Brominated Flame Retardants

Brominated flame retardants (BFRs) are mixtures of man-made chemicals that are added to a wide variety of products, including for industrial use, to make them less flammable. They are used commonly in plastics, textiles and electrical/electronic equipment.

There are five main classes of BFRs, listed here with their common uses:

- Polybrominated diphenyl ethers (PBDEs) – plastics, textiles, electronic castings, circuitry
- Hexabromocyclododecanes (HBCDDs) – thermal insulation in the building industry
- Tetrabromobisphenol A (TBBPA) and other phenols – printed circuit boards, thermoplastics (mainly in TVs)
- Polybrominated biphenyls (PBBs) – consumer appliances, textiles, plastic foams
- Other brominated flame retardants.

These classes of BFRs have been marketed as technical mixtures under different commercial brands consisting of different chemical compounds within each class.

In the European Union (EU) the use of certain BFRs is banned or restricted; however, due to their persistence in the environment there are still concerns about the risks these chemicals pose to public health. BFR-treated products, whether in use or waste, 'leach' BFRs into the environment and contaminate the air, soil and water. These contaminants may then enter the food chain where they mainly occur in food of animal origin, such as fish, meat, milk and derived products.

Activities Role EU framework Completed work

EFSA's work on brominated flame retardants (BFRs) is carried out by the Panel on Contaminants in the Food Chain (CONTAM). The Panel has published advice on monitoring food and feed for the presence of BFRs and assessed the possible risk for human health

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narised as follows:

Polybrominated biphenyls (PBBs) – the risk to the European population from exposure to PBBs through food is of no concern. PBBs are no longer produced or used in Europe and environmental concentrations are low and declining, therefore PBBs should be a low priority for further research or monitoring efforts.

Polybrominated diphenyl ethers (PBDEs) – eight PBDEs were considered of primary interest and relevant toxicity data were available for four of them (BDE-47, -99, -153 and -209). The risk assessment was limited to these four, for which the margin of exposure (MOE) approach was used. For BDE-99, the MOE indicates a potential health concern with respect to the current dietary exposure. This was notable for young children (aged 1-3 years old), although the presence of one food sample in the category 'Food for infants and small children' with a high concentration of BDE-99 could have led to overestimation of the exposure for this specific age group. For BDE-47, -153 and -209 the current dietary exposure is unlikely to raise a health concern. As numerous products containing PBDEs are still in use, the surveillance of PBDEs should continue.

Hexabromocyclododecanes (HBCDDs) – current dietary exposure to HBCDDs in the EU does not raise a health concern. Furthermore, additional exposure, particularly of young children, to HBCDDs from house dust is unlikely to raise a health concern.

Tetrabromobisphenol A (TBBPA) – current dietary exposure to TBBPA in the EU does not raise a health concern. No occurrence data for TBBPA derivatives were submitted to EFSA and no information on their toxicity was identified. Therefore a risk assessment on TBBPA derivatives was not possible.

Brominated phenols and their derivatives (other than TBBPA or its derivatives) – due to the lack of occurrence data and toxicity studies, the risk assessment focused on 2,4,6-tribromophenol (2,4,6-TBP) only. It is unlikely that current dietary exposure to 2,4,6-TBP in the EU would raise a health concern. Also exposure of infants to 2,4,6-TBP via breast feeding is unlikely to raise a health concern. Due to lack of data a risk assessment of the other brominated phenols or their derivatives was not possible.

Emerging and Novel BFRs – this opinion looks at lesser-known BFRs not covered in the five other scientific opinions. Whereas 'emerging' BFRs have been identified in materials and/or goods and in wildlife, food or humans, 'novel' BFRs have been identified only in materials and/or goods but not in wildlife, food or humans. Limited and widely varying data on 17 emerging and 10 novel BFRs were collected. Due to the lack of data and limited information on occurrence, exposure and toxicity for all these BFRs, a risk characterisation was not possible. Using available information and a modeling exercise, the CONTAM Panel identified some emerging and novel BFRs that could be a potential health concern and should be considered first for future investigations. There is convincing

evidence (including more extensive toxicity data) that the emerging BFR *tris(2,3-dibromopropyl) phosphate* (TDBPP) and the novel BFR *2,2-Bis(bromomethyl)-1,3-propanediol* (DBNPG) are genotoxic and carcinogenic, warranting further surveillance of their occurrence in the environment and in food. Based on the limited experimental data on environmental behaviour, *1,2-bis(2,4,6-tribromophenoxy)ethane* (BTBPE) and *hexabromobenzene* (HBB) were identified as compounds that could raise a concern as reports indicate that they can accumulate in the body over time.

Glossary: Margin of Exposure

The Margin of Exposure (MOE) is a tool used by risk assessors to characterise the risk from exposure to carcinogenic and/or genotoxic substances in food or feed. In practice, an MOE is derived either for a substance i) where no toxic threshold for an adverse health effect has been defined, or ii) for which the limited data available do not allow a Tolerable Daily Intake (TDI) to be set.
The MOE is a ratio of two factors which assesses for a given population: the dose at which a small but measurable adverse effect is first observed and the level of exposure to the substance considered. The higher the MOE, the lower the potential health risk is for consumers.