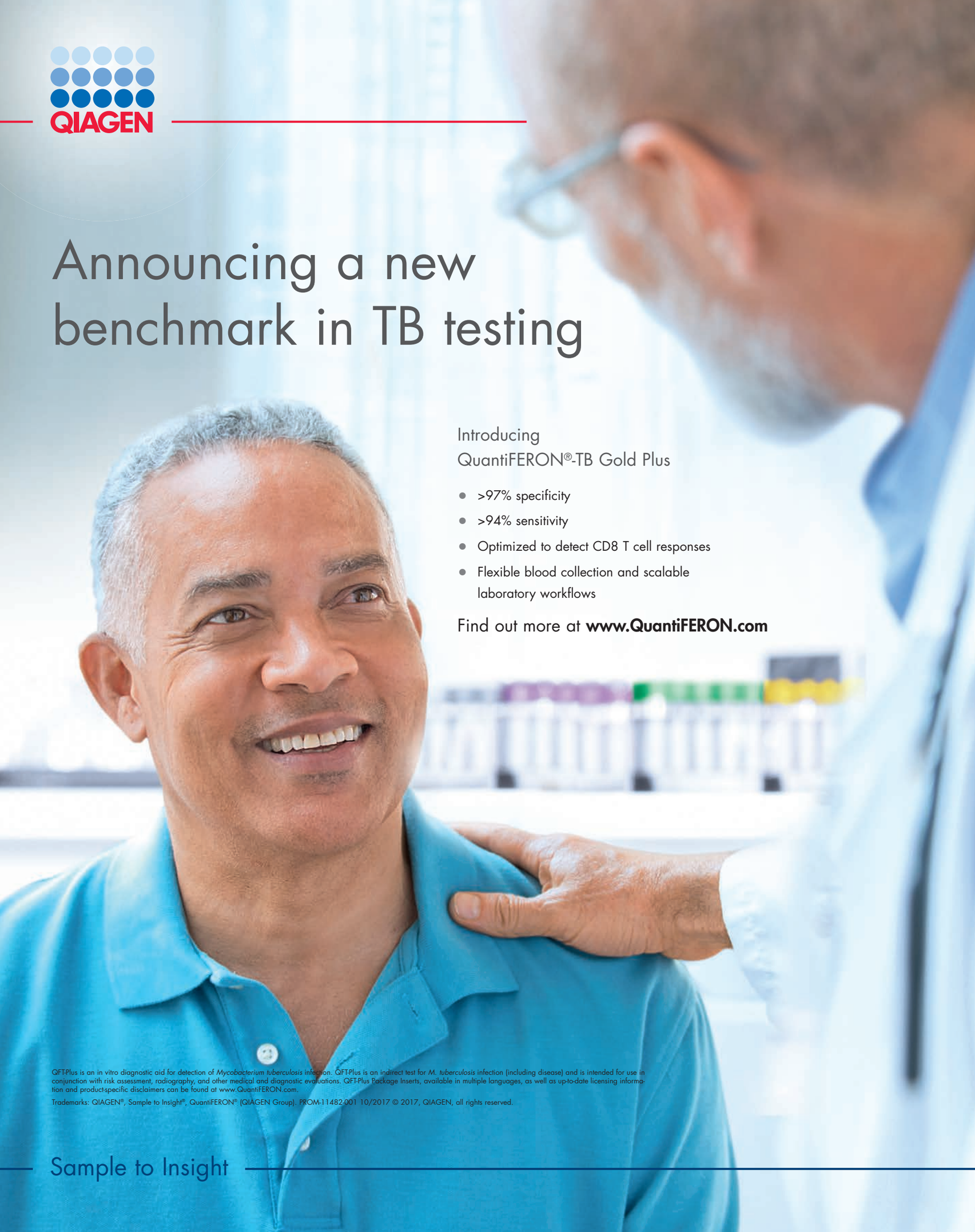

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Protecting Communities from Chemicals of Concern

In the 1970s, the National Health and Nutrition Examination Survey showed that gasoline lead was a major exposure for children and adults—a huge finding that would not have been known otherwise. Today NHANES provides a critical baseline for national background levels of exposure to other chemicals, but state efforts to test and document local, possibly elevated, exposures to the new "alphabet soup" of PFOAs and PFOSs have been little funded and lagging. Public health laboratories aim to change that.

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This publication was supported by Cooperative Agreement #5NU60OE000103, #NU60OE000103, #U2GGH001097, #1U50OE000094-01 and #NU2GGH001993 funded by the US Centers for Disease Control and Prevention (CDC); by Cooperative Agreement #U22MC24078, UG5MC27837 and #UG9MC30369 funded by the Health Resources and Services Administration (HRSA); by Cooperative Agreement #1U18FD004710 and #1U18FD006244 funded by the Food and Drug Administration (FDA) and by Assistance Agreement #83483301 funded by the Environmental Protection Agency (EPA). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC, HRSA, FDA, EPA or the Department of Health and Human Services.

To submit an article for consideration, contact Gynene Sullivan, editor, at gynene.sullivan@aphl.org.

Making the Case for Biomonitoring

When I first heard about biomonitoring early in my public health career, I was intrigued and amazed by the scientific brilliance of the concept.

It was not simply the ability of modern instruments to detect and accurately quantify the ultra-low concentration of environmental chemicals in blood or urine, remarkable as it was for any scientist. I was even more impressed by a new integrative concept—the ability to obtain the totality of environmental exposures (or more accurately "body burden") for an individual with a single test. Instead of having to come up with separate, difficult measurements of a given contaminant in air, water and food, and use complex modeling algorithms, with a ton of assumption, and end up with an approximation of what a person was exposed to, we can now tell everyone how much of a chemical they absorbed by measuring it directly in their body fluids!

While the full potential of this concept is still to be realized—and, as it always is in science, not quite as simple as it sounds—we are now closer than ever before to bringing biomonitoring to all states.

The diagnosis of lead poisoning by determining the blood lead concentration is the most widely known example of biomonitoring. Perhaps because it has been in the public health field for so many decades, it has become a stand-alone program, seemingly without a clear connection to the rest of the biomonitoring efforts. It has become automatic in many states with universal screening requirements to test children for lead and compare their level to CDC-defined reference levels without necessarily thinking this is biomonitoring. It's a blood test, one of many a doctor can order, and you get it from any medical lab. Surprisingly, it is the "emerging" contaminants with undefined reference levels and unclear health effects that make people want to know whether these chemicals might be present in their bodies.

In the last few years, there have been several instances of states dealing with the problem of drinking water wells contaminated with per- and polyfluoroalkyl substances (PFAS). These substances are normally not monitored for in drinking water, and the discovery of a significant PFAS contamination in a community usually comes as a shock to residents, and sometimes to government officials as well. The response to such recent events in New Hampshire, New York and Vermont involved biomonitoring tests provided by federal and/or state laboratories, with a great deal of anxiety and learning involved. Given the relative novelty of the approach, I was very surprised when during the discussion of planned surveillance of drinking water wells for PFAS in Rhode Island, it was one of the environmental agency officials who said "Are you going to have to do these blood tests, too"? While the tone of his question left no doubt about what he was thinking of these "blood tests"—and his hope it would not go that far—the fact that he knew this possibility existed and how it could be used left me smiling.

Over the past decade, APHL's Environmental Health Committee spent a lot of effort convincing state environmental health directors and other stakeholders that biomonitoring is a core function of public health. Position statements and fact sheets were written and distributed, but not much was happening in states without direct access to biomonitoring funds. Thanks to several years of federal funding given to states for biomonitoring efforts, more and more public health officials became conversant in this field.

This year, we have another milestone: the National Biomonitoring Network is being launched, helping link laboratories with interest in biomonitoring increase their capabilities to perform sound biomonitoring measurements and conduct scientifically valid biomonitoring studies. You can read about the Network elsewhere in this issue. ■

"Over the past decade, APHL's Environmental Health Committee spent a lot of effort convincing state environmental health directors and other stakeholders that biomonitoring is a core function of public health."

– Ewa King, PhD

Meeting the Change in Seasons… with Meetings

I'm a summer kind of person. I love the warmth, the sand and the somewhat relaxed feeling we have at APHL once the Annual Meeting is over.

But this year the end of summer was marked by a very intense hurricane season, more so than in others of recent memory. Harvey walloped Houston and coastal Texas, then Irma bounced through the US Virgin Islands and the surrounding Caribbean basin before impacting Florida. Finally, Maria hit the USVI with a one-two punch and rolled over Puerto Rico with catastrophic effects. APHL stood up our incident command structure to assist members in the affected regions, share information and provide the federal government with some situational awareness. Now we look to the rebuilding process and have sent an assessment team to San Juan. Our thoughts and prayers go out to our members and all the others suffering through the long process of response and recovery, and then to rebuilding lives and their institutions.

In the fall, things pick up at APHL. Along with the usual harbingers such as apple cider, pumpkins, leaf peeping and football games, it's meeting season, which gets me "out and about" for many opportunities to visit with members. In September, APHL held the Newborn Screening and Genetics Symposium in New Orleans. We had hundreds of participants including members from 45 newborn screening programs. I also met with our corporate members from Perkin Elmer to thank them in person for their many contributions to APHL. I took home some wonderful memories of New Orleans, but sadly I also took home the flu (I didn't get my influenza vaccination early enough).

Luckily, I rebounded quickly enough to attend a meeting on US biosecurity hosted by the National Security Staff at the White House. Now THAT was a meeting! I was honored to represent the public health laboratory community on such a critical issue of national security—biosecurity both here and abroad.

Next up were APHL's fall committee meetings. I love to learn what's going on in member labs so we can synthesize that into APHL strategy for member services and programs. So far we've hosted finance, food safety, global health, lab systems and standards, knowledge management, environmental health, and environmental laboratory science. But I also attended meetings in Geneva and Lyon with WHO to cement agreements on a Global Laboratory Leadership Program, then was back in Silver Spring for three days of leadership meetings including the annual corporate leadership council, the council of chairs, and the APHL Board meeting, where we established a new strategic map for APHL.

In early November I was on the West Coast for the California Association of Public Health Laboratory Directors meeting in San Luis Obispo immediately followed by the InFORM Conference in Garden Grove. I was happy to have our president Ewa King join me for those meetings where we met members from local labs in California and food safety-focused members from across the country. In late November, APHL will bring together all APHL field staff based on the African continent for a week-long series of training and meetings in Johannesburg. I do get to be home for three days before I leave for what I expect is the final trip of the year and that's to Nashville for the Southeast Regional Collaborators meeting, one of the regional meetings supported through the ELC program at CDC. I haven't had the opportunity to meet with members in the southeast for a very long time. Also, I'm really looking forward to experiencing the barbeque in Nashville!

"In late November, APHL will bring together many APHL field staff based on the African continent for a week-long series of training and meetings in Johannesburg."

– Scott Becker, MS

My travel schedule has been packed, but it's been exhilarating to visit our members where they live and work. I remain very thankful and proud to be member of such a close-knit community of professionals. I'm also thankful for a little "at home" time before we jump into 2018. ■

Marine Biotoxins: A Snapshot of Public Health Laboratory Testing Capabilities

by **Curtis Andrews**, microbiogist laboratory manager, Alabama Department of Public Health-Mobile; **Leanne Flewelling**, PhD, research administrator II, Florida Fish and Wildlife Conservation Commission; **Katherine Hubbard**, PhD, research scientist, Florida Fish and Wildlife Conservation Commission; **Blaine Rhodes**, director, Office of Environmental Laboratory Sciences, Washington State Public Health Laboratories; **Drew Sheehan**, microbiologist, Alabama Department of Public Health-Mobile; and **Sarah Wright**, senior specialist, Environmental Laboratories

THE FOUR MOST COMMONLY TESTED TYPES OF MARINE TOXINS:

Algae	Toxin Produced	Potential Illness	Location
Karenia brevis	brevetoxins	neurotoxic shellfish poisoning (NSP)	Gulf of Mexico, Atlantic coast up to DE
Pseudo-nitzschia	domoic acid	amnesic shellfish poisoning (ASP)	Florida west coast, Atlantic northeast coast, Pacific coast
Dinophysis	okadaic acid	diarrhetic shellfish poisoning (DSP)	OR, TX, WA, Long Island Sound, Cape Cod (MA)
Alexandrium, Gymnodinium*, Pyrodinium bahemese*	saxitoxins	paralytic shellfish poisoning (PSP)	Pacific coast, Atlantic northeast coast, FL

**not all species within this genus produce the toxins*

Source: Woods Hole Oceanographic Institute

According to the US Centers for Disease Control and Prevention (CDC), all coastal states report some level of harmful algal blooms (HABs) in their marine waters every year. About 16 different marine alga can produce a wide variety of toxins.

These toxins can bioaccumulate in filter-feeding bivalve molluscan shellfish such as mussels, oysters, clams, scallops and geoducks, harm and kill marine animals, and potentially cause severe human illnesses or death. Human exposure to HAB toxins occurs primarily by eating contaminated shellfish, though some may be inhaled via wave aerosolization. Since the toxins are chemicals and not proteins, they do not break down when shellfish is cooked, pasteurized, frozen or canned. The US Food and Drug Administration's (FDA's) National Shellfish Sanitation Program establishes guidelines to ensure that shellfish are sanitary and safe for human consumption. CDC's Division of Laboratory Sciences Emergency Response Branch develops analytical methods to help identify people exposed to PSPs and other algal toxins. CDC has supported exposure investigations within the US through analysis of clinical samples and works with state and local laboratories to expand their capacity to respond.

The economic impact of HABs can be felt through commercial and recreational shellfish harvesting activities (valued at $1 billion or more in some states) and tourism. Many coastal states have well-established shellfish monitoring programs to protect public health and safety, ensuring these industries continue to flourish.

Alabama

In 1991, the Alabama Department of Public Health began monitoring HAB biotoxins in shellfish growing areas along the Alabama Gulf Coast and at four to five regulated shellfish growing water sites. Two microbiologists routinely examine water samples microscopically to quantitate *Karenia brevis*, *Pseudo-nitzschia* and *Dinophysis*. These marine algae can bloom in large numbers and create the "red tides" found in Gulf waters.

Due to the complex nature of the only FDA-approved method (mouse bioassay) to quantify brevetoxin levels, oyster samples are sent to the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWC-FWRI). A review of Alabama's historical data suggests blooms of significant magnitude occur about every ten years and are most active in the fall months. The impact on Alabama Gulf Coast tourism and the shellfish industry is detailed in the 2015 article, "Red tide invades Alabama waters, shuts down fall oyster harvest."

WA PHL Analyst David Nguyen prepares blue mussel samples for extraction and analysis of three algal toxins (saxitoxins, domoic acid, okadaic acid) by shucking the shells from the edible portions. Photo: Shelley Lankford

Laboratory recommendations for starting or expanding a marine biotoxin program:

1. **Identify the need for monitoring.**
2. **Collaborate with and determine responsibilities among state and federal partner agencies.**
3. **Train laboratory analysts to recognize target algal species and/or perform toxin testing.**
4. **Pick the most conservative and trusted technology available to perform the toxin tests. You can stand a few false positives, but you cannot have ANY false negatives.**
5. **Develop a multi-disciplinary response plan for each potential biotoxin affecting your state's marine areas.**

Florida

Florida's state biotoxin testing program is a partnership between the Florida Department of Agriculture and Consumer Services (FDACS), the shellfish harvest area management authority, and FWC-FWRI, which provides technical support through statewide HAB monitoring and biotoxin testing. Analytes tested as part of the $2.7 million/year program include ASP, NSP, and PSP toxins. The eight-person program also partners with the National Oceanic and Atmospheric Administration and

FDA to improve testing methods, and sometimes collaborates with private institutions to develop and apply biotoxin testing assays. Recent events include a *Karenia brevis* bloom that started in fall 2016, continued through spring 2017 and resulted in commercial bivalve harvest closures by FDACS in Southwest Florida that extended through the summer. In mid-July, concentrations of ASP toxins in shellfish meat samples warranted a closure in a different area.

