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LIVSMEDELS VERKET

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Market Basket 2010 – analysis of persistent organic pollutants (POPs) in Swedish market basket samples

Preface

The following document is an extract from a report under production (provisional title: Market Basket 2010 – chemical analysis, intake estimation and risk assessment of compounds in Swedish food baskets). The present document presents analytical results on selected POPs in up to 45 food samples, partly financed by the Swedish EPA. In the coming report, per capita intake estimation and risk assessment will also be presented. The full report will be sent to the Swedish EPA when finalised, at latest May 2012.

Background

Market Basket surveys are performed with the purpose to obtain information on levels of nutrients and potentially harmful components in commonly consumed products or product groups, on the food market. By use of per capita food consumption data, derived from producers and trade statistics, defined market/food baskets are collected and the mean intake of analysed components in food/food groups could easily be estimated. In Sweden earlier Market Basket studies have been performed in 1999 and 2005. In the Swedish Market Basket study from 1999, reports have been published on the levels and estimated intakes of persistent organic pollutants (POPs) (Darnerud et al., 2006) and metals (Becker et al., 2011), and data from the 2005 Market Basket study include POPs (Törnkvist et al., 2011), fats and fatty acids (Becker et al., 2008) and starch, sugars and dietary fiber (Becker et al., 2009) (the latter two reports in Swedish). The aims of the present Market Basket study is a) to produce up-to-date concentration data of nutrients and contaminants in food groups of relevance for Swedish consumers, b) to estimate the theoretical mean per capita exposure of the analysed compounds in food, based on sales figures, and c) to investigate changes with time of per capita exposure data.

The purchased food baskets contain specific food items or categories that have a mean consumption of at least 0.5 kg per person and year (corresponding to ca 1.5 g/day). This means that ca 90 % of the direct consumption is covered by these market baskets, when expressed in kg per person. A purchase list with specific food items/categories is produced, and guided by this list the responsible purchase person chooses one or several food items to be purchased/sampled, depending on the specificity of the statistics. Each market basket thus contains more than 130 food items

In the present Market Basket study SBA statistics from 2007 was used. Supplementary statistics for fish and fats/oils has been obtained from the market research company GfK, Sweden. This is due to the lack of detailed data on fresh fish and on fats/oils in the SBA report. The GfK statistics are based on their consumer panels and could be transformed into figures on the total consumption volume (in kg) and on some of the leading products and specific types or products of fish.

The food baskets in Market Basket 2010 were collected from five different prominent provision grocer's chains (Coop, ICA, Willys, Hemköp, and Lidl). The purchases were made in May-June 2010, plus a supplementary purchase of fruit, vegetables, and potatoes in the autumn of the same year (September-October) with the purpose to obtain more Swedish-grown products. Due to delay in obtaining consumption data on fish, sampling of this food group was postponed and synchronised with the vegetables (September-October).

One idea with the food sampling in this project was to look for possible differences between standard-price and low-price products. Based on this approach two food basket were collected at each food chain, one standard and one low price basket. For one of the food chains (Lidl) only one basket was collected because of a limited selection of food items within each food group. To conclude, nine different food baskets were collected from these Uppsala food stores during spring 2010, and five supplementary purchases of vegetables, fruits and potatoes (of what was defined as standard price category) from these food chains were done in autumn the same year.

The food items/categories in the purchased market baskets has been divided into 12 food groups, which are used in order to match with the groups in the food data base at NFA. These groups are cereals, pastries, meat, fish, dairy products, eggs, fats, vegetables, fruits, potatoes, sugar and sweets, and beverages (alcoholic beverages, coffee, tea, and tap water excluded). Based on these groupings, the contribution of the different food groups to the total intake of nutrients as well as of food contaminants could be estimated.

