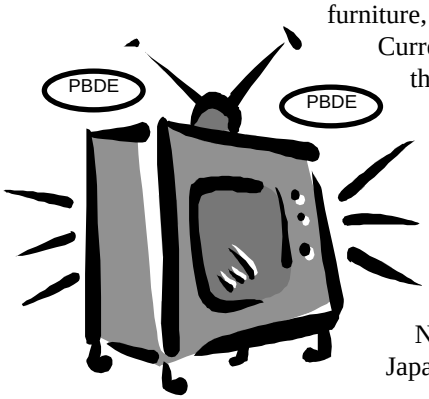
Brominated Flame Retardants

briefing

Endocrine Disrupting Chemicals: Brominated Flame Retardants

Use

Brominated flame retardants are applied to consumer products to prevent fire from taking hold quickly. They are found in very many plastic items, such as the casing of electronic and electrical goods, in foam filled furniture, and on textiles. Current consumption in the European Union is estimated at between 11,000 and 25,000 tonnes per year. They are produced in the UK, France, the Netherlands, USA, Japan and Israel.



The polybrominated diphenyl ethers (PBDEs, sometimes also referred to as PBBEs) are of greatest concern. Penta-, octa- and deca-PBDE are widely used in Europe. Polybrominated biphenyls (PBBs) and tetrabromobisphenol A (TBBA) are also commonly used brominated flame retardants, although this briefing will concentrate on the PBDEs.

As well as being released from industrial sites that produce or use PBDEs, these chemicals leach from the many items in which they are used and can escape during recycling or from landfill sites. They are already very widespread in coastal waters and in remote areas far from their original source, moving freely in the environment.

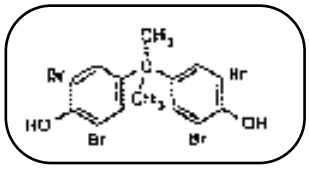
There is also concern that incineration of PBDEs can produce brominated dioxins and furans, which have similar properties to the chlorinated dioxins and furans on the OSPAR List of Chemicals for Priority Action.

Toxicity

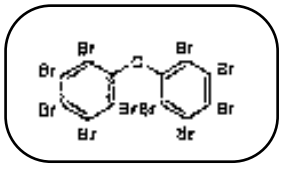
Although deca- and octa-PBDEs are less likely to bioaccumulate, penta- and tetra-PBDEs are readily bioaccumulated, building up in fatty tissue of animals. None of the PBDEs appear to be easily biodegradable. Generally the lower the level of bromination, the greater the concern. The commercial production mixtures of penta-PBDEs also contain tetra-PBDEs. Furthermore there is concern that octa- and deca-PBDEs may have the ability to break down in the environment to the more harmful lower brominated derivatives. It is difficult to predict the longer-term impact of accumulation of PBDEs in whales, dolphins, seals, birds and man, but the available toxicological work to date suggests that PBDEs have endocrine disrupting effects on the thyroid system, and can also affect the liver as well as nervous and immune systems.

Human Exposure

Human exposure is likely through contaminated food and via the leaching of small quantities of PBDEs from the wide range of items in the home and workplace which contain these flame retardants. There has been a rapid rise in the amount of PBDEs found in breast milk in the last 25 years, up to 16 micrograms per kilogram of fat. Although the build-up is alarming, PBDEs are not yet at the level where breastfeeding would be discouraged.



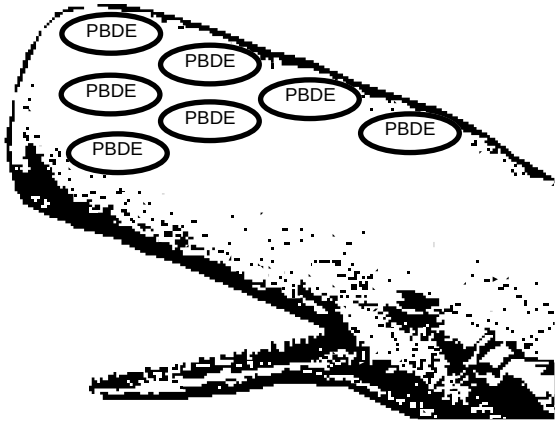
Tetrabromobisphenol A



Decabromo diphenyl ether

Wildlife Exposure

PBDEs have reached the aquatic environment throughout the OSPAR region. Penta- and tetra-PBDEs have been found to be bioaccumulating in a number of aquatic and marine species in the OSPAR region. The long term effects of these chemicals on species at the top of the food chain are difficult, if not impossible, to predict from limited short term toxicity tests on a few selected species. If effects do become evident, then due to the persistent and bioaccumulative nature of these substances, it will be impossible to reverse these effects in the short term.