Washington

Washington has over 800 miles of saltwater coast capable of growing shellfish. Shellfish toxicity levels are regulated by the Washington State Department of Health Office of Environmental Health and Safety (OEHS) and PSP, ASP and DSP testing is conducted by the Shellfish Biotoxins Laboratory at the Washington State Public Health Laboratories. The laboratory has a $1.25 million/year budget, six full-time employees and analyzes 8,000–10,000 live shellfish samples per year. Shellfish are shucked, and toxins are extracted from appropriate tissues and tested. The mouse bioassay is used for PSP since it has a complicated set of toxins, and high performance liquid chromatography is used for ASP and DSP toxins since they have only one and three congeners respectively.

Analytical turnaround times of 24 hours or less not only allows the shipment of fresh Washington shellfish all over the world, but also for quick identification of unsafe harvest areas. In 2015, the biggest *Pseudo-nitzschia* bloom in history occurred along the US and Canadian Pacific coastlines, affecting untold sea mammals and birds. But because of the efforts of coastal shellfish programs and laboratories, no humans were sickened. ■

DIGITAL EXTRA:
Read how Rhode Island State Health Laboratories combatted large numbers of *Pseudo-nitzschia* algae in the Narragansett Bay.

Developing New Lab Methods to Assess Chemical Exposure in New Hampshire

by **John Schneider**, toxicologist, BiomonitoringNH, New Hampshire Public Health Laboratories

Results for a group of samples show highly elevated levels of inorganic arsenic (+3) and arsenic (+5). The lab identification numbers are consecutive, indicating that the samples are likely from the same household and that the household probably accesses a well with arsenic concentrations above the recommended safe limit for drinking water. Immediately I notify our program epidemiologists who contact the household to explain the health effects of arsenic exposure and discuss well remediation options.

Though this is not a common occurrence at the New Hampshire Public Health Laboratories, we see it occasionally since certain areas of New Hampshire have a high probability for arsenic concentrations that exceed the US Environmental Protection Agency's maximum contaminant level for well water. Residents of these areas are sometimes unaware that their well may be a source of exposure to arsenic and other contaminants.

Measuring Chemicals of Concern

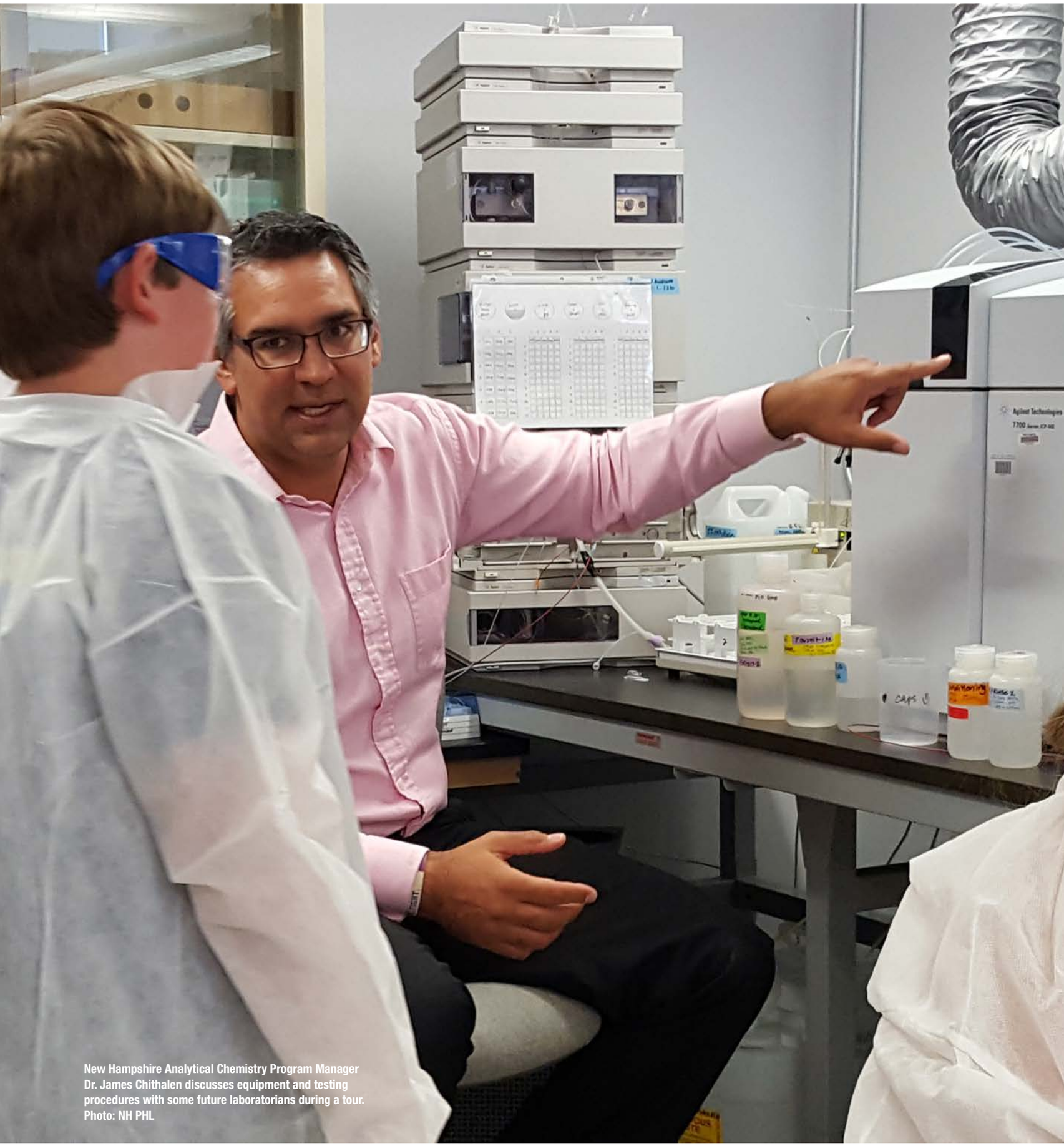
Our biomonitoring laboratory group team, BiomonitoringNH, is working on two studies to assess exposure of New Hampshire residents to specific chemicals of concern. One is a targeted biomonitoring study measuring urinary concentrations of arsenic and uranium. The other is a randomized, statewide surveillance study to measure background levels in the population of various toxic metals, pesticides and emerging contaminants such as perfluoroalkyl substances (PFAS). For the past 18 months, BiomonitoringNH has worked to develop the laboratory testing capability necessary for these studies.

BiomonitoringNH selected high-performance liquid chromatography-inductively coupled plasma-mass spectrometry (HPLC-ICP-MS) to measure six arsenic species in urine. This method can indicate whether arsenic exposure is coming from dietary sources such as seafood, or from the more toxic inorganic species found in drinking water. Many steps were involved in the set-up of this method, including making quality control materials in-house because none were available commercially. Preparation of quality controls for arsenic speciation was carried out in an oxygen-free environment for better preservation. However, the lab initially did not have a procedure to follow. All preparation and aliquoting was conducted inside the glove box once the oxygen had been removed. We did not know how well this process would work; it was a case of "let's try it and see what happens." Fortunately, the materials have already lasted much longer than if prepared in the presence of oxygen.

A Solid Foundation for Future Testing

BiomonitoringNH has ramped up testing for its targeted study and is quickly approaching its goal of analyzing 500 participants. The laboratory group also is working to validate additional methods to be used in an upcoming statewide surveillance study. These new methods all utilize liquid chromatography-tandem mass spectrometry (LC-MS/MS). Method validation for the analysis of twelve perfluoroalkyl substances in serum is currently wrapping up. BiomonitoringNH will then focus on validating two additional methods: one for serum cotinine, a marker for environmental tobacco smoke exposure, and another for a panel of ten metabolites of commonly used pesticides and herbicides.

BiomonitoringNH looks forward to applying these new methods to help state residents minimize their exposure to potentially harmful chemicals present in the environment. The initiative reaffirms the value of biomonitoring laboratories in protecting the health and safety of their communities. ■



New Hampshire Analytical Chemistry Program Manager Dr. James Chithalen discusses equipment and testing procedures with some future laboratorians during a tour. Photo: NH PHL

BIOMONITORING

Protecting Communities from Chemicals of Concern

by **Nancy Maddox,** MPH, writer

Hoosick Falls (population 3,600) is a rural river-bend village in upstate New York, about five miles from Vermont. Norman Rockwell and Grandma Moses both lived nearby, in a landscape adorned with rolling hills and the flowing waters of the Walloom and Hoosic rivers. Once upon a time, children flew down snowy village slopes on cast-off sheets of Teflon™ from the old, local Honeywell plant, according to the *New York Times*.

But that was years ago. Long before Michael Hickey's father died of kidney cancer in 2013. Before Hickey tested his widowed mother's tap water for the perfluorinated compounds (PFCs) once used to make Teflon™ here. Before the test results came back positive, with levels of perfluorooctanoic acid (PFOA) spiked above the US Environmental Protection Agency's (EPA's) "health advisory level" for drinking water—now set at 70 parts per trillion (ppt) PFOA and perfluorooctane sulfonate (PFOS) combined.

From that point onward, the feel of village life changed. Wadsworth Center Laboratories confirmed that Hoosick Falls' public water supply, serviced by an underground aquifer, was laced with about 600 ppt PFOA. The state department of health provided residents with bottled water for drinking and cooking and made plans for water treatment. And an EPA administrator wrote the village mayor, noting PFOA's "extreme persistence in the environment and its toxicity, mobility and bioaccumulation potential."

Yet, in the midst of this situation, Hoosick Falls was fortunate in one regard. Just 30 miles south in Albany, scientists at the Wadsworth Center, part of the New York State Department of Health (DOH), had been investigating PFCs for many years, looking at levels in wildlife and then newborn screening bloodspots. The scientists knew these emerging, unregulated compounds—associated in some studies with endocrine disruption, developmental problems, testicular cancer, kidney cancer, liver damage and thyroid disease—had raised concerns in other states. And they recognized the value of being able to measure the chemicals in people—part of the science of biomonitoring.

"If it's in the water, and we've been drinking it, are we exposed?"

An important early biomonitoring success story occurred in the late 1970s, when the US Centers for Disease Control and Prevention's (CDC's) second National Health and Nutrition Examination Survey (NHANES II)—the only US health survey incorporating laboratory testing on blood and urine—included lead testing for the first time. James Pirkle, MD, PhD, director of the Division of Laboratory Sciences (DLS) in CDC's National Center for Environmental Health (NCEH) said NHANES II "showed, unexpectedly, that gasoline lead was a major exposure for children and for adults—a huge finding that we would not have known otherwise." Soon thereafter, the country began phasing lead out of gasoline.

Today, NHANES tests a nationally representative slice of the population (about 5,000 people/year) for over 300 chemicals, providing critical baseline

"The November 2017 launch of the APHL/CDC National Biomonitoring Network (NBN), is envisioned as a a collaboration of biomonitoring laboratories with harmonized test methods and quality management systems that yield comparable data, accuracy and precision."

or "background" levels of exposure for US residents, overall. But state biomonitoring efforts to document local background levels and to test for suspected elevated exposures have been little funded and lagging (as have efforts to track health outcomes associated with elevated exposures to determine high-risk exposure levels).

"Is every state prepared for biomonitoring emergency response?" asked Lovisa Romanoff, MS, deputy director of laboratory sciences at NCEH. "I would say it depends on what chemical we're talking about. Lead, probably yes. PFOA, no. There are not that many labs that measure chemicals like PFOA."

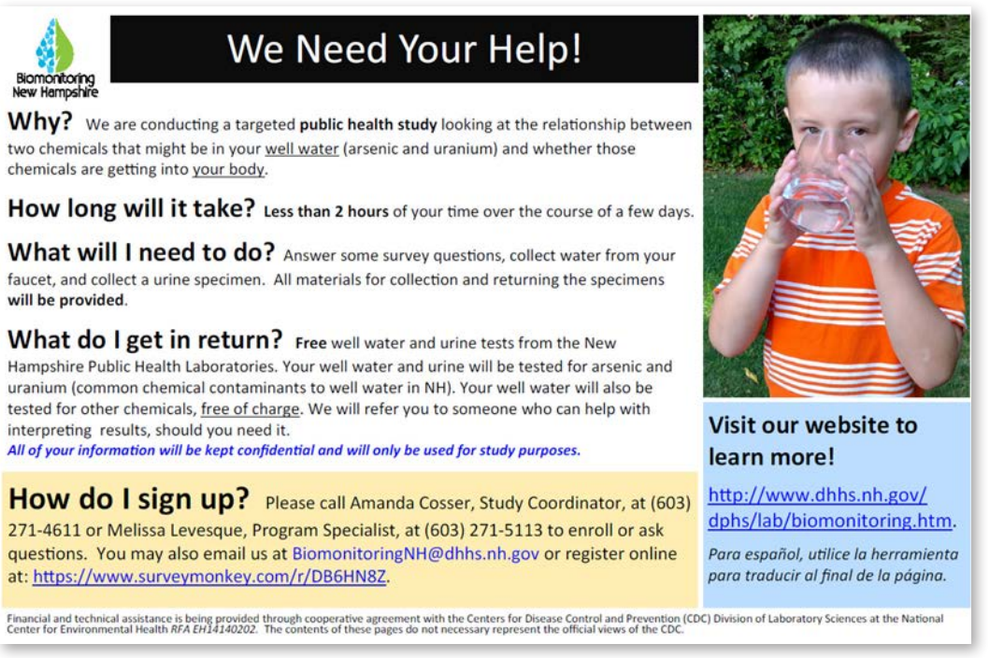
National health authorities and public health laboratory leaders would like to see this change. Said Pirkle, "It remains a main priority for me to help expand state biomonitoring programs."

One step toward that goal is the November 2017 launch of the APHL/CDC National Biomonitoring Network (NBN), envisioned as a collaboration of biomonitoring laboratories with harmonized test methods and quality management systems that yield comparable data, accuracy and precision.

Although the network has yet to formally accept laboratory members, it is already seen as a resource to help laboratories plan studies across state lines, exchange lessons learned and access subject matter expertise. So far, the network has workgroups focused on study design, laboratory methods, and the revision and expansion of APHL's 2012 *Guidance for Laboratory Biomonitoring Programs*.

Ultimately, said Pirkle, the NBN will provide "better opportunities for better science."

Ken Aldous, PhD, co-chair of the NBN Network Steering Committee and director emeritus of Wadsworth's environmental health sciences program, said as soon as Hoosick Falls residents



New Hampshire mailed these postcards to communities to recruit study participants. Photo: NH PHL

learned about the village's tainted tap water, they had the exact kinds of questions biomonitoring is designed to answer: "Are we contaminated [with PFOA]? …. If it's in the water, and we've been drinking it, are we exposed?"

New York State offered to test everyone in the village and outlying area. And Aldous secured CDC approval to utilize Wadsworth's high-tech, CDC-funded, public health emergency preparedness laboratory, part of a nationwide network of surge capacity labs, collectively known as the Laboratory Response Network for Chemical Threats (LRN-C).

