Flame Retardants in Furniture Foam

Concerns & Health Risks

http://ofwineandwords.blogspot.com/2011/08/haiku-81411.html

Flame retardant (FR) chemicals are used widely in foam to help upholstered furniture meet flammability standards such as California's TB 117 (residential) and 133 (public buildings), with a goal of reducing fire-related injuries and death. However, research findings link health risks with exposure to some types of FR chemicals, suggesting that FR chemicals in upholstered furniture may harm employees, consumers, and their children. These concerns have led California to revise TB 117 even as a patchwork of states work to ban individual FR chemicals or whole classes of FR chemicals. **Recent widespread media attention has raised consumer concern about the safety of FR chemicals, increasing pressure on furniture companies and regulators to make informed and responsible choices about FR chemicals.**

How is the safety of FR chemicals governed?

The Toxic Substances Control Act (TSCA) authorizes EPA to regulate the use of chemicals that may injure health or the environment but does not require safety testing of new FR chemicals.[1] Further, businesses can restrict public identification of chemicals that do not have safety tests reported to EPA, which prevents independent researchers from identifying these chemicals and testing their safety.[2] As concerns rise about a particular FR chemical, states may regulate its use with patchwork rules. After a body of evidence develops, foam companies may respond to public pressure by replacing widely used FR chemicals with alternatives. Often less is known about the safety and health effects of these replacement FR chemicals, and, as outlined below, unfortunately in some cases the replacements may later be found to be toxic.

This lack of safety testing, including the safety of long-term, low-level exposure, particularly in early childhood, both increases risks for public health and also leaves furniture companies chronically uncertain about safe manufacturing practices.

A Conveyor Belt of Toxic FR Chemicals

Historically, companies have manufactured a series of FR chemicals with unknown health risks:

- Polybrominated biphenyls (PBBs), which are similar to polychlorinated biphenyls (PCBs), began use as FR chemicals in foams and textiles in 1970, but production ceased voluntarily within just a few years, after people in Michigan ate beef exposed to PBB-contaminated cattle feed.[3]
- Polybrominated diphenyl ethers (PBDEs), which became common in the late 1970s, have chemical properties similar to PBBs. Their effects on human health were unknown then; all PBDEs have now been phased out of use in the U.S. over concerns about their health risks, such as effects on brain development.[4]
- Scientific concerns are now growing about potential health risks of the FR chemicals replacing PBDEs, such as TDCPP and organophosphate FR chemicals.[5,6] Some states have passed or are considering bans on several FR chemicals in children's products and in furniture.

Emerging FR chemicals, including both halogenated and organophosphate compounds, frequently have chemical properties similar to those of compounds with known health concerns, and their toxic potential warrants caution.

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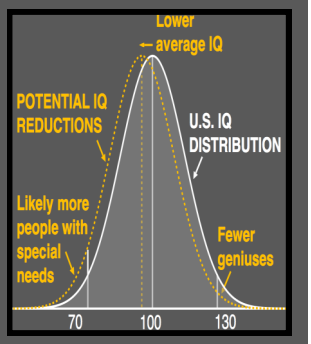
"History has shown that it often takes millions of taxpayer dollars and several decades of research on these new chemicals before we realize there is a health hazard."[7]

—Dr. Heather Stapleton, a leading researcher on the environmental chemistry of flame retardants at Duke University, testifies in front of the U.S. Senate Committee on Environment & Public Works

A national effect?

Exposure to halogenated and organophosphate FR chemicals may, like lead exposure, permanently decrease some children's IQ.[20–23]

Widespread exposure to these FR chemicals, such as from furniture and electronics, might decrease our national IQ, affecting some children's future professional performance and increasing the number of people needing special services.



Possible changes in the U.S. population's IQ

Although research is ongoing, there are risks that both halogenated and organophosphate FR chemicals may contribute to population-level IQ reductions and other neurological disorders.

How might halogenated FR chemicals harm human health?

Halogenated FR chemicals contain either bromine or chlorine atoms, which are chemically similar to iodine, a halogen found in thyroid hormones. Some of these halogenated FR chemicals may cause health problems by mimicking thyroid hormones and interfering with their normal activity—which includes breathing and heart function, digestion and metabolism, activity of other hormones, and muscle and brain development.[8–10] **Exposure to seemingly low quantities of halogenated FR chemicals at important times during development in childhood is now associated with lower IQ and other permanent changes in behavior such as ADHD.**[11–13]

While the carcinogenicity of many halogenated FR chemicals has not been tested, TDCPP is suspected to cause cancer.[5] Emerging research further suggests that exposure to Firemaster® 550, a mixture of brominated and organophosphate FR compounds, may increase the risk of obesity and lead to additional metabolic disruption in the body.[14]

Are organophosphate FR chemicals safe?