Analysis of persistent organic pollutants (POPs)

Persistent organic pollutants (POP) such as polychlorinated biphenyls (PCBs), chlorinated pesticides (e. g. DDT, HCH, HCB, chlordanes) and brominated flame retardants (PBDE, HBCD) are lipophilic substances that have the propensity to bioaccumulate and biomagnify in the food web. As a result of their stability in the environment, high volume production, long time use and long-range atmospheric transport they are ubiquitously spread in the environment and are found both in wildlife and humans (Bernes 1998). These chemicals have been intentionally produced in order to meet various demands in society. PCBs have been widely used in industry as e.g. heat exchange fluids, in electric transformers and as additives in paint and plastics (ATSDR 2000). DDT was widely used as an insecticide mainly in agriculture, forestry and malaria control during the 1940s-1960s. Although DDT has been banned since the end of the 1970s due to its significant toxicity to wildlife it is still employed in malaria vector control programmes in some tropical countries (WHO 2007). The main DDT metabolite, DDE is even more stable than DDT and still one of the predominant contaminants found in humans and wildlife (Bernes 1998). Hexachlorocyclohexane (HCH) and chlordanes have been used as broad-spectrum insecticides since the 1940s, e.g. for agriculture and in gardens. The HCH isomer γ-HCH (lindane) has often been used as a substitute for DDT and in some countries as pharmaceutical treatment against lice and scabies. Hexachlorobenzene (HCB) has been used in a small scale as a fungicide but it is also formed unintentionally as a contaminant in chemical and combustion processes (Bernes 1998). Polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecane (HBCD) have been used worldwide as flame retardants since the 1970s and were added to a large variety of consumer products such as furniture upholstery, textiles, plastics and electronic products (Alaee et al. 2003).

Dioxins (polychlorinated dibenzo-p-dioxins, PCDDs and polychlorinated dibenzofurans, PCDFs) have not been intentionally produced, but instead they are formed as a result of

certain chemical processes at high temperature, for example, during incomplete combustion and in pulp and paper industry (EPA 2005). Dioxins have similar chemical-physical properties as PCBs and accumulate in the food chain.
The production, use and release of the chlorinated pesticides and PCBs have in many cases been strongly controlled or prohibited since the 1970s. Strong measures have also been taken to reduce dioxin emissions in the 1980s. In spite of all regulations, the ubiquitous use of POPs and the presence of large reservoirs make them still present in the environment. However the levels in Sweden and other countries have decreased during the last decades (Bignert 2011). Strict bans have also been imposed on the worldwide production and use of some PBDE formulations. Technical mixtures of penta- and octabromodiphenyl ether were banned globally in 2009 and since 2008 the use of decabromodiphenyl ether (BDE-209) has been banned in electronic applications within the EU (UNEP, 2009; Renner 2004; European Court of Justice 2008). Despite these bans, the release of PBDEs from existing products that are in service or have been disposed of in landfill sites is likely to continue for many years to come.

For the general population the main pathway for exposure to POPs is through diet, specially from food of animal origin but for the flame retardants indoor air and dust are other important ways of exposure (Darnerud et al. 2006; Johnson-Restrepo and Kannan 2009; Törnkvist et al. 2011).

Analytical methods – general comments

Dioxins (PCDD/F), PCBs, PBDEs, HBCD and chlorinated pesticides were analysed in selected food groups mainly contributing to POP intake consisting of eggs, fats/oils, fish/fish products, meat/meat products and dairy products. Chlorinated pesticides were only measured in “standard price” baskets. One sample per each food group and basket was analysed. This resulted in 45 samples for POP analysis (5 food groups x 9 baskets).

The analyses of PBDE, HBCD and chlorinated pesticides were performed at the National Food Agency (NFA), Sweden. PCDD/F and PCB were analysed by the National Institute for Health and Welfare (THL), Finland. The results are presented inTable 1-3. The results are presented as mean values and in some cases as mean of sums of congeners. In the calculation of mean values, levels below the limit of quantification (LOQ) are extrapolated to either 0, i.e. lower bound (LB), to half the LOQ value, i.e. medium bound (MB) or to the LOQ value, i.e. upper bound (UB). In addition, in the case of PBDE and HBCD, levels below LOQ but above the limit of detection (LOD) are used without extrapolating to estimate mean concentrations, and these results are also presented in Table 1. Levels below the LOQ are more uncertain than the ones above the validated LOQ levels but are in this case estimated to be more precise than the extrapolated levels. The non-extrapolated mean concentrations are compared to data based on medium bound values, in order to estimate a possible overestimation error by the medium bound method. The PCDD/F and dioxin-like PCB (DL-PCB) levels are estimated as toxic equivalents (TEQ) using both the toxic equivalency factors (TEF) set by WHO in 1998 and the new reevaluated TEFs from 2005 (Van den Berg 2006). No data on BDE-138, BDE-183, o,p’-DDT and γ-HCH are presented due to levels below LOD or LOQ for all samples analysed.