Wadsworth scientists immediately set about devising a high-throughput method to measure PFOA in blood, using liquid chromatography/tandem mass spectrometry with 96-well plate sample prep. Over the following months, the NYS DOH collected specimens from about 2,900 people. Unsurprisingly, given the US background exposure documented by NHANES, almost all tested positive for the compound. More concerning, the geometric mean level for specimens from people served by village water was significantly above national background levels.

Yet Hoosick Falls was not an isolated incident. Elevated levels of PFOA were confirmed in the water supply of nearby Petersburgh, NY (about 90 ppt), and in private well water in North Bennington, VT (up to 2,880 ppt), both incidents associated with local manufacturing plants. And another PFC, PFOS (present in the foams used to suppress aircraft fires), was detected in:

- Lake Washington, the water source for Newburgh, NY (about 150 ppt). (Nearby Stewart Air National Guard Base has since been declared a Superfund site, with PFOS levels as high as 5,900 ppt.)
- Well water supplying New Hampshire's Pease International Tradeport, the site of the former Pease Air Force Base.

Because Vermont and New Hampshire had no capability to test for PFCs in human tissues at the time, Wadsworth took on the bulk of the biomonitoring for all of these incidents, ultimately testing about 7,500 specimens, so far.

Community Outreach Key to Biomonitoring

All of those interviewed for this article agree that the need for biomonitoring is likely to grow, as the extent of existing environmental health threats becomes better understood and new threats arise.

Already, companies like DuPont are using a new compound, GenX, in place of the PFOA they once used to make Teflon™, stain-resistant carpeting and other household products. The problem is, the limited data thus far available suggest GenX is associated with some of the same health problems as PFOA, including cancer.

Yet despite the multiplying threats, funding for biomonitoring remains scarce. *(See sidebar.)*

Perhaps the biggest booster has been CDC, which has funded state biomonitoring efforts since 2001, when the agency awarded planning grants to 25 state and regional programs, supporting 33 states in all. "The purpose of those awards was to task states with developing plans for what they would do with larger implementation grants," said Romanoff. But after 9/11, the follow-up funding never made it through Congress. Instead, CDC cobbled together some of its own core revenue to compete just three new awards, running from 2003-2007.

"These were smaller awards," said Romanoff. "The mass spectrometry [biomonitoring] platform is incredibly expensive. We were just not able to do what we really hoped for."

Then, in 2009, with dedicated funding for state biomonitoring, CDC competitively awarded California, New York and Washington full implementation grants, totaling $5 million/year for five years. And the agency currently supports nine states with six awards.

One of those programs is based at the New Hampshire Public Health Laboratories, where scientists are examining levels of arsenic and uranium in 500 private well water users, their well water and a comparison group of 50 public water users.

New Hampshire's groundwater is known to be at risk for elevated arsenic, owing to two sources of the heavy metal: New England's granite bedrock geology and past use of arsenic-laced pesticides on local orchards and farmland. Only

BIOMONITORING FUNDING LAGS BEHIND NEED

Funding for biomonitoring comes from five key sources.

1. CDC's National Center for Environmental Health currently supports nine states—California, Massachusetts, New Hampshire, New Jersey, Virginia and the states comprising the Four Corners Biomonitoring Consortium (Arizona, Colorado, New Mexico and Utah)—with biomonitoring grants collectively totaling $5 million annually.
2. The US Environmental Protection Agency funds CDC's Agency for Toxic Substances and Disease Registry to implement the Biomonitoring of Great Lakes Populations program, which assesses exposure to legacy and emerging contaminants in susceptible populations in the Great Lakes Basin. Currently, the program funds studies at Health Research, Inc./NY State Department of Health and the Wisconsin Department of Health Services.
3. The National Institute of Environmental Health Sciences Children's Health Exposure Analysis Resource (CHEAR) funds a network of one state laboratory (New York's Wadsworth Center), one nonprofit laboratory (Research Triangle Institute) and four academic laboratories to test children's specimens associated with National Institutes of Health biomonitoring studies.
4. Emergency state funding is sometimes available for biomonitoring after high-profile disasters, such as the 2015 breach at Colorado's Gold King Mine, which released over 3 million gallons of toxic wastewater into the Animas River.
5. At least two states—California and Minnesota—have legislatively-mandated state biomonitoring programs, whose funding varies from year to year.

Maine has a higher rate of bladder cancer than New Hampshire and, in both states, it is linked to arsenic exposure. Uranium was added to the study based on past research showing that it tends to co-occur with arsenic.

One of the most interesting aspects of the New Hampshire study is the public health laboratory's outreach to recruit participants. Amanda Cosser, MPH, the laboratory's biomonitoring program manager, said "We identified towns we want to target based on groundwater arsenic risk modeling from the US Geological Survey and picked a random set of addresses with private wells. Then we introduce the project with a postcard that gives three ways to contact us: call, e-mail or complete an online survey. If they don't respond, we follow up with a formal letter."

Additional outreach comes through the involvement of town administrators, managers and selectmen. After meeting with laboratory staff, said Cosser, "they've taken it upon themselves to advertise our study in their town letters and on their websites."

So far, 375 well water users have joined the study.

Another CDC-funded study is underway at the Virginia Division of Consolidated Laboratory Services (DCLS), under the direction of Chris Retarides, PhD, and Shane Wyatt, the lab's lead biomonitoring scientists. The focus here is two-part: (1) a surveillance survey to determine baseline, local exposures to six heavy metals and perchlorate (a naturally occurring contaminant in fertilizer and a rocket fuel constituent, linked to thyroid disease) and (2) an assessment of firefighter's exposure to toxic combustion products, including polycyclic aromatic hydrocarbons (PAHs) produced by burning wood and cyanide produced by burning plastics.

"If we see high levels of PAHs and very low levels of cyanide, we know the exposure was mostly dermal," said Retarides, since PAHs can be absorbed through the skin or inhaled, while cyanide is largely inhaled.

As in New Hampshire, community outreach is a key study component. Retarides said the researchers initially considered working through local health departments to enlist surveillance survey participants, but found health department staff to be taxed with other important duties. Instead, they chose to recruit participants at the Commonwealth's 23 community colleges, knowing that most recruits would be under Virginia's median age of 37.

New Hampshire PHL's technical advisory committee (TAC) reviews and provides feedback on a draft report package for the Targeted Arsenic and Uranium Public Health Study. Photo: NH PHL

Said Retarides, "It says on the Virginia Community College System webpage that, no matter where you are in the state, you're no more than 30 minutes from a community college.…These are commuter schools; people go there because they're convenient. And most [community college students] are exposed to the local environment and water systems."

As of late September, the DCLS team had collected over 900 urine specimens for the surveillance survey and completed analyses on about 500, with no unusual findings thus far. The firefighter study is still ramping up.

A New Frontier: The Exposome

Retarides has high hopes for NBN, which he called "a great undertaking." Having been on the periphery of efforts to establish the network, he said, "I know the people involved are a great treasure trove of knowledge. It will be a big help to states looking for survey methods, analytical methods and epidemiology and analytical chemistry expertise. [Biomonitoring] is not just about measuring samples, you have to go out and get them, and the measurements have to be meaningful."

In addition to providing information and training, network members could also perform testing for other laboratories within or outside NBN, either as part of an emergency response or to support a biomonitoring study. Aldous said, "It's not just routine testing, but testing for novel compounds that can be disseminated across the network, maybe something in commerce now that people aren't taking great notice of, but that needs to be looked at across the country."

Julianne Nassif, MS, director of APHL's Environmental Health program, said NBN will focus initially on developing technical guidance for biomonitoring programs, a membership application process and a network structure, with tiers based on a laboratory's capability and activities.

NBN leaders also plan to convene additional workgroups, to begin an initiative on quality management and quality systems, and to investigate options for where to store state biomonitoring data, such as in the EPHT Network maintained by CDC or a new, stand-alone database.

In the meantime, the science of biomonitoring continues to evolve in ways big and small. The latest buzz word in the field is *exposome*, encompassing the entire universe of one's environmental exposures from the prenatal period onward, together with all the associated biological responses to those exposures throughout the lifespan. Thanks to technological advances, particularly

> **"Biomonitoring is not just about measuring samples, you have to go out and get them, and the measurements have to be meaningful."**

in digital electronics, scientists expect to measure more and more exposome analytes in ever tinier specimens.

But it's not just scientists who are concerned with biomonitoring these days. Doug Farquhar, JD, who monitors environmental health legislation at the National Conference of State Legislatures, said the topic increasingly arises in state law: "[Historically] if I saw a couple [biomonitoring-related] bills it would stand out. This year, it's like wham! We had four states include a biomonitoring effort in their state's appropriation [MA, MN, NH, NJ,] and another six with legislation including a biomonitoring component."

Back in New York, Aldous cited one reason biomonitoring should be of interest to policymakers: program evaluation. For example, since a new water-treatment plant filtration system was installed in Hoosick Falls, water going out through the public distribution system has measured less than 2 ppt PFOA. Given the compound's three-year half-life in the human body, residents' body burden should be dropping.

A biomonitoring study to confirm that assumption, Aldous said, "would show the value of the remediation, the effort put in and the money spent to reduce the exposure."

Biomonitoring may not yet be a household word, but the concept is gaining currency, with consumers seeking out products like paraben-free make-up, BPA-free water bottles and phthalate-free pacifiers.

"People want to know more about what's in their bodies, " said Kristin Dortch, MS, CDC's biomonitoring project officer. "If they know another state tested for [a high-profile chemical], they want to know, *Why not us?*" ■

15 minutes with Patrick Breysse

by **Nancy Maddox**, MPH, writer

Patrick Breysse, PhD, CIH—a leader in the fields of environmental health and exposure assessment—assumed the directorship of CDC's National Center for Environmental Health (NCEH) and Agency for Toxic Substances and Disease Registry (ATSDR) in late 2014. Before that, the prolific researcher spent nearly 30 years on the faculty of The Johns Hopkins University (JHU), studying issues linked to adverse environmental exposures. The Seattle native is a board certified industrial hygienist. His last positions at JHU—where he also earned his PhD in environmental engineering—were associate chair for educational programs in the Department of Environmental Health Sciences, director of the Industrial Hygiene Training Program and co-director of the Johns Hopkins Center for Childhood Asthma in the Urban Environment.

Your father was a University of Washington professor whose groundbreaking environmental health studies earned him the moniker, "The Ralph Nader of the Pacific Northwest." When did your own interest in environmental health science begin?

It started in high school, sitting around the dinner table talking about things my father was working on. I did a science project on noise levels encountered around the house. My father was frequently in the news because of his work, which stimulated a lot of curiosity on my part. He was a founding member of the Department of Environmental Health at the University of Washington. Many of the issues he dealt with in the 1960s and '70s are still plaguing us today. He encouraged me to specialize in occupational and environmental health. I think that was good advice.

What have been some of your most notable, and surprising, research findings?

Research conducted with my colleagues at Johns Hopkins produced some of the first observations identifying mouse allergen exposure as an important risk factor for asthmatic children in the inner city. Unlike cockroach allergen, which isn't readily entrained into the air, mouse allergen is contained on smaller particles that can be suspended in air. I also collaborated on a number of studies looking at health effects of wildfire smoke exposure in the northeastern US coming from fires in Canada thousands of kilometers away. We detected an increase in indoor and outdoor air pollution and in hospitalizations for respiratory diseases. This finding is very relevant to what we're seeing today, with wildfires across the country. I was also involved in the earliest studies of the health impact of biomass cooking in the developing world. This is a tremendous source of morbidity and mortality, and if we want to address the global burden of disease, this is one of the biggest places to start. While I began this work at Johns Hopkins, I continue to direct efforts on this issue at CDC.

Finally, work we are conducting at CDC has helped highlight the ubiquity of exposure to perfluorinated substances in drinking water across America. Potentially hundreds of millions of Americans are exposed to these substances, which are found in consumer products, industrial emissions and firefighting foam.

What is an industrial hygienist, and how are such professionals important to public health?

An industrial hygienist is an environmental health specialist who concentrates on worker safety and health. When I was at JHU, I taught in the industrial hygiene training program and did research and consulted as an industrial hygienist. I'm very proud of being credentialed as a certified industrial hygienist. My background in industrial hygiene prepared me well for a broader career as an environmental health scientist.

You have been involved in health and exposure studies across the globe, from Peru to Nepal. What have you learned about working with vulnerable communities?

It's a challenge to work with communities anywhere in the world. Much of the burden of environmental risk is borne by vulnerable populations. No matter which community we work with, we are ethically bound to receive informed consent to participate. This requires us to explain the risks associated with data collection (e.g. blood draws for biomonitoring studies) and to communicate the results back

to participants. Risk communication can be challenging when different languages and cultures are involved. In these cases, we have to have consent forms and other materials translated into culturally acceptable languages.

There are often unanticipated complications when conducting field-based studies. We once had to delay a project because customs in the Dominican Republic impounded our sampling equipment. In another study, we suspended hair sample collection from children in East Baltimore because many of the children had hair so short we couldn't collect it. Another study involved communities in India that had a religious prohibition against cutting hair. So obviously it was unacceptable to collect hair samples from them.

As NCEH/ATSDR director, you have been involved in high-profile environmental health investigations. How important is biomonitoring in such situations?

Our goal is to prevent exposures from happening. But if they do happen, the goal shifts to assessing the extent of the exposure. In many cases, biomonitoring plays an important role in this assessment. Lead is a perfect example. We wouldn't have been able to characterize the risks during the Flint, Michigan, water crisis if we didn't have blood lead levels and national reference blood lead data from biomonitoring.

At a time when science is being relegated to a secondary position in policy circles, how can APHL and CDC help the newly launched National Biomonitoring Network grow and flourish?

The first thing is to better communicate the need for exposure characterization in addressing health concerns about existing and emerging hazardous exposures. In addition, we need to be prepared to address a wide range of possible exposures that might arise from an emergency or terrorist event. We can't possibly deal with the environmental challenges of the day without high-quality laboratory capacity.

Formalizing the National Biomonitoring Network is critical to expanding laboratory capacity to deal with the myriad of exposure challenges we face today. We hope to broaden the use of high-quality biomonitoring to increase state's ability to conduct routine surveillance, support health investigations and respond to emergencies. We want biomonitoring to be more readily available, so we can improve the quality of exposure and health assessments.

What are your ultimate goals for environmental health?