The organophosphate FR chemicals replacing halogenated FR chemicals are structurally similar to organophosphate pesticides. In adults, moderate and high exposure to organophosphate pesticides can cause nerve damage and cognitive problems.[15] In infants and children, even much lower levels may harm brain development.[16]

Organophosphate FR chemicals, such as TDCPP, triphenyl phosphate, and isopropylated triaryl phosphate, are being used in furniture foam even as research suggests that these compounds may change brain and heart development, responses to sex hormones, and reproductive function.[17–19] A preliminary study suggests that TDCPP may harm brain development and function at a level similar to a common organophosphate pesticide.[17]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Tests of the high-dose toxicity of some organophosphate FR chemicals, such as resorcinol-bis (diphenyl phosphate), which has been used in electronics, have not yet presented serious health concerns.[6,20] Safety tests of high-dose, short-term exposures, however, may not reveal important health risks from the compound chemically degrading, from years of comparatively low exposures in adults, or from low exposure during critical developmental periods in childhood. **Many of these organophosphate FR chemicals have not yet been tested for such life-long safety.**[6]

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What does this graph mean?

People in the U.S., especially in California, have blood levels many times higher than most people living in Europe and Japan.[27-31]

Children in the U.S., especially in California, have even higher blood levels of BDE-47. Small children frequently ingest FR chemicals in dust when they put their hands in their mouths while crawling on the floor.

Young children are growing and developing rapidly. Changes in their development may lead to life-long effects on brain and health.[32,33]

Workers who handle polyurethane foam, such as foam recyclers, regularly breathe in airborne particles carrying FR chemicals.

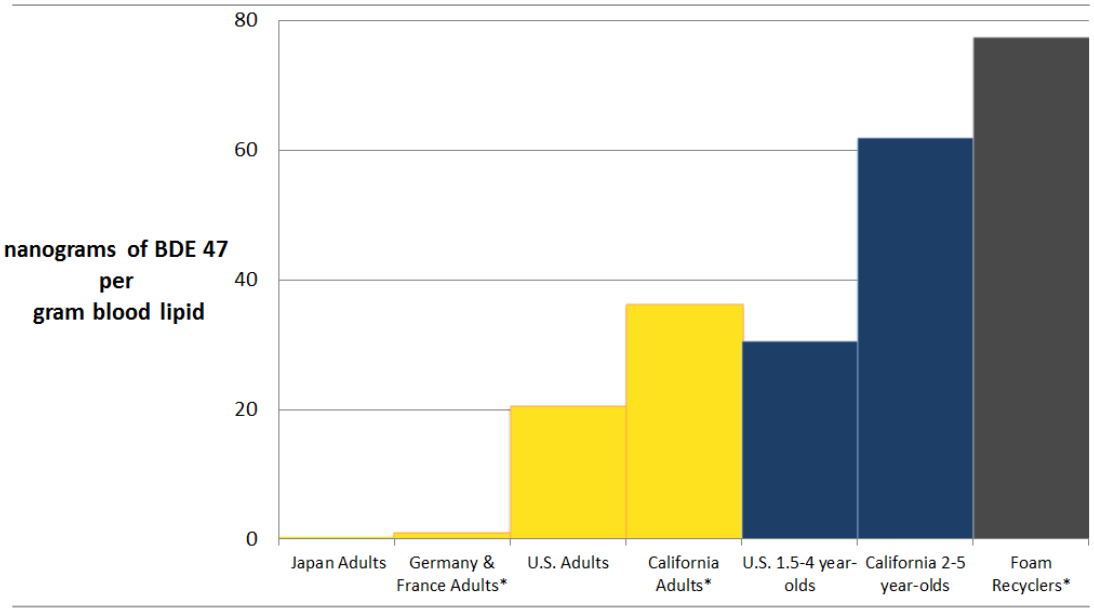
Direct and consistent exposure likely causes these workers to have the highest levels of BDE-47 among the groups represented here.[34]

What are the levels of U.S. exposure?

Upholstered furniture, as well as vehicles, building insulation, and electronic devices, expose consumers, children, and workers to these FR chemicals.[5] **About 80% of human exposure may derive from dust, and dust samples in virtually every home tested in the U.S. have FR chemicals in them.**[5]

People in the U.S. carry in their bodies much higher levels of halogenated FR chemicals such as BDE-47, a component of pentaBDE, than people in other developed countries (see chart). Children's exposures to PBDE levels within the ranges in the United States have been associated with changes in brain development and with reduced IQ.[12,21,22]

All PBDEs have been removed from new products in the U.S., and initial testing suggests that body levels of PBDEs in the U.S. are decreasing.[25] **Now, people in the U.S. increasingly test positive for the halogenated and organophosphate FR chemicals replacing PBDEs**.[26]



Values are either medians (*) or geometric averages of the best available data from 2003-2007. Sample sizes remain small for some groups; more comprehensive testing would improve our understanding of likely exposure in each group.

What about fire safety?

California's revised TB 117-2013 will apply a smolder test to the upholstery over foam, eliminating the open flame test and making it easier to meet TB 117 without FR chemicals.[34] Would removing FR chemicals from foam make furniture less safe in fires?

- Some halogenated and organophosphate FR chemicals may increase smoke and carbon monoxide production when burned, decreasing visibility during a fire and increasing the danger of smoke inhalation.[36,37] Inhaling smoke is a primary cause of fire-related deaths.[38]
- Using FR chemicals that meet TB 117 in furniture foam may have much less impact on how a whole piece of furniture burns than do the properties of fabric coverings and inter-liner fire barriers.[39–41] Fire barriers can substantially delay the progress of a fire. Some of these barriers contain halogenated or organophosphate flame retardants, however, suggesting caution about some specific barrier materials.

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