Moving Forward
Biomonitoring Stories From the States

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Introduction
Human exposure to naturally-occurring and manufactured chemicals has long been a concern to people, health professionals and policymakers. Undesirable chemical residues may be present in food, water, air and a multitude of everyday objects; it is not surprising that each of us has multiple opportunities for exposure every day. Measuring levels of chemicals in our environment and consumer products is extremely useful for understanding the magnitude and distribution of potential problems, but these measurements are not always predictive of how much of a chemical has been absorbed or who may be most affected by this exposure. The member laboratories of the Association of Public Health Laboratories (APHL) believe that the best way to answer these important questions is through biomonitoring, a rigorous scientific process that measures levels of environmental chemicals or their metabolites in people’s blood or urine.

Biomonitoring studies may be targeted and designed to answer a specific community concern, such as whether those living near water sources with high arsenic levels are consuming arsenic through their drinking water. Or, biomonitoring studies may be population-based, such as the collection of surveillance information about environmental chemical levels in the general population. Each type of biomonitoring study provides valuable answers to difficult questions. Biomonitoring data are not only useful in assessing exposure and planning interventions but are often the impetus for policy change. The most successful biomonitoring efforts are conducted collaboratively with laboratorians, toxicologists and epidemiologists. These environmental health professionals are essential in the study design, analysis and interpretation of biomonitoring data.

This report highlights case studies where biomonitoring is being effectively used for the protection of public health, whether at the federal or state level. APHL believes that the ability of governmental health and environmental agencies to effectively contribute to and safeguard environmental public health is dependent upon public health laboratories’ ability to quickly and effectively measure chemicals in those who may have been exposed. The role of public health laboratories is to provide health professionals and policymakers with scientifically-sound laboratory data needed to make decisions about protecting the public’s health. If more widely implemented, biomonitoring has the potential to provide unique information to enable the medical community and state public health departments to carry out their missions.

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Biomonitoring Subcommittee Co-Chair  Biomonitoring Subcommittee Co-Chair
Definition
Biomonitoring
• is the measurement of naturally-occurring and manufactured chemicals in the human body, specifically in blood, urine, saliva or tissues;
• has become the standard for assessing human exposure to chemicals throughout the world;
• is a tool that reduces the uncertainty of assessing exposure in people and can be used to connect exposure to possible related health outcomes; and
• is used to help make decisions about how best to protect people from diseases, birth defects, disabilities, dysfunction or death related to chemical exposures.

CDC’s Involvement
For more than 30 years, the Centers for Disease Control and Prevention’s (CDC) Environmental Health Laboratory has used biomonitoring to help protect the public’s health. One of the first examples of this occurred in 1976 when CDC measured lead levels in children and found elevated levels in 90% of children aged 1-5. This evidence helped convince the U.S. Environmental Protection Agency (EPA) and state environmental regulatory agencies to reduce lead in the environment, with a priority emphasis on removing lead from gasoline. Measuring lead levels in the population contributed to the establishment of lead poisoning prevention programs involving the routine monitoring of lead levels in young children and follow-up to reduce exposure if indicated. Results from later biomonitoring studies conducted by both CDC and several state public health laboratories helped inform policy makers regulating other toxic chemicals such as dioxins, mercury and many pesticides.

Today, CDC’s Environmental Health Laboratory operates the National Biomonitoring Program to assess levels of chemicals and other potentially toxic substances found in people’s bodies. Through this program, chemists at CDC measure more than 450 chemicals and nutritional indicators in people and participate in specific exposure studies and investigations.

In 2005, the National Biomonitoring Program published the third National Report on Human Exposure to Environmental Chemicals, which is an ongoing assessment of the exposure of the U.S. population to environmental chemicals using biomonitoring. The Third Exposure Report included exposure information on 148 chemicals defined by age, sex and race or ethnicity. This report establishes population reference ranges that can be used by physicians and scientists to determine whether a person or group has an unusually high exposure. The report also helps to assess whether public health interventions are working. For example, the report documented that lead levels have decreased in children from 4.4% to 1.6% since the 1990s, providing evidence that efforts to reduce lead exposure in children have been successful. By measuring cotinine (a metabolite of nicotine) in people’s blood, CDC has been able to track exposure to environmental tobacco smoke (ETS) in people who do not smoke. The data in the report showed that cotinine levels have decreased by more than 65% since the late 1980s, demonstrating that efforts to reduce ETS exposure in the population have made significant progress, but that ETS exposure remains a major public health concern.