PBDE and HBCD

PBDEs and HBCD were analysed according to a method described elsewhere (Törnkvist et al. 2011), with a few modifications. Briefly, food homogenates were extracted first with a mixture of hexane/acetone and thereafter with a mixture of hexane/diethyl ether. After evaporation of the organic solvents the lipid content was determined gravimetrically. The extracts were redissolved in hexane and the lipids were removed by sulfuric acid treatment. Further clean up was made on silica gel column. BDE-85 and ^{13}C-BDE-209 were used as internal standards. Ten PBDE congeners (BDE-28, -47, -66, -99, -100, -138, -153, -154, -183 and -209) and HBCD were measured by high resolution gas chromatography/low resolution mass spectrometry (HRGC/LRMS) in electron capture negative ion mode.

All glassware was heated or rinsed with acetone prior to use to reduce the risk of contamination. The laboratory is UV-light protected to prevent degradation of BDE-209 during work up. Suspected high levels of BDE-209 were confirmed by a second analysis due to enhanced risk for contamination for this specific congener via air/dust. Each batch of six samples was analysed together with a laboratory blank and a quality control sample to verify the accuracy of the method. Reported concentrations were corrected for levels found in the blank samples. Estimated LOQ was set to either ten times the standard deviation of the blank value, or in the case the analyte was not found in the blank, to the lowest concentration of the calibration standards. The LOQ depended on the analyte quantified and ranged between 2.5-5.9 pg/g fresh weight (f.w.) for PBDEs and HBCD except BDE-209 whose LOQ was 14 pg/g f.w. LOQ is lower in this study compared to the market basket study performed 2005, where LOQ values for PBDE and HBCD ranged between 5-50 pg/g f.w depending on matrix and the analyte quantified. BDE-209 was not analysed in 2005. Levels below LOQ but above the LOD were used without extrapolating in per capita intake estimations to compare calculations based on extrapolated medium bound mean levels and non-extrapolated.

Dioxins and PCB

Analysis of PCDD/Fs and PCBs were done according to accredited methods at the National Institute for Health and Welfare in Kuopio, Finland (Isosaari et al. 2006). Seventeen toxic chloro-substituted PCDD/Fs, twelve dioxin-like PCBs (CB-77, -81, -105, -114, -118, -123, -126, -156, -157, -167, -169, -189) and sixteen non dioxin-like PCBs (CB-28, -52, -66, -74, -99, -101, -110, -128, -138, -141, -153, -170, -180, -183, -187, -194) were quantified by isotope dilution technique by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). LOQ for fish samples ranged between 0.02-0.3 pg/g f.w. for PCDD/F and dioxin-like PCBs and 0.4-4 pg/g f.w. for non dioxin-like PCBs depending on the analyte quantified. LOQ for remaining matrices analysed ranged between 0.004-0.7 pg/g lipid weight (l.w.) for PCDD/F and dioxin-like PCBs and between 0.1-7 pg/g l.w. for non dioxin-like PCBs, depending on matrix and analyte.

Chlorinated pesticides

The analytical method used to analyse chlorinated pesticides; hexachlorobenzene (HCB), hexachlorocyclohexane (α-, β-, γ-HCHs), chlordanes (oxy-, α-, γ-chlordane and trans-nonachlor) and DDT (o,p'-DDT, p,p'-DDT, p,p'-DDD and p,p'-DDE) has previously been described (Törnkvist et al. 2011).

