



Biomonitoring is the process of measuring environmental chemicals in people.

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Biomonitoring

By Glen Andersen

From helping determine the effectiveness of public policy to responding to terrorism, biomonitoring plays a significant role in protecting public health. Biomonitoring—the process of measuring environmental chemicals, such as pesticides or mercury, in people—is also used to look at the chemicals that may affect conditions or diseases such as birth defects, developmental disabilities and cancer. Currently, most state laboratories do not have adequate biomonitoring capacity and must rely on federal government assistance. A federal effort is under way to help states develop this capacity so they can better respond to local health needs.

What types of questions can biomonitoring answer?

- Do increased levels of mercury, dioxin or polychlorinated biphenyls (PCBs) in game fish threaten our community's health?
- Have no-smoking policies been effective in reducing tobacco smoke exposure for non-smokers in our state?
- Do pesticides pose a risk to our residents who farm, live near farms or eat certain foods?
- In the event of a suspected terrorist attack: Did the attackers use chemical weapons? Who was exposed and who needs medical treatment?

By indicating exactly what chemicals people have in their bodies and at what levels, biomonitoring provides a scientific foundation upon which sound policy decisions can be built. Biomonitoring also provides health departments with the tools to investigate clusters of illnesses like cancer or birth defects.

Serious Diseases, Uncertain Causes. Environmental factors have been linked to diseases such as asthma, leukemia, learning disabilities, cancer and developmental disabilities. Seventeen percent of U.S. children under age 18 have developmental disabilities—such as mental retardation, autism, cerebral palsy and attention deficit hyperactivity disorder. Although the causes of most are unknown, research suggests that chemicals in the environment—including mercury, lead and PCBs—can cause developmental disabilities in children.

Biomonitoring in Practice

Washington's Department of Health recently began testing pesticide handlers to determine if they are overexposed to these hazardous chemicals. The results surprised investigators—nearly one in four farmworkers tested had suffered potentially harmful pesticide exposure. Twenty of the 345 pesticide handlers tested had such severe damage that immediate removal from their jobs was required. In response to the preliminary data, the Washington Farm Bureau issued a labor advisory, reminding members to provide information and proper training to pesticide workers and require worker compliance with safety protocols.

Federal Action

The Centers for Disease Control and Prevention (CDC) currently collects data on human exposure to more than 140 environmental chemicals. The data can be used to:

- Determine which chemicals are getting into people and at what levels.
- Determine how many people have chemical exposures that are above known toxicity levels.
- Establish a baseline that can be used by physicians and scientists to determine whether a person or group has an unusually high exposure to a chemical.
- Assess the effectiveness of public health efforts to reduce exposure to specific chemicals.
- Set priorities for research on health effects.

State Action

Most states rely on the CDC to investigate chemical accidents or disease clusters and assist in research.

Currently, CDC is working to equip state laboratories to conduct their own testing. CDC awarded \$10 million in planning grants to states between 2001 and 2003. Due to a drop in 2004 funding, however, only a few states received grants to carry their plans forward.

California is the only state so far to consider biomonitoring legislation. Senate Bill 1168, introduced in February 2004, would have created a pilot program to monitor breast milk to determine if environmental contamination is related to increases in diseases such as autism or breast cancer. It also would have created other pilot projects to test for environmental exposures in order to recommend public health action. The bill passed the Senate but was defeated in the Assembly.

Examples from Wisconsin and New Hampshire are not legislative, but demonstrate the type of plans that were developed with CDC funds. New Hampshire would like to test private wells and collect clinical samples to determine if residents are being exposed to high arsenic levels. Residents then would be told how to reduce exposure. Approximately 13 percent of New Hampshire's private wells violate the EPA arsenic standard. Wisconsin, which issued a state-wide advisory to protect residents from exposure to mercury and PCBs in fish, would like to investigate the extent of mercury exposure in its population. Wisconsin also is interested in using biomonitoring to address the needs of farm workers concerned about chemical exposure from aerial pesticide spraying, working in the fields and drinking contaminated water.

Although immediate uses for biomonitoring exist—such as detecting and responding to chemical terrorism or investigating disease clusters—it also is used as a basic research tool. Determining exposure levels to common environmental chemicals provides researchers with some of the basic information needed to determine what role the environment plays in causing disease.

Selected References

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Centers for Disease Control and Prevention
Biomonitoring Program
www.cdc.gov/nceh/dls/factsheets/biomonitor

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A Success Story

In 1976, the Centers for Disease Control and Prevention was measuring lead levels in children's blood. They found that a very high proportion of children—nearly nine out of 10—had unsafe levels of lead in their bloodstreams (lead exposure can cause behavioral problems and I.Q. loss in children). Researchers discovered that leaded gas was the primary cause. The data helped the U.S. Environmental Protection Agency follow through with eliminating lead from gasoline. Lead levels in children dropped dramatically as a result.

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