

PBDE LEVELS IN ESTONIAN FOODSTUFFS

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Abstract

Chemicals are nowadays produced and marketed in great numbers. Chemical residues may affect all major organs of the body, causing serious health outcomes like cancer, birth defects, and brain damage. In 2006 the concentrations and composition profiles of polybrominated diphenyl ethers (PBDEs) were first time determined in Estonian (aquaculture, butter, milk, pork and wild fish) and imported food (fish oil). PBDE summary concentrations in Estonian food were all below 4 ng/g fat, and the majority of concentrations were below 2 ng/g fat. In wild fish the concentrations varied between 0.65 and 2.30 in fresh weight. Highest concentrations in foodstuffs excluding wild fish was analysed in two fish oil samples (5.1 and 4.0 ng/g fat) imported from Russia.

Introduction

The objective of this article is to harmonise and integrate the activities of the European Union (EU) New Member State - Estonia in the field of chemical food safety with those of Old Member States, as Finland. On the basis of this information, recommendations how to improve chemical food safety management in Estonia will be prepared. This will be achieved by the activities planned in two paths: one aimed at gathering knowledge on sources of dietary data [1] and another focussing on strategies/approaches and capabilities of monitoring food chemical contamination with persistent organic pollutants, like polychlorinated dibenzo-*p*-dioxin (PCDDs), polychlorinated dibenzofurans (PCDFs), dioxin-like polychlorinated biphenyls (DL-PCBs), other polychlorinated biphenyls (other-PCBs)[2;3] and polybrominated diphenyl ethers (PBDEs). By the Finnish data [4], the contribution profile of PBDEs suggested that there might be a difference in human exposure sources of PBDEs when compared with PCDD/Fs and PCBs.

Methods

Meat (pork) samples were collected from slaughter houses, milk and butter samples either from the dairies or individual farms, and samples of wild fish from the Baltic Sea and imported fish oil from food shops. Samples were extracted, defatted, fractionated and purified and analysed for 16 PBDEs were performed with HRGC/HRMS [4]. Concentrations were calculated with upper bound method. The Finnish laboratory is an accredited testing laboratory (No T077) in Finland (current standard: EN ISO/IEC 17025). The scope of accreditation includes PCDD/Fs, non-ortho PCBs, mono-ortho- and other PCBs, and PBDEs from environmental samples. Fish oil is used as an internal quality control sample in the laboratory, and the random errors within the laboratory for sum of PBDEs are 4,3%, respectively [4].

Results and Discussion

Milk, milk products and wild fatty fish are good indicators for the contamination of persistent organic pollutants (POPs) in the food chain. Thus, butter and wild fish from Baltic Sea has been used for comparison of the PCDD/PCDF contamination in several countries [2-7] .

TABLE 1. Content of PBDEs in Estonian wild fish from Baltic Sea in 2006.

Wild fish		Number of samples	Sum of PBDEs (fresh weight ng/g) (min.-max.)
Baltic herring	lowerbound	4	0.65-0.85
	mediumbound		0.66-0.86
	upperbound		0.67-0.86
Baltic Sprat	lowerbound	3	0.87-0.92
	mediumbound		0.88-0.94
	upperbound		0.90-0.95
Eel	lowerbound	2	0.91-1.26
	mediumbound		0.97-1.32
	upperbound		1.03-1.37
Lamprey	lowerbound	3	1.95-2.25
	mediumbound		1.99-2.27
	upperbound		2.02-2.30

TABLE 2. Content of PBDEs in Estonian foodstuffs in 2006.

Foodstuffs		Number of samples	Sum of PBDEs (fat weight ng/g) (min.-max.)
Meat - Pork	lowerbound	3	0.05-3.74
	mediumbound		0.27-3.82
	upperbound		0.48-3.90
Butter	lowerbound	2	0.38-1.15
	mediumbound		0.89-1.48
	upperbound		1.40-1.80
Milk	lowerbound	3	0.02-0.05
	mediumbound		0.47-0.73
	upperbound		0.93-1.40
Aquaculture-Fish oil (Russia)	lowerbound	2	3.83-4.65
	mediumbound		3.90-4.85
	upperbound		3.97-5.06
Aquaculture-Fish oil (Norway)	lowerbound	1	0.91
	mediumbound		1.19
	upperbound		1.46

Highest concentrations in foodstuffs excluding wild fish was analysed in two aquaculture-fish oil samples (5.1 and 4.0 ng/g fat) imported from Russia. Polybrominated diphenyl ethers content was determined in three fish oil samples, and sample No 1 (Norway, Peter Möller) was clearly distinguished from samples No 2 and No 3 (Russia, "BioKontur"). PBDE summary concentrations in Estonian food were all below 4 ng/g fat, and the majority of concentrations were below 2 ng/g fat. In wild fish the concentrations varied between 0.65 and 2.30 in fresh weight.

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