

PCDD and PCDF levels in human milk in Estonia and certain Nordic countries

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INTRODUCTION

PCDDs and PCDFs have been found in human milk samples in all over the world. It has been suggested that one of the largest sources of PCDDs and PCDFs in the environment is waste incineration. Other sources are eg. automobiles, copper smelters, scrap reclamation in the iron and steel industry. Analyses of fish and dairy products indicates that the major exposure is via food.

The sources of PCDDs and PCDFs vary in different countries. For example, in Estonia there are power plants which use oil shale as a fuel. It is mined in Northeastern Estonia. Industry in Narva and Kohtla-Järve as well as oil shale mines in the vicinity generates a lot of waste. In Finland, 3 municipal waste incineration centres have been in operation, but presently only one of them is in use. There are about twenty municipal waste incineration centres in use in Sweden, and in Norway municipal waste incineration centres are located in 3 places. Estonia has no such centres.

The aim of this study is to compare the levels of PCDDs and PCDFs in Estonian, Swedish, Finnish, and Norwegian human milk.

METHODS

Human milk from primipara mothers was collected in different Nordic countries and Estonia for determination of PCDDs and PCDFs. An aliquot of approximately 300 ml of milk was extracted and cleaned up according to methods utilizing liquid-liquid partition extraction and a PX-21 carbon enrichment of the analytes. The PCDDs and PCDFs were determined using HRGC-HRMS, at a method detection level (MDL) of 0.1 - 1 ppt (1).

RESULTS AND DISCUSSION

The data given in Table 1 and 2 indicates that the levels of PCDDs and PCDFs in human milk are similar in Estonia, Finland, Sweden and Norway. Results also show that the same isomers are found in the same proportions. Similarly, the average concentrations of PCBs in human milk in these countries have been reported to be at the same level (2-4).

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Table 1. Levels of PCDDs and PCDFs in human milk (ng/kg on a fat weight basis).

COMPOUND	COUNTRY					
	Estonia		Sweden			
	Tarto 1991 ¹⁵	Tallinn 1991 ¹⁵	Sundsvall 1987 ¹⁶	Umeå 1987 ¹⁶	Göteborg 1987 ¹⁶	Borlänge 1987 ¹⁶
2,3,7,8 -TCDD	4.1	3.3	3.3	2.9	3.2	2.8
1,2,3,7,8 -PeCDD	5.6	3	7.8	7.2	7.5	6.5
1,2,3,4,7,8 -HxCDD	2.2	1.6	{	{	{	{
1,2,3,6,7,8 -HxCDD	7.9	6.6	{31.2	{38.9	{39.0	{26.5
1,2,3,7,8,9 -HxCDD	4.3	3.5	7.1	8.2	6.2	6.1
1,2,3,4,6,7,8 -HpCDD	13.5	10	52.2	72.1	67.3	41.8
OCDD	147	111	209	255	263	184
2,3,7,8 -TCDF	1.3	0.7	3.8	3.7	4.1	3.6
1,2,3,7,8 -PeCDF	0.2	0.2				0.8
2,3,4,7,8 -PeCDF	23.8	12.8	19.6	17.1	19.6	17.0
1,2,3,4,7,8 -HxCDF	3.6	4.7	4.0	5.3	5.2	7.0
1,2,3,6,7,8 -HxCDF	2.6	2.5	3.3	4.4	3.7	3.7
2,3,4,6,7,8 -HxCDF	0.8	0.4	2.0	2.4	2.6	1.3
1,2,3,7,8,9 -HxCDF	<0.1	<0.1	nd	nd	nd	<1.5
1,2,3,4,6,7,8 -HpCDF	3.9	1.9	6.7	12.1	11.4	5.7
1,2,3,4,7,8,9 -HpCDF	<0.1	<0.1				
OCDF	1.2	0.9	nd	nd	nd	<2.5
TEQ (Nordic)	21.4	13.5	22.6	22.4	23.8	20.8
Number of mothers	6	6	10	10	10	10
Number of samples/ pooled samples analyzed	1	1	10	10	10	10

nd = not detected

Table 2. Levels of PCDDs and PCDFs in human milk (ng/kg on a fat weight basis).

COMPOUND	COUNTRY				
	Finland		Norway		
	Helsinki 1986-88 ⁽⁷⁾	Kuopio 1986-88 ⁽⁷⁾	Hamar 1987 ⁽⁶⁾	Skien 1987 ⁽⁶⁾	Tromsø 1987 ⁽⁶⁾
2,3,7,8 -TCDD	2.0	1.8	2.5	2.6	3.0
1,2,3,7,8 -PeCDD	5.5	5.6	4.7	5.4	4.7
1,2,3,4,7,8 -HxCDD	<0.5	<0.5	{	{	{
1,2,3,6,7,8 -HxCDD	36	22	{18.8	{19.2	{18.0
1,2,3,7,8,9 -HxCDD	7.0	5.8	4.9	3.6	4.8
1,2,3,4,6,7,8 -HpCDD	49	28	40.3	38.0	34.5
OCDD	154	113	150	148	156
2,3,7,8 -TCDF	0.3	0.3	4.1	5.1	4.5
1,2,3,7,8 -PeCDF	0.2	0.2	0.9	1.3	0.8
2,3,4,7,8 -PeCDF	15	15	11.5	17.9	13.6
1,2,3,4,7,8 -HxCDF	2.6	2.9	4.6	8.3	3.8
1,2,3,6,7,8 -HxCDF	1.0	1.0	2.7	5.3	2.7
2,3,4,6,7,8 -HxCDF	2.0	2.3	0.8	1.8	0.9
1,2,3,7,8,9 -HxCDF	<0.5	<0.5	<1.5	<1.5	<1.5
1,2,3,4,6,7,8 -HpCDF	8.8	12	5.5	5.3	5.8
OCDF	1.6	1.9	<2.5	<2.5	<2.5
TEQ (Nordic)	17.9	16.0	14.9	20.4	16.1
Number of mothers	38	31	10	10	10
Number of samples/ pooled samples analyzed	1	1	10	10	10