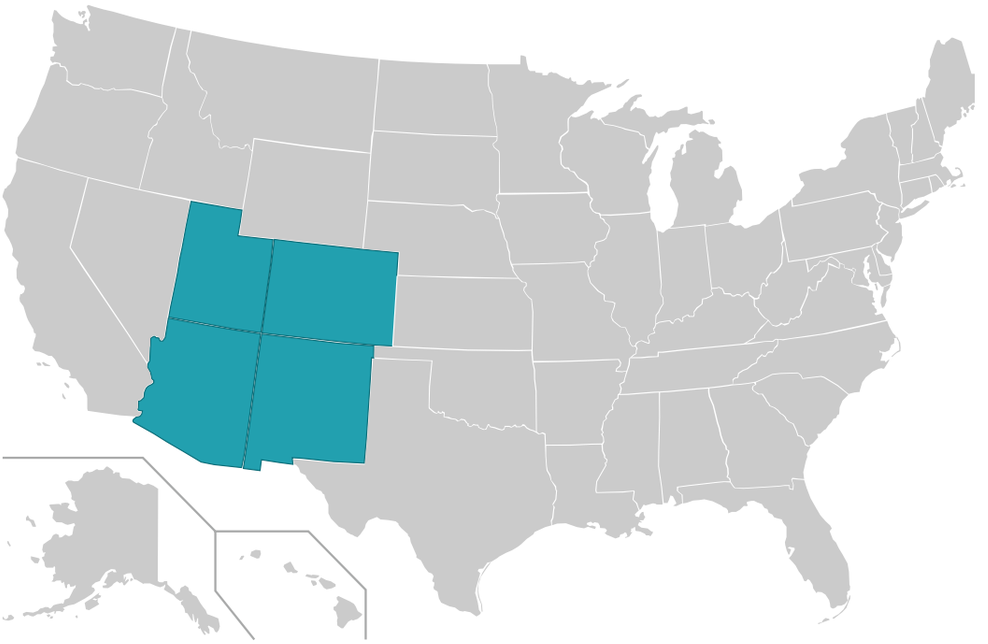
The overall goal is to anticipate, identify and prevent hazardous exposures in order to improve health and wellbeing. To do that, we need to know how and when hazardous exposures occur. This work requires a wide range of expertise, including toxicologists, clinicians, epidemiologists, engineers and chemists.

How can people limit their exposure to environmental toxicants?

We all face potentially hazardous environmental exposures in our homes, our workplaces and the communities we live in. There are often simple things we can all do to reduce or eliminate hazardous exposures in our everyday lives. But in order to do this, we must be better informed about the sources of exposure, the routes of exposure (i.e., how they get into our bodies) and the potential impacts. For example, if you have a house built before 1978, you are at risk for lead-based paint exposure. As a result, you should not renovate without taking precautions like keeping your child away from any repair work that disturbs paint and hiring a qualified contractor to do the work. In addition, you should consult with your pediatrician about blood lead monitoring to assure your children are safe. If you have asbestos in your house, simply knowing where it is, and not disturbing it, can be extremely important. Knowledge is power; knowing what's in your environment and how you might be exposed can take you a long way down the path of minimizing your exposure and reducing any possible health effects. If there are easy things you can do to lower your exposure, do them. This is prudent public health practice. ■

Leveraging Lab Capacity Toward Regional Health Concerns in the Four Corners

by **Kim Krisberg**, writer



2,4-Dichlorophenoxyacetic acid — otherwise known as 2,4-D — is the active ingredient in a variety of weed killers and one of the most common, widely used herbicides in the world. Studies in lab animals have found that high doses of 2,4-D are associated with negative heath effects. Research on human exposure is more of a mixed bag.

According to the Agency for Toxic Substances and Disease Registry, it doesn't appear that contact with small amounts of 2,4-D is harmful to people. Some studies on workers with relatively high exposure rates, such as professional herbicide applicators, have identified a possible link to cancers of the lymphatic system. Other studies found no strong evidence between 2,4-D and cancers. The US Environmental Protection Agency says there's not enough evidence to either refute or support 2,4-D as a human carcinogen, while the International Agency for Research on Cancer has deemed 2,4-D as "possibly carcinogenic" based on "inadequate evidence in humans and limited evidence in experimental animals." In other words, we need more research.

One place where research is happening is inside the public health labs of Arizona, Colorado, New Mexico and Utah, where a collaborative known as the Four Corners States Biomonitoring Consortium (4CSBC) hopes to gather new insights into environmental exposures that could impact people's health. With funding from the US Centers for Disease Control and Prevention's (CDC's) National Biomonitoring Program, 4CSBC began its work in 2014, building on the previous efforts of the Rocky Mountain Biomonitoring Consortium, of which all four states had been a member. The collaborative's day-to-day mission is to generate the data on environmental contaminants that can inform protective public health actions. It's also an exercise in optimizing public health lab capacity to measure regional environmental contaminants.

"I think this is one of the most relevant grant-funded projects we do," said Eric Petty, chemistry program manager within the Colorado Department of Public Health and Environment's Laboratory Services Division and his state's lead for 4CSBC. "It produces so much meaningful data and it's pretty unlimited regarding the number of studies we can design. There's so much out there that hasn't been looked at."

The consortium is focused on three main studies: heavy metal exposure from private well drinking water; pesticide, herbicide and phthalates exposure; and the San Luis Valley (Colorado) Children's Study, which assesses hazardous chemical exposure among children ages 3 to 13. In each state, public health labs partner with environmental health workers and epidemiologists to recruit residents who want to take part, collect water and urine samples for testing, and eventually reconnect with residents to discuss results and any health-protective recommendations. The 4CSBC labs spread out the testing responsibilities according to capacity, so as to not burden any one state. Testing results are interpreted, in part, by using baseline data from CDC's National Health and Nutrition Examination Survey.

"We have similar geological settings, we all have a legacy of mining in heavy metals, we're agricultural states, our populations can be sparse, we have common problems regarding arsenic and pesticides," said Sanwat Chaudhuri, PhD, 4CSBC's principal investigator and scientific advisor for chemical and environmental services at the Utah Public Health Laboratory. "It just makes more sense that we work together to try to solve our problems."

> **"I love biomonitoring. It's a wonderful way for the public health lab and epidemiology to work together in tackling real-world problems."**
> *— Jason Mihalic, Arizona Department of Health Services*

To date, Chaudhuri said the consortium has tested more than 900 urine samples and about 500 water samples. Labs work closely with their state colleagues in epidemiology and environmental health—or in Utah and New Mexico, with CDC-funded participants in the National Environmental Public Health Tracking Program—in determining where in the states to focus their biomonitoring efforts and what kind of data gaps the consortium can help fill. Chaudhuri added that the consortium leverages its unique work to help particularly vulnerable communities reduce their risk of harmful exposure. For example, because well water often goes unregulated, 4CSBC can help alert residents to potential contaminants, while collecting the data that allow health officials to measure changes in environmental risk.

4CSBC teams regularly share data with each other and evaluate their progress during monthly phone calls and at two face-to-face meetings each year.

"We couldn't have stretched (the CDC biomonitoring funds) across four states if wasn't for our collaborations," Chaudhuri said. "We get so much in-kind support from our environmental health and tracking partners—who else can better appreciate the need for biomonitoring data?"

On the ground, the biomonitoring collaborative not only hopes to offer new insights, but to boost capacity for more traditional public health responsibilities, such as safeguarding drinking water quality. For example, in New Mexico, about 20 percent of residents depend on drinking water sources—like private wells—that aren't regulated by either federal or state oversight. At the same time, said Heidi Krapfl, MS, chief of the New Mexico Department of Health's Environmental Health Epidemiology Bureau, the state's geology means private well water drinkers may be at heightened risk of harmful arsenic and uranium exposures. Urine uranium concentrations above a certain threshold are already a notifiable condition in New Mexico.

To better understand that risk, New Mexico's 4CSBC team partners closely with the state's environmental health tracking program to collect and analyze water samples. To date, according to Barbara Toth, PhD, MS, epidemiologist supervisor at the New Mexico Department of Health, the biomonitoring effort in New Mexico has collected about 150 household water samples for heavy metal testing and just more than 200 urine samples for heavy metal and phthalate testing.

"Tracking is about exposure and health outcomes," Toth said, "and biomonitoring is the method by which we understand that exposure."

Krapfl added: "Those three legs of the stool—tracking, biomonitoring and private well water testing—provide a strong foundation for supporting public health actions in the state. You really need all three."

One of the 4CSBC's main projects—the San Luis Valley Children's Study—is focused on a specific community in Colorado. According to Petty, the 4CSBC lead in Colorado, the area has a particularly shallow water table and has a history of agricultural use. To get a clearer picture of the risk, 4SCBC is partnering with a researcher from the University of Colorado who conducts the field work and collects samples, while the Colorado public health lab does the testing. To date, Petty said the lab has tested more than 200 urine samples and 100 water samples.

"The consortium is a great way to consolidate resources," Petty said. "Ultimately, there's so much information these studies can provide in the future."

Well water quality is a priority issue in Arizona too, according to Jason Mihalic, chief of the Chemistry Office at the Arizona Department of Health Services and the state's principal 4CSBC investigator. Any Arizona resident who uses well water can take part in the biomonitoring effort. But to sweeten the deal—and attract as many participants as possible—the Arizona lab offers a free water analysis for 19 metals using an EPA-approved method. The Arizona 4CSBC effort is also partnering with existing well water programs at the University of Arizona to spread word about the biomonitoring effort.

For many of the compounds included in 4CSBC testing—such as pyrethroid insecticides and phthalates—biomonitoring will produce the first regional baseline data available, Mihalic noted.

And more precise data means public health can be even more effective in protecting communities against potentially harmful exposures.

"I love biomonitoring," Mihalic said. "It's a wonderful way for the public health lab and epidemiology to work together in tackling real-world problems." ■

DIGITAL EXTRA:
Read more about the Four Corners States Biomonitoring Consortium.

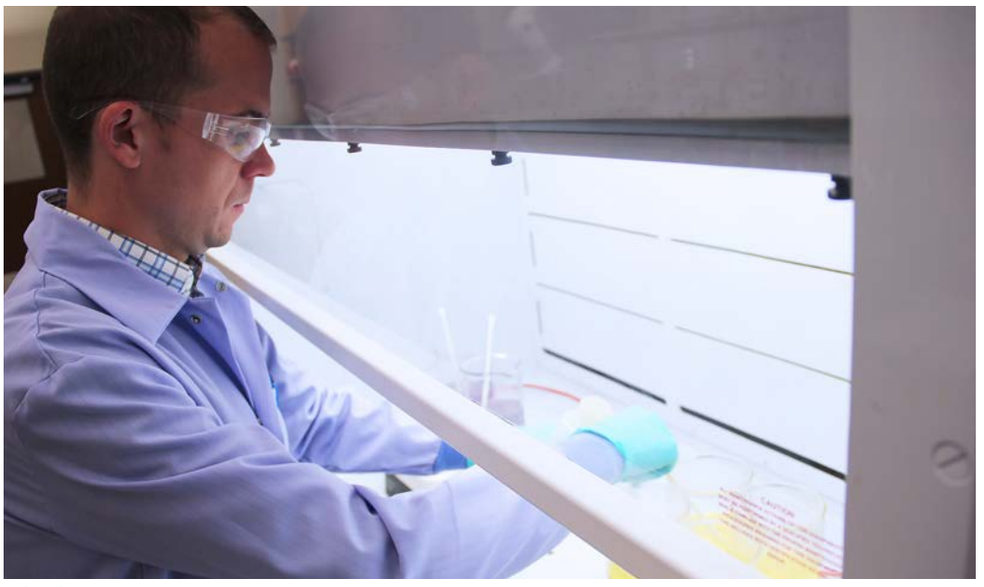
Iowa's State Hygienic Laboratory Tackles Radioanalytical Challenges for Lead-210

by **Dustin May**, radiochemistry supervisor and graduate researcher, State Hygienic Laboratory at the University of Iowa

Even though lead's adverse health impact on human health is commonly recognized, the health impacts of radioactive lead isotopes are often ignored and overlooked. Lead-210 (^{210}Pb) is a radioactive form of lead that can be found naturally in earth sediments, rocks that contain natural uranium, ground-derived water and in air as a decay product of radon gas. Radon is a cancer causing gas and is the second leading cause for lung cancer according to the American Cancer Association. Adverse health impacts of ^{210}Pb include the carcinogenic effects of its beta particle emission, as well the alpha particle emission of its decay product, Polonium-210 (^{210}Po), which is extremely hazardous when inhaled or ingested. It is, therefore, helpful to actively monitor for the environmental contaminant ^{210}Pb. However, the determination of ^{210}Pb in complex aqueous solutions, such as hydraulic fracturing flowback fluid, is a common radioanalytical challenge in environmental science.

Researchers at the State Hygienic Laboratory (SHL) and University of Iowa have developed a new alternative method to measure ^{210}Pb by using the electron-capture, gamma-emitting isotope Lead-203 (^{203}Pb) as a yield tracer. The new method takes advantage of the relatively short half-life (52 hours) of the ^{203}Pb isotope and its pure gamma emission to circumvent interferences from stable lead and alkaline earth metals in the chemical separation and enables the accurate measurement of ^{210}Pb in environmental samples at trace levels.

Laboratory supervisor Dustin May analyzes drinking water for gross alpha particles as part of community water system regulatory compliance. Photo: University of Iowa



"As with all science, and especially with environmental science, we must actively ask questions and do the work to determine the potential impacts of contaminants in the environment. Research on these potentially important environmental hazards is critical to developing evidence-based, common sense regulation to protect public health."

—Dustin May, radiochemistry supervisor and lead for research projects

Alpha-emitting radionuclides are co-precipitated with iron hydroxide using a color indicator, bromocresol purple, and a strong base, ammonium hydroxide. Photo: University of Iowa

Traditionally, yield for ^{210}Pb measurements is determined utilizing the recovered mass of a stable lead carrier. This approach, while very simple, is susceptible to interferences from endogenous stable lead and high levels of alkaline earth metals such as barium and strontium. Additionally, mass-based yield approaches limit the counting methodology to gas-flow proportional counting or require the use of inductively-coupled plasma-mass spectrometry (ICP-MS) analysis for yield determination. The new method developed at SHL eliminates the need for a stable lead carrier entirely, while allowing for the use of variable counting methodologies, including liquid scintillation counting. This additional flexibility can allow for simpler calibration and counting procedures utilizing liquid scintillation counting (LSC).

Besides offering the full spectrum of radioanalytical testing services to support the public health community, the SHL's radiochemistry department is leading research efforts to answer important questions such as hydraulic fracturing's impact on our environment, as well as the potential impact of less well-understood radioactive isotopes (such as ^{210}Pb and ^{210}Po) on public health in public and private drinking water. These radioactive isotopes are not routinely monitored in drinking water, and their prevalence in public and private drinking water has not been widely studied; SHL and the University of Iowa researchers are currently undertaking several studies examining the distribution of these radioactive materials in drinking water. ■

Tennessee Tracks Prevalence of *Trichomonas vaginalis* and *Mycoplasma genitalium* Infections

by **Michael B. McWilliams**, supervisor, Knoxville Regional Laboratory, Tennessee Department of Health Division of Laboratory Services; **George J. Dizikes**, PhD, HCLD/CC(ABB), director, Knoxville Regional Laboratory, Tennessee Department of Health Division of Laboratory Services; and **Richard S. Steece,** PhD, D(ABMM), assistant commissioner and laboratory director, Tennessee Department of Health Division of Laboratory Services

In a poster presented at the 2017 APHL Annual Meeting, we described a recent study that examined prevalence of infection by two sexually-transmitted organisms that we believe will become increasingly important in coming years. Both of these organisms, *Trichomonas vaginalis* (TV) and *Mycoplasma genitalium* (MG), were more prevalent than we had initially anticipated, which is of grave concern since they are associated with potential health risks.

Study Parameters

The study was conducted by examining samples from 1,000 women living in eastern Tennessee which had initially come into county public health laboratories with a physician request for chlamydia (CT) and gonorrhea (NG) screening. We subsequently de-identified and analyzed all of these samples using the Aptima® TV Assay, a nucleic acid amplification test (NAAT) available from Hologic, Inc. While there is no FDA-cleared assay to diagnose MG, our laboratory used analyte specific reagents (ASRs) available from Hologic to develop a nucleic acid amplified test to validate for the qualitative detection of MG.

