ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYBROMINATED BIPHENYLS and POLYBROMINATED DIPHENYL ETHERS

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about polybrominated biphenyls and polybrominated diphenyl ethers. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is 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 biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) are manmade chemicals found in plastics used in a variety of consumer products to make them difficult to burn. Some people who ate food contaminated with PBBs in the 1970s had skin problems. Almost nothing is known about health effects of PBDEs in people. PBBs have been found in at least 9 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA). PBDEs have not been identified in any of the 1,613 sites.

What are PBBs and PBDEs?

PBBs and PBDEs are manufactured chemicals found in plastics used in a variety of consumer products (computer monitors, televisions, textiles, plastic foams, etc.) to make them difficult to burn. Because they are mixed into plastics rather than bound to them, they can leave the plastic and find their way into the environment. PBBs and PBDEs are similar, but not identical compounds. Both are colorless to off-white solids. Both PBBs and PBDEs are mixtures of up to 209 individual component chemicals called congeners.

The manufacture of PBBs was discontinued in the United States in 1976, while production of PBDEs has continued to the present. Trade names of some commercial PBB mixtures include FireMaster BP-6® and FireMaster FF-1®. Trade names of some PBDE commercial mixtures include Bromkal 70-5DE®, Tardex 50L®, and Saytex 115®.

What happens to PPBs and PBDEs when they enter the environment?

❏ PBBs entered the air, water and soil during their manufacture and use.
❏ PBBs entered the environment when animal feed was accidentally mixed with PBBs in lower Michigan in 1973.
❏ PBBs entered the environment during the disposal of contaminated animal feed and animal products, and during the disposal of plastic products containing PBBs in waste sites.
❏ Small amounts entered the environment from improper incineration of plastics containing PBBs.
❏ PBDEs entered air, water, and soil during their manufacture and use in consumer products.
❏ In air, PBDEs can be present as particles, but eventually settle to soil or water.
❏ Sunlight can degrade some PBDEs in air.
❏ PBDEs do not dissolve easily in water, but stick to particles and settle to the bottom of river or lakes.
❏ Some PBDEs in water can build up in fish.

How might I be exposed to PBBs and PBDEs?

❏ Exposure to PBBs by the general population will be mainly from past releases.
❏ Michigan residents who ate animal products contaminated with PBBs were exposed to these chemicals.
❏ Some people living in Michigan's lower peninsula may still be experiencing exposure to PBBs.
❏ You can be exposed to PBBs in the air if you live near a waste site that contains PBBs.
❏ Low levels of PBDEs are found in air, sediments, animals, and food.
❏ Analyses of blood, breast milk, and body fat indicate that most people are exposed to low levels of PBDEs.
❏ Exposure to higher levels of PBDEs can occur in workers who produce or manufacture PBDE-containing products.
❏ Exposure to PBDEs can also occur if you work in a confined place where plastics and foam products are recycled, and computers are repaired.

How can PBBs and PBDEs affect my health?

Most of what we know about the health effects of PPBs in people comes from studies of people in Michigan who ate PBB-contaminated animal products for several months. Some residents complained of nausea, abdominal pain, loss of appetite, joint pain, fatigue, and weakness. However, it could not be clearly established that PBBs were the cause of these health problems. There is stronger evidence that PBBs may have caused skin problems, such as acne, in some people who ate contaminated

food. Some workers exposed to PBBs by breathing and skin contact for days to months also developed acne.

Studies in animals exposed to large amounts of PBBs for a short time or to smaller amounts for longer time show that PBBs can cause weight loss, skin disorders, nervous and immune system effects, and effects on the liver, kidneys, and thyroid gland.

There is no definite information on health effects of PBDEs in people. Rats and mice that ate food with moderate amounts of PBDEs for a few days had effects on the thyroid gland. Those that ate smaller amounts for weeks or months had effects on the thyroid and the liver. Preliminary evidence suggests that PBDEs may cause neurobehavioral alterations and affect the immune system in animals.

How likely are PBBs and PBDEs to cause cancer?

We do not know whether PBBs can cause cancer in humans, but we know that they can cause liver cancer in rats and mice. Based on the findings in animals, the Department of Health and Human Services (DHHS) determined that PBBs may reasonably be anticipated to be carcinogens. The International Agency for Research on Cancer (IARC) has determined that PBBs are possibly carcinogenic to humans.

We do not know whether PBDEs can cause cancer in humans. Rats and mice that ate food with decabromodiphenyl ether (one type of PBDEs) throughout their lives, developed liver tumors. Based on this evidence, the EPA has classified decabromodiphenyl ether as a possible human carcinogen.

How can PBBs and PBDEs affect children?

Children are exposed to PBBs and PBDEs in generally the same way as adults, mainly by eating contaminated food. Because PBBs and PBDEs dissolve readily in fat, they can accumulate in breast milk fat and be transferred to babies and young children. They can also cross the placenta and reach the fetus.

No specific health effects attributed to PBBs were found in children who ate contaminated food in the Michigan accident or in children born to mothers who ate the contaminated food. No studies are available of children exposed to PBDEs.

Neurobehavioral alterations have been found in animals that were exposed to PBBs in the womb and by nursing. Such exposures also caused changes in thyroid hormone levels in the newborn animals and birth defects. Exposure to PBDEs in the womb and through nursing has also caused thyroid effects and neurobehavioral alterations in newborn animals, but not birth defects.

How can families reduce the risk of exposure to PBBs and PBDEs?

❑ Since PBBs are no longer produced or used, the risk of exposure to these compounds is limited.

❑ Do not eat fish or wildlife caught in contaminated locations; always follow posted health warnings.

❑ Discourage children from playing in the dirt near waste sites.

❑ Discourage children from eating dirt, from putting their hands in their mouths or from doing other hand-to mouth activities.

❑ If you are exposed to PBDEs at work, you may carry PBDEs home on your skin, clothes, or tools. You can avoid this by showering, and changing clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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

There are tests that can detect PBBs and PBDEs in blood, body fat, and breast milk. These tests can tell whether you have been exposed to high levels of the chemicals, but cannot tell the exact amount or type of PBB or PBDE you were exposed to, or whether harmful effects will occur. Blood tests are the easiest and safest for detecting recent exposures to large amounts of PBBs or PBDEs. These tests are not routinely available at the doctor's office, but samples can be sent to laboratories that have the appropriate equipment.

Has the federal government made recommendations to protect human health?

There are no federal guidelines or recommendations for protecting human health from exposure to PBBs.

The EPA requires that companies that transport, store, or dispose *p*-bromodiphenyl ether (a particular PBDE compound) follow the rules and regulations of the federal hazardous waste management program. The EPA requires that industry tell the National Response Center each time 100 pounds or more of *p*-bromodiphenyl ether are released to the environment.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Polybrominated Biphenyls and Polybrominated Biphenyl Ethers (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. 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.