International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

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Levels of polychlorinated dibenzo-p-dioxins (PCDD/Fs) and Polychlorinated Biphenyls (PCBs) in the Breast Milk of Women Residents of Magnitogorsk

English Summary

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Russia

December 2004

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IPEN gratefully acknowledges the financial support of the Global Environment Facility, Swiss Agency for Development and Cooperation, Swiss Agency for the Environment Forests and Landscape, the Canada POPs Fund, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM), Mitchell Kapor Foundation, Sigrid Rausing Trust, New York Community Trust and others.

This report is available in the following languages: English Summary and Full report in Russian

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English Summary

"Iskorka" City Non-governmental Movement

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"The Women's Network at the Urals" NGO

Chelyabinsk
2004.

Contents

1. Introduction and Objectives

In the early 1970s, 2, 3, 7, 8-TCDD levels in breast milk were measured for the first time (Baughman, 1973). Since 1987, under the auspices of the European WHO Office (WHO/EURO), international research studies have been continuing in the framework of the program "Levels of PCBs, PCDDs and PCDFs in human milk" (Yrjanheikki, 1989, WHO, 1991, WHO, 1996, 2000). In two recent series of research studies, samples from Russia were also studied.

Estimates of breast milk contamination levels are made to: a) get reliable and compatible data on PCDD/Fs levels, b) assess human dioxin loads in the region, without the need to rely on indirect assessments of daily intakes via food chains or other assessments of breast feeding risks on the basis of "tolerable daily intakes", c) estimate trends of environmental impacts on human health.

Some trends of changes in PCDD/Fs levels in lactation were identified (USEPA, 1994a; IARC, 1997):

1. only the most toxic isomers (2,3,7,8-TCDD/F) were found in breast milk (Van den Berg, 1986; Beck, 1987);
2. concentrations of individual isomers show a good correlation, increasing in the range of tetra-chloro compounds to hexa- and octa-chloro compounds. In the case of Western Europe, the highest contributions to the overall toxicity are made by 2, 3, 4, 7, 8-penta-CDF (35%), the sum of hexa-CDDs (22%) and 1, 2, 3, 7, 8-penta-CDD (21%) (Vesl, 1992). In the case of North America, the contribution of the sum of hexa-CDDs is somehow higher than that of penta-isomers of dioxins and furans, while no prevalence of 1,2,3,7,8-penta-CDD was identified (Ryan, 1993);
3. the analysis of large numbers of individual samples demonstrates that individual differences vary from 5% to 10% for the majority of isomers (Beck, 1989; Dewailly, 1992; Furst, 1992; Hashimoto, 1995; Liem, 1995);
4. PCDD/Fs levels in breast milk decrease at longer nursing time and decrease substantially at subsequent lactations (Becк, 1992, 1994b; Furst, 1992a; Hirakawa, 1995), however, these levels tend to increase with a mother's age (Becк, 1994a; Rarke, 1997);
5. PCDD/Fs levels in breast milk are lower if a mother is a vegetarian, comparatively to the case of a common mixed diet (Vesk, 1992); a direct correlation was found between animal fat consumption and breast milk levels of PCDD/Fs (Pluem, 1993);
6. some studies have not revealed substantial differences in breast milk PCDD/Fs levels between residents of rural and industrial areas (Petreas, 1998; Ryan, 1993), while some others suggest that such differences exist (Koopman-Esseboom, 1994; Wuthe, 1992; Abraham, 1998);
7. higher levels of dioxins/furans were found in breast milk of exposed women (Schecter, 1994a; Masuda, 1994; Brodskiy, 1995); exposures of breast-fed infants were found to exceed exposures of bottle-fed infants (Abraham, 1996);
8. the trend of decreasing PCDD/Fs levels in breast milk was identified; the highest rates of decrease (up to 14%/year) were observed for countries with the highest initial dioxin levels in 1980s (UK, the Netherlands, Germany, Belgium, USA) (WHO, 1996; Liem, 1995; Papкe, 1997; Schecter, 1996b, 1997b; Noren,1998)

There is no such comprehensive data on the composition, time series and geographic patterns of PCBs levels in breast milk.

The third wave of international research of breast milk levels of PCDD/Fs and PCBs was carried out in 2000 -2002. We used the third wave data for comparative data analysis as the most informative data array.

In the third wave of research, aggregate samples were studied from 62 different regions, including 21 countries (van Leeuwen, 2002).

2. Research Objects and Materials

We studied the averaged sample of breast milk from 25 women who were permanent residents of Magnitogorsk.

