Brominated Flame Retardants in Baby Foods and Infant Formulae

Report to Food Standards Agency

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Report Information Sheet

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Summary

Approximately 120 samples of baby foods and 30 infant formulae have been analysed for the presence of brominated flame retardants (BFRs). Analysis covered the occurrence of BFRs resulting from the past use of three main commercial PBDE mixtures, Penta-BDE, Octa-BDE and Deca-BDE and also hexa-bromocyclododecane (HBCD) which is another high volume BFR that is being phased out due to widespread environmental presence (HBCD).

Both baby foods and infant formulae were characterised by a low presence of both PBDEs and HBCD, with congeners remaining undetected above the prevailing LODs, in many samples. Where PBDEs were found, the most commonly detected congeners were BDE-47, BDE-99 and BDE 209.

1. Introduction

Brominated flame retardants (BFRs) are used (either chemically bonded, or more commonly, as additives) in industrial and domestic polymeric materials, in order to delay the onset of fire. Historically, the most commonly used BFRs were polybrominated diphenyl ether (PBDE) mixtures, but as concern about potential and reported toxicological effects have been studied and reported over the last 15 years or so, the three main commercial PBDE mixtures, Penta-BDE, Octa-BDE and Deca-BDE have been phased out of use in some parts of the world (notably the EU and some States in the US). Similarly the use of other high volume BFRs such as hexa-bromocyclododecane (HBCD) is being phased out during this year (2015) due to widespread environmental presence, the potential to bio-accumulate in the food chain and reported toxicity. Despite bans or restricted use, PBDEs and HBCD continue to be found routinely in foods, and investigations on current levels are ongoing, with a view to evaluate any trends in occurrence. Data on BFRs in baby foods and infant formulae, is however scarce, and given some of the reported biological effects on neurotoxicity and cognitive disorders, this investigation was designed to establish the current occurrence of PBDEs, HBCD and TBBPA in these foods.

2. Samples and Methods

Approximately 120 samples of baby foods and 30 infant formulae were selected in consultation with the FSA, from an earlier study on heavy metal contamination, project FS 102048 (Brereton, 2014).

Analysis for PBDEs, HBCD and TBBPA content was carried out as in previous studies for the FSA, using internal standardization with ^{13}C labelled material. HBCD stereoisomers and TBBPA were measured using LC-MS/MS, and PBDEs were measured using GC-high resolution MS.

The PBDEs measured were the 17 congeners that have been quantified in previous work for the FSA (PBDE 28, PBDE 47, PBDE 49, PBDE 99, PBDE 100, PBDE 138, PBDE 153, PBDE 154, PBDE 183 and PBDE 209). These include the 10 PBDE congeners that have been specified in Commission Recommendation 2014/118. HBCD analytes include diastereomers. α-, β-, and γ-HBCD, and TBBP-A as normally reported to the FSA (also specified in Commission Recommendation 2014/118).

The methodologies that were used for PBDE and HBCD analyses have been published in peer reviewed journals (Fernandes et al, 2004; Harmer et al, 2008). They have been used to carry out investigations or surveys for the FSA and other customers on food and animal feed. The methodologies are continuously validated by regular and successful participation in international proficiency testing where available (PBDEs and more recently, HBCD). The results of In House Reference Material analyses have been included with the results (PBDEs), as well as the results of the last PT schemes on HBCD.

3. Results

The results are presented in Annex 1 and are supplied both as an Excel spreadsheet and in pdf form.

The results are reported in conventional units - µg/kg on a whole weight basis. The limits of detection were calculated dynamically during analysis and incorporated the associated procedure blanks that were routinely used. These are generally similar to or better than those proposed in Commission Recommendation 2014/118.

Both baby foods and infant formulae were characterised by a low incidence of positive detection for PBDEs as well as HBCD, with no congeners found in many samples. Where PBDEs were found, the most commonly detected congeners were BDE-47, BDE-99 and BDE 209. The range of occurrence was from <0.002 µg/kg for most congeners up to 0.82 µg/kg for BDE-209 in a sample of infant formula.

HBCD occurrence was rare. Only α-HBCD was detected, in two samples of baby foods, at levels of 0.03 µg/kg (occurrence range was <0.01 to 0.03 µg/kg). TBBPA was not detected in any sample at an LOD of <0.01 µg/kg. Neither BFR was detected in infant formulae samples.

4. Conclusions

Both baby foods and infant formulae were characterised by a low presence of both PBDEs and HBCD, with no congeners above the prevailing LODs in many samples. Where PBDEs were found, the most commonly detected congeners were BDE-47, BDE-99 and BDE 209.

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