Both tests were run on Hologic's Panther system. Our test was straightforward and resulted in a reliable, accurate test that allowed us to conduct this study. In contrast to the traditional wet-mount tests commonly used in many laboratories for identifying TV, a number of studies[2-7] indicate that NAATs are more sensitive. In addition, we found the Aptima TV assay to be less labor-intensive.

The majority of the samples (785) were from urine, but 192 were endocervical swabs and 23 were vaginal swabs. The samples were obtained from women ages 20 to 62, with the majority (632) from women in the 20-35 age group.

Study Results

We found an overall prevalence of TV and MG to be 7.6% and 9.7%, respectively. As has been previously reported,[1] the incidence of TV was highest in the population of women past the age of 35 (12.5%). The reasons for this increase, as well as the potential health implications, remain unknown. Results indicate the highest prevalence of MG (11.4%) in the 20-35 age group. In comparison, we observed an overall prevalence of chlamydia infection of 8.9%, with the highest rate in women under age 20 (11.7 %), and prevalence of gonorrhea of 2.2%, with highest prevalence (2.5%) in women aged 20-35.

Rates of co-infection were determined to be 1.2% for both TV and CT and 1.8% for both MG and CT. Women with three or more infections were present at less than 1% for each of the potential combinations examined (CT+NG+TV; CT+NG+MG; CT+TV+MG; NG+TV+MG; and CT+NG+TV+MG).

Implications for TV and MG Prevalence

Infections with multiple sexually-transmitted organisms have been commonly reported and would be expected given their shared risk factors and the deleterious effects any one of these organisms may have on host defense. What was surprising were the relatively high number of TV and MG infections in these women, which in some age groups rivaled or even surpassed CT prevalence. CT infection is known to have serious adverse health impacts, including pelvic inflammatory disease and infertility. Since the long-term effects of MG are unknown, its prevalence in the population may warrant an investigation of these effects. A secondary problem surrounding MG is that while symptoms can mimic CT, a relatively large number of infections are resistant to CT antibiotics; it is therefore imperative that the causative agent of infection be identified so as to not exacerbate this resistance. The surprisingly high prevalence of TV, particularly in older women, raises the question of whether or not TV should be considered a reportable disease in the US. ■

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From the Great Lakes to Lake Victoria: Strengthening Microbiology in Uganda

by **Marty K. Soehnlen**, PhD, MPH, section manager, Microbiology and acting director, Infectious Disease, Michigan Department of Health and Human Services Bureau of Laboratories

Marty Soehnlen (center) and the CPHL Microbiology group

The pull of public health is strong for so many laboratorians—no matter where we are from. But after almost 22 hours of travel and a late night drive, I oscillated between exhaustion and exhilaration thinking about the project ahead. With the support of the State of Michigan, I was ready to begin a four-week stay in Uganda to assist APHL's Global Health Program in setting up microbiology and molecular testing laboratories in Kampala's new Central Public Health Laboratory (CPHL).

Different, Yet Familiar

The late night arrival and hour drive from the airport in Entebbe to Kampala allowed me some time to soak in new sights, sounds and contrasting smells—a mix of diesel fumes from cars and clean air of farmlands. It provided me with the perfect image to describe this country of extremes: unparalleled beauty and friendliness among hard economic conditions. And yet, the smell of fresh waters along the edges of Lake Victoria reminded me of home near the Great Lakes. I treasured the drives from the hotel in the central part of Kampala to the laboratory which is along the swamplands of Lake Victoria. I also appreciated the times at the outdoor group lunches where I would hear the staff tell me stories of each of the unique villages and cities they grew up in. It reminds me how similar we all are to one another despite great distances.

Getting To Work

The first day was a whirlwind of lab tours and learning about staff capabilities, but it was very clear that staff were thirsting for additional knowledge and recommendations. Early work concentrated on developing plans to bring CPHL up to standards that would allow application for international ISO accreditation by the end of 2017. While the system's foundation was well-prepared for the accreditation process, it was time to start thinking of system improvements and moving testing capabilities forward over the next three years. Plans were developed for expanding media production, developing capability to test for pathogens from environmental specimens, expanding the clinical service offerings from both traditional culture and molecular methods, and developing partnerships for training programs with the country's health care facilities.

Training staff from the ground up is challenging, but offers many benefits. Microbiologists often don't have the chance to physically set up a thermocycler or gel electrophoresis units for PCR, an exercise that they enjoyed. They also learned about unidirectional workflow, cross-contamination prevention, programing and loading both a conventional and real-time thermocycler, and casting and loading conventional agarose gels. To facilitate planning for molecular testing at CPHL, I wrote a series of standard operating procedures to serve as templates. This allowed for the start of training on molecular workflows and gave CPHL staff a look at things to come. The teams learned about development of validations and verifications for new assays, safe and effective use of personal protective equipment (PPE), spill cleanup steps, and safe and effective use of biological safety cabinets.

Each staff member displayed an unbridled enthusiasm to expand CPHL's capabilities to help the people of Uganda. At the end of four weeks, I knew that I had made lifelong connections and gained even more life experience than I am able to share. ■

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Curriculum Upgrade Comes to Laboratory Medicine at the University of Sierra Leone

by **Isatta Wurie**, PhD, senior technical consultant; Professor **Onike Rodrigues**, deputy vice chancellor, University of Sierra Leone; **Esther Vitto**, laboratory program support, Global Health; **Mohamed Fofanah**, associate specialist, Administration and Finance, Global Health; and **Palmira Mangae**, associate specialist, Global Health

Sierra Leone faces a shortage of qualified laboratory scientists capable of detecting outbreaks and responding to public health events. In July 2017, APHL, under the leadership of the University of Sierra Leone College of Medicine and Allied Health Sciences (COMAHS), facilitated a review and harmonization of the laboratory science curricula to improve the capacity, quality and number of the country's laboratory scientists.

Collaboration in Freetown

The review was conducted in Freetown, in collaboration with CDC Sierra Leone, Ministry of Health and Sanitation, the Pharmacy Board and Kings College Partnership. The group discussed ways to upgrade the 2014 curricula for Diplomas, Pharmacy, Bachelors of Science (BSc), Bachelors of Medicine (MBBS) and Medical Laboratory courses to a unified format. Objectives included:

- Implement the single pre-medical or access year proposed in a previous curricula review exercise
- Draw up course-credit "modular" curricula for the basic and pre-clinical years
- Introduce general studies into the pre-medical curricula
- Streamline curricula to include only relevant materials
- Improve students' practical experience
- Update the curricula to reflect the current needs of the country and global health lessons

At the end of the five-day intensive, all participating departments adopted the proposed modular credit system. A General Studies module—covering communication and computer skills among others—was introduced to the Pre-Med and Year One BSc Laboratory Science Course.

The updated curricula led some departments, such as Basic Medical Sciences and Community Medicine, to downsize their course offerings. The pure sciences, notably Chemistry and Chemical Pathology, downsized theoretical aspects but increased practice sessions. There is still progress to be made, especially in the quantification of stocks for practical sessions.

Next Steps

The upgraded curricula must be validated by the University Curriculum Committee and other stakeholders, and approved for implementation by the University Senate. It is hoped that COMAHS will have an approved, printed curricula for the 2018-2019 academic year. ■

Improved Sample Transport System Increases Access to Viral Load Testing

By **Lydia Tongowona**, laboratory mentor, APHL Zimbabwe Trust; **Levi Vere**, laboratory quality monitoring manager, APHL Zimbabwe Trust; **Sadaf Chaudhry**, manager, Global Health; and **Haley Rademacher**, associate specialist, Global Health

APHL, working with Ministry of Health and Child Care in Zimbabwe, has launched a new specimen transport system to strengthen the country's viral load (VL) testing. The new transport system supports implementation of a national five-year HIV VL testing plan created to help the country meet UNAID's 90-90-90 target. The ambitious plan aims to achieve 40% VL coverage for patients on HIV treatment in 2017.

APHL began in 2016 by deploying VL testing platforms at six provincial laboratories across the country. Because the platforms use blood plasma for testing, it became crucial to deliver high quality whole blood specimens that had been stored and transported properly in the required cold chain. As demand for VL testing services increased with the testing ramp-up, it became clear that Zimbabwe needed an efficient and effective system that could transport specimens from point-of-care sites to VL testing laboratories within 24 hours.

"Hub-and-Spoke" Model

APHL and its Zimbabwean partners developed a "hub-and-spoke" specimen transport system model covering all health facilities supported by PEPFAR, including 585 priority sites in 36 of the country's 60 districts. Level II laboratories at district hospitals in the 36 districts serve as the "hubs" of the system. They receive whole blood samples from nearby point-of-care sites, and prepare and store samples before forwarding them to a provincial VL laboratory. Point-of-care sites at clinics and rural health centers in the districts act as the "spokes."

This "hub-and-spoke" system has brought laboratory capacity closer to sample collection sites, allowing specimens to be delivered to a laboratory that can process them within 24 hours of collection. As an added benefit, APHL has established laboratory quality management systems at 25 of the 36 hubs.

Motorbikes Increase Access to Testing

Each hub laboratory receives a mentorship visit to identify capacity and needs, define acceptance and rejection criteria for viral load samples, and implement information systems for accurate maintenance of specimen referral information. The laboratory also receives a motorbike used to pick up specimens from point-of-care sites. Motorbike riders receive fuel, uniforms, registration and licensing, comprehensive insurance, and payment for time spent in transport, as well as support for maintenance and servicing of the vehicles.

Remarkable Results in Less than a Year

Deployment of the new specimen transport system has shown remarkable results. In less than a year, over 90% of the PEPFAR priority sites have transported VL samples to their nearest provincial laboratory; VL testing has increased from around 5% to over 35% of patients in PEPFAR priority districts, and the rejection rate for samples has stabilized below 2% across all sites. ■

"In less than a year, over 90% of the PEPFAR priority sites have transported VL samples to their nearest provincial laboratory; VL testing has increased from around 5% to over 35% of patients in PEPFAR priority districts, and the rejection rate for samples has stabilized below 2% across all sites."

APHL mentor Lydia Tongowona (left) hands over a motorbike to transport officer Richman Mleya of Matebeleland North Province

Building Lab Capacity in Africa: The Democratic Republic of the Congo

by **Melissa Warren**, senior specialist, Influenza

The DRC team works together at the Influenza Laboratory Mentorship Program during the July 2017 kickoff meeting in Kigali, Rwanda. From Left: Hugo Kavunga, Norma Tavakoli and Edith Nkwembe

APHL TRAINING ACTIVITIES

Through its global health and scientific programs, APHL supports a wide range of training activities worldwide. While some engagements are relatively long-term, others, such as discipline-specific training workshops, may run only one week. Regardless of duration, all APHL trainings aim to cumulatively build capacity for laboratory testing in targeted regions.

In 2017, APHL delivered four regional infectious disease-related trainings in Africa, all of which were attended by DRC:

- Packaging and Shipping for Respiratory and CSF Specimens – Uganda
- Influenza Virus Isolation – Senegal
- Zika and Yellow Fever Laboratory Diagnostics – Uganda
- WHO Laboratory Quality Stepwise Implementation tool – Rwanda

Recently emails shot back and forth through cyberspace with introductions between Albany and Kinshasa:

> *"I'm glad to work with you once again, [the] first time was in 2011 if my memory is good!"*

> *"Excellent memory! You are correct we met in May 2011. I look forward to seeing you again in the future."*

These messages between an APHL consultant, US Centers for Disease Control and Prevention staff and the National Institute Biomedical Research (INRB) of the Democratic Republic of the Congo (DRC) marked the beginning of the APHL-CDC Influenza Laboratory Mentorship Program in Africa. Designed to build capacity to detect a novel human influenza infection, the program will operate in the DRC and in nine other African countries. Developing this capacity is critical to global preparedness and rapid response planning, and particularly in Africa, where flyways bring birds from Europe and Asia, creating the potential for movement of avian influenza. The prospect is a major concern for public health officials.

The new program will assign a mentor to guide each African laboratory toward its goals. At the INRB, which is working to improve quality management and to meet the World Health Organization terms of reference for National Influenza Centers requirements, the mentor visited the country in 2011 for an influenza laboratory capacity review assessment and met the local CDC staff, who remembered the encounter from six years earlier. Such reconnections are becoming common given the breadth of APHL's activities in Africa.

The email exchange between APHL, CDC and the INRB ended in a discussion of logistics for an upcoming conference call. How would the INRB be dialed into the call? The question was a humbling reminder of the obstacles confronted by international partners in their daily work. A call that would be a simple task in many parts of the world is not so simple in the DRC and other countries with limited infrastructure. This makes progress at laboratories in these countries all the more impressive. ■

PHLs and AMD: A Technology Match in Atlanta and Nationwide

by **Christin Hanigan, PhD**, senior specialist, Advanced Molecular Detection

Public health laboratory (PHLs) applications of advanced molecular detection (AMD) technology have burgeoned over the past four years, and this year's AMD Day, held September 25-26 in Atlanta, showed how far they have come. In addition to detection of foodborne diseases, PHLs are using AMD technologies to detect vaccine preventable diseases, respiratory diseases, antibiotic resistance and more.

Beginning as a half day, US Centers for Disease Control and Prevention (CDC)-only event with poster presentations, AMD Day has evolved to two full days of presentations and discussions that bring together state and local PHLs, industry partners and CDC scientists. While it retains its focus on poster presentations, scientific exchange and development of laboratory collaborations, as of 2017, AMD day now includes oral presentations in multiple formats.

Notable among these was the IGNITE session, which challenged speakers to tell stories of their work in only five minutes with 20 slides. Dave Boxrud of the Minnesota PHL won kudos for his account of the 2016 *Legionella* outbreak in Hopkins, MN, which he told from the perspective of "Legionella Larry" who loved the cooling tower he found on Airbnb and was frustrated by the public health laboratory that found him out and stopped his fun.

At another session, four laboratorians discussed the implications of AMD technology for the laboratory workforce. One of the workforce needs related to the implementation and use of AMD technology is having bioinformatics capabilities. Training and placing bioinformaticians who can interpret the voluminous and complex data generated by AMD technologies is a top priority at PHLs. Yet bioinformatics is a relatively new field and even newer for PHLs.

Poster presenters wait in line for their chance to speak about their work...in one minute or less. Photo: CDC

While PHLs have become creative in building bioinformatics capacity, the APHL/CDC Bioinformatics Fellowship offers an alternative worthy of consideration. Since its inception four years ago, the program has enrolled 24 fellows, many of whom remain in public health. Thirteen presented projects at AMD Day. Seven fellows from the most recent class attended; one presented work conducted at the Virginia Division of Consolidated Laboratory Services prior to the fellowship. ■

Building a Digital Bridge

by **Rachel Shepherd**, associate specialist, Informatics

In an immense collaboration between public health entities, systems vendors, public health agencies and healthcare providers, APHL has joined a national effort to develop a systematic, widespread and sustainable approach to using national electronic health record data to improve public health surveillance. This "Digital Bridge" requires coordination from all facets of public health, with the ultimate goal of revolutionizing the way healthcare providers and public health jurisdictions communicate.

A Solid Foundation

Currently, when someone visits their healthcare provider and displays signs of a notifiable condition—pertussis, for instance—the provider must report the suspected case to the health department, where that data is tracked for outbreak prevention. This reporting process is done manually through a series of forms filled out and submitted by the provider. Through electronic case reporting, the Digital Bridge intends to convert this type of one-directional report into an automated and multifaceted bi-directional dialogue.