The samples were extracted with a mixture of hexane/acetone followed by a mixture of hexane/diethyl ether. The fat content was determined gravimetrically after evaporation of the solvents. The fat was then removed from the extracts by sulfuric acid treatment and after that a further clean-up was made on a silica gel column. The substances were quantified on a gas chromatograph (Agilent Technologies 6890) equipped with dual capillary columns and dual electron capture detectors (GC/ECD). o,p'-DDD was used as internal standard for the analysis. A number of blank and control samples were analysed together with the samples to verify the accuracy and precision of the measurements. LOQ for the chlorinated pesticides were 0.013-0.13 ng/g f.w. depending on matrix and quantified substance. LOQ is higher in this study compared to the market basket study performed 2005, where LOQ values ranged between 0.005-0.06 ng/g f.w. depending on matrix and the analyte quantified. LOQ was revised after 2005.

Short conclusions

The highest levels of POPs were found in fish samples. The differences in PBDE, HBCD, PCB and dioxin levels between the standard- and low-price baskets were in general small. Small differences in levels were also seen between the different grocer's chains (not shown in tables). The levels of BDE-209 (not measured in earlier market baskets) were low in fish, but prominent in fats. Of total TEQs, the DL-PCBs were the major constituents in fish, but were less important in other food groups. Among the chlorinated pesticides p,p'-DDE was still the single compound generally found in highest levels.

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Table 1. PBDE[1] and HBCD levels in food homogenates of selected market basket food groups, based on samples collected in five grocery chains in Uppsala, Sweden, 2010. The market baskets were divided in standard (S) and low (L) price food items. Levels are given in pg/g fresh weight and mean values are presented as medium bound (MB), lower bound (LB), upper bound (UB) and as non-extrapolated mean (NE)[2]. N= number of samples analysed per each food group and basket.

		Fat (%)	BDE-28	BDE-47	BDE-66	BDE-99	BDE-100	BDE-153	BDE-154	BDE-209	HBCD
FISH (S)	**Mean (MB)**	**10.8**	**9.60**	**144**	**25.3**	**30.2**	**37.0**	**7.98**	**24.2**	**8.60**	**174**
N=5	Range (MB)	8.23-14.0	7.32-11.6	111-184	12.2-41.5	20.8-45.1	25.4-50.5	5.62-11.6	19.8-32.7	7.00-15.0	100-222
	Mean (LB)		9.60	144	25.3	30.2	37.0	7.98	24.2	3.00	174
	Mean (UB)		9.60	144	25.3	30.2	37.0	7.98	24.2	14.2	174
	<LOQ/all		0/5	0/5	0/5	0/5	0/5	0/5	0/5	4/5	0/5
	Mean (NE)		9.60	144	25.3	30.2	37.0	7.98	24.2	11.3	174
FISH (L)	**Mean (MB)**	**11.9**	**9.14**	**142**	**25.4**	**29.4**	**36.3**	**7.19**	**20.8**	**24.3**	**186**
N=4	Range (MB)	10.2-12.5	7.13-10.8	131-150	21.0-31.8	23.7-35.2	32.6-39.1	5.15-9.42	16.7-24.9	7.00-60.8	133-254
	Mean (LB)		9.14	142	25.4	29.4	36.3	7.19	20.8	20.8	186
	Mean (UB)		9.14	142	25.4	29.4	36.3	7.19	20.8	27.8	186
	<LOQ/all		0/4	0/4	0/4	0/4	0/4	0/4	0/4	2/4	0/4
	Mean (NE)		9.14	142	25.4	29.4	36.3	7.19	20.8	23.6	186
MEAT (S)	**Mean (MB)**	**12.1**	**1.25**	**2.70**	**1.30**	**2.95**	**1.25**	**1.25**	**1.25**	**8.48**	**3.19**
N=5	Range (MB)	10.5-13.2	1.25-1.25	2.70-2.70	1.30-1.30	2.95-2.95	1.25-1.25	1.25-1.25	1.25-1.25	7.00-14.4	2.50-5.93
	Mean (LB)		0	0	0	0	0	0	0	2.88	1.19
	Mean (UB)		2.50	5.40	2.60	5.90	2.50	2.50	2.50	14.1	5.19
	<LOQ/all		5/5	5/5	5/5	5/5	5/5	5/5	5/5	4/5	4/5
	Mean (NE)		0.176	1.89	0	2.86	0.806	0.846	0.438	8.41	3.33
MEAT (L)	**Mean (MB)**	**12.2**	**1.25**	**2.70**	**1.30**	**2.95**	**1.25**	**1.25**	**1.25**	**17.9**	**3.90**
N=4	Min-max	10.7-13.5	1.25-1.25	2.70-2.70	1.30-1.30	2.95-2.95	1.25-1.25	1.25-1.25	1.25-1.25	7.00-38.3	2.50-5.54
	Mean (LB)		0	0	0	0	0	0	0	14.4	2.65
	Mean (UB)		2.50	5.40	2.60	5.90	2.50	2.50	2.50	21.4	5.15
	<LOQ/all		4/4	4/4	4/4	4/4	4/4	4/4	4/4	2/4	2/4
	Mean (NE)		0.257	2.18	0	3.57	0.848	1.16	0.660	16.5	3.67