Samples were taken according to the WHO Guidelines, and survey forms were completed for all donors. The survey form template is enclosed - see the Annex. The survey forms suggest the adequacy of the sampling procedures; none of the donors had occupational exposure to chemicals and all of them had lived in Magnitogorsk for not less than 5 years. Individual differences are not significant (Fig. 1 - Fig. 8). The average age of the women donors was 25 years; their average weight was 62.7 kg.

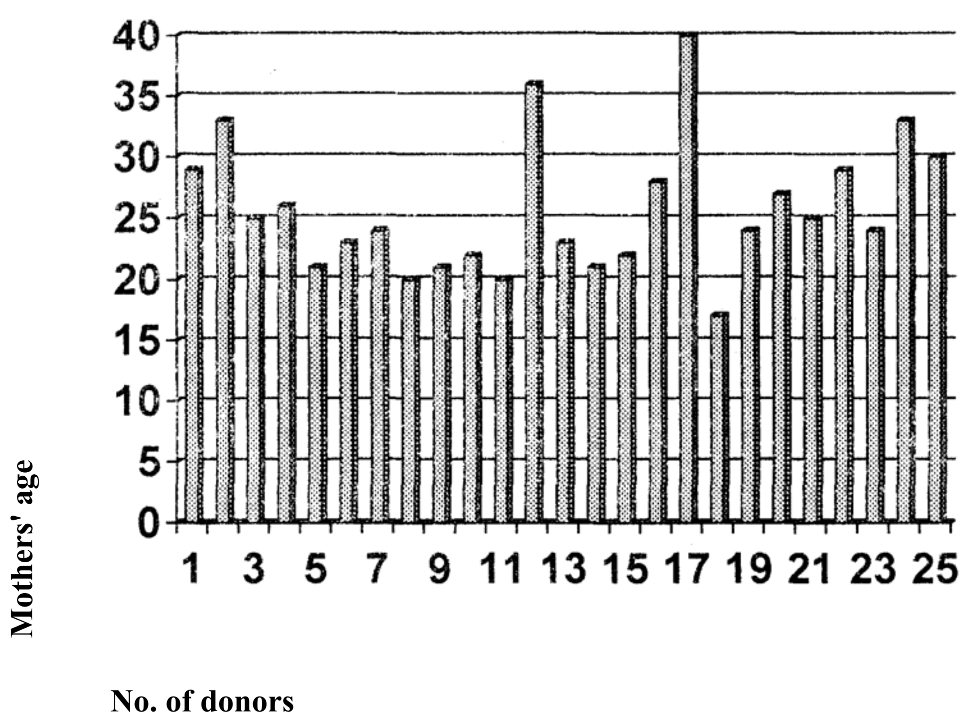

Fig. 1. Age of Magnitogorsk donors.
Average age – 25 years

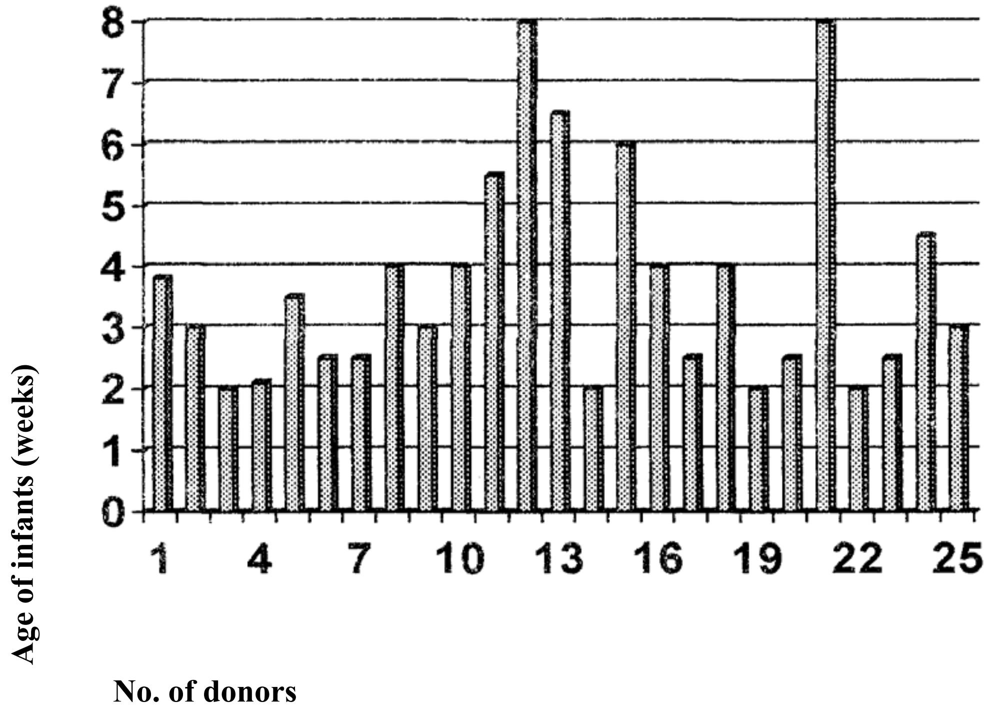

Fig. 2. Graph of infants' age at the moment of taking breast milk samples.
Average age – 3.7 weeks.

