



## NICNAS Information Sheet PBDEs

# Interim Public Health Risk Assessment Report on Certain PBDE Congeners contained in commercial preparations of Pentabromodiphenyl ether and Octabromodiphenyl ether

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### What are PBDEs?

Polybrominated diphenyl ethers (PBDEs) are 209 structurally related chemicals (congeners), which can be grouped on the basis of the number of bromine atoms in the molecule (between one and ten). Some PBDEs have been used as flame retardants (known as Polybrominated Flame Retardants – PBFRs). They increase the fire safety of plastics and other materials in homes, cars and offices.

### PBDE chemical congeners:

#### POLY BROMINATED DIPHENYL ETHERS [PBDEs]

##### PENTABROMODIPHENYL ETHER [PentaBDE]

refers to the average number of bromines – PentaBDE contains mostly congeners in the tetrabrominated (**BDE-47**), pentabrominated (**BDE-99**, **BDE-100**) and hexabrominated (**BDE-153**, **BDE-154**) range.

##### OCTABROMODIPHENYL ETHER [OctaBDE]

refers to the average number of bromines – OctaBDE commonly contains hexabrominated (**BDE-153**, **BDE-154**), heptabrominated (BDE-183), octabrominated (BDE-197, BDE-203), nonabrominated (BDE-206) and decabrominated (BDE-209) congeners.

**Note:** Major congeners identified in the diagram above are numbered according to an internationally accepted numbering system.

Major congeners discussed in this information sheet are shown in bold.

**OctaBDE** and **PentaBDE** are not single chemicals but commercially produced mixtures of a range of related chemical components with average bromine content of eight and five atoms per molecule, respectively. The most toxic to humans (ie. potential to cause adverse health effects) and bioaccumulative (ie. potential to accumulate in the human body) congeners are in the **tetrabrominated** (four bromine atoms) to **hexabrominated** (six bromine atoms) range.

### **Uses**

**PentaBDE** has predominantly been used in polyurethane materials such as furniture foams. **OctaBDE** is mostly used in acrylonitrile/butadiene/styrene (ABS) hard plastics in computer casings and in electrical products such as power point fronts, light switches and electrical connections.

Regulatory activity by NICNAS in 2001 has seen the Australian use of these two chemicals decline significantly. **PentaBDE** and **OctaBDE** are not manufactured in Australia and available information indicates that no import of either chemical has occurred since mid 2005.

### **Regulatory Status**

**OctaBDE** and **PentaBDE** were declared Priority Existing Chemicals (PECs) for full risk assessment under the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act).

As per the notice in the *Chemical Gazette* of 6 February 2007 octaBDE is no longer a PEC as it was removed from the Australian Inventory of Chemical Substances (AICS). Manufacture and importation of octaBDE is also not permitted under the NICNAS exemption categories except as laboratory standards for analytical determination. Persons importing octaBDE for analytical purposes must comply with annual reporting obligations as required under the Act.

### **Interim assessment outcomes**

Recent Australian studies determined PBFR levels in breast milk, blood, aquatic sediments and indoor environments. This data indicated that the overall levels of PBDEs in Australian breast milk were low, consistent with those reported internationally. Highest levels of PBDEs in blood in Australia were detected in young children (0-4 years of age) and lower levels in women of childbearing age.

Importantly, there is no evidence of any adverse health effects in newborns, children or adults from exposure to PBDEs. Public health risk determinations were undertaken to assess the more toxic and bioaccumulative congeners (tetra to hexabrominated range) found in **PentaBDE** and **OctaBDE**. In determining risk, NICNAS adopted a highly conservative approach using "worst-case" risk assessment parameters. Results from Australian biomonitoring studies for a particular subpopulation of concern were compared with results in laboratory rats and mice. This highly conservative approach was used in the absence of information to quantify the uncertainties in the risk assessment.

While the highest levels of PBDEs were detected in young children, a conservative risk assessment indicated that this group was not at greatest risk of adverse health effects from exposure to congeners found in **PentaBDE** and **OctaBDE**.