Cont. Table 1

		Fat (%)	BDE-28	BDE-47	BDE-66	BDE-99	BDE-100	BDE-153	BDE-154	BDE-209	HBCD
DAIRY (S)	**Mean (MB)**	**7.37**	**1.25**	**2.70**	**1.30**	**2.95**	**1.25**	**1.25**	**1.25**	**7.00**	**2.50**
N=5	Range	3.10-10.3	1.25-1.25	2.70-2.70	1.30-1.30	2.95-2.95	1.25-1.25	1.25-1.25	1.25-1.25	7.00-7.00	2.50-2.50
	Mean (LB)		0	0	0	0	0	0	0	0	0
	Mean (UB)		2.50	5.40	2.60	5.90	2.50	2.50	2.50	14.0	5.00
	<LOQ/all		5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5
	Mean (NE)		0.032	1.38	0	1.69	0.450	0.222	0	1.11	0.654
DAIRY (L)	**Mean (MB)**	**6.60**	**1.25**	**2.70**	**1.30**	**2.95**	**1.25**	**1.25**	**1.25**	**7.00**	**2.50**
N=4	Range (MB)	5.63-8.01	1.25-1.25	2.70-2.70	1.30-1.30	2.95-2.95	1.25-1.25	1.25-1.25	1.25-1.25	7.00-7.00	2.50-2.50
	Mean (LB)		0	0	0	0.0	0	0	0	0	0
	Mean (UB)		2.50	5.40	2.60	5.90	2.50	2.50	2.50	14.0	5.00
	<LOQ/all		4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
	Mean (NE)		0.0450	0.840	0	1.11	0.318	0.188	0	1.04	0.105
EGGS (S)	**Mean (MB)**	**10.2**	**1.25**	**3.37**	**1.30**	**4.28**	**1.70**	**1.55**	**1.58**	**11.1**	**3.46**
N=5	Range (MB)	9.07-11.8	1.25-1.25	2.70-6.07	1.30-1.30	2.95-9.61	1.25-3.48	1.25-2.77	1.25-2.89	7.00-18.5	2.50-7.31
	Mean (LB)		0	1.21	0	1.92	0.696	0.554	0.578	6.94	1.46
	Mean (UB)		2.50	5.53	2.60	6.64	2.70	2.55	2.58	15.3	5.46
	<LOQ/all		5/5	4/5	5/5	4/5	4/5	4/5	4/5	3/5	4/5
	Mean (NE)		0.114	1.78	0	3.89	1.28	1.34	0.90	12.2	2.07
EGGS (L)	**Mean (MB)**	**10.9**	**1.25**	**2.70**	**1.30**	**2.95**	**1.25**	**1.25**	**1.25**	**15.7**	**2.50**
N=4	Range (MB)	10.4-11.6	1.25-1.25	2.70-2.70	1.30-1.30	2.95-2.95	1.25-1.25	1.25-1.25	1.25-1.25	7.00-24.8	2.50-2.50
	Mean (LB)		0	0	0	0	0	0	0	12.2	0
	Mean (UB)		2.50	5.40	2.60	5.90	2.50	2.50	2.50	19.2	5.00
	<LOQ/all		4/4	4/4	4/4	4/4	4/4	4/5	4/4	2/4	4/4
	Mean (NE)		0.145	1.15	0	4.01	0.988	1.82	0.772	16.1	1.91