To start, systems vendors are working with healthcare providers to enhance infrastructure so that when a physician updates a patient's chart, their electronic health record is automatically updated and compared with a set of trigger codes. The trigger codes alert the system to generate and electronically send an electronic initial case report (eICR), which includes patient data, signs and symptoms, and additional information on why this suspected case is of interest to public health. The eICR is then sent through the state's Health Information Exchange or other existing networks like DirectTrust, or eHealth Exchange, into the APHL Informatics Messaging Services Platform (AIMS). AIMS houses CSTE's Reportable Condition Knowledge Management System (RCKMS), which looks at all eICRs and decides if they are reportable and to what jurisdictions.

Traffic Control

Once the initial case report is received in AIMS, RCKMS analyzes the address information in the report to determine which public health agency or agencies the report could be reported to.

AIMS is a secure, cloud-based environment in which public health agencies can transport, validate, translate and route their electronic data.

DIGITAL BRIDGE PARTNERS:

- Allscripts
- ASTHO
- Cerner
- CDC
- CSTE
- Deloitte
- Epic
- eClinicalWorks
- Kaiser Permanente
- Meditech
- NACCHO
- ONC Health Information Technology
- Partners Health Care
- Park Nicollet
- PHII

RCKMS evaluates the report against the associated jurisdictions' reporting guidelines to confirm if it is a reportable event, and if so, for what condition. While jurisdictions specify their own unique guidelines for reportability, they can also author guidelines about communication back to the physician or provider, which could include a suggested course of action to the provider for a certain condition, next steps for patient safety, outbreak guidance, or it may request additional information. This reportability response, created by AIMS and RCKMS, is also sent to the appropriate jurisdictions for epidemiologist review.

This expanded communication and exchange of information will improve patient health and prevent the spread of communicable diseases with early intervention. Healthcare providers will be able to submit eICRs at a faster pace, as much of their existing paperwork will be automated from the moment they update their patients' charts.

Revolutionizing communication for public health in the digital age is a colossal undertaking that requires true partnership, the development of a standardized legal framework, investments in infrastructure and technology, and significant governance. But if public health comes together to exchange critical surveillance data faster, lives can be saved and epidemics can be avoided. ■

AIMS Portal Solutions in Action: More Than Just Data Exchange

by **Michelle Meigs**, manager, Informatics

To be impactful, public health data needs to get into the right hands at the right time and place. This has never been more evident than in the Antibiotic Resistance (AR) Laboratory Network (ARLN), where member laboratories are charged with detecting existing and emerging types of antibiotic resistance across the nation, and ensuring that local and federal experts have the timely information they need to combat these threats.

As the ARLN launched and public health laboratory AR testing capability grew, it was clear that support for informatics solutions had to evolve at the same time. Under the guidance of the US Centers for Disease Control and Prevention's (CDC's) AR coordination team, APHL's Informatics program was about to embark upon an exciting journey.

There were two problems to solve. The first was how to get 55 public health laboratories to report standardized AR laboratory data for a number of different pathogens to a multitude of CDC Programs. The second was how to enable efficient ordering and timely resulting for carbapenem resistant Enterobacteriaceae (CRE) colonization testing at the regional public health laboratory level.

The answer to both was a portal. The word "portal" has been bouncing around the informatics world for some time, but in the case of the ARLN more precision was required.

ARLN's Approach

To support reporting on a national scale, the ARLN reporting portal was developed and deployed on the APHL Informatics Messaging Service (AIMS) Platform. The reporting portal was designed to capture critical AR data from public health laboratories, map it into a database and allow CDC programs to download and import these data into their systems.

To support CRE Colonization Test order and Resulting with a two-day reporting turn-around time requirement, APHL competitively selected a commercial, off-the-shelf solution called "Lab Web Portal." This unique solution is a fully-realized web portal deployed on AIMS as a centrally hosted service. As this project matures, there is great potential for an AIMS-hosted test order and result portal to support surge capacity, epidemiological test approval and prioritization, and other emerging public health needs.

Evolution of portal solutions

Portals have been in use for some time on AIMS in a variety of ways, but ARLN was the first project where we truly had to identify the varying flavors of portals and look at the evolving need for such services.

CDC's Poxvirus and Rabies Branch was the first program to specify requirements and deploy a reporting portal to support rabies electronic laboratory reporting (ELR) data submission. The rabies portal served as the prototype for the ARLN reporting portal. APHL plans to "pay it forward" as we continue to collaborate with the Rabies program on the portal's utility, building on lessons learned during the ARLN project.

As AIMS continues to grow technical roots from a simple data exchange service to a cloud-based platform supporting national informatics initiatives, we expect the technical footprint of portal solutions to grow, allowing users to collect, interact with and exchange data in new and innovative ways. ■

I WANT YOU! ... TO ADD YOUR LAB'S DATA TO THE PHLSD

by **Jacob Rosalez**, manager, Institutional Research

The Public Health Laboratory Systems Database (PHLSD), developed by APHL and the US Centers for Disease Control and Prevention (CDC), allows member laboratories to maintain key information in an easy-to-use database of testing (clinical and environmental) and equipment data. By contributing to the database, members support the development of a national testing directory accessible to participating laboratories, select CDC partners and APHL staff. This directory will provide public health laboratory stakeholders with important information that can be leveraged during public health emergencies. It will also encourage collaboration among laboratories.

The PHLSD is available to all member laboratories, and training webinars are provided. To sign up for a PHLSD training and find out more about the database's benefits, contact Jacob Rosalez at jacob.rosalez@aphl.org. ■

LABORATORY INFORMATICS SELF-ASSESSMENT TOOL

2016 ASSESSMENT PREVIEW

APHL, in partnership with CDC, has developed an informatics self-assessment for laboratories, identifying 19 critical operational areas for evaluation. The initiative also tracks progress longitudinally and compares results against the national standard. The data below are based on averages from the 26 state or local labs that have thus far submitted their 2016 SA. Look for the full report later this year!

2016 INFORMATICS REPORT CARD

Average scores, out of three (3).

HIGHEST SCORING CAPABILITY AREAS

2.59 REPORT PREPARATION AND DISTRIBUTION

2.52 LABORATORY CERTIFICATIONS, ACCREDITATIONS AND LICENSURE

LOWEST SCORING CAPABILITY AREAS

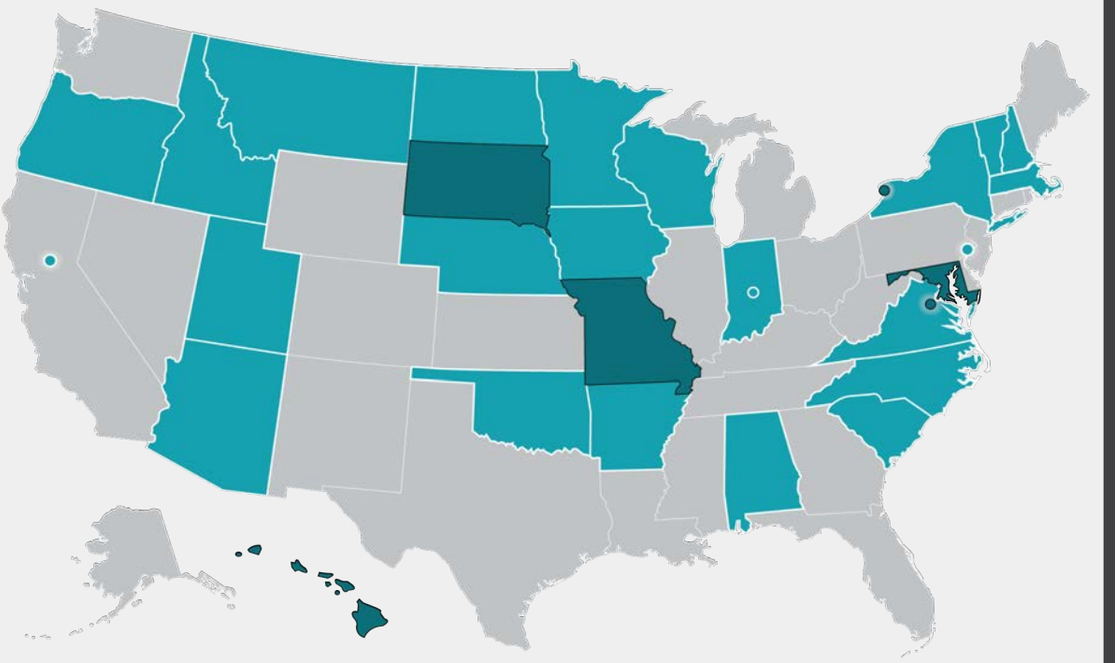
1.63 LABORATORY SAFETY AND ACCIDENT INVESTIGATION

1.69 MEDIA, REAGENTS, CONTROLS: MANUFACTURING AND INVENTORY

PARTICIPATING STATE & LOCAL LABORATORIES

ASSESSMENT SUBMITTED

AL Bureau of Clinical Laboratories
AZ Dept. of Health Services
AR Public Health Laboratory
(CA) Placer County Public Health Laboratory
ID Bureau of Laboratories
(IN) Marion County Public Health Laboratory
IN State Public Health Laboratory
MA Dept. of Public Health
MN Public Health Laboratory Division
MT Laboratory Services Bureau
NC Dept. of Agriculture & Consumer Services
ND Div. of Laboratory Services
NE Public Health Environmental Laboratory
NH Public Health Laboratories
(NY) New York City Public Health Laboratory
NY State Dept. of Agriculture and Markets
NY State Dept. of Health, Wadsworth Center
OK State Dept. of Health
OR State Public Health Laboratory
(PA) Philadelphia Public Health Laboratories
SC Bureau of Laboratories
State Hygienic Laboratory at the Uni. of Iowa
Unified Utah State Laboratories: Public Health
VT Dept. of Health Laboratory
VA Div. of Consolidated Laboratory Services
WI State Laboratory of Hygiene



Labs that have submitted a Self-Assessment

Labs that have started a Self-Assessment

ASSESSMENT IN PROCESS

HI Laboratories Div.
MD Dept. of Health and Mental Hygiene
MO State Public Health Laboratory
(NY) Erie County Regional Laboratories
SD Public Health Laboratory
(VA) Fairfax County Health Dept. Laboratory

When Newborn Screening Meets Policy: Nebraska's Path to Adding Disorders

by **Nisha Quasba**, associate specialist, Public Policy

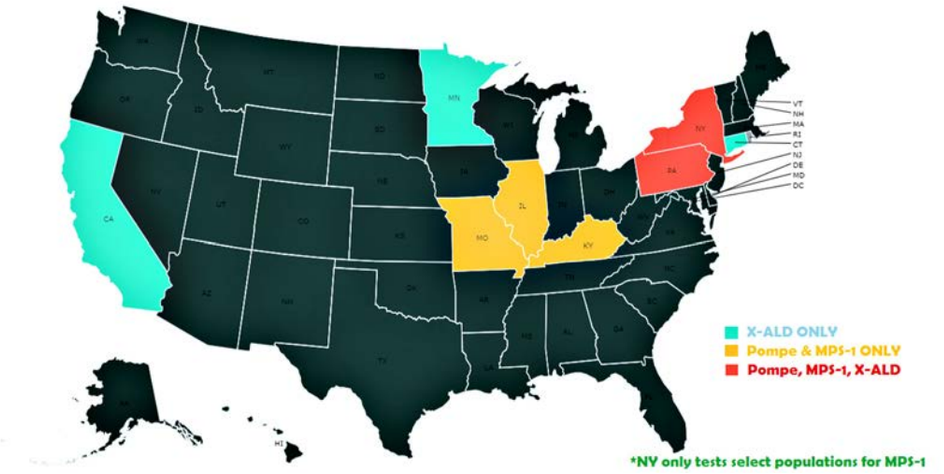
Through its NewSTEPs agreement with the Health Resources and Services Administration (HRSA), APHL is assisting state public health laboratories to add three new disorders to their newborn screening (NBS) panels. The disorders—Pompe, Mucopolysaccharidosis Type 1 (MPS-I), and X-linked Adrenoleukodystrophy (X-ALD)—were added to the Recommended Uniform Screening Panel (RUSP) within the past two years. At this time, only Pennsylvania offers screening for all three disorders universally, while New York screens for Pompe and X-ALD and only screens select populations for MPS-I.

APHL's Public Policy team supports this NewSTEPs initiative by identifying political and organizational trends between states, and potential education gaps that may create barriers in implementing these disorders within a state. Using NewSTEPs' four-phase model for implementing a NBS disorder, the team has focused on states in phase one: the legislative/mandate stage. These NBS programs require assistance to add new conditions to the required list in the state, including fee increases to support capital and legislative mandates.

Each state determines which disorders it will include on its NBS panel based on its own evaluation. However, budgetary restrictions, workforce shortages and legislative mandates influence a state's capacity to implement these additions. Nebraska, a phase 1 state, was one of the first the Public Policy Team researched to understand the legislative landscape.

Tracking Success in Nebraska

The Nebraska Newborn Screening Advisory Committee (NBAC) advises the state's Newborn Screening and Genetics Program on matters related to newborn screening, disorders, inherited disease and inborn errors of metabolism. The NBAC meets quarterly and any member is able to request a review to add or remove a disease from the newborn screening panel. Once a recommendation is approved by a simple majority of the committee, Program Manager Julie Luedtke carries the recommendation forward within the health department. The director of the Division of Public Health/Chief Medical Officer and the CEO have final approval. The CEO also has final approval on any decision affecting health department personnel or funding.



APHL's Public Policy program provides assistance by identifying political and organizational trends between states and potential education gaps that may create barriers in implementing disorders within a state.

In 2016, NBAC recommended that Pompe, MPS-1, and X-ALD be added to the NBS panel, but only if follow-up services could be expanded to uphold the quality of the program. Luedtke had persistently requested additional funding so the program could absorb the increase in follow-up and quality assurance work that would be needed from any new additions to the panel. The program requested the per-infant-administrative fee for screening to be increased from $10 to $20 via a legislative bill in July 2016; however, the increase was not granted.

In January 2017, LB91 and LB401 were introduced to the floor by Senator Robert Hilkemann, a Republican state legislator and previous board member of the Nebraska State Board of Health. LB401 included the addition of X-ALD, MPS-1 and Pompe to the NBS panel and LB91 allowed the NBS fee to increase but not exceed $20. On April 27, 2017, the Governor approved and signed both bills.

Luedtke attributes the success of the bill to external support from advocates and legislators. Senator Hilkemann's office was instrumental in determining what resources were needed to successfully add the conditions. Not only did they increase the funding available to the program, they also included language to delay implementation so proper preparation could take place. A third staff member was hired to do follow-up and quality assurance activities, allowing the program to absorb the addition of the three new conditions.

While the act becomes effective July 1, 2018, in the interim the NBS program will be formulating a series of new educational materials, devising reporting mechanisms and language, establishing proper follow-up protocols, and educating hospitals and providers of the implications of this addition. ■

Looking at the Newborn Screening "Big Picture" in the Big Easy

by **Oluwafunke Akinsola**, associate specialist, Newborn Screening and Genetics; **Erin Darby**, MPH, CHES, specialist, Newborn Screening and Genetics; **Sari Edelman**, MPH, specialist, Newborn Screening and Genetics; and **Laura Russell**, MPH, specialist, Newborn Screening and Genetics

In September, APHL's Newborn Screening and Genetic Testing Symposium convened in New Orleans, bringing together over 500 laboratorians, follow up staff, clinicians, nurses, genetic counselors, parents and industry partners. Sessions examined emerging newborn screening (NBS) technologies, candidate conditions, achievements in timeliness and improvements in patient outcomes and other developments in the field. Selected highlights follow.

