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**Environmental**  
**HEALTH**

*Dedicated to a safe  
and less toxic world for  
Michigan's children*

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## MI Department of Environmental Quality on Deca-BDE

*The following statements are excerpted from "Polybrominated Diphenyl Ethers: A Scientific Review with Risk Characterization and Recommendations," a May 2007 draft report by the Michigan Department of Environmental Quality Toxics Steering Group. The full report is available online at:  
[www.michigan.gov/documents/deq/deq-keytopics-tsg-pbdereview\\_187119\\_7.pdf](http://www.michigan.gov/documents/deq/deq-keytopics-tsg-pbdereview_187119_7.pdf)*

### **RECOMMENDATION**

**"The recommendation is made to support legislation banning Deca-BDE. This recommendation is contingent on the availability of a safe alternative."**

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### Health Effects

"Toxicity data for PBDEs are limited. Exposure of laboratory animals to PBDEs has resulted in histopathological changes to the liver, neurodevelopmental effects in developing animals, and/or reductions in thyroid hormone levels."

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### Levels of PBDEs in Humans Highest in the USA

"Data on concentrations of PBDEs in human blood, breast milk, and adipose tissue have consistently shown levels to be significantly higher in North America, compared to Europe or Japan. Levels found in the U.S. are the highest of all countries for which there are data and are about 10-100 times greater than human tissue levels in Europe."

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"Several recent studies have identified detectable levels of BDE-209 [deca] in human tissues."

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### PBDE Levels Rising in Humans

"Temporal trends of PBDEs in human tissues show levels in North America are increasing significantly over time...PBDE levels in breast milk also show similar increases over time and appear to be doubling every two-to-five years in North America (Betts, 2002)."

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### PBDEs in the Great Lakes

"PBDEs have been found in ambient air, lakes, rivers, soils, and sediments as well as in the indoor environment... PBDE levels measured in the Lake Michigan water column in 1997-1999 ranged from 31-158 pg/L compared to 6 pg/L in Lake Ontario (Hale et al., 2003)... BDE-209 is the predominant congener found in most sediments, including those of the Great Lakes, where average concentrations ranged from a low of 11 ng/g in Lake Superior to a high of 227 ng/g in Lake Ontario (Song et al, 2004, 2005b; Zhu and Hites, 2005)."

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### Deca in Food, Fish, and Wildlife

"Great Lakes fish have been observed to have relatively high concentrations of PBDEs compared to other foods."

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"BDE-209 [deca] had been detected in food and wildlife. Studies have shown that terrestrial animals (those feeding on land) may be more likely to bioaccumulate BDE-209 [deca] as compared to aquatic feeding organisms."

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### Persistent & Bioaccumulation

"Based on the chemical characteristics of PBDEs, they are expected to be persistent and bioaccumulative in the environment. The half-life of PBDEs in soil and water was estimated to be 150 days, and 600 days in sediment."

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"Bioaccumulation in the environment has been well documented in numerous species and at numerous locations globally."

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### Debromination (Breakdown) of Deca to More Toxic Chemicals

"Studies have shown that several species of animals readily metabolize BDE-209 from the parent compound to lesser-brominated congeners. Debromination of BDE-209 reduces or eliminates the presence of BDE-209 [deca], but results in higher concentrations of the lower brominated congeners, many of which are more toxic than BDE-209 [deca]."

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"A human study evaluating occupational exposure to BDE-209 demonstrated some workers with high exposures to BDE-209 by blood levels elevated 5-100 times that of the reference workers. Among those workers with higher exposures to BDE-209, there were also elevated blood levels for Octa- and Nona-BDE... These results are suggestive that there may be reductive debromination occurring after exposure to BDE-209 resulting in Octa- and Nona-BDE metabolites. The authors do not rule out the possibility of preferential bioavailability and/or retention of these congeners as alternate hypotheses for these results (Thuresson et al., 2005)."

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### Deca Can Leach from Products

"Commercial production of PBDEs began in the late 1970s. PBDEs are physically combined with the polymer material being treated (additive flame retardant) rather than chemically combined (reactive flame retardants). As a result, there is a possibility that PBDEs may diffuse out of the treated material to some extent."

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### Additivity of PBDEs with Other Toxicants

"Another critical consideration is that the hypothyroxemia and some of the altered neurological and neurobehavioral effects are similar to those observed after exposures to noncoplanar PCBs. Eriksson et al., (2006), evaluated the potential additive effects of BDE-99 and PCB-52. They found a greater than additive effect of the two chemicals combined on alteration of spontaneous locomotor behavior and habituation capability in mice dosed on postnatal day ten. Further evaluation of potential additivity of effects from these two classes of chemicals should be considered."

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### Manufacture of Deca

"Commercial Deca-BDE contains 0.3-3% Nona-BDE and 97-98% Deca-BDE (WHO, 1994). **In the United States, PBDEs are only produced in Arkansas at the Albemarle Corporation (Magnolia, AR) and at the Great Lakes Chemical Corporation (Eldorado, AR) (ATSDR, 2004)."**

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### Toxicity Similar to Dioxins

"Some PBDE congeners exhibit toxicity similar to dioxins."

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### Uses of Deca

"About 40% of commercial Deca-BDE is used in high impact polystyrene applications, such as television and radio housings. Other significant uses of commercial Deca-BDE are in textile applications, such as polyester fiber additives and coatings for automobile fabric, tarpaulins, and tents."

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### Absorption of Deca

"Recent studies indicate there can be 10-65% absorption of Deca-BDE after oral exposure (Sandholm et al., 2003; Birnbaum and Staskal, 2004)... More recent studies have demonstrated greater than 10-65% absorption of the administered BDE-209 doses (Morck et al., 2003; Sandholm et al., 2003; Viberg et al., 2003b; Birnbaum and Staskal, 2004)."

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