Cont. Table 1											
		Fat (%)	**BDE-28**	**BDE-47**	**BDE-66**	**BDE-99**	**BDE-100**	**BDE-153**	**BDE-154**	**BDE-209**	**HBCD**
FATS (S)	**Mean (MB)**	**68.9**	**1.25**	**7.71**	**1.30**	**14.4**	**1.54**	**3.10**	**1.25**	**107**	**23.7**
N=5	Range (MB)	66.2-72.0	1.25-1.25	6.06-10.4	1.30-1.30	11.6-16.1	1.25-2.71	1.25-4.34	1.25-1.25	53.9-248	8.40-51.8
	Mean (LB)		0	7.71	0	14.4	0.542	2.85	0	107	23.7
	Mean (UB)		2.50	7.71	2.60	14.4	2.54	3.35	2.50	107	23.7
	<LOQ/all		5/5	0/5	5/5	0/5	4/5	1/5	5/5	0/5	0/5
	Mean (NE)		0.300	7.71	0.600	14.4	1.85	3.28	1.35	107	23.7
FATS (L)	**Mean (MB)**	**66.3**	**1.25**	**5.57**	**1.30**	**13.6**	**1.58**	**2.47**	**1.25**	**66.6**	**21.7**
N=4	Range (MB)	62.7-70.0	1.25-1.25	2.70-11.3	1.30-1.30	10.7-18.5	1.25-2.55	1.25-4.33	1.25-1.25	37.4-94.8	5.79-47.4
	Mean (LB)		0	4.22	0	13.6	0.638	1.85	0	66.6	21.7
	Mean (UB)		2.50	6.92	2.60	13.6	2.51	3.10	2.50	66.6	21.7
	<LOQ/all		4/4	2/4	4/4	0/4	3/4	2/4	4/4	0/4	0/4
	Mean (NE)		0.288	6.53	0.320	13.6	1.77	2.93	1.32	66.6	21.7

[1] BDE-138 and BDE-183 are excluded since levels were <LOQ for all samples analysed.

[2] Mean values calculated using non-extrapolated levels that are above the limit of detection (LOD) but below the limit of quantification (LOQ).

Table 2. Levels of PCDD/F and PCB in food homogenates of selected market basket food groups, based on samples collected in five grocery chains in Uppsala, Sweden, 2010. The market baskets were divided in standard (S) and low (L) price food items. Levels are given in fresh weight and mean values are presented as medium bound (MB), lower bound (LB) and upper bound (UB). N= number of samples analysed per each food group and basket.

		pg TEQ g^{-1} (1998 TEF)			pg TEQ g^{-1} (2005 TEF)			ng g^{-1}		
	Fat %	∑PCDD/F[1]	∑DL-PCB[2]	∑Total TEQ[3]	∑PCDD/F[1]	∑DL-PCB[2]	∑Total TEQ[3]	∑I-PCB[4]	CB-153	∑NDL-PCB[5]
FISH (S, N=5)										
Mean (MB)	**11.0**	**0.178**	**0.308**	**0.488**	**0.139**	**0.240**	**0.382**	**3.12**	**1.09**	**1.47**
Mean (LB)		0.168	0.308	0.474	0.131	0.240	0.370	3.12	1.09	1.47
Mean (UB)		0.188	0.308	0.496	0.152	0.240	0.394	3.12	1.09	1.47
FISH (L, N=4)										
Mean (MB)	**12.2**	**0.208**	**0.323**	**0.530**	**0.165**	**0.255**	**0.418**	**3.28**	**1.18**	**1.49**
Mean (LB)		0.205	0.323	0.528	0.165	0.255	0.418	3.28	1.18	1.49
Mean (UB)		0.210	0.323	0.533	0.170	0.255	0.423	3.28	1.18	1.49
MEAT (S, N=5)										
Mean (MB)	**11.7**	**0.0198**	**0.0280**	**0.0476**	**0.0174**	**0.0234**	**0.0406**	**0.227**	**0.0836**	**0.767**
Mean (LB)		0.0166	0.0280	0.0446	0.0143	0.0234	0.0378	0.227	0.0836	0.767
Mean (UB)		0.0226	0.0280	0.0506	0.0200	0.0234	0.0434	0.227	0.0836	0.767
MEAT (L, N=4)										
Mean (MB)	**11.5**	**0.0120**	**0.0115**	**0.0235**	**0.0106**	**0.00922**	**0.0200**	**0.117**	**0.0403**	**0.0426**
Mean (LB)		0.00818	0.0113	0.0195	0.00680	0.00923	0.0158	0.117	0.0403	0.0426
Mean (UB)		0.0160	0.0115	0.0275	0.0145	0.00923	0.0238	0.117	0.0403	0.0426
DAIRY (S, N=5)										
Mean (MB)	**4.82**	**0.00996**	**0.0122**	**0.0224**	**0.00864**	**0.0107**	**0.0196**	**0.0629**	**0.0259**	**0.0218**
Mean (LB)		0.00654	0.0122	0.0190	0.00526	0.0107	0.0160	0.0625	0.0259	0.0213
Mean (UB)		0.0136	0.0122	0.0258	0.0122	0.0107	0.0230	0.0634	0.0259	0.0223
DAIRY (L, N=4)										
Mean (MB)	**4.68**	**0.00873**	**0.00918**	**0.0183**	**0.00765**	**0.00803**	**0.0160**	**0.0515**	**0.0210**	**0.0182**
Mean (LB)		0.00585	0.00918	0.0150	0.00473	0.00803	0.0128	0.0510	0.0210	0.0178
Mean (UB)		0.0118	0.00918	0.0213	0.0106	0.00803	0.0188	0.0520	0.0210	0.0187