For information, contact:

Stephan Lutter
WWF North-East Atlantic Programme
Am Güthpol 11 · D-28757 Bremen · Germany
Tel: +49 421 65846-22 · Fax: +49 421 65846-12
E-mail: lutter@wwf.de

Some high levels of PBDEs (µg/kg)

Media	TetraBDE (tetra) 2,2'4'4-	PeBDE (penta) 2,2'4'4'5-	OBBE (octa)	DBBE (deca)
Sediments (dw) UK World		**898** Tees Est. **1,400** Sweden	**1,405** R.Skerne **22** Japan	**3,190** R.Calder **14,000** US
Flounderliver (ww) Tees Bay UK 13.6% lipid	**1,294**	**108**	**115**	**<1.2**
Floundermuscle (ww) Tees Bay UK 1.2% lipid	**22**	**4.4**	**7**	**<1.2**
Mussel (ww) The Wash UK 1.8% lipid	**3.5**	**3.9**	**16**	**<1.2**
Arctic char(lipid) muscle, Sweden 5.3% lipid	**400**	**64**		
Osprey (lipid) Sweden 0.4% lipid	**1,800**	**140**		
Guillemot eggs (lipid) Sweden	**130-1,500**	**24-330**		
Dolphin blubber (ww) Southern North Sea	**2,600-3,000**	**220**		
Sperm whale (ww) Dutch coast blubber 72.2% lipid	**95**	**15**		**<3**
Whitebeaked dolphin (ww) Dutch coast, blubber 99% lipid	**5,500**	**1,200**		**<10**
Human milk (lipid) Sweden	**16.1**	**4.47**	**Sum of all PBDEs = 28.2**	

North-East Atlantic and International Action

Already by 1998, the International Programme on Chemical Safety had recommended that *"brominated flame retardants should not be used where suitable replacements are available"*.

In the EU, the use of PBDEs is subject to review under the programme of work on existing substances. A risk assessment report is being prepared, in this case by the UK and France.

At the Fourth International Conference on the Protection of the North Sea, the Environment Ministers of the various signatory countries, including both the UK and France, explicitly agreed, by the year 2000 *"to take concerted action within the framework of the competent international forums to substitute the use of the following hazardous substances by less hazardous or preferably non-hazardous substances where these alternatives are available: ....brominated flame retardants."*

Brominated flame retardants are also included in the OSPAR List of Chemicals for Priority Action. At Sintra in July 1998, OSPAR countries pledged to *"make every endeavour to move towards the target of cessation of discharges, emissions, and losses of hazardous substances by the year 2020. We emphasise the importance of the precautionary principle in this work."*

The Swedish National Chemicals Inspectorate (KEMI) has proposed a complete ban on the marketing and use of PBDEs and PBB. Worryingly, when KEMI surveyed companies thought to be using these chemicals, of the 200 companies surveyed, one third did not know if their products contain brominated flame retardants. Although not manufactured in Sweden, brominated flame retardants are imported in many electrical goods. This has made attempts at voluntary restrictions since 1990 only partially successful (ENDS 15 March 1999). There is already much international support for the phasing out of brominated flame retardants, but a legal instrument converting these commitments into a concrete timetable and deadline is still required, in the form of an OSPAR Decision.

Reduction of Inputs

There are substitutes available for many uses of brominated flame retardants, although the bromine industry argues that greater quantities of non-brominated flame retardants are required to achieve similar performance. Some plastics such as PVC do not require brominated flame retardants, but have other environmental problems associated with them. Furthermore, wider consideration needs to be given to the need for flame retardants as opposed to better flame detection and other suppression systems, such as sprinklers.

WWF calls on governments and industry to...

• Accept the need for precaution: there are so many pollutants now found in wildlife and humans, including breast milk, that urgent measures should be put in place to reduce exposure and releases of substances such as PBDEs.

• Carry out more research: more work needs to be done to understand the effects of long-term exposure to low levels of many persistent and bioaccumulative chemicals, including their potential effects on the learning behaviour of offspring, both human and wildlife, and the functioning of the immune system.

• Implement the substitution principle: within EU legislation on industrial chemicals, chemicals that are used for the same purpose should be evaluated as a group, allowing for substitution where there are already equivalent less dangerous substances or preferably non-hazardous alternatives available. However, the substitution principle should only be used to accelerate substitution with safer alternatives.

• Impose mandatory labelling of products containing brominated flame retardants: until a phase-out date for PBDEs is agreed in the short-term, mandatory labelling schemes to identify products containing brominated flame retardants should be imposed.

• Phase out persistent and bioaccumulating substances, or substances whose breakdown products possess these properties, regardless of their currently known toxicity. In conclusion, WWF believes that deca-, octa-, penta- and tetra-BDEs should be phased out as soon as possible.

Text prepared by Guy Linley-Adams

References / Further Reading

European Chemicals Bureau, Risk Assessment of Polybrominated Flame Retardants under EU Existing Substances Regulation (793/93), Ispra

Swedish Environment Protection Agency (1998) Dioxin '98. Volume 35 Organohalogen Compounds, Stockholm.

WWF UK (1999) Brominated Flame Retardants. A briefing for WWF United Kingdom by Gwynne Lyons.