

FACT SHEET

THE RIGHT TRACK: MONITORING THE CHEMICALS IN OUR BODIES CAN IMPROVE PUBLIC HEALTH

WHAT IS BIOMONITORING?

Every day we come in contact with many chemicals that are used in industry and agriculture and can be found in common products such as cosmetics, toys, and plastics. Some of these chemicals can get into our air, water, soil, dust, and food. As a result, all of us have chemicals in our bodies, and some of them can cause adverse health effects such as birth defects, learning problems, obesity, cancer, asthma, and other illnesses.

Biomonitoring is the measurement of chemicals in a person's body by collecting, processing, and analyzing samples of blood, urine, and/or saliva.¹ These measurements contribute critical information on the effect of chemical exposures on human health and facilitate the following interventions:

- **PREVENTION:** Biomonitoring can inform decisions about how best to protect people from chemical exposure and related threats such as birth defects, disabilities, illness, or death.
- **EARLY DETECTION AND INTERVENTION:** Biomonitoring can identify spatial and temporal patterns in the levels of chemicals of concern. It helps to identify potential public health threats and disproportionately exposed groups.
- **INDIVIDUAL BEHAVIOR MODIFICATION:** Biomonitoring measures the levels of contaminants in the body as opposed to the surrounding environment, thus sending a clearer and more direct health message. If presented in an understandable format, these data can inform individual consumer choices.
- **COMMUNITY-LEVEL INTERVENTIONS:** Biomonitoring data can spur community awareness, advocacy, and policy changes.
- **POLICY ASSESSMENT:** Biomonitoring helps evaluate the effectiveness of public health efforts and regulatory programs aimed at decreasing exposures to specific chemicals.

HOW BIOMONITORING CAN HELP IMPROVE PUBLIC HEALTH OUTCOMES

Biomonitoring studies can help answer specific community concerns or inform public health surveillance efforts to detect and measure spatial and temporal differences in population exposures.² This information can help focus actions taken to lower harmful chemical exposures and improve public health. The two following case studies show biomonitoring in action.

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Elevated mercury levels in pregnant women linked to skin-lightening creams acquired abroad

In 2011, the University of California, San Francisco, conducted a study to evaluate the sources and levels of exposure to environmental chemicals in pregnant women and their infants.³ Pregnant women in their third trimesters provided samples of maternal and umbilical cord blood, as well as environmental exposure and demographic

information. California's biomonitoring program analyzed the samples for several environmental chemicals, including mercury.

Laboratory analysis revealed one participant with surprisingly high levels of mercury. A follow-up investigation identified a face cream purchased in Mexico as the exposure source. Additional investigations across the country identified similar cases of highly elevated levels of urinary mercury linked to skin-lightening creams purchased abroad. The San Francisco Department of Public Health and agencies from other states were then able to raise public awareness through media coverage, and the Food and Drug Administration issued a national Consumer Update warning of the dangers of such creams.

In this study, biomonitoring helped identify and reduce a harmful exposure for an individual and her family and, when combined with information from multiple states, led to a nationwide effort to warn consumers about this health threat.

NYC HANES: Elevated mercury levels in New York City Asian communities

In 2004 the New York City Health and Nutrition Examination Survey (NYC HANES) collected health information through surveys and measurements of lead, cadmium, and mercury in blood samples from a representative group of 1,811 adult New Yorkers.⁴ Biomonitoring data revealed mercury levels more than three times the national average, with Asian participants showing the highest concentrations, relative to other racial and ethnic groups.

In the study, fish consumption levels had the highest correlation with elevated mercury levels in participants. The more frequently participants consumed fish, the higher their mercury levels. In particular, Asian New Yorkers reported eating more fish than other groups, which could explain why their mercury levels were the highest.

In response, the city developed public education programs targeting at-risk individuals and communities. For example, brochures were created in Chinese, Korean, Japanese, and English with advice on how to lower mercury exposure during pregnancy and breastfeeding. To better inform policy interventions, the New York Department of Public Health also tested mercury levels in fish from several markets. The tests showed that mercury levels in market fish were not especially high compared with national averages, further suggesting that greater fish consumption was the cause of heightened mercury levels in New Yorkers.⁵

This effort shows how biomonitoring can be used to identify local health threats and target resources at specific communities most at risk.

Ongoing support at both federal and state levels will enable the crucial work of state biomonitoring programs to continue.

BIOMONITORING CALIFORNIA: A CASE FOR STATE BIOMONITORING PROGRAMS

For more than 30 years, the Centers for Disease Control and Prevention (CDC) has used nationwide biomonitoring to help protect the public's health. However, the CDC does not have the capacity to address state-specific environmental health concerns, and nationwide sampling does not reflect the varied and diverse populations of individual states.

Established in 2006, the California Environmental Contaminant Biomonitoring Program (Biomonitoring CA) has developed into the nation's premier state biomonitoring program. The goal of Biomonitoring CA is to measure and track chemicals in Californians. This information can then be used to promote policies that ensure the places where Californians live, work, and play are free from dangerous levels of toxic substances. Biomonitoring CA provides all study results to participants, empowering them to take action to reduce their exposures through changes in personal behavior and advocacy.