Cont. Table 2

		pg TEQ g^{-1} (1998 TEF)			pg TEQ g^{-1} (2005 TEF)			ng g^{-1}		
	Fat %	**∑PCDD/F[1]**	**∑DL-PCB[2]**	**∑Total TEQ[3]**	**∑PCDD/F[1]**	**∑DL-PCB[2]**	**∑Total TEQ[3]**	**∑I-PCB[4]**	**CB-153**	**∑NDL-PCB[5]**
EGGS (S, N=5)										
Mean (MB)	**9.03**	**0.0400**	**0.00858**	**0.0484**	**0.0384**	**0.00706**	**0.0458**	**0.0777**	**0.0270**	**0.0384**
Mean (LB)		0.0294	0.00820	0.0378	0.0284	0.00670	0.0352	0.0774	0.0270	0.0381
Mean (UB)		0.0502	0.00892	0.0592	0.0486	0.00740	0.0564	0.0779	0.0270	0.0388
EGGS (L, N=4))										
Mean (MB)	**8.83**	**0.0480**	**0.0423**	**0.0923**	**0.0455**	**0.0169**	**0.0625**	**1.21**	**0.545**	**0.353**
Mean (LB)		0.0383	0.0423	0.0818	0.0355	0.0169	0.0525	1.21	0.545	0.353
Mean (UB)		0.0583	0.0423	0.100	0.0558	0.0169	0.0728	1.21	0.545	0.353
FATS (S, N=5)										
Mean (MB)	**71.5**	**0.0664**	**0.0356**	**0.102**	**0.0622**	**0.0318**	**0.0940**	**0.183**	**0.0814**	**0.0652**
Mean (LB)		0.000256	0.0356	0.0362	0.000498	0.0318	0.0324	0.181	0.0814	0.0648
Mean (UB)		0.134	0.0358	0.170	0.126	0.0318	0.160	0.185	0.0814	0.0655
FATS (L, N=4)										
Mean (MB)	**69.8**	**0.0685**	**0.0224**	**0.0905**	**0.0645**	**0.0196**	**0.0840**	**0.115**	**0.0500**	**0.0472**
Mean (LB)		0.00013	0.0208	0.0208	0.000385	0.0179	0.0183	0.113	0.0500	0.0467
Mean (UB)		0.138	0.0240	0.160	0.128	0.0213	0.150	0.117	0.0500	0.0478

[1] Sum TEQ of 17 dioxins (PCDD/F).
[2] Sum TEQ of 12 dioxin-like PCB (CB 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169 and 189).
[3] Sum TEQ of 17 PCDD/F and 12 dioxin-like PCB.
[4] Sum of six non dioxin-like PCB, i.e. indicator PCB (CB 28, 52, 101, 138, 153 and 180).
[5] Sum of ten non dioxin-like PCB (CB 66, 74, 99, 110, 128, 141, 170, 183, 187 and 194).

