ADVISORY COMMITTEE ON ANIMAL FEEDINGSTUFFS

56th Meeting of ACAF on 14 December 2011

Presentation Paper: Contamination of the food chain by brominated flame retardants

Dr David N Mortimer
Policy Lead, Environmental Contaminants,
Chemical Safety Division

Action: the Committee is asked to consider whether the Food Standards Agency should carry out an investigation into the presence of brominated flame retardants and their by-products in the feed chain.

Chemical Safety Division

December 2011

Brominated flame retardants in the food chain

Purpose

1. This paper provides information about the presence of brominated flame retardants in the food chain and concerns for human health, and asks the Committee to consider whether it is necessary and appropriate to investigate their presence in the feed chain.

Background

3. Brominated flame retardants (BFRs) are a category within a range of substances used to delay the onset of fire. They are incorporated, often at significant levels, into a very wide range of materials and products including furniture, textiles, building materials, aircraft and automotive parts, electrical and electronic goods and consumer products in order that these meet national or international flammability standards. The global value of the flame retardant industry is estimated at around £4billion per annum.

4. Within the BFR category are a number of sub-categories, notably polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), hexabromocyclododecanes (HBCDDs) and tetrabromobisphenol A (TBBPA). Some newer BFRs have also been identified, including hexabromobenzene (HBB), decabromodiphenyl ethane (DBDE), bis(2,4,6-tribromophenoxy)ethane (TBE) and tetrabromodiethylhexyl phthalate (TBDEHP).

5. Although the use of BFRs is justified on the grounds of fire safety, there has been increasing concern over recent years about the longer-term potential health impact arising from their use. They have been detected in various environmental media, biota, house dust and human milk, as well as in food. [1] Furthermore, BFRs do not prevent fires and, when the articles they contain do burn, fire toxicity has been shown to increase significantly, with a higher level of carbon monoxide and thicker smoke. [2] Among the combustion products are dioxin-related compounds and these, too, have been found in food. [3]

Michigan Incident

6. What is believed to be one of the worst chemical incidents in US history occurred in Michigan in 1973 and involved BFR contamination of animal feed. An estimated quarter to half a tonne of polybrominated biphenyls (PBBs) was mistakenly added to high protein feed in place of magnesium oxide. It caused

adverse effects on animal health and productivity as well as illness in consumers. It took almost a year to identify the source of the problem. It led to the culling of about 30,000 cattle, 6,000 pigs, 1.5 million chickens and the disposal of 865 tonnes of feed and several hundred tonnes of food. The estimated cost by 1979 was $215m, equivalent to around £500m in today's terms. [4]

Environmental and health concerns

7. During the 1970s, concerns were already being raised about the safety of polychlorinated biphenyls (PCBs) and their manufacture and use was phased out over a number of years. Structural and toxicological similarities of PBBs to PCBs were recognised and PBB manufacture and use also ceased in the 1970s. PBBs were largely replaced by the polybrominated diphenyl ethers (PBDEs), but concerns were also raised about the persistence and toxicity and their ability to bioaccumulate i.e. build up in animals and fish. The manufacture and use of PBDEs has also been phased out over the last decade. In 2009, two classes of PBDEs were listed under the Stockholm Convention on Persistent Organic Pollutants. The hexabromocyclododecanes (HBCDDs) are also under consideration for listing. [5]

8. The Food Standards Agency first began investigating the presence of BFRs in food in 2002, after being alerted by the Environment Agency to high localised contamination of the Skerne-Tees river system downstream of a BFR production facility. Analysis showed very high levels of BFRs, particularly HBCDDs, in trout and eels taken from the River Skerne. [6] This was followed by an investigation into the presence of brominated chemicals in wild and farmed fish and shellfish and a total diet study. BFR levels in farmed salmon appeared to be about twice those in wild (Atlantic) salmon, although the COT did not identify any significant health concerns. [7]

9. More recently and in response to a call by EFSA for more data, FSA carried out a survey for brominated chemicals in a range of foods. Other than fish, the highest levels were found in samples of meat, liver, cheese and dairy products, which was to be expected given their lipophilicity (tendency to associate with fat) and bioaccumulative properties. Again, though, the results did not raise any toxicological concerns. This work is being prepared for publication.

10. In 2011, EFSA published a series of opinions on BFRs in food, covering PBBs, PBDEs and HBCDDs. In the case of PBBs, EFSA took the view that they were of no concern as levels of dietary exposure were already very low and background environmental concentrations were declining. [8] For PBDEs,

although most were considered of low risk to health, there was concern about possible neurodevelopmental effects in young children associated with BDE-99. [1] In view of the fact that many PBDE-containing products are still in use, EFSA recommended that monitoring for PBDEs in food and diet should continue, that toxicological studies with purified congeners might be considered and that epidemiological studies should be conducted. EFSA made similar recommendations in the case of HBCDDs, noting that, although there was unlikely to be a health concern, manufacture and use of HBCDDs continued to be significant and may even be increasing. [9]

11. Following the EFSA opinions, the Commission has repeated the call for further data. Currently, there is no indication that the Commission is considering the imposition of limits for BFRs in food. Nevertheless, if evidence of a clear risk to health should come to light, or if further monitoring shows that levels of BFRs in the environment and food are rising, it is likely that limits would be considered as a possible risk management tool.

12. There is no published data on levels of BFRs in feed. Feed ingredients sourced from outside the European Union, in particular from countries where BFRs are produced and used in very high volumes (such as the USA and China), may be at higher risk of contamination.

Action required

13. The Committee is invited to note and comment on the contents of this discussion paper. In particular the Committee is asked to consider whether the FSA should carry out an investigation into the levels of BFR contamination in the feed chain.

Dr. David N Mortimer
December 2011

References

[1] EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on Polybrominated Diphenyl Ethers (PBDEs) in Food. EFSA Journal 2011;9(5):2156.

[2] Fire toxicity - Stec A, Hull R. 2010. Fire toxicity.Woodhead publishing Limited, Oxford.

[3] Investigation into the Occurrence of Mixed Halogenated Dioxins, Furans and Biphenyls in Food, Project Code: C01050, 24/03/2011. Available on Foodbase at http://www.foodbase.org.uk/results.php?f_category_id=&f_report_id=656

[4] Environmental Politics and Science: The Case of PBB Contamination in Michigan. Reich, M R. Amer. J Public Health **73:3** (1983) 302-313

[5] Stockholm Convention website: http://chm.pops.int/default.aspx

[6] Brominated flame retardants in trout and eels from the Skerne-Tees river system and total diet study samples. Food Survey Information Sheet 52/04, available at http://www.food.gov.uk/multimedia/pdfs/fsis5204pdf.pdf

[7] Brominated chemicals in farmed and wild fish and shellfish and fish oil dietary supplements. Food Survey Information Sheet 04/06, available at http://www.food.gov.uk/multimedia/pdfs/fsis0406.pdf

[8] EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on Polybrominated Biphenyls (PBBs) in Food. EFSA Journal 2010; 8(10):1789.

[9] EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on Hexabromocyclododecanes (HBCDDs) in Food. EFSA Journal 2011;9(7):2296.