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About PBDE Flame Retardants

For years, manufacturers have added chemicals to plastics and fabrics so they won't catch on fire or burn easily when exposed to flame or high heat. Some of the more widely used of these additives are polybrominated diphenyl ethers, or PBDE's. Recently, concerns have been raised about the health effects of exposure to PBDE's. This fact sheet provides information about what is currently known about PBDE's and what can be done to reduce your exposure to PBDE's.

What are PBDE's and where are they found?

PBDE's (Polybrominated Diphenyl Ethers) are man-made chemicals that are often added to foam padding, plastics or fabrics so they won't catch on fire or burn as easily if they are exposed to flame or high heat. These flame retardants can be found in computer plastics, toys, food packaging, upholstered furniture, clothing, appliances and other products. They do not breakdown quickly and remain in the environment for a long time.

Why do we use flame retardant chemicals?

Fires are a leading cause of death and injury in the U.S. Each year, more than 600 children ages 14 and under die, and nearly 47,000 are injured in fires. The elderly are also vulnerable to being injured or killed in fires.

Strict fire safety regulations in the U.S. require manufacturers to take steps to reduce the flammability of their products. Brominated flame retardants like PBDE's slow the rate at which products catch fire and continue to burn. PBDE's are blended into plastics and foams during the manufacturing process. If products containing PBDE's are exposed to flame and high heat, they release bromines that rob the air of the oxygen needed to start or feed a fire which helps to prevent or control the fire

Three types of PBDE formulations:

There are three types of polybrominated diphenyl ethers—penta, octa and deca—which contain different numbers of atoms of bromine in the molecules. For example, penta has an average of five bromines, and deca has mostly 10 bromines per PBDE molecule.

PBDE's in consumer products

The three types of PBDE's are used in different kinds of consumer products:

- Penta: Used in polyurethane foam such as in mattresses, seat cushions, other upholstered furniture and rigid insulation.
- Octa: Used in high-impact plastics such as fax machines and computers, automobile trim, telephones and kitchen appliances.
- Deca: Used in carpet foam pads, draperies, televisions, computers, stereos and other electronics, cable insulation, adhesives, and textile coating.

PBDE's in consumer products

It is not easy to tell which of these products contains PBDE's, but many of them do. There are no product labels that list PBDE's and retailers generally are not aware which of their products contain PBDE's. Also, there is no simple or inexpensive way to test for PBDE's. A few manufacturers have found alternatives to PBDE's and have stopped putting PBDE's in their products. Others are waiting for proof that PBDE's cause harm. By 2004, penta and octa PBDEs were phased out of production by manufacturers in the United States and Europe. Older consumer products may still contain penta and octa PBDEs. Deca PBDE continues to be used in high amounts worldwide.

PBDE's in the environment

PBDE's are slowly and continuously released from items they were added to and enter the environment. They show up in the air, soil, oceans, lakes, and in the tissues of animals in the food chain throughout the world. PBDE's travel great distances and have been detected in remote regions which indicates that these chemicals can move freely from where they are made and used. PBDE's are found in wildlife, especially fish. The effects on wildlife are not well understood.

The levels of PBDE's in the environment have been increasing rapidly since the 1970s. Environmental levels of PBDE's measured in the U.S. are generally higher than levels measured in most other parts of the world, including Europe.

How are people exposed to PBDE's?

The exact ways that people are exposed to PBDE's are not fully known. The potential routes of exposure include food, indoor air, and certain jobs.

Foods. People are exposed to PBDE's through the food chain, which is probably the greatest exposure pathway to these chemicals. PBDE's are stored in the fat tissue of animals and, therefore, foods high in animal fat may have higher concentrations. The highest levels of PBDE's in foods are found in fish, but they are also in everything from meat and dairy products to fruits and vegetables. Food and beverages can absorb small amounts of PBDE's from plastic containers, utensils and packaging materials.