CDC is not the only laboratory measuring people’s exposure to chemicals. State health departments are often involved in various investigations about potentially hazardous environmental exposures. However, many state public
health laboratories are under-resourced and cannot provide biomonitoring services, despite a recognized need to do so. For this reason, CDC launched a planning grant program in 2001 to build biomonitoring capacity in state public health laboratories. CDC awarded $10 million to 25 states for this activity and, in 2003, awarded $2.6 million to New Hampshire, New York and the Rocky Mountain Biomonitoring Consortium* to implement biomonitoring programs.

In 2002, shortly after the events of September 11, 2001, and subsequent anthrax attacks, Congress authorized funding for the Public Health Emergency Preparedness (PHEP) cooperative agreement to support preparedness nationwide in state, local, tribal and territorial public health departments. The PHEP cooperative agreement provides funding to enable public health departments to have the capacity and capability to effectively respond to the public health consequences of not only terrorist threats, but also infectious disease outbreaks, natural disasters and biological, chemical, nuclear and radiological emergencies. In 2004, as part of the PHEP funding, state public health laboratories purchased instruments to conduct biomonitoring for chemical threats. In 2005, CDC indicated that these instruments can have multiple uses, allowing states to use them for non-emergency biomonitoring studies as resources permit.

In 2009, CDC awarded a total of $5 million to three states (California, New York and Washington) for state-based laboratory biomonitoring programs. This funding will increase the capability and capacity of these states to conduct biomonitoring and thus assess human exposure to environmental chemicals within their jurisdictions. Thirty-three states applied for funding, either individually or in a partnership with other states.

**States’ Involvement**

State health departments not only participate in environmental exposure investigations, but also address concerns regarding environmental exposures unique to each individual state. For example, naturally-occurring uranium is present in ground water in pockets throughout the Rocky Mountains as well as in South Carolina, Connecticut and other eastern states. These states are more likely to focus their biomonitoring efforts on uranium, while others might focus on contaminants, such as mercury or lead, that are prevalent in their regions. CDC cannot possibly address all of the potential environmental exposures in each state; therefore, states need to build and expand their own biomonitoring capability. CDC’s Exposure Report presents data collected to provide estimates of exposure for the civilian, non-institutionalized U.S. population. The current survey design does not permit CDC to estimate exposure on a state-by-state or city-by-city basis. For example, CDC cannot extract a subset of data and examine levels of blood lead that represent a state population. In order to produce such data, states need the capability to conduct biomonitoring assessments statewide or in communities or groups where chemical exposure is a concern.

While many states did not receive federal grant funding in 2001 or 2003, some were able to use their existing capacity to leverage

* The consortium comprises six states—Arizona, Colorado, Montana, New Mexico, Utah and Wyoming.
resources for biomonitoring projects. Because of limited funding and political support, states are in various stages of biomonitoring projects. Some state legislatures have developed legislation or appropriated funding for biomonitoring.

The following state biomonitoring activities demonstrate the need and importance of further capacity development at local levels.

**Vermont: Collaborating on Metals and Fetal Health**

The Vermont Department of Health Laboratory, in conjunction with the Vermont Department of Health State Environmental Epidemiologist and the University of Vermont, Department of Maternal Fetal Health, are conducting a biomonitoring study of cord blood for cadmium, lead and mercury. Biologists in Vermont found elevated lead and mercury levels in wildlife around Lake Champlain and other areas. Both mercury and lead impair neurological development in fetuses and young children, which is one reason the Vermont laboratory chose to further investigate the prevalence of these metals.

The study will look at risk factors associated with elevated levels of these three metals and also determine if there are any associations between elevated levels and pregnancy outcomes. The results of this study may expand their work with pregnant women, children and women of child-bearing age.

**Iowa: Dual-Use Options for Biomonitoring**

The University of Iowa Hygienic Laboratory (UHL) leverages existing resources and equipment for biomonitoring studies. UHL uses equipment from the chemical threat preparedness program to monitor lead, cadmium and mercury in newborn screening dried blood spots. Laboratorians developed a high-throughput method to detect these metals in blood spots and can measure approximately 200 specimens per day per instrument.

UHL determined that use of these data for individual diagnoses would not be practical at this time; however, a large number of specimens considered in aggregate could point to geographically localized hot spots in spite of the potential for false high positives. This information would help focus targeted biomonitoring studies to accurately assess the impact of environmental and industrial contamination on the health outcomes of children. In addition to detection of geographic hot spots, there may be a sufficient number of individual samples showing elevated levels of metals to suggest the need for future sampling and testing of identifiable specimens.

