PBDE flame retardant levels in blood in the Australian population

Toms L, Harden F, Hobson P, Päpke O, Ryan J, and Muller J 2006, *Assessment of the concentrations of polybrominated diphenyl ether flame retardants in the Australian population: levels in blood*, Australian Government Department of Environment and Heritage, Canberra

The report is available at the Department of Environment and Water Resources website: http://www.environment.gov.au/settlements/publications/chemicals/bfr/blood.html

The study involved the collection and testing of pooled blood samples from five regional areas (four urban, one rural). Concentrations of PBDEs found were between 6.4 and 80 $ng.g^{-1}$ lipid.

Concentrations by Age

The highest concentrations were found in the youngest age group (0-4 years) with an inverse relationship between age and PBDE concentration observed. Concentrations in the 0-4 years age group were around two times higher than for the 5-15 years age group and around four times higher than the greater than 16 years age group.

Factors believed to result in the inverse relationship between PBDE concentration and age included the commencement of exposure in the 1970s, the exposure pathways (such as breast milk and dust) and the half-lives of PBDEs reducing the concentrations over time.

Due to the high concentrations found in children, the study conclusion notes that children may be the most vulnerable to these chemicals and that a detailed assessment of the specific routes of PBDE exposure for young children is warranted, together with an evaluation of risk management options if there is assumed to be a potential risk.

Regional Variation

There was found to be limited regional variation, with it being suggested that specific products in an house rather than regional variation is likely to be a major determinant.

Gender

While there was no statistically significant difference between concentrations found in each gender, the mean concentration of PBDEs was generally higher for males than that for females.

Concentrations over time

The study compared two sampling periods (2002-03 and 2004-05) and found that during this period the concentrations in males increased significantly, while there was no significant change for females.

Congeners

The major component congeners found in the samples were typically BDE-471, BDE-992, BDE-1003, BDE-1534, BDE-2075 and BDE-209.6

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1 2,2',4,4'-Tetrabrominated diphenyl ether
2 2,2',4,4',5-Pentabrominated diphenyl ether
3 2,2',4,4',6-Pentabrominated diphenyl ether
4 3,4,4',6'-Hexabrominated diphenyl ether

International comparisons

The level of PBDEs in Australian adults were higher than those observed in Europe and Asia but were lower than those observed for adults in North America. For the 0-4 years age group, the levels were higher than children in Norway but lower than those found in children in North America.

5 2,2,3,3',4,4',5,6,6-Nonabrominated diphenyl ether
6 Decabromodiphenyl ether