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New flame retardants detected in indoor and outdoor environments

New research suggests that a flame retardant marketed as a replacement for a banned and discontinued PBDE retardant can be found in people's homes and the outdoor environment.

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New research published in *ES&T* (DOI [10.1021/es801070p](https://doi.org/10.1021/es801070p)) presents the first evidence that a widely used flame retardant introduced as a replacement for the persistent, bioaccumulative, and toxic [Penta-BDE retardant formulation](#) is present in dust found in North American homes. Coupled with indications that the retardant is also entering the outdoor environment, the research raises questions about its safety.



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[Heather Stapleton](#) of Duke University's Nicholas School of the Environment and Earth Sciences and her colleagues set out to determine whether household dust contains flame retardants that can be used in place of Penta-BDE, which was banned in the EU and discontinued in the U.S. in 2004. By using gas chromatography

In addition to being found in house dust, both TBPH and TBB have been detected in sewage sludge from wastewater treatment plants that discharge effluent into the San Francisco Bay, according to Susan Klosterhaus, an environmental scientist with the San Francisco Estuary Institute and a coauthor of the research.

and electron capture negative ion mass spectrometry, the researchers detected four

brominated compounds in dust collected from 19 Boston-area homes. Three of the compounds — bis(2,4,6-tribromophenoxy)ethane (known as BTBPE), decabromodiphenyl ethane (DBDPE), and hexabromocyclododecane (HBCD)—were familiar flame retardants, but the fourth was a mystery.

Over the course of the next 8 months, Stapleton and her colleagues identified the unknown compound as (2-ethylhexyl) tetrabromophthalate (TBPH) and verified the presence of 2-ethylhexyl 2,3,4,5-tetrabromobenzoate (TBB) in the dust samples. These two compounds are the active ingredients in the [Firemaster 550 flame retardant](#) made by [Chemtura Corp.](#) However, TBPH is also used as a flame retardant in other products.

A written statement from Chemtura says independent testing of Firemaster 550 showed that it had “a better environmental profile [than Penta-BDE and met] the U.S. EPA’s toxicological requirements.” The company “believes that new and alternative flame retardants should be shown to be safer for the environment and human health than those they are intended to replace,” and it continues “to conduct additional toxicology and exposure testing that will be shared with the EPA.”

In the new *ES&T* research, Stapleton and colleagues found that the relative distribution of the flame retardants in the house dust followed the same log-normally skewed patterns that have previously been shown for [PBDEs](#) in house dust. These patterns suggest that some people are exposed to far higher amounts of the chemicals than others.

[Tom Webster](#), associate chair of environmental health at Boston University’s School of Public Health and a paper coauthor, says scientists are particularly concerned about the potential risk that such chemicals pose to small children, who can unintentionally consume relatively large amounts of dust. In light of the potential for exposure that is documented in the new paper, Webster expressed dismay over the paucity of toxicology data available for the Firemaster 550 components.

Bob Luedeka, executive director of the [Polyurethane Foam Association](#), says that although no official statistics exist on flame retardant usage, he understands that Firemaster 550 is widely used to meet California’s flame retardant standards, the nation’s only regulations to address the flammability of upholstered furniture. Until about 5 years ago, Luedeka says, some furniture manufacturers used foam formulated to meet California standards in all of their U.S. products, but he believes this practice is declining.

Luedeka stresses that although individual manufacturers make their own choices about flame retardants, his association recently launched a program called [CertiPUR](#) to help manufacturers worldwide ensure consumers that their products meet standards for known hazards. However, the only flame retardants considered unacceptable in CertiPUR are the ones that are “flat-out banned,” Luedeka says. Those are limited to Penta-BDE, Octa-BDE, and Deca-BDE (the latter is [banned in the EU](#) and in some U.S. states.)

Luedeka credits a report issued in 2005 by the [Furniture Flame Retardancy Partnership](#), a joint venture among EPA, industry, and environmental groups, with providing some information on the 14 retardants that can be used with polyurethane foam padding for upholstered furniture. However, Luedeka says, “We’re still lacking environmental health and safety data on some of these [retardants] to ensure that they do not affect reproduction or development.”

Stapleton says that she and her colleagues have had a hard time tracking down information about which consumer goods are sources of the other flame retardants they found. “It’d be nice if manufacturers were required to list which flame retardants were used to treat consumer products,” she says.