Scientists at the UHL also plan to study arsenic exposure in a subpopulation of adults and children living in northern Iowa, where naturally-occurring arsenic is prevalent. While still in the planning stages, this builds on studies performed in other states, such as Minnesota, and the work being done in Vermont and New Hampshire.

**Massachusetts: Response to Mercury Exposure at a Middle School**

A naïve student hoping for an early dismissal released elemental mercury in a public area in a large middle school. Since mercury exposure can cause impaired development, vision impairment and other neurological effects, local and state health officials coordinated a rapid response. The state HazMat team cleaned the site while state Department of Public Health (DPH) environmental health staff sampled the air. The air monitoring indicated mercury
contamination in other areas of the school as well as, in neighboring buildings where students and faculty were evacuated, driving the decision to add a human biomonitoring component to the investigation.

Laboratorians and toxicologists at the DPH Bureau of Environmental Health (BEH) collaborate routinely on chemical exposure studies; BEH consulted the laboratory early to discuss the feasibility of testing urine specimens from potentially-exposed individuals. Fortunately, the laboratory already had a validated method to measure for mercury in urine.

Scientists tested 30 people for mercury exposure, including students and staff in the immediate vicinity of the release incident. Investigators learned that the student who released the mercury had stored it in his home for several months prior to the event. The student’s family was included in a second round of sampling and testing. The laboratory determined most individuals did not have elevated levels of mercury. Those who were affected were identified and guided to specialized medical treatment.

This story illustrates the cooperative relationships necessary for investigations involving human exposure to chemicals, whether they are emergency response, surveillance efforts or prospective studies. The biomonitoring data were critical in identifying individual exposure levels and ultimately allayed the fears of those who were present but not exposed.

**Virginia: Reducing Exposure to Uranium in a Local Water Supply**
The primary water source for two Virginia housing subdivisions was two wells that were known to be contaminated with uranium. A concerned homeowner sent water and hair samples to a private laboratory to test for uranium. When the tests showed abnormally high levels of uranium in the water, the Virginia Department of Health (VDH) collected water samples to submit to the Division of Consolidated Laboratory Services (DCLS), issued a drinking water advisory and began an epidemiological investigation. DCLS, in collaboration with the VDH, developed a questionnaire and collected and tested urine samples from 150 volunteers from the affected subdivisions.

As a result of DCLS finding elevated uranium levels in people and in the water samples, officials at the water treatment plant installed a filtration system. Subsequent water testing showed a reduction in uranium levels. The VDH conducted a follow-up epidemiological study, and urine testing by DCLS showed reduced levels of uranium in the residents following the filtration system installation.

**Virginia: Measuring Herbicide Exposure**
A study at the Virginia Commonwealth University examined urine samples from professional turf applicators for 13 of the major products used by those companies. These turf products can be toxic in high concentrations, affecting neurological development, reproductive organs and the liver. DCLS developed a new method to detect these compounds and found high concentrations present in the urine samples provided by the turf applicators. As a result of the analyses by DCLS, the companies enforced more rigorous safety measures and

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1. Turf applications are chemicals used to treat golf and sports turf, as well as lawns.
established additional personal protective equipment requirement in an effort to reduce worker exposure to the harmful chemicals.

**Rhode Island: Association Between Mercury and Preterm Birth**

With the 2002 CDC Biomonitoring Planning grant, laboratory scientists in Rhode Island consulted with epidemiologists, risk assessors, physicians, academics, environmental groups and the public to identify projects where biomonitoring could be used. One project involved testing umbilical cord blood samples for mercury, lead and cadmium. These metals are of particular concern in Rhode Island due to the age of the housing stock and high seafood consumption. The project was made possible through cooperation among the Rhode Island State Health Laboratory, the Office of Risk Assessment at the Rhode Island Department of Health and obstetricians at Memorial Hospital of Rhode Island.

The laboratory received and tested more than 500 umbilical cord blood samples from women and their babies who were delivered at Memorial Hospital. An epidemiologist with the Office of Risk Assessment performed the statistical analysis. Preliminary data showed that, while the geometric mean of the cord blood mercury concentration was lower than the national value provided in CDC’s Exposure Report, pregnant black women in Rhode Island had a much higher chance of having an elevated cord blood mercury level than pregnant white women. The study also indicated that a significant number of pregnant women in Rhode Island (approximately 1 in 6) have an elevated cord blood mercury concentration, indicating a higher risk of exposure to the developing fetus. The study results are currently being compiled for publication. Ultimately, such information will help health officials better target communications about mercury exposure.