Biomonitoring CA measures widely used chemicals that are known or thought to be harmful. Many of these chemicals stay in the body or the environment for extended periods of time, prolonging the potential for health impacts. These chemicals include:

- Flame retardant chemicals in furniture foam, cars, and electronics
- Mercury from coal-fired power plants and mines, which pollutes air and water and contaminates fish, and which can also sometimes be found in skin-lightening creams
- Phthalates in plastic products, food, and personal care products such as nail polishes, shampoos, soaps, and cosmetics
- Pesticides used to kill weeds and insects in farms, homes, yards, and parks

Biomonitoring CA was originally funded by the CDC, which issues grants to start state programs, but the state of California must now reinforce its support to sustain the program. Ongoing support at both federal and state levels will enable the crucial work of state biomonitoring programs to continue. The two case studies that follow demonstrate how state biomonitoring programs can partner with organizations for effective public health research and outcomes.

Health and Environmental Research in Make-up of Salinas Adolescents (HERMOSA) study

Partners: University of California, Berkeley, Clinica de Salud del Valle de Salinas, Center for the Health Assessment of Mothers and Children of Salinas Youth Council, and Biomonitoring CA

This study, led by a local youth council, enrolled 100 Latina girls in Salinas, California, to measure the presence of hormone-disrupting chemicals in their bodies and to educate them about these substances, which are often found in personal care products.⁶ The study sought to determine if levels of these chemicals in the girls' bodies could be decreased through the use of low-chemical personal care products. After just three days, participants saw levels of all four chemical classes of concern decrease by 25 to 45 percent. The results were shared with the community, empowering the affected population to make changes to address the exposures.

This study demonstrates that people can take steps to reduce their own chemical exposures. It is also an excellent example of community-based research, in which populations overburdened with health risks work with researchers to address concerns relevant to their community and develop informational resources that are culturally appropriate.

Biomonitoring Exposures Study (BEST)

Partners: Kaiser Permanente and Biomonitoring CA

The purpose of this ongoing study is to examine potential links between chemical exposures (to pesticides, air and water pollution, and industrial site contamination) and the significant health disparities that exist in California's Central Valley, such as higher rates of chronic disease.⁷ Participants were randomly selected across gender, age, ethnicity, and location, with an emphasis on Latino and Asian/Pacific Islander communities that encounter disproportionate environmental hazards and pollution. This study includes the unique opportunity to connect biomonitoring data and comprehensive medical information through collaboration with Kaiser Permanente.⁸

The BEST study can inform the design of effective interventions and public health policies for the Central Valley and can serve as a model for how biomonitoring can be enlisted in environmental justice initiatives.

ENDNOTES

- 1 Centers for Disease Control and Prevention, "National Biomonitoring Program," www.cdc.gov/biomonitoring/ (accessed April 07, 2016).
- 2 Association of Public Health Laboratories, "Examples of Biomonitoring in Public Health," APHL Public Health Laboratory Issues in Brief, 2013, www.aphl.org/aboutAPHL/publications/Documents/EH_2013October_Examples-of-Biomonitoring-in-PH.pdf.
- 3 Carrie A. Dickenson et al., "Elevated Mercury Levels in Pregnant Woman Linked to Skin Cream from Mexico," *American Journal of Obstetrics and Gynecology* 209, no. 2 (August 2013): e4-e5, [www.ajog.org/article/S0002-9378\(13\)00517-6/pdf](http://www.ajog.org/article/S0002-9378(13)00517-6/pdf).
- 4 Wendy McKelvey et al., "A Biomonitoring Study of Lead, Cadmium, and Mercury in the Blood of New York City Adults," *Environmental Health Perspectives* 15, no.10 (October 2007): 1435-1441, www.ncbi.nlm.nih.gov/pmc/articles/PMC2022653/pdf/ehp0115-001435.pdf.
- 5 Wendy McKelvey et al., "Mercury and Polychlorinated Biphenyls in Asian Market Fish: A Response to Results From Mercury Biomonitoring in New York City," *Environmental Research* 110, no.7 (October 2010): 650-657, www.sciencedirect.com/science/article/pii/S0013935110001155?via%3Dihub.
- 6 Center for Environmental Research and Children's Health, "The Hermosa Study," University of California, Berkeley, <http://cerch.org/research-programs/hermosastudy/> (accessed April 08, 2016).
- 7 Biomonitoring California, "The Biomonitoring Exposures Study (BEST)—2.Expanded," Office of Environmental Health Hazard Assessment, <http://biomonitoring.ca.gov/projects/biomonitoring-exposures-study-best-2expanded> (accessed April 08, 2016).
- 8 The BEST study is a joint effort between Biomonitoring California and the Kaiser Permanente Northern California (KPNC) Division of Research. Investigators collected and analyzed blood and urine samples from 341 adult KPNC members and confidentially connected these data with participants' comprehensive medical information in order to better understand how chemical exposures affect certain health outcomes.