Polybrominated Diphenyl Ethers - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polybrominated diphenyl ethers (PBDEs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polybrominated diphenyl ethers (PBDEs) are man-made chemicals found in plastics used in a variety of consumer products to make them difficult to burn. Very little is known about the health effects of PBDEs in people, but results from some studies suggested an association between PBDE exposure and altered neurodevelopment. PBDEs have not been found in any of the 1,832 current or former National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are PBDEs?

Polybrominated diphenyl ethers (PBDEs) are flame-retardant chemicals that were added to plastics and foam products to make them difficult to burn. These substances are not single chemical compounds, but rather mixtures of several brominated substances. The entire family of PBDEs consists of 209 possible substances that are referred to as congeners.

There were three important commercial PBDE mixtures (i.e., penta-, octa-, and deca- bromodiphenyl ethers [BDEs]). DecaBDE's main use was for electronic enclosures, such as television cabinets. OctaBDE was largely used in plastics for business equipment. PentaBDE was principally used in foam for cushioning in upholstery.

PentaBDE and octaBDE mixtures were voluntarily withdrawn from the U.S. marketplace by their manufacturers at the end of 2004. In the U.S., the manufacture and import of PBDEs was discontinued by the end of 2013

What happens to PBDEs when they enter the environment?

- PBDEs can be released into the air, water, and soil at places where they are produced or used.
- In air, PBDEs can be present in both the vapor phase and as particles; eventually PBDEs settle to soil or water.
- Sunlight can degrade some PBDEs.
- PBDEs do not dissolve easily in water, but stick to particles and settle to the bottom of river or lakes.
- Various food items, including fish, meat, and dairy products, have been shown to contain low concentrations of PBDEs.
- Lower-brominated PBDEs bio-concentrate in aquatic organisms.

How might I be exposed to PBDEs?

- The concentrations of PBDEs in human blood, breast milk, and body fat indicate that most people are exposed to low levels of these substances.
- The primary route of exposure to PBDEs for the general population of the United States is from ingestion of contaminated dust in indoor environments, including both personal residences and work-place environments. This accounts for 80–90% of total PBDE exposures of the general population.
- You may be exposed also to PBDEs from eating foods with high fat content, such fatty fish.
- People can also be exposed by inhalation; consumer products such as computers and televisions treated with PBDEs can continue to release these substances to air over time.
- Touching soil containing PBDEs may result in a small amount of PBDEs passing through your skin into the bloodstream; ingestion of soil can lead to higher PBDEs exposure.

How can PBDEs affect my health?

There is no definite information on health effects of PBDEs in people. However, several recent studies have evaluated associations between PBDE concentrations in blood and/or breast milk and various health effects. Results from some studies suggested an association between PBDE exposure and altered neurodevelopment. Studies that examined other systems had inconclusive results or no association with PBDEs was evident.

How likely is PBDEs to cause cancer?

We don't know if PBDEs can cause cancer in people, although liver tumors developed in rats and mice that ate extremely large amounts of decaBDE throughout their lifetime. Lower-brominated PBDEs have not yet been tested for cancer in animals.

The International Agency for Research on Cancer (IARC) has stated that PBDE as a group is not classifiable as to its carcinogenicity to humans based on inadequate evidence of carcinogenicity in humans and inadequate or limited evidence in experimental animals. The EPA states that mono-, di-, tri-, tetra-, penta-, hexa-, octa-, and nonaBDEs are not classifiable as to human carcinogenicity and that there is "inadequate information" to classify the specific congeners 2,2',4,4' tetraBDE, 2,2',4,4',5-pentaBDE, and 2,2',4,4',5,5'-hexaBDE. However, EPA assigns a classification of "suggestive evidence of carcinogenic potential" for decaBDE. The Department of Health and Human Services has not classified PBDEs as carcinogens.

How can PBDEs affect children?

Studies indicate that infants and toddlers have higher exposures to PBDEs compared to older children or adults. Children are exposed to PBDEs in generally the same way as adults, mainly by eating contaminated household dust and food. Because PBDEs dissolve readily in fat, they can accumulate in breast milk and may be transferred to babies but exposure of fetuses in the womb could occur through the placenta.

Results from human studies are suggestive of an effect of PBDEs on neurodevelopment in children, including impaired cognitive development (comprehension, memory), impaired motor skills, increased impulsivity, and decreased attention.

How can families reduce the risk of exposure to PBDEs?

- Dust containing PBDEs can collect on your hands and be ingested through hand-to-mouth activities; regular hand washing may decrease PBDE exposure from this route.
- PBDE exposure may be decreased by regular vacuuming and cleaning of air ducts and filters to reduce indoor dust levels.
- Since many older consumer products such as televisions, computers, and furniture containing polyurethane foam contain PBDEs, replacing older products with newer ones that do not contain these substances may decrease residential PBDE exposure.

Is there a medical test to show whether I've been exposed to PBDEs?

PBDEs and their breakdown products (metabolites) can be measured in human blood, hair, and breast milk. However, the detection of PBDEs or their metabolites cannot predict the kind of health effects that might develop from that exposure. Because PBDEs and their metabolites either leave the body or are distributed to body fat fairly rapidly, the tests need to be conducted within days if an acute, high-level exposure is suspected.

Has the federal government made recommendations to protect human health?

The EPA requires that companies that transport, store, or dispose monobrominated diphenyl ether (a specific PBDE compound) follow the rules and regulations of the federal hazardous waste management program. The EPA also limits the amount of monobrominated diphenyl ether put into publicly owned waste water treatment plants.

References

This ToxFAQs™ information is taken from the 2017 Toxicological Profile for Polybrominated Diphenyl Ethers produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333-4027.

Phone: 1-800-232-4636.

ToxFAQs™ on the web: www.atsdr.cdc.gov/toxFAQs

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.