Analyzing Screening Performance

A session on managing cutoff values to reduce false negative and false positive results brought together experts in the field to review methods for optimizing screening performance. Dr. Mary Seeterlin of the Michigan Department of Health and Human Services detailed her novel approach to reducing false negative screening results for Carnitine Palmitoyltransferase Type II Deficiency by comparing tandem mass spectrometry analyte ratios. Dietrich Matern, MD, PhD, of the Mayo Clinic discussed the Mayo Clinical Laboratory Integrated Reports (CLIR), a post analytical tool designed to compare data across NBS labs. To date, the tool has demonstrated utility in Kentucky, New York and North Carolina for some NBS tests, and other tests are under evaluation. Dr. Travis Henry from the State Hygienic Laboratory at the University of Iowa concluded the session with a report on another promising approach, the use of median normalization of NBS data to improve test performance.

Gene Sequencing Forum

The first gene sequencing forum, hosted by the APHL NBS Molecular Subcommittee, offered participants the opportunity to share progress reports, learn about resources, and discuss molecular and gene sequencing technologies. Benefits and barriers to sequencing by contract, a detailed account of Massachusetts's process to simultaneously implement sequencing for four NBS conditions, and the use of next generation sequencing technology to inform a genotyping panel were among the topics discussed. Participants also identified the need for a framework for laboratory information management system (LIMS) capacity, educational materials for parents/ families, family testing guidelines and guidance on data reporting.

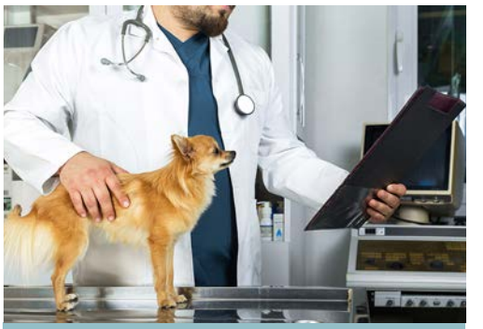
The new NewSTEPs website utilizes community-oriented tools to facilitate communication and employs a clear and easily navigable design. It includes a resource library, which allows users to easily search for materials and filter by type, topic and/ or disorder.

Spinal Muscular Atrophy—Quality Test Methods and Treatment

A session on Spinal Muscular Atrophy (SMA) discussed significant international progress in screening and treating SMA, with a focus on assay methods, as well as clinical considerations and challenges. SMA is currently under evidence review by a workgroup of the US Secretary of Health and Human Services' Advisory Committee on Heritable Disorders in Newborns and Children for consideration to be added to the Recommended Uniform Screening Panel (RUSP), a list of conditions recommended for routine newborn screening.

Continued Improvements In NBS Timeliness

The NBS field continues to make progress in the timeliness of specimen collection, delivery and reporting. In a related session, Ashley Comer explained how the Iowa NBS program, a NewSTEPs 360 timeliness sub-awardee, utilizes NewSTEPs infographics to monitor performance and identify areas for improvement. Attendees concurred that building sustainable partnerships among newborn screening systems and stakeholders is critical to advancing timeliness.



JUST BARK FOR FOLLOW UP

At a mixer organized by the NewSTEPs Short Term Follow-up Workgroup, attendees voted on the most notable story about short term follow up. The winner: Oklahoma, whose program once received an incorrect fax number and inadvertently sent results to a veterinarian instead of the primary care provider! (Don't worry, the mistake was quickly corrected, and the vet assured them that he did not treat human patients).

(from l to r:) Mei Baker, MD, W. Harry Hannon, PhD, Joseph Orsini, PhD and Scott Becker

AND THE WINNERS ARE...

At an awards luncheon, APHL recognized distinguished professionals for their contributions and commitment to the field of newborn screening:

Jeffrey Botkin, MD, MPH, chief of the Division of Medical Ethics and Humanities in the Department of Internal Medicine at the University of Utah School of Medicine received the George Cunningham Visionary Award in Newborn Screening. This award honors an individual who has made contributions to expanding and improving the screening of newborns by state public health agencies.

Joseph Orsini, PhD, a research scientist in the newborn screening program at the New York State Department of Health, was recognized with the Harry Hannon Laboratory Improvement Award in Newborn Screening. This award honors an individual who has made significant contributions to improving the quality of testing, establishing innovative and creative laboratory approaches and technologies, as well as providing laboratory training and education for new technologies and assays.

Thalia Wood, MPH, retired manager of the Children's Health Unit for the state of Alaska the newborn the oversight agency for the state's newborn screening program) and retired staff member of APHL's Newborn Screening and Genetics Program was awarded the Judi Tuerck Follow Up and Education Award in Newborn Screening. This award recognizes an individual who has made significant and outstanding contributions that have had a direct impact on improving the quality of follow-up and education for the newborn screening system. ■

DIGITAL EXTRA:
Presentations from the 2017 Newborn Screening and Genetic Testing Symposium are now available on the APHL website. The next symposium will be held April 7-10, 2019 in Chicago, IL.

Top: (from l to r:) Erin Rothwell, Jeffrey Botkin, MD, MPH and Scott Becker

Bottom: (from l to r:) Scott Becker, Thalia Wood and Carol Johnson

Identifying the Missing Link for BSOs: Leadership

by **Sean Page,** associate specialist, Public Health Preparedness and Response

For biosafety officials/officers (BSOs), leadership is viewed as a two-pronged issue. As the designated biosafety expert for their public health laboratory, they are expected to address internal biosafety risks and gain personnel buy-in to establish and maintain positive biosafety culture. In addition, they are expected to perform sentinel clinical outreach for their respective state or territory. APHL is helping to bridge the gap between technical knowledge and leadership skills through a new leadership workshop available to BSOs nationwide.

Establishing Relationships

Because BSOs serve as unsolicited consultants for clients with varying knowledge of biosafety, outreach to sentinel clinical outreach can present a unique challenge. BSOs may encounter obstacles in establishing relationships with laboratories. These include:

1. Securing approval from top leadership
2. Identifying the number of sentinel clinical laboratories in the state
3. Establishing reliable contacts at the laboratories
4. Reaching distant laboratories in large states
5. Finding a mutually convenient time to perform site visits.

With so many factors working against them, many BSOs have struggled to gain buy-in from the sentinel clinical laboratories they serve, thus reducing the number of laboratories they can reach. APHL has responded to this challenge with a leadership skill-building workshop.

The Art of Leadership

Developed by APHL's Biosafety, Public Policy and Workforce Development, the four-day workshop offers skill development sessions on leadership, project management, public policy, communications, training program development and implementation of evaluation measures. Participants leave with an invaluable network and broader skill set that benefits them, their host laboratory and the public health laboratory system.

Three workshops will be held across the US to reach all 62 BSOs by region. The first was held at the Hawaii Department of Health State Laboratories Division September 22-29. Invited participants included biosafety officers of the Pacific Islands as well as sentinel clinicians from Hawaii. During the four-day workshop, there were several group interactive and didactic exercises, including Exemplary Leadership/MICEE, Affinity exercise, and Single Override Communication Objective (SOCO). By the end of the week, attendees expressed they were leaving the workshop with more confidence, new communication and leadership tools to bring back to their lab staff, and a fresh understanding of effective communication, persuasion and connecting stakeholders under the mission of upholding biosafety and biosecurity practices. ■

Attendees and instructors of the Biosafety Leadership Workshop: Pacific Islands at the Hawaii Department of Health,State Laboratories Division.

top: Biosafety officers and sentinel clinical laboratorians collaborating on the Affinity Exercise, a brainstorming activity

bottom: Participants learn how to develop and deliver a tailored message through interviews.

Giving Your Data Its Due: A Few Pointers for Conference Speakers

by **Afua Owusu**, intern, Communications

Given their expertise and passion for their work, one might expect public health laboratory scientists to be strong speakers who convey their findings in a clear and compelling manner. However, an informal assessment of APHL conference presentations indicates that this is not always the case. Below are some pointers that will help you to give your data its due at the next conference.

1. Slides are visual guides.

Your slides should support, not repeat, your oral presentation. Limit bullets to five per slide, use key words rather than full sentences and consider using animation to present one bullet at a time. By controlling the quantity and flow of visuals, you make it easier for the audience to assimilate your content and prevent them from reading ahead while you are speaking. Remember, less is more.

2. Choose compatible software programs.

Make sure that your software programs are compatible to avoid issues with display of graphs and charts, notably in Microsoft PowerPoint. It's best to create graphs in Excel and then embed them in slides instead of pasting them as an image.

3. Make your slides readable.

What is visible on your office computer screen may be difficult to decipher in a darkened conference room. If people are squinting to distinguish the information on your slides, you will lose them quickly. Use 26-point type or greater for the main text and avoid cluttering slides with unnecessary copy, logos or graphics. Be sure to include white space (i.e., blank space without text or graphics) to focus the audience's attention on your content. Make graphs, flow charts and other data visualizations large, and label elements clearly. Consider presenting successive views of a graph to show nuances in your data.

4. Be consistent.

Watch out for inconsistencies in your presentation that can distract the audience and dilute your message. Do not use more than three fonts and keep colors consistent across the presentation, including graphs and other visuals.

5. Keep your presentation lively.

Open with a riveting anecdote, example or data point to engage the audience. Hold their interest by varying your tone and pitch, and speaking with enthusiasm. Close by recapping your key points in a memorable way.

6. Make time to rehearse.

Your presentation will go more smoothly if you rehearse. Even if your in-box is overflowing with emails, make time to practice aloud with your slides. You'll be glad you did.

Done well, presentations advance public health laboratory science and practice, and raise your standing as an expert in the field. Done poorly, they give your listeners a chance to check their email. Consider these points in planning your next presentation. Your data deserves to be heard—and understood. ■

Nebraska Public Health Laboratory: A Horse of a Different Color

By **Nancy Maddox**, MPH, writer

The Nebraska Public Health Laboratory (NPHL), says Director Peter Iwen, PhD, D(ABMM), is "unique compared to other public health labs."

Following reorganization in 1997, the laboratory moved to the University of Nebraska Medical Center (UNMC) campus in Omaha, under the directorship of Steven Hinrichs, MD, and it continues under the university's administrative support today. While NPHL staff are UNMC employees, most funding is received through contractual agreements with the Nebraska Department of Health and Human Services (NE-DHHS). "In this arrangement," said Iwen, "federal grant dollars flow through NE-DHHS via contracts that are executed to obtain fiscal support for the laboratory."

A second distinctive feature of the NPHL is its workload: the laboratory performs only human testing and other highly specialized epidemiological services. Although NPHL coordinates routine STD, viral, fungal, bacterial, TB and parasite testing, much of this work is contracted out as fee-for-service testing through laboratories at Nebraska Medicine (NM), the academically-affiliated hospital on the UNMC campus. Basically, said Iwen, "NPHL performs clinical testing or manages the shipment of specimens for testing that the hospital laboratory does not perform."

The advantages of this arrangement for NM and NPHL include decreased costs for routine testing, due to the increased economies of scale achieved by combining test volumes, plus the opportunity for NPHL scientists to do collaborative research and to teach at UNMC—major benefits in a "fiscally reserved" state whose cattle population outnumbers its 1.9 million residents.

Facility

NPHL is one of 95 laboratories in the Durham Research Center II tower, sited on the western edge of the UNMC campus, five miles west of the Missouri River, which separates Nebraska from Iowa. The 30,000-square-foot facility—which includes offices and ancillary spaces, a BSL-3 containment suite, a biological and chemical terrorism preparedness laboratory and multiple BSL-2 laboratories—takes up a portion of the top floor of the eight-story building, which opened in 2009. Specimens enter the building through a dedicated, ground-level receiving dock or via courier services coordinated with UNMC Regional Pathology Services.

NPHL staff. Back row (l to r): Karen Stiles, Amanda Heeg, Tony Sambol, Peter Iwen, David Moran, Amanda Bartling, Emily McCutchen, and Kacie Flaherty. Front row (l to r): Vicki Herrera, Sarah Trotter, Roxanne Alter, and Bin Li. Photo: NPHL

Director

Iwen was reared 30 miles north of Fargo, ND, in a farming community of about 400 people. Although his father, grandfather and great grandfather were small-town "druggists," he aspired to study horticulture at North Dakota State University (NDSU) in Fargo. His career goals changed, however, when, as a sophomore, he discovered the field of microbiology. Iwen subsequently majored in bacteriology, unfazed by having no clear idea "what to do after graduation." Fortunately, a former NDSU advisor connected him with a colleague at UNMC, which led to Iwen and his wife to Omaha in 1978, where he began his UNMC career as a mycology researcher. Iwen soon discovered that as a UNMC employee, he could work full time to support his growing family and take graduate classes for free. This perk allowed him to complete a master's degree and work in the hospital's clinical microbiology laboratory on weekends to obtain ASCP microbiology certification. "The master's degree and certification allowed me to move into a teaching position on campus," Iwen said, which was followed by enrollment in the infectious diseases doctoral program. He was awarded his PhD at about the same time the events around 9/11 unfolded, and Iwen was soon tapped to serve as the university's first campus biosafety officer and associate director of NPHL. When Hinrichs segued from NPHL director to chair of UNMC's Department of Pathology and Microbiology in 2009, Iwen took over the empty post. He said, "Steve is my boss and continues to provide unwavering support for NPHL." In addition to directing NPHL, Iwen is a microbiology professor. At the June annual meeting of the American

Society for Microbiology, the American Academy of Microbiology conferred upon Iwen the distinction of fellow.

Staff

NPHL directly employs 12 people (some partially supported through other university programs), including Iwen, six microbiologists, two chemists, an administrative assistant, a training coordinator and a state biosafety officer. Federal dollars also support positions in the NM clinical laboratory and in the NE-DHHS Public Health Environmental Laboratory in Lincoln.

Revenue

The annual budget fluctuates around $2 million, with most of that funding from federal grants coming through the NE-DHHS. The university supports basic functions, such as human resource assistance, security, sponsored programs management, IT support, environmental services, utilities and billing services. In addition, NPHL has access to electronic laboratory reporting (ELR) through the NM ELR system.

Testing

NPHL is responsible for roughly 50,000 public health tests a year. Those tests performed on site are highly specialized and include influenza and Zika virus PCR, epidemiological tests for foodborne pathogens, mosquito testing for arboviruses and tests for high-risk pathogens. As part of the latter, NPHL provides laboratory support for NM's Nebraska Biocontainment Unit (NBU)—one of ten regional US treatment centers that provide care for patients infected with a deadly infectious disease. As a member of the Laboratory Response Network for biological and chemical terrorism preparedness—and registered as a Tier 1 Select Agent laboratory—NPHL also performs select agent confirmatory testing and screens suspicious, unknown environmental samples. To control costs, Nebraska's newborn screening is contracted out to PerkinElmer, Inc.

Success Stories

- Collaborated to develop training on the safe handling/processing of specimens potentially containing a special pathogen through the National Ebola Training and Education Center, a federal program coordinated among UNMC, Emory University in Atlanta and Bellevue Hospital in New York City.

