

Flame retardants, policy, and public health: past and present

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In the 1970's, flammability regulations for children's pajamas, furniture, and baby products (strollers, baby carriers, high chairs, etc) were enacted to reduce fire deaths and injuries. These regulations were met by adding high levels of halogenated flame retardants to fabrics and polyurethane foam. Since then a series of toxic, bioaccumulative, and/or persistent organohalogen flame retardants have been removed from use due to their hazard to human health and the environment.

For example, in 1977, the Consumer Product Safety Commission (CPSC) banned brominated Tris [tris (2,3-dibromopropyl) phosphate] from children's sleepwear after it was found to be a mutagen, a carcinogen, and absorbed into children's bodies. The replacement, chlorinated Tris [tris (1,3-dichloro-2-propyl) phosphate], or TDCP, also a mutagen, was removed from use in pajamas, but not other products.

Beginning in the 1970s, the fire retardant pentabromodiphenyl ether (pentaBDE) was added to polyurethane foam in furniture and juvenile products to meet California's Technical Bulletin 117 (TB 117). PentaBDE is semi-volatile and migrates into dust. This organohalogen accumulates in humans, wildlife, and the environment and has the potential to cause adverse health effects. Legislation banning pentaBDE and also octaBDE was passed in California in 2003 and subsequently in eight other states and the EU.

The primary replacements in polyurethane foam are the same chlorinated Tris that was removed from children's sleepwear, and Firemaster 550, a mixture of four chemicals known to be toxic or lacking health information. In 2004, the EPA Design for the Environment predicted reproductive, neurological, & developmental toxicity and persistent degradation products from Firemaster 550, which is currently found in dust, sediment, and marine mammals.

In numerous animal experiments and a lesser number of human studies, pentaBDE and related fire-retardant chemicals have been reported to cause thyroid and endocrine disruption, reproductive, neurological, and developmental impairments, and cancer. Young children have about three times the levels of their mothers due to high levels in breast milk and dust. U.S. levels of PBDEs in house dust and body fluids are higher than those of other countries. Californian has higher levels than residents of other states. For the most highly exposed populations, the margin of safety for PBDE exposure appears to be low to non-existent for developmental neurotoxicity and reproductive toxicity.

However the California standard has not been shown to have reduced fire deaths in that state compared to other states which have no flammability regulations. The major causes of decreased U.S. fire deaths are less cigarette smoking, more smoke alarms and building sprinklers, childproof lighters, fire safe cigarettes and candles.

Recent attempts to alter California TB117 to reduce the use of halogenated flame retardants were defeated by chemical industry lobbyists. However, several industry proposals for requirements to increase the usage of unneeded flame retardants failed after peer-reviewed scientific research results were brought into regulatory processes.

Reducing halogenated flame retardants in consumer products appears to present an opportunity to contribute to preventing a wide range of adverse human health and environmental impacts without compromising fire safety.