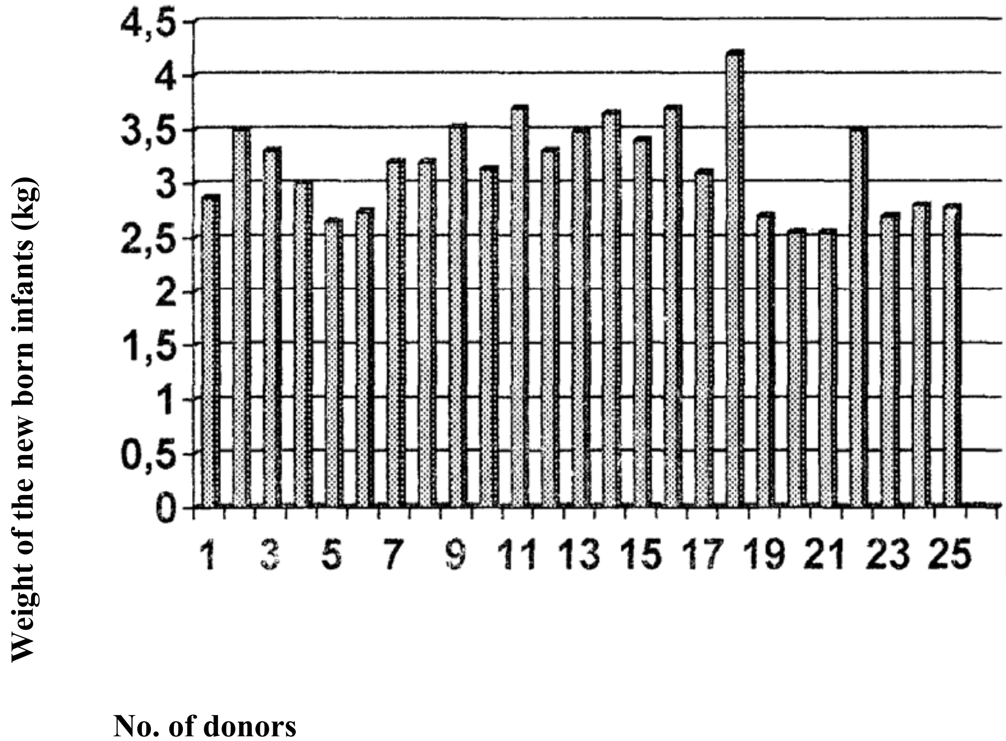

Fig. 3. Graph of weight of the new born infants at birth.
Average weight – 3.16 kg.