Blood levels of these congeners detected in women of childbearing age do not pose a risk to the women themselves. However, the risk assessment indicated a potential risk of neurodevelopmental effects in the offspring from maternal exposure, based on results from laboratory animals.

As a result of the risk assessment, the regulator is adopting a precautionary approach by immediately prohibiting the import and/or manufacture of pentaBDE in Australia, pending the outcome of a full risk assessment. As indicated above introduction of octaBDE is already prohibited.

## *International activity*

Introduction and use of **OctaBDE** and **PentaBDE** as a substance or in preparations at concentrations higher than 0.1% (including in articles) was banned in the European Union in 2004. **OctaBDE** and **PentaBDE** were also included in the EU Directive on Restriction of Hazardous Substances (RoHS – the Directive applicable to new electrical and electronic equipment) in 2006. Two manufacturers in the United States voluntarily phased out their manufacture at the end of 2004. Furthermore these two chemicals are currently being assessed for possible inclusion on the Stockholm Convention on Persistent Organic Pollutants.

## *Questions:*

### **What are the benefits of PBDEs?**

- Flame retardants are widely used to reduce the flammability potential of a range of products. Their use has made a significant contribution to the reduction in human life lost from fire over several decades. In addition to reducing the likelihood that an item will ignite, flame retardants inhibit the spread of a fire, and give occupants up to 15 times more escape time from a fire than they would have if flame retardants were not used.

### **How could PBDEs affect health?**

- Importantly, there is no evidence of any adverse health effects in newborns, children or adults, from exposure to PBDEs.
- Recent Australian studies indicate that the highest levels of PBDEs were detected in the blood of young children (0-4 years of age) and lower levels in women of childbearing age.
- While the interim risk assessment indicates a potential risk of developmental effects in the unborn child based on extrapolation from results in laboratory animals, this determination is based on a highly conservative risk assessment approach using “worst-case” assessment parameters.
- The overall levels of PBDEs found in breast milk are low and do not pose a risk to breast fed infants. Mothers should continue to breastfeed their babies.

### **Can these chemicals be introduced into Australia in articles?**

- It is possible that articles such as furnishing foams, hard plastics used in electrical equipment casings (eg. TV casings), circuit board laminates and electrical insulation containing **Octa-** and **PentaBDEs** may continue to be imported into Australia. However, the quantities of these chemicals in imported articles are expected to decline significantly due to the lack of commercial availability of these chemicals as a result of international regulatory action and voluntary activity by industry.
- To date the exact sources that contribute to environmental levels of PBDEs, particularly in the indoor environment, have not been identified. Further research is required to ascertain the presence of PBDEs in specific articles in Australian homes and offices and the potential for release of these chemicals from articles.

### **What is the Australian Government doing to address PBDEs?**

- NICNAS is adopting a precautionary approach to the regulation of **PentaBDE** by immediately prohibiting the import and/or manufacture of the chemical in Australia. The immediate prohibition of the introduction of the chemical will prevent the introduction of commercial products from overseas and protect human health and safety. This prohibition is consistent with international regulatory activity.

### *Questions (continued):*

- OctaBDE was removed from the Australian Inventory of Chemical Substances (AICS) on 6 February 2007. Manufacture and/or importation of octaBDE will require notification to and assessment of the chemical by NICNAS. Manufacture and importation of octaBDE is also not permitted under the NICNAS exemption categories except as laboratory standards for analytical determination. Persons importing octaBDE for analytical purposes must comply with annual reporting obligations as required under the *Industrial Chemicals Notification and Assessment Act*.
- NICNAS will commission a study to determine the sources of these chemicals in domestic dwellings and offices. This information will be incorporated into the full risk assessment of **PentaBDE** (expected to be completed by mid 2007) and will assist in determining the need for further regulatory action.
- The Australian Government Department of the Environment and Water Resources is investigating the potential for Australia to harmonise with the EU Directive on the restriction of certain hazardous substances in electrical and electronic equipment (RoHS Directive), which would ban the use of **Octa-** and **PentaBDEs** in such equipment.