Table 3. Chlorinated pesticide[1] levels in food homogenates of selected market basket food groups, based on samples collected in five grocery chains in Uppsala, Sweden, 2010. All samples were standard-price products. Levels are given in ng/g fresh weight and mean values are presented as medium bound (MB), lower bound (LB) and upper bound (UB). N=number of samples analysed per each food group.

	Fat %	p.p'-DDE	p.p'-DDD	p.p'-DDT	HCB	α-HCH	β-HCH	α-Chlordane	γ-Chlordane	Oxy-chlordane	trans-Nonachlor
FISH (N=5)											
Mean (MB)	**10.7**	**2.13**	**0.701**	**0.386**	**0.520**	**0.093**	**0.073**	**0.382**	**0.057**	**0.106**	**0.487**
Range (MB)	8.32-14.3	1.81-2.49	0.595-0.767	0.262-0.470	0.481-0.589	0.073-0.113	0.032-0.084	0.339-0.469	0.032-0.084	0.096-0.141	0.436-0.649
Mean (LB)		2.13	0.701	0.386	0.520	0.093	0.067	0.382	0.045	0.106	0.487
Mean (UB)		2.13	0.701	0.386	0.520	0.093	0.079	0.382	0.070	0.106	0.487
<LOQ/all		0/5	0/5	0/5	0/5	0/5	1/5	0/5	2/5	0/5	0/5
MEAT (N=5)											
Mean (MB)	**12.1**	**0.183**	**0.013**	**0.031**	**0.171**	**0.007**	**0.008**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Range (MB)	10.3-13.4	0.114-0.316	0.013-0.013	0.013-0.069	0.074-0.458	0.007-0.007	0.007-0.014				
Mean (LB)		0.183	0	0.026	0.171	0	0.003				
Mean (UB)		0.183	0.025	0.036	0.171	0.013	0.013				
<LOQ/all		0/5	5/5	2/5	0/5	5/5	4/5				
DAIRY (N=5)											
Mean (MB)	**6.22**	**0.069**	**0.013**	**0.013**	**0.064**	**0.007**	**0.007**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Range (MB)	4.05-9.94	0.047-0.105	0.013-0.013	0.013-0.013	0.040-0.093	0.007-0.007	0.007-0.007				
Mean (LB)		0.069	0	0	0.064	0	0				
Mean (UB)		0.069	0.025	0.025	0.064	0.013	0.013				
<LOQ/all		0/5	5/5	5/5	0/5	5/5	5/5				

Table 3

	Fat %	p.p'-DDE	p.p'-DDD	p.p'-DDT	HCB	α-HCH	β-HCH	α-Chlordane	γ-Chlordane	Oxy-chlordane	trans-Nonachlor
EGGS (N=5)											
Mean (MB)	**9.73**	**0.062**	**0.013**	**0.013**	**0.025**	**0.007**	**0.007**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Range (MB)	8.72-10.3	0.013-0.123	0.013-0.013	0.013-0.013	0.016-0.051	0.007-0.007	0.007-0.007				
Mean (LB)		0.059	0	0	0.025	0	0				
Mean (UB)		0.064	0.025	0.025	0.025	0.013	0.013				
<LOQ/all		1/5	5/5	5/5	0/5	5/5	5/5				
FATS (N=5)											
Mean (MB)	**67.5**	**0.429**	**0.065**	**0.065**	**0.197**	**0.032**	**0.032**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Range (MB)	65.7-69.2	0.218-0.573	0.065-0.065	0.065-0.065	0.165-0.215	0.032-0.032	0.032-0.032				
Mean (LB)		0.429	0	0	0.197	0	0				
Mean (UB)		0.429	0.130	0.130	0.197	0.063	0.063				
<LOQ/all		0/5	5/5	5/5	0/5	5/5	5/5				

[1] o.p'-DDT and γ-HCH are not presented because all the values were <LOQ
n.a. = not analysed