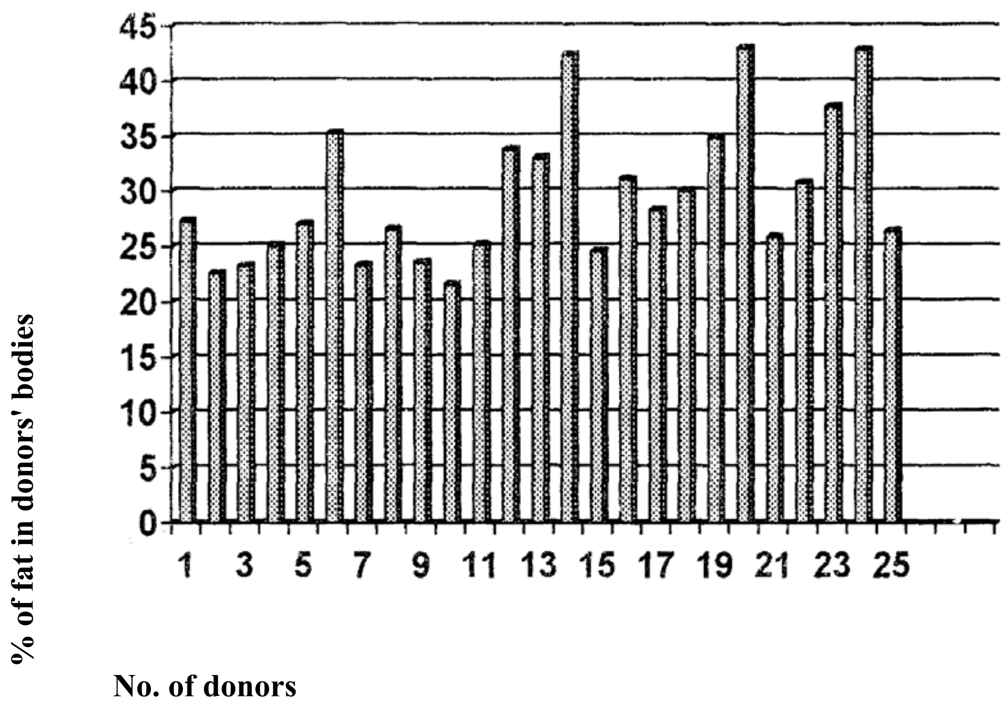

Fig. 4. Graph of fat levels in donors' bodies (%).
Average fat level – 29.8%.

Table 1. Some parameters of the breast milk donors.

3.

Parameters	**Magnitogorsk**
Sex of infants	13 girls and 12 boys
Smokers	5
Non-smokers	20
Eat fish 1 time a week	23
Do not eat fish	2

Methods of Quantitative Chemical Analysis of PCDD/Fs and PCBs in Breast Milk

Determination of the levels of 17 toxic PCDD/Fs in breast milk samples was made according to USEPA 1613, rev. B, Oct., 1994 "Tetra-through Octa- Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS".

The laboratory of Bashkir Republican R&D Environmental Centre was certified by bodies of the RF State Committee for Standards to measure PCDD/Fs levels in biological substrates (including fatty and muscle tissues, blood and breast milk). Method USEPA 1613 was certified by the RF State Committee for Standards and officially registered as MVI RB E1-01/USEPA 1613 (a full and adequate translation of USEPA 1613).

Determination of the levels of 12 toxic PCBs in breast milk samples was made according to USEPA 1618, "Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS" Revision A, 1999.

The laboratory of Bashkir Republican R&D Environmental Centre was certified by bodies of the RF State Committee for Standards to measure PCBs by the above technique (the technique was certified by the RF State Committee for Standards and registered as MVI RB E1-02/USEPA 1618 (a full and adequate translation of USEPA 1618).

3.1. Sampling and Production of the Average Sample

The average breast milk sample of about 130 ml in volume was taken from 25 women - residents of Magnitogorsk - by health care facilities of Magnitogorsk and Chelyabinsk, frozen at -18°C and delivered to the laboratory of Bashkir Republican R&D Environmental Centre. The average sample was made by mixing equal volumes from 25 individual donor samples. Pending the analysis, the sample was stored at the same temperature.

Immediately before the analysis, the sample was unfrozen and homogenised. The average sample was separated into two 60 ml samples for parallel analysis.

The mixture of ^{13}C-labeled PCDD/Fs was added to 60 ml of the average sample (10 µl of mixture of $^{13}C_{12}$ Cl_4-Cl_7-PCDD/Fs with concentration of 10 pg/µl (except OCDD with concentration of 20 pg/µl) - product of Cil, Inc., cat. # EDF 8999-4, and 500 µl of mixture of $^{13}C_{12}$ -PCB - product of Wellington. The solution was stirred by the electric mixer for 1 hour.

3.2. Extraction

The extract purification was made separately for determination of PCBs and PCDD/Fs. In the case of PCDD/Fs determination, the sample with a desiccant was extracted in a separating funnel by a

2*150 ml of acetone/hexane mixture (1/2), washed by water and dried by anhydrous magnesium sulphate. The extract was evaporated to dryness, and lipids were determined by weight.

After the extraction, the purification control standard was added - $^{37}Cl_4$-2, 3, 7, 8-TCDD (10 µl, at 8 pg/µl, product of Cil, cat. # EDF 6999). In the case of PCBs determination, extracts were filtered through 0.13 cm Teflon filters (porosity 0.45 µm) and were purified at 300 mm stainless steel gel column Envirogel TM GPC C1eanup (manufactured by Waters) with internal diameter of 19 mm, at upward flow of mobile phase (methylene chloride).

