

Determination of Polybrominated Diphenyl Ethers (PBDEs) in Animal Fat.

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In support of Australia's agricultural industry the Australian National Residue Survey (NRS) undertakes monitoring of residues and contaminants on behalf of participating industries in raw foods such as crops, meats and grains. The results of these NRS surveys underpin access for Australian products to major export marketsⁱ. The NRS as part of these regular surveys has been conducting an unidentified analytical response (UAR) program since 1996. UARs are detector responses observed during routine analysis of samples that are not laboratory artefacts and do not correspond to any of the analytes covered by the laboratory's method. A number of UARs have been detected and investigated throughout this program with one such case in 1998 revealing the presence of polybrominated diphenyl ethersⁱⁱ. At this time the laboratory did not have any standards and quantification of these compounds was not performed. During August 2002, UARs were again encountered in two more fat samples during routine residue screening and were qualitatively identified as PBDEs. Analyses of these two samples as well as the sample from 1998 that had been stored in a freezer were undertaken for PBDEs using isotope dilution capillary gas chromatography-electron impact high resolution mass spectrometry with monitoring of either M⁺ or M-2BR⁺ ions. Three additional fat samples that had been tested in the residue screening program without any evidence of PBDEs were also included to give an indication of possible background levels.

Brominated flame retardants (BFRs) are extensively used in a wide range of materials including polymers and textiles that are in common usage in both the domestic and work environments. Polybrominated diphenyl ethers (PBDEs) are one class of BFRs that have received a lot of attention due to their persistence in the environment and ability to bioaccumulate through the food chain. PBDEs have been found to increase exponentially in human breast milkⁱⁱⁱ in temporal studies where levels of organochlorine compounds viz. dioxins and PCBs have decreased. PBDEs are structurally very similar to dioxins and PCBs and because of this there is increasing concern regarding their toxicology. Unlike dioxins & PCBs which are strong inducers of the aryl hydrocarbon hydroxylase (Ah) receptor PBDEs interrupt the thyroid function with decreased production of free thyroxin hormone (T₄) in animals and humans.

PBDEs are an emerging and increasingly important POP and development of methodology to determine them at the ultra-trace level will be an Australian first and will also add to the international database of the presence of these compounds in the food chain.

1. M. O'Flynn, The NRS and Australia's Management of Chemical Residues, 17th Conference of Residue Chemists, 24-26 November 1999, Perth, Western Australia.
 2. W. Korth and M. Croft, Bounty Hunters – The Pursuit of UARs in Residue Chemistry, 17th Conference of Residue Chemists, 24-26 November 1999, Perth, Western Australia.
 3. Noren K, Meironyte D. Contaminants in Swedish human milk. Decreasing levels of organochlorine and increasing levels of organobromine compounds. *Organohalogen Compounds* 38:1-4 (1998).
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