Lead Technologist Vicki Herrerra trains staff of the National Ebola Training and Education Center on correct PPE use. Photo: NPHL

- Coordinated the laboratory testing for patients admitted to the NBU during the Ebola virus disease outbreak. NPHL was also the first public health laboratory to package and ship Ebola-infected specimens through a commercial courier. "That was a big deal since no guidance was available at the time on how to do this," Iwen said.
- Implemented a multiplexed PCR assay to detect gastrointestinal pathogens to include a program to provide culture services to support culture-independent testing in Nebraska.
- Developed a web-based laboratory telemedicine service, STATPack™, in collaboration with the University of Nebraska at Omaha. This program allows clinical laboratories to send digital images of suspicious or unknown organisms to the NPHL for identification or other consultation. More than 20 systems are now deployed in Nebraska, and the Oklahoma and Kansas state PHLs have also installed the system in their states.
- With UNMC, created a post-doctoral clinical microbiology fellowship training program, accredited by the Committee on Postgraduate Education Programs of the American Academy of Microbiology. The two-year program qualifies a fellow to sit for the examination for certification as a diplomat of the American Board of Medical Microbiology—a certification that qualifies PhD microbiologists to serve as laboratory directors under CLIA. Several individuals now working in public health have gone through this program at UNMC.
- Developed the Electronic Laboratory Information Reporting Technology (ELIRT) software to enable test ordering and reporting with NE-DHHS clinics. The system is integrated with the NM ELR (Sunquest System) and with the National Electronic Disease Surveillance System, through which Nebraska epidemiologists gain real-time access to reportable disease results.
- Established a statewide program to detect and confirm carbapenemase-producing organisms.
- Produced an international quality assurance program for FTIR and Ramon devices.
- Set up a statewide specimen courier service in collaboration with UNMC Regional Pathology Services.

Challenges

- Providing services to a population spread across 77,000 square miles, including many "completely rural" jurisdictions.
- Maintaining a highly competent staff of scientists in an environment of fiscal uncertainty.
- Adhering to the "ever-changing regulatory requirements as defined by the Federal Select Agent Program and CLIA in a financially restricted environment."

Goals

- Serve as a regional reference center for pathogens with high prevalence in Nebraska, such as West Nile virus and other arboviruses, *Yersinia enterocolitica*, *Cryptosporidium* and *Francisella tularensis*. Genetic characterization of *F. tularensis* is an ongoing collaborative research program among personnel at NPHL, UNMC and the US Department of Defense.
- Expand mutual research opportunities with UNMC faculty.
- Enhance relationships and integration with state epidemiologists, who are located in facilities 50 miles from NPHL.
- Continue upgrading the laboratory's information technology systems. ■

Supporting Public Health in Growing King County

by **Nancy Maddox**, MPH, writer

King County, Washington, is renowned for its coffee shops, fish markets and high-profile corporate denizens, including Amazon, Boeing, Starbucks and Microsoft. But the trait that most impacts the work of the local public health laboratory is its high rate of growth.

The county—which stretches from the crest line of the Cascade Range in the east to Puget Sound in the west—is home to about 2.1 million residents. And while the jurisdiction is sparsely populated in the mountainous inland, it grows increasingly urban as one travels seaward, toward the county seat of Seattle, where 700,000 people live in the roughly 10-mile-wide strip of land between Elliott Bay and Lake Washington.

This densely populated area, said Paul Swenson, PhD, director of the Seattle-King County Public Health Laboratory, is "just going nuts" with growth. For two years running, Seattle has been named the crane capital of the country, surpassing New York City, Chicago, Los Angeles and every other US city in the number of construction cranes at work.

"The city continues to add thousands of high-paying jobs, which drives the cost of housing up," said Swenson. Yet, he said, "The high cost of housing isn't keeping people from coming to Seattle." Local voters just approved a $54 billion dollar ballot measure to expand light rail services and alleviate congestion on city streets.

As a program in the local health department, Public Health–Seattle & King County (PHSKC), the laboratory's workload rises with the population. Said Swenson, "Our health department operates a number of clinics to serve high-risk populations. That drives almost all the work that we do."

Facility

The laboratory takes up 5,000 square feet in the basement of the West Clinic of Harborview Medical Center (HMC), a specialty care facility (including a world-renowned Level 1 trauma center) run by the University of Washington.

"Before moving here in 1997," said Swenson, "our lab was located in downtown Seattle in the Public Safety Building, which was slated for demolition." At the time, a voter-approved bond financed brand new laboratory construction and equipment in the county-owned HMC building, which is situated just east of Interstate 5 overlooking Elliott Bay and the downtown area.

Laboratorians enter the building through the main hospital entrances and then through a separate laboratory entrance off one of the main basement hallways. Swenson stressed that "although we're located in the medical center, we're a Public Health–Seattle & King County program. We don't serve the hospital, for the most part; we're just located here, along with several other public health programs, because the [HMC] buildings are all owned by the county."

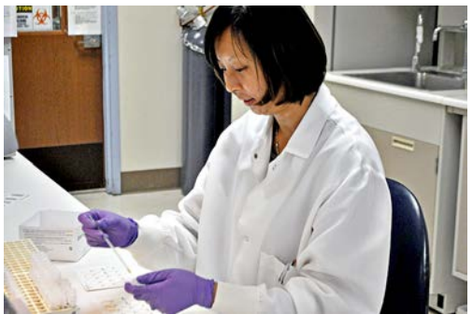
The laboratory is primarily a BSL-2 facility, but has a 200-square-foot BSL-3 suite reserved for TB work.

Seattle & King County Laboratory Staff. Back row (l to r): Song Cho, Paul Swenson, Abebe Woldai, Sokkhanha Esteban, Kristine Mejilla, Robin Cowan, Azza El-Sabaeny. Front row (l to r): Barbara Treen, David Ewing, Justin Nguyen, Candice Le, Alfred Iqbal. Photo: PHSKC

Director

Swenson was born and raised in Seattle and earned his undergraduate degree at Seattle University. After college graduation, he relocated to the East Coast for six years to study clinical and laboratory microbiology at the Medical College of Virginia (MCV). He did his doctoral work under the direction of Mario Escobar, PhD, and postdoctoral training, also at MCV, under the direction of Harry Dalton, PhD.

"When I finished the post-doc," Swenson said, "I moved to New York and directed the clinical virology laboratory at North Shore University Hospital on Long Island. I was there for five years, until I returned to Seattle in 1986 to take over as the director of the public health laboratory here. ... It was actually hard to leave New York. I had a position there that I was very happy with. But I couldn't pass up the opportunity to come back home."



Candice Le performs RPR syphilis serology testing.
Photo: PHSKC

Staff

In addition to Swenson, the laboratory employs 11 people: Laboratory Manager Alfred Iqbal, PhD, six microbiologists, one laboratory assistant, two administrative staffers, and a part time medical technologist who oversees CLIA-waived, point-of-care testing at county clinics. Although the laboratory has no current vacancies—"we seldom do"—Swenson anticipates one staff retirement within the next year.

Revenue

The laboratory's annual $2.4 million budget comes mainly from fees for services provided to PHSKC clinics. Those fees are billed through a unique system, started in 2012. As Swenson explains, "We basically have no [dedicated] funding. There is an internal system through which we bill all of our public health clinics for the testing that we do, and we are expected to bring in sufficient revenue from those clinics to meet all of our expenses." Theoretically, said Swenson, "As our expenses increase over time, we can increase what we charge our clinics to cover those costs." Yet, in practice, he said, "We're under tremendous pressure to be cost-competitive and to keep our fees as low as they can possibly be, because the clinics are also under tremendous budget constraints, and our fees are a big cost to them. … So raising fees is not an option if there's any way it can be avoided."

In addition to internal clinic payments, some CDC-funded work, clinical testing for external providers and occasional clinical studies for local biotech companies "bring in a few dollars."

Testing

The vast majority of the 90,000 or so tests performed by the laboratory each year are routine diagnostic analyses: serology tests for HIV, syphilis and hepatitis and nucleic acid amplification tests (NAATs) for chlamydia and gonorrhea. Virtually all of this work is conducted on behalf of 11 PHSKC clinics, including STD and TB clinics co-located at HMC, three primary care clinics, three family planning clinics, a refugee screening clinic and two jail health clinics. Almost half of all the laboratory's work comes from the STD clinic alone, which is within easy walking distance. A county-operated courier service transports specimens from outlying clinics.

In addition, the laboratory performs:

- TB cultures, smears and QuantiFERON®–TB Gold assay for the county TB clinic at HMC.
- Surveillance and outbreak testing for influenza and other respiratory viruses.
- Miscellaneous, low-volume serology and microbiology tests, such as measles, mumps and rubella antibody testing, gonorrhea cultures and stool cultures.

Said Swenson, "There's a lot of testing that we don't do, like clinical chemistries or hematologies. We contract with a commercial laboratory to do that work."

Success Stories

- Interfacing the ApolloLIMS® laboratory information management system (LIMS) with the Epic electronic health record system used in PHSKC clinics. As of late August, every clinic but one is linked to the LIMS, and the final clinic is slated to go live by the end of 2017. Prior to this major undertaking, said Swenson, "We were still connected electronically [to the clinics], and they could print their lab reports, but they were getting a paper report and would still have to do data entry [into the electronic health record]. Now, no one has to do that."
- Replacing culture- or antigen-based tests with faster, more sensitive NAATs over the past year. Recently implemented NAATs include assays for trichomonas, Group A streptococcus, pertussis, herpes, varicella zoster virus and influenza. "The technology is a good fit for our laboratory."
- Finalizing a memorandum-of-understanding (MOU) with the Washington State Public Health Laboratory to assure "the most efficient, cost-effective laboratory services for the state of Washington." Although some of the details are still being hammered out, the MOU allows the laboratory to free up surge capacity at the state level by taking on routine clinical testing during public health emergencies requiring state laboratory support.

Challenge

"Just maintaining adequate resources to support the cost of the services we provide is our biggest challenge. The clinics [that provide the bulk of the laboratory's funding] are under such budget constraints that they've had to get smaller, and that can trickle down to the laboratory." In fact, three county family planning clinics closed in 2015, representing the first clinic closures in three decades. The county's next biennial budget cycle begins in 2019, and, said Swenson, "There's a fair amount of uncertainty about what's going to happen."

Goals

- Evaluate the performance of the QuantiFERON®–TB Gold Plus test, just recently approved by the US Food and Drug Administration. "Our TB clinic is eager to switch over to that when it becomes available."
- Examine the feasibility of running NAATs for *Mycoplasma genitalium*, bacterial vaginosis, vaginal candidiasis and other targeted infections on the laboratory's Hologic® Panther testing platform.
- Evaluate possible use of the reverse screening algorithm for syphilis, which involves screening with one of the new, highly automated treponemal tests and confirming with a rapid plasma reagin test.
- Maintain CLIA compliance in our laboratory and in our public health clinics, performing waived testing. ■

APHL Initiates New Classes of Laboratory Fellows

by **Heather Roney**, MA, manager, Fellowship Programs

In August, APHL's ten new Antimicrobial Resistance (AR) Fellows gathered at the US Centers for Disease Control and Prevention (CDC) for orientation. The orientation provided an overview of AR trends in the US and activities to prevent, detect and respond to resistant infections. AR Fellows also participated in laboratory rotations at CDC, receiving hands-on training on laboratory detection methods and results interpretation for carbapenem-resistant *Enterobacteriaceae*, antibiotic-resistant *Neisseria gonorrhoeae* and *Candida auris*. The AR Fellow who will focus on multi-drug resistant tuberculosis spent additional time at CDC, working one-on-one with members of CDC's Division of Tuberculosis Elimination.

The 2017-2018 class of Bioinformatics Fellows held its orientation in conjunction with AMD day in Atlanta at the end of September. All seven new fellows have begun their assignments at their host laboratories.

A new Ronald H. Laessig Memorial Newborn Screening Fellow took up her position at the North Carolina State Public Health Laboratory in August. Ellen Stevens, PhD, will perform a method validation and pilot screening of 5,000-10,000 babies for cystic fibrosis. She will also analyze data to determine which mutations are most common in the NC population and the frequency of occurrence.

The six new Infectious Diseases Laboratory Fellows are working in their state public health laboratories. Thomas Moore, based in the Tennessee Department of Health, recently traveled to the CDC Arbovirus Disease Branch in Fort Collins, CO, to train in PRNT (Plaque Reduction Neutralization Test) and cell culture protocols, techniques he will implement in his host laboratory. ■

DIGITAL EXTRA:
Read more about all of APHL's fellowship programs.

Top: APHL's newest class of Bioinformatics Fellows attend CDC's AMD Day as part of their program orientation in September. (From l to r:) Sara Zufan, Logan Fink, Sarah Schmedes, Tiffany Hsu, Su Bin Park, Erik van Rooey and Kevin Libuit

Bottom: The first class of APHL-CDC Antimicrobial Resistance Fellows attend an orientation session in Atlanta in August,. (From l to r:) Nicholas Florek, Mimi Precit, Alesha Stewart, Emily Snavely, Lisa Leung, Eric Ransom, Jennifer Dale, Marisabel Etter, Ayodele Ojebode and Victoria Stone

TOOLS YOU CAN USE

Get the mobile app or follow the links below to enjoy interactive features

PUBLICATIONS

New APHL Guidance: TB Cooperative Agreement Toolkit

The TB Cooperative Agreement Toolkit has been updated for the new Tuberculosis Elimination and Laboratory Cooperative Agreement, which was released on July 17. It contains upgraded performance indicators, a glossary of defined terms, a turnaround-time calculator and three data templates to aid laboratories in the application process and navigate the coming year.

New APHL Training Tools: Quality Management Training Series

The Quality Management Training Series (QMTS) is a free comprehensive set of laboratory quality management learning tools, built to provide timely and consistent training for new hires and veteran staff, alike. .

Laboratory Competency Implementation Toolbox

APHL members have developed resources, tools and examples to assist laboratories in their efforts to implement behavior-based laboratory competencies, and incorporate them into their workplace processes.

CDC BT Rule Out or Refer: Virtual Knowledge Exercise

This virtual exercise provides an opportunity for the microbiologist to participate in a series of three virtual case studies using ASM's sentinel laboratory protocols in a safe environment to detect potential biothreat agents. The three, interactive web-based exercises are designed for all clinical and veterinary diagnostic laboratorians performing microbiology testing.

ATSDR Updates Guidance Documents

The Agency for Toxic Substances and Disease Registry (ATSDR) has updated their Substance Priority List (SPL) and Completed Exposure Pathway (CEP) Site Count Report. ATSDR's Substance Priority List helps determine which substances will have ATSDR Toxicological Profiles and is revised every two years.

TFAH Policy Brief Proposes Improvements to Lead Exposure Testing for Children

Trust for America's Health (TFAH) has released a policy brief, "Recommendations to Prevent and Mitigate the Effects of Lead Poisoning." Recommendation seven proposes ways to improve blood lead testing among children at high-risk of exposure and find and remediate the sources of their exposure.

NEW APHL COMMUNITIES HAVE LAUNCHED!

APHL has upgraded APHL listservs to online communities! The communities provide more functionality, such as the ability to attach documents to posts, and create a single home for all your discussion threads and resources. If you are currently an APHL listserv member, please log on to My APHL to create an aphl.org account or, if you already have one, to ensure your information is up-to-date. Each new "community" has an APHL staff manager who can walk you through the transition. Please contact membership@aphl.org if you have any questions. Enjoy exploring your new communities!

LAB CULTURE PODCAST

Episode 6: What is the Biosafety Peer Network?

The Biosafety Peer Network is intended to foster a collaborative community, advance biosafety and biosecurity in laboratories, and ultimately improve public health laboratory biosafety and biosecurity across the US. Rebecca Sciulli (Hawaii), Paul Fox (Hawaii) and Anne Marie Santos (Guam) sat down for a conversation about their work.

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