



Californians Have Twice the National Average of Toxic Flame Retardants in Their Blood

Californians have been exposed to significantly higher levels of toxic flame retardants called polybrominated diphenyl ethers, or PBDEs, than people living in other parts of the country and the world.

In a peer-reviewed study published in the October 1, 2008, online edition of *Environmental Science & Technology*, Silent Spring Institute researchers found double the amount of penta-BDEs in the blood of California residents compared to the nationwide average. The scientists also found chemical ingredients of these commercial flame retardant mixtures in the dust of California homes at four to ten times the levels found elsewhere in the United States and 200 times higher than in Europe. The most contaminated California homes had levels higher than had ever been detected in household dust. Animal studies have linked PBDEs to thyroid abnormalities, endocrine disruption, cancer, and effects on brain development.

The study provides evidence that a flammability standard unique to California—one that requires furniture to be fire resistant to an open flame for 12 seconds—has led to an increased exposure to penta-BDEs, which manufacturers have added to polyurethane furniture foam to meet the standard.

“If you live in California, you are at far greater risk of exposure to toxic penta-BDE flame retardants than if you live anywhere else in the country or the world,” says lead author Dr. Ami Zota, a scientist at the Silent Spring Institute. “These chemicals enter the body when people breathe or ingest contaminated house dust, which is why California residents have double the amount of the chemical in their bloodstreams compared to the national average. The health effects are particularly concerning for babies, children, and pregnant women.”

Implications of the Research for California and the Nation

These study findings may have even broader implications for the future, as state and federal governments are considering imposing new fire safety standards that would expand the use of flame retardants. The California Bureau of Home Furnishings and Thermal Insulation, for example, is now considering extending flammability standards to bed covers, a change that would encourage the use of potentially toxic flame retardants. In addition, the U.S. Consumer Product Safety Commission is considering adopting fire standards for furniture and bed covers.

Following bans in several states, including California, penta-BDE manufacturing in the United States halted in 2004. Furniture treated with the chemical is still present, however, in many homes. Most states, unlike California, have not banned the use of it in imported furniture.

“Concerns about safety gave PBDEs a black eye so the U.S. manufacturer stopped making it,” says Ruthann Rudel, the study director and senior scientist at the Silent Spring Institute. “The problem now is that one hazardous chemical is being traded for another.”

To comply with California’s strict standards, furniture foam is now treated with alternative flame retardants such as tris(1,3-dichloro-2-propyl) phosphate (TDCP), which is a probable human carcinogen, and Firemaster 550, which is suspected of being toxic but has not been tested adequately.

The chemical structure of PBDEs is similar to that of polychlorinated biphenyls, or PCBs, for which adverse health effects, including effects on brain development and breast cancer, have been demonstrated in humans. Penta-BDEs migrate out of furniture and end up in house dust, resulting in human exposure. Young children are especially vulnerable because of their close contact with the floor and frequent hand-to-mouth behavior.

The study found that levels of penta-BDEs in the blood were lower among U.S. residents who were born outside the country, confirming the less frequent use of these chemicals outside the United States. Within the country, blood levels of penta-BDEs were higher among individuals with lower incomes and younger age groups.

“California’s fire standard was passed thirty years ago with the best intentions, but an unintended consequence is that many families have been exposed to toxic chemicals at levels that were never anticipated,” says Zota. “Even more surprising, virtually all the penta-BDE produced globally was used to meet this fire standard, and now these chemicals have been detected in nearly every species across the globe.”

Methodology for the Research

The study was conducted by Silent Spring Institute in collaboration with the University of California Berkeley, Brown University, and Communities for a Better Environment, a California environmental justice organization. The researchers compared dust samples collected from 49 homes in two California communities—Richmond and Bolinas—with 120 homes in Cape Cod, Massachusetts, along with results from published home tests in Texas; Boston, Massachusetts; and Washington, DC; as well as in Canada, the United Kingdom, and Germany. When researchers found high levels of penta-BDEs in California dust, they wondered whether the same pattern would be found in national human biomonitoring data. To answer this question, the researchers analyzed regional differences in human blood levels of PBDEs from more than 2,000 people in the National Health and Nutrition Examination Survey, a nationally representative dataset maintained by the U.S. Centers for Disease Control and Prevention.

Significance of the Study

This is the first study to systematically examine the effects of California’s fire safety standards, and it provides compelling evidence that the state’s furniture flammability standard has led to unparalleled and widespread exposures to flame retardants. The health consequences of these elevated exposures have yet to be properly evaluated in human studies, but animal studies and human studies of structurally similar PCBs raise concerns.

These findings are timely as California is on the verge of implementing flammability standards for bed clothing, and in the past two years there have been initiatives at the state and federal level to adopt California’s TB117 furniture flammability rule. Although use of penta-BDE has been phased out, new chemicals have been substituted without assessment of their safety or environmental impact. This study’s findings foreshadow future exposure patterns to be anticipated from these substitutes. These results suggest the need for more thoughtful assessment of environmental and health impacts of product use decisions before they are implemented.

Citation for the Study

Zota, A.R., R.A. Rudel, R.A. Morello-Frosch and J.G. Brody. 2008. **Elevated House Dust and Serum Concentrations of PBDEs in California: Unintended Consequences of Furniture Flammability Standards?** *Environmental Science and Technology*, DOI: 10.1021/es801792z