



## FACTS & FIGURES: POLYBROMINATED DIPHENYLETERS (PBDEs)

### PDBE OVERVIEW

- Widespread in the estuary, both geographically and in the food chain
- Released through use and disposal of fire-retardant consumer goods
- Bioaccumulative
- Similar to PCBs in chemical structure and sublethal effects, such as neurotoxicity and hormone disruption
- Toxic for humans
- Use is widespread

### WHAT ARE PBDEs?

PBDEs are synthetic flame retardants used in plastics, cushions, and fabrics. Chemically similar to PCBs, PBDEs come in 209 different forms, or congeners, which are combined in three commercial flame retardant products:

- **Penta-BDE:** Present in insulation and in foam for furniture, mattresses, and automobile seats; more toxic than the octa and deca mixtures.
- **Octa-BDE:** Present in high-impact plastic products, including computer housings, kitchen appliance casings, and telephone handsets.
- **Deca-BDE:** Most commonly used mixture. Present in carpets, drapes, non-clothing fabrics, and the plastic found in televisions, computers, stereos, and other electronics; less toxic than penta or octa mixtures, but may break down in the environment into more toxic and bioaccumulative forms.

PBDEs are persistent, toxic, and do not dissolve readily in water. Instead, they tend to accumulate in soil, sediment, household dust, and sewage. They have been detected in fish, wildlife, and people.

Production of penta- and octa-BDEs was phased out in North America and Europe by 2004, but deca is still widely used. In 2007, Washington passed legislation to ban the use of deca in mattresses, televisions, computers, and residential upholstered furniture by 2011, as long as suitable alternatives can be found. In 2008, Washington passed child safety legislation regulating these contaminants in children's products. In 2006 and 2008, Oregon enacted laws that restrict three different types of brominated flame retardants and bans any product in Oregon commerce if the product contains more than one-tenth of one percent of penta-, octa-, or deca-brominated diphenyl ether.

### IMPACTS ON FISH & WILDLIFE & THE ENVIRONMENT

PBDEs are considered contaminants of emerging concern, and additional scientific information is needed about their effects and their presence in the environment. Their effects on juvenile salmon are believed to be similar to those of PCBs and DDT, ranging from neurotoxicity to hormone disruption.

There is little information about the threshold level for health effects of PBDEs on juvenile salmon. Concentrations in samples in the lower Willamette River are high compared to other parts of the Pacific Northwest and higher than in some resident fish in the region.

### IMPACTS ON HUMAN HEALTH

Possible health effects of exposure to PBDEs may include:

- Impaired learning abilities
- Altered behavior
- Disruption to the endocrine system lowering thyroid hormone levels and impairing the reproductive and immune systems
- Some forms of PBDEs may cause cancer.

Children are a greater risk because they put their fingers and other objects into their mouths more often than adults do. A child's body also develops more rapidly than an adult. Exposure to these contaminants during certain stages of development do greater harm. We need to learn much more about the impact and toxicity PBDEs have on humans.

### SOURCES OF EXPOSURE

Penta- and octa-BDEs are released to the environment (primarily the air) during the disposal of older consumer products at recycling facilities, landfills, and solid waste incinerators. Deca, which is still being manufactured, has been found in house dust and in biosolids at sewage treatment plants. During recent decades, PBDEs in the environment have increased exponentially.

In the Columbia River estuary, juvenile salmon are exposed to PBDEs through prey, suspended sediment, and river water.

### PBDEs IN THE ESTUARY

PBDEs have been found in river water samples, on suspended sediment, and in the tissue and stomach contents of juvenile salmon from sites throughout the Columbia River estuary, from just below Bonneville Dam to the mouth of the river near Astoria.

### References

- Lower Columbia River Estuary Partnership. 2007. *Lower Columbia River and Estuary Ecosystem Monitoring: Water Quality and Salmon Sampling Report*.
- Oregon Department of Human Services, Office of Environmental Public Health. 2011. *Polybrominated Diphenyl Ether (PBDE) Fact Sheet*.
- Lower Columbia River Estuary Partnership. 2007. *Lower Columbia River and Estuary Ecosystem Monitoring: Water Quality and Salmon Sampling Report*.