

Cancer-causing flame retardants linger on in California

Chemicals remain in household dust samples, some of them years after being banned.

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Chemicals designed to slow household fires continue to be found in worrying quantities in US homes, long after some of them have been banned because of suspected links to cancer and other conditions.

The most controversial chemicals — used to fire-proof sofas and foam baby products such as high-chair seats — are now on the way out, but a new generation with sometimes unknown health effects has taken their place, warn researchers.

Two studies published today in *Environmental Science and Technology*^{1,3} are prompting some scientists to call for a fundamental reform of how flame-retardant compounds are dealt with by regulators — and why they are used in the first place.

Previous studies have shown that a huge variety of flame retardants are present in household products such as sofa foams, especially in California, where legislation demands that foam inside furniture must be able to withstand an open flame for at least 12 seconds (see '[A burning issue](#)'). Some of these compounds have been linked to a range of negative health effects in animals and humans, including carcinogenicity and neurotoxicity.

The flame retardant PentaBDE, one of a group of compounds called polybrominated diphenyl ethers or PBDEs, was phased out from 2004 in the United States and the European Union, following earlier bans in California and some European countries.

But now, epidemiologist Julia Brody and toxicologist Ruthann Rudel of the Silent Spring Institute in Newton, Massachusetts, and their colleagues have shown¹ that flame retardants including PentaBDE hang around in household dust for years. The chemicals are thought to leach out of foam products into the wider household environment.

The team took dust samples from 16 Californian homes in 2006, and again in 2011. Every sample contained at least one flame-retardant chemical, and 41 compounds were found in at least half of the samples.

Compounds related to PentaBDE were present in all samples. This is likely to be from 'legacy' household products — for example, old sofas that have not been replaced, say the researchers.

Chemicals and the brain

Earlier this month, the largest-ever study on PBDEs and neurological development found² that children whose mothers had increased levels of PBDEs in their blood during pregnancy were likely to perform poorly in concentration tests at the age of five, and to do worse than expected on IQ tests at age seven.

"We're building a body of evidence that these PentaBDEs are associated with adverse outcomes. We also now see that what happens in California has impact on other places in the United States and has its impact for a very long time," says Brenda Eskenazi, director of the Center for Environmental Research and Children's Health at the University of California, Berkeley, and a co-author of the study, which was published in *Environmental Health Perspectives*. "We don't buy new couches every day. These compounds have long half lives. This is an ongoing problem."

Other compounds introduced to replace PentaBDE are now also prevalent. Of a total of 55 chemicals detected by Brody, Rudel and their team¹, 13 were related to PBDEs, 3 were components of a replacement chemical called Firemaster 550 and 15 were other brominated flame retardants.

In a separate study³, another team of researchers also highlights the growing use of replacement flame retardants. Heather Stapleton,



Kate Fredriksen / SHUTTERSTOCK

Old sofas may harbour banned flame retardants, which have been implicated in causing cancer.

an environmental chemist at Duke University in Durham, North Carolina, and her colleagues looked at 102 foam samples from couches bought between 1985 and 2010 across the United States. PBDEs were present in 39% of samples from sofas bought before 2005; 24% contained another flame retardant, tris (1-3-dichloroisopropyl) phosphate or 'tris'.

In samples from couches bought after 2005, the most common compounds were tris (52%) and Firemaster 550 (18%). Tris was once used to fire-proof children's sleepwear, but it was withdrawn in the late 1970s after concerns were raised that it can cause cancer.

In their paper¹, Brody and Rudel note that there have been no studies on the carcinogenicity or reproductive and developmental effects of the brominated components of Firemaster 550.

Firemaster 550 is manufactured by Chemtura of Philadelphia, Pennsylvania, which strongly defends its product. In a statement to *Nature*, the company said that regulators had required “extensive testing” of the brominated component of Firemaster 550, and the tests had been conducted by independent laboratories. Based on these studies, Chemtura's scientists concluded — and the US Environmental Protection Agency agreed — that this component was less likely to accumulate in organisms than the flame retardant it replaced, and that “predicted exposure was orders of magnitude lower than levels associated with potential toxicity”.

California schemin'

Some researchers pin the blame for the prevalence of flame-retardant compounds on California's flammability rules.

“The problem with the standard now is it can only be met by adding the chemicals,” says Rudel. “The bigger problem is there isn't a requirement for some kind of assessment of the safety of chemicals that are used before they're used.”

This means that concerns about one substance lead to the “substitution of one bad chemical for another”, she notes. California Governor Jerry Brown is pushing to reform the state's laws.

Larissa Takser, who studies flame retardants at the University of Sherbrooke in Canada, notes that many of the latest findings are expected, given the history of the use of such compounds. She says that the important questions are should these compounds be tested before use, and do they need to be used as widely as they are?

“I'm not against the substances,” she says. “It's the use.”

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References

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