**Rocky Mountain Consortium: Collaboration Between States**

In 2001, six states (New Mexico, Colorado, Arizona, Utah, Wyoming and Montana) agreed to form the Rocky Mountain Biomonitoring Consortium (RMBC). With funding from CDC, RMBC has demonstrated inter-state cooperation between epidemiologists and laboratory on a variety of biomonitoring projects.

Wyoming and New Mexico developed a pilot project to assess the ability to collect human samples in one state and ship the samples to another state for analysis. Wyoming public health officials collected more than 100 urine samples from clinics and shipped them to the New Mexico Scientific Laboratory Division. Laboratorians in New Mexico analyzed the samples for the presence of thiodiglycol (mustard gas) and an industrial environmental contaminant. This project provided an opportunity to develop multi-state protocols for:
• soliciting local participation;
• collecting, shipping and analyzing multiple samples; and
• coordinating data analysis and obtaining biomonitoring information on environmental exposures.

The consortium states consulted community and public environmental groups, prioritized environmental health concerns in each state and then evaluated the feasibility of biomonitoring. One of the highest priority projects involved evaluating exposure to heavy metals from drinking water. Public health officials expressed concern about 12 metals (antimony, arsenic, beryllium, cadmium,
lead, manganese, mercury, molybdenum, platinum, selenium, tungsten and uranium). Based on environmental monitoring data, each of the states identified regions with high and low levels of metals in drinking water supplies. Since some forms of arsenic are more toxic than others, the states wanted to identify the type of arsenic in subjects with elevated urinary arsenic levels.

The states sought volunteers from identified regions across six states with varying populations and ultimately collected water and urine samples from a total of 2,000 study participants. In addition, a standard epidemiologic questionnaire was developed to assess potential sources of exposure to the metals.

Epidemiologists from New Mexico and Wyoming compiled and analyzed the data. The project established initial population baselines for heavy metals exposure in the six states. It also demonstrated that, while individuals’ drinking water levels correlated with urinary arsenic levels, they only explained 7% of the variation in urine levels, indicating that there might be other exposure sources. In addition, the study identified a previously unknown public health issue regarding elevated urinary uranium in one of the states, which is now under further investigation. The participating health agencies provided this information to the study participants and answered their questions about exposure to arsenic.

This project demonstrates how a consortium approach can be used by multiple states to pursue public health endeavors in a cost-effective manner. More specifically, it demonstrates how states can cooperate and pool limited fiscal, technical and human resources to implement biomonitoring projects that would otherwise be beyond the resources and technical capacity of some states. This project also demonstrates how collaboration among states with low populations can increase the size, statistical power and relevance of scientific studies.

**Minnesota: Minneapolis Children’s Arsenic Study**

In previous decades, arsenic-based pesticides were produced in a Minneapolis neighborhood, leading to community concerns about children being exposed to unhealthy levels of arsenic. Environmental monitoring by the EPA, the Minnesota Department of Agriculture and Minnesota Department of Health revealed elevated levels of arsenic in the soil.

In 2004 and 2005, the production site was capped with clean soil, and in 2008 EPA replaced contaminated yards in the surrounding community with clean topsoil. After several public meetings, the Minnesota Department of Health (MDH) initiated the Minneapolis Children’s Arsenic Study. This study was one of four studies funded by biomonitoring legislation. A scientific advisory panel guided the study, and community participation was essential to its success.

The study encouraged collaboration and partnership between the health department’s Public Health Laboratory Division, Health Promotion and Chronic Disease Division and Environmental Health Division. Experts included laboratory scientists, epidemiologists, toxicologists, exposure assessment researchers,
community health educators, a biostatistician and a physician-consultant. Partnering with the neighborhood health clinic made responding to informal questions from the community easier.

The MDH team selected children for this project because they are more likely to be exposed to arsenic in the soil, through playing on the ground and frequent hand-to-mouth behavior. A total of 65 children, ages three through ten, participated in the study. MDH mailed sample containers with instructions for the adult caregivers to collect urine specimens and also asked them to avoid feeding the children any fish or seafood for several days prior to specimen collection. Finally, caregivers completed a brief questionnaire that included questions about the duration of the child’s outdoor play during the previous week, contact with wood treated with chromated copper arsenic preservatives and recent exposure to dietary supplements, homeopathic medicines and secondhand tobacco smoke.

