For years manufacturers have added brominated flame retardants (BFRs) to everything from plastic computer housing to sofas to comply with anti-flammability regulations. Studies, however, now link certain classes of BFRs—notably some polybrominated diphenyl ethers (PBDEs)—to thyroid malfunction, cancer and learning disabilities.

But do the chemicals actually migrate from electronics and furniture into the human body? Biomonitoring data from the California Department of Toxic Substances Control show that PBDEs were absent in blood and fatty tissues 30 years ago but are readily detected in the fluids and tissues of contemporary populations. Moreover, the state found that Californians carry an especially high “body burden” of the chemicals—as much as 40 times more than their European counterparts. Scientists even found flame retardants in breast milk.

Thanks in large measure to biomonitoring data, a laboratory-based biomonitoring is revolutionizing public health policy making by providing concrete data about human exposure to potentially harmful chemicals, such as pesticides, dioxins, flame retardants and naturally-occurring mercury and arsenic. By directly measuring the level of environmental chemicals and their breakdown products in bodily tissues and fluids, biomonitoring distinguishes true health hazards from benign events with negligible human exposure.
California bill banning the penta and octa forms of PBDEs was signed into law in 2003.

Just three years later, in September 2006, California became the first state in the nation to enact legislation establishing an ongoing biomonitoring program to assess residents’ exposure to chemicals associated with cancer, birth defects or other adverse health effects.

“We monitor our air and water for pollution. We monitor fish for mercury. But we don’t monitor ourselves to determine what chemicals we have accumulated in our bodies.”

California State Senator Deborah Ortiz

Laboratory testing will be carried out by the California Department of Toxic Substances Control’s Environmental Chemistry Laboratory and the California Department of Public Health’s Environmental Health Laboratory. The latter will also archive specimens for future research.

Among other things, the biomonitoring program provides an opportunity to assess whether California’s ban on PBDEs will have a beneficial effect; that is, whether the level of PBDEs in human specimens decreases over time.

With state funding, the program is just now getting started. Public sector stakeholders and experts appointed by the legislature will provide input to determine which chemicals the state will monitor. The plan is to study a representative sample of Californians every two years and also to conduct targeted community studies. These targeted studies may encompass specific geographic locations, as well as groups that share similar exposures by virtue of occupation, product use, lifestyle, etc.

The parallel development of a laboratory information management system will make it easier to record and analyze the large volume of data associated with the program, including thousands of test results and detailed demographic and survey information collected from study participants. The computerized information system will also facilitate the reporting of personal test results to participants who elect to receive them.

Already the program has benefited from considerable support from the Centers for Disease Control and Prevention (CDC), which awarded California a two-year biomonitoring planning grant in 2001. In addition, CDC's National Center for Environmental Health, Division of Laboratory Sciences, will fund a one-time community-based study whose focus has yet to be determined and provide ongoing technical support, including methods training for laboratory staff and proficiency testing to evaluate the quality of testing.

Ultimately, biomonitoring data will aid policy makers and public health authorities in several ways:

- Establish the background exposure or chemical “reference levels” of Californians so that trends and unusual spikes can be identified.
- Determine the extent of chemical exposure—and therefore the appropriate response—following industrial accidents, natural disasters or acts of terrorism involving common chemicals.
- Determine the need to add, eliminate or otherwise revise laws and regulations to better safeguard health.
- Provide data for health tracking studies to examine potential long-term effects of specific chemical exposures.

In short, California’s biomonitoring program will supplement theoretical exposure models with concrete data from real human specimens—a firmer foundation for public policy decisions.

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