Indoor air and household dust. PBDE's can move out of those products in which they are used and enter the air and dust. This may be one of the ways PBDE's get into our bodies. We may breathe in the particles, touch our hands or materials containing PBDE's to our mouths, or absorb them through our skin. The number and kinds of products containing PBDE's in a home or building influences the levels of PBDE's in indoor air. Levels of PBDE's are 20 to 50 times higher in the air inside many homes than in outside air. PBDE's are also found in dust samples from homes and other buildings. House dust samples collected from U.S. homes are five to 50 times higher in PBDE's than those collected from homes and buildings in Europe. The higher levels found in the US are due to the greater use of plastics which contain them.

Certain jobs. Workplace studies show that people who work in jobs such as electronics recycling or in manufacturing or disposal of products containing PBDE's, are often exposed to more PBDE's. Research still needs to be done in order to better understand how to identify and reduce worker exposures to PBDE's.

The health effects of PBDE's

The health effects of PBDE's have not been studied extensively in humans. In animal studies, PBDE exposure before and after birth caused problems with brain development. These studies observed problems with learning, memory and behavior. They also show that exposure to PBDE's during development can decrease thyroid hormone levels, affect reproduction, and reduce immune system performance.

These effects are observed mainly in studies with penta forms of PBDE's. Some similar toxic effects are seen with octa and deca forms of PBDE's, but to a lower degree. It is unclear whether PBDE's can cause cancer in humans. Measuring levels of PBDE's in humans PBDE's find their way into our bodies and are stored for a long time in body fat or other tissues. PBDE's have been measured in blood, fat and breast milk collected from people around the world. The PBDE's found in human tissue samples are mostly penta PBDE's. octa and deca PBDE's are also found, but at generally lower levels.

The highest levels of PBDE's among the general population are found in the U.S. and Canada—10 to 100 times higher than levels reported for people in Europe and Japan. One reason for the higher levels of PBDE's in U.S. and Canadian may be because of the greater use of the compounds in these countries. While levels in people in Japan and some European countries are decreasing, levels in people in the U.S. appear to be increasing.

Limiting exposure to PBDE's

It is especially important for women of childbearing age to limit their exposure to PBDE's and other harmful chemicals. The most critical period of exposure to many toxic chemicals happens during development in the womb and during infancy.

PBDE's are found throughout the environment, but the ways that they get into our bodies are not fully known. Until more research is done, we cannot be certain about how to prevent exposure to many chemicals and allergens in your home. The following guidelines are recommended:

Cleaning and Dusting

- Keep indoor living and working spaces clean and free of dust.
- Avoid stirring up dust when you vacuum and clean. The way you dust and the kind of vacuum you use make a difference. Wet and damp cleaning methods are generally safer than dry dusting, sweeping, or vacuuming. Properly ventilate living and working spaces, especially while you clean. This might include opening up windows and doors, or using properly installed fans.
- Wash your hands after cleaning and dusting.
- Remove shoes when entering the house. This helps prevent tracking in unwanted chemicals from outside.

Repairing, Recycling and Remodeling

- Cover or replace cushions on sofas, chairs and car seats where the foams pads are exposed.
- Properly recycle or dispose of furniture, mattresses, rugs, draperies and carpet padding, and all electronic equipment.
- Avoid tracking construction dust into living areas during home remodeling. Pregnant women and young children should avoid dust from construction and remodeling projects.
- Try to contain dust and particles when replacing foam padding beneath carpets. Wear protective clothing and a respirator
- Do not burn plastics in stoves, fireplaces, burn piles or burn barrels.

Foods

- Follow the advice of Oregon's fish consumption guidelines (guidelines can be found at oregon.gov/DHS/ph/envtox/fishconsumption.shtml). Even though the fish advisories are not based on PBDE's, following the advice will reduce exposure to PBDE's.
- Prepare fish and meats in ways that allow fats and oils to be removed from the meat and be discarded. PBDE's concentrate in the fat of fish and in other fatty meats.
- Wash you hands before and after preparing food.
- Know that breastfeeding is the healthiest choice for babies and mothers. The best advice for mothers is to limit exposure to PBDE's and other contaminants that can accumulate in mother's milk.

Reduce PBDE's in the environment

The best, long-term way to deal with harmful chemicals is to support policies and programs in your community that help reduce environmental pollution. Some companies are producing furniture and other products that are free of PBDE's. You may want to contact companies prior to purchasing their products to ask about their use of PBDE's.