The public health laboratory followed the published CDC method for total urinary arsenic and conducted a second analysis on any specimen found with an elevated level. In this study, 23 of the 65 specimens had total arsenic concentrations above the threshold, and the laboratory characterized the types of arsenic in these 23 specimens.

The results indicated that the community as a whole did not have elevated levels of arsenic. The analysis found no correlation between levels of arsenic in the soil and levels found in the participants’ bodies.

Only four of the children had total arsenic levels above the standard. Notably, the predominant form of arsenic in the three samples with the highest concentrations was an organic type of arsenic that is also a relatively nontoxic form associated with dietary seafood.

Organizers within MDH credit partnerships with the successful completion of this study. The MDH team released the project results in spring 2009 through various channels including news releases, fact sheets, web postings and community meetings. These meetings provided opportunities for the public to comment and ask questions. Connections to the community, university and policy makers not only garnered the necessary funds for the study, but also helped to shape and validate the project.

**New York: Laboratory Analysis Evaluates Mercury Threat**

Mercury poisoning poses a serious threat to human health. Prolonged, direct exposure can cause damage to the brain, nervous system and kidneys. In New York City, laboratory analysis of people’s exposure to mercury prompted a public health intervention.

In 2004, New York City’s Department of Health and Mental Hygiene (NYC DOHMH) conducted the first ever local Health and Nutrition Examination Survey of health conditions common among adult residents. As part of the survey, the department screened residents’ urine and blood samples for the presence of three toxic metals—lead, cadmium and mercury—at the state’s public health laboratory located at the Wadsworth Center.

Testing produced some unexpected results. Wadsworth scientists identified one participant with a urine mercury level almost five times what is considered elevated. A cross-check with
the results of the participant’s blood sample likewise showed an elevated level of mercury.

The high blood level could have been attributed to seafood, since some fish bioaccumulate mercury, but mercury from fish is typically not found in urine. The survey participant displayed no overt signs or symptoms consistent with mercury poisoning.

Health investigators proceeded to the subject’s home, where they found an imported skin lightening cream with a mercury content of 6,190 parts per million (ppm). According to FDA regulations, cosmetic products manufactured in, or imported to, the US may not contain more than 1 ppm of mercury. The NYC DOHMH initiated an investigation to determine whether this or other similar products were available for purchase in the city. Six labeled products, including the one at the participant’s home, were obtained and tested by both the FDA and a New York state-certified environmental testing laboratory. Analysis demonstrated that the products contained between 4,700-41,600 ppm mercury, levels that constitute a clear health risk.

The NYC DOHMH responded with media alerts and an announcement to health care providers warning against use of skin lightening creams containing mercury and similar products that do not list ingredients. Health inspectors ordered stores to cease sales, embargo products and post bilingual consumer advisory signs. Additional products were located and tested. Ultimately, 12 manufacturers of mercury-tainted products were identified, including nine in the Dominican Republic.

The NYC DOHMH continues to work with other state agencies, the CDC, the Pan American Health Organization and the Dominican Republic to halt manufacturing and export of such products, screen workers for mercury exposure and alert consumers to the dangers of skin products containing mercury. The state laboratory’s use of biomonitoring made it possible to identify this problem and led to important public health actions to prevent future exposure.

State Legislation

California

The California legislature approved the California Environmental Contaminant Biomonitoring Program Statute and the Governor signed it into law in September 2006. This was the first biomonitoring legislation to pass at the state level and marked a major milestone for biomonitoring across the nation.

The California Environmental Contaminant Biomonitoring Program has several purposes:

1. Determine levels of environmental chemicals in a representative sample of Californians.
2. Establish trends in the levels of these chemicals over time.
3. Assess the effectiveness of public health efforts and regulatory programs to decrease exposures to specific chemicals.

The legislation originally provided no funding, although funds were provided later. The law emphasizes peer review by a scientific guidance panel, public participation, consultation
with CDC and coordination with the Environmental Health Tracking Program. The first sampling cycle is expected to commence in fiscal year 2011-2012.

The California program contains several organizational components:
• Scientific guidance panel.
• California Department of Public Health (Environmental Health Investigations Branch and the Environmental Health Laboratory Branch).
• California Department of Toxic Substances Control (Environmental Chemistry Laboratory).
• California Office of Environmental Health Hazard Assessment (Reproductive and Cancer Hazard Assessment Branch).

Minnesota
In Minnesota, state legislation provided the impetus for biomonitoring. In 2005 and 2006, a bill to create a Minnesota biomonitoring program was introduced and defeated in the state legislature. In 2007, the bill was introduced with two major changes: (1) the bill described four biomonitoring pilot projects, and (2) the bill called for the creation of a program that spans both biomonitoring and environmental public health tracking. The bill was passed and signed into law that year.

The Minnesota Environmental Health Tracking and Biomonitoring Program Statute (effective July 1, 2007) provided $500,000 per year for two years for biomonitoring pilot projects. Funding began in summer 2008, and the Minneapolis Children’s Arsenic Study was the first of the four projects to be launched. The program is housed in the state health agency, and it is required to partner with the state agriculture agency, state environmental protection agency and the University of Minnesota.

A distinctive feature of the legislation is the identification of four biomonitoring pilot projects. Roughly, each of the four pilot projects is to study one community that is presumably highly exposed to a particular harmful substance: arsenic, mercury, perfluorochemicals or a chemical to be designated. The remainder of the biomonitoring legislation is modeled after the California statute, and it establishes a scientific advisory panel, requires community participation and directs the health agency to develop biomonitoring program guidelines. This Minnesota statute funds biomonitoring, funded for the first two years only; however, environmental health tracking is funded at $500,000 per year on an ongoing basis.

Illinois
The third state to sign biomonitoring legislation into law was Illinois with the Illinois Biomonitoring Feasibility Study Act Statute (effective January 1, 2008). The legislation calls for a two-year feasibility study to determine the best way to establish an Illinois Environmental Contaminant Biomonitoring Program that includes several functions:
1. Monitor the presence and concentration of designated chemicals in a representative sample of the population of this state.
2. Produce biomonitoring studies that provide data for scientists, researchers, public health personnel and community members to explore potential linkages between chemical exposure and health concerns.

A distinctive feature of the legislation is the identification of four biomonitoring pilot projects.
3. Support Illinois public health by establishing trends in chemical exposures, validating modeling and survey methods, supporting epidemiological studies, identifying highly exposed communities, addressing the data gaps between chemical exposures and specific health outcomes, informing health responses to unanticipated emergency exposures, assessing the effectiveness of current regulations and setting priorities for research.

A scientific guidance panel is to advise the University of Illinois at Chicago (UIC) regarding the design and implementation of a biomonitoring program. A report to the legislature is due two years after enactment of this statute.

**Federal Legislation**

In July 2009, House Speaker Nancy Pelosi introduced the Coordinated Environmental Public Health Network Act of 2009. This bill expands the scope and amount of biomonitoring data collected and analyzed by CDC, state laboratories and consortia of state laboratories, in order to obtain robust information, including information by geographically defined areas and subpopulations, about a range of environmental exposures. Although no appropriation amount is mentioned in this authorizing legislation, the act provides an opportunity to educate policymakers about the need to support biomonitoring at the national and state levels.

**Future Directions**

Many questions about environmental exposures are yet to be addressed, and laboratories hold the keys to unlocking some of the answers. Laboratories can determine the actual concentrations of chemicals in people as a result of environmental exposure, and these data are essential to assessing relationships between chemical exposure and human health.

APHL is committed to helping public health laboratories develop and expand their biomonitoring programs. APHL also recognizes that biomonitoring goes beyond the laboratory and that an effective national biomonitoring system requires the skills, expertise and supporting infrastructure of a variety of additional entities and individuals.

APHL has developed a five-year plan to establish a National Biomonitoring Network (NBN) of public health laboratories. APHL is also working with state public health laboratories to better understand the unique needs at each state. APHL convenes both a Subcommittee and a Workgroup dedicated to addressing biomonitoring issues from policy to the technical laboratory aspects. Staff is working with member laboratories to develop a Biomonitoring Database to serve as a repository of state laboratory information such as the types of projects, analytical methods and instrumentation the laboratories are using for biomonitoring. This database will allow the laboratories to seek out other states working on similar projects and collaborate on developing new methods or testing more samples.

At the same time, APHL plans to work with CDC, EPA and other partner organizations to educate policy makers and assist states in educating their state legislators on the importance of biomonitoring. Through this, states may be able to receive the resources and political support they need to establish robust biomonitoring programs. Only then will states be able to expand their biomonitoring beyond the start-up programs and truly understand the effects of the vast number of chemicals people are exposed to every day.
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References


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