3.3. Extract Purification

In the case of PCDD/Fs determination, the extract was dissolved in 50 ml of methylene chloride/hexane mixture (2/1) and purified at the modified silica gel column (1 g SiO_2, 4 g SiO_2/KOH, 1 g SiO_2, 8 g H_2SO_4/SiO_2, 2 g SiO_2, 4 g Na_2SO_4), eluted by 200 ml of methylene chloride/hexane mixture (1:1), the column with basic aluminium oxide (6 g Al_2O_3), eluate - hexane/methylene chloride (2/1), 25 ml, the carbon column (0.55 g carbopac C/Celite 545), eluates – 2*3 ml of hexane in direct flow, 2 ml of mixture of methylene chloride/methanol/toluene (15:4:1), 30 ml of toluene in counter flow. Then, the solvent was replaced by dodecane.

The extract was evaporated up to 5 µl, immediately before measurements 5 µl of the internal standard were added to the extract (Cil, cat. # EDF 5999).

In the case of PCBs determination, chromatographic separation was made in a steady flow mode. 1 ml sample of the extract was used.

3.4. Measurements

Isomer-specific analysis of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans and polychlorinated biphenyls was made at the analytical unit, incorporating Car1o ЕгЬа 8035 chromatograph and high resolution mass spectrograph Autospec-Ultima (VG), at electron impact mode (36 ev), at resolution of ≥ 10.000. Mass numbers were set by PFK, two molecular ions were registered for native and labelled isomers of PCDD/Fs and PCBs. Peak areas ratios for pairs of molecular ions, absolute retention times, S/N ratios, determined for calibration solutions - all these parameters met theoretical values within reasonable error limits of USEPA 1613 and 1668 methods. The absolute detection limit for 2, 3, 7, 8-TCDD was 10 fg.

Necessary requirements were met for real matrices: the mass-spectrogram contained the both characteristic peaks with interval of ± 2 sec, S/N ratio was ≤ 3, the ratio of peak areas was within the limit of ± 15% of the theoretical value.

Isomers of PCDD/PCDFs were separated at the nonpolar capillary column DB-5MS J&W Scientific, 60 m of length, with 0.25 µm thick layer of (5%-phenyl) - methylpolysiloxane, with helium as carrier gas. Temperature of the injector was 270°C, the test sample volume (dodecane solution) was 1 µl.

Quality control was ensured by:

- daily trial checks of the instrument sensitivity, S/N ratios, retention times and isotope ratios of two measured peaks of the standard mixture of native and labelled substances (Cil, cat. # EDF 9999-3),
- running blank tests to ensure lack of contamination,
- use of standard solution to control precision of the determination method (Cil, cat. # EDF-7999).

Results of determination of PCDD/Fs were expressed in toxicity equivalents WHO-TEQ.

4. Results

Table 2. Levels of polychlorinated dibenzo-p-dioxins and dibenzofurans in breast milk of women - residents of Magnitogorsk.

PCDD/Fs	**Concentrations (pg/g fat)**	**TEQ-WHO, (pg/g fat)**
2378-TCDD	2.30	2.3
12378-PCDD	0.50	0.51
123478-HCDD	2.02	0.20
123678-HCDD	4/0	0.4
123789-HCDD	0.94	0.09
123678-hepta-CDD	5.59	0. 06
OCDD	23. 13	0
2378-TCDF	1. 05	0.10
12378-PCDF	0.91	0. 05
23478-PCDF	5. 67	2. 83
123478-HCDF	3.73	0.37
123678-HCDF	0.08	0. 01
123789-HCDF	0.08	0. 01
234678-hepta-CDF	1.71	0.17
1234678-hepta-CDF	2.57	0.03
1234789-hepta-CDF	0.05	0
OCDF	0.09	0
Sum of PCDDs	**38.53**	**3.60**
Sum of PCDFs	**15.93**	**3.57**
Sum of PCDD/Fs, pg/g fat	**54.46**	**7.16**

Table 3. PCBs levels in breast milk of women - residents of Magnitogorsk.

PCBs-WHO	**Concentrations (pg/g fat)**	**TEQ-WHO (pg/g fat)**
33'44'-TCB (77)	16.87	0
344'5-TCB (81)	7.74	0
233'44'-PCB (105)	12232.69	1.22
2344'5-PCB (114)	1775/0	0. 89
23'44'5-PCB 118)	39973.85	4.00
2'345'5-PCB (123)	664/39	0.07
33'44'5-PCB (126)	0	0
233'44'5-HCB (156)	8285.53	4. 14
233'44'5'-HCB (157)	1812.38	0. 91
23'44'55'-HCB (167)	2018.09	0.02
33'44'55'-HCB (169)	14.28	0. 14
233'44'55'-hepta-CB (189)	232.65	0. 02
##77, 81, 126, 169	**38.89**	**0.15**
Sum of PCBs	**67033.48**	**11.41**

5. Comparative analysis of our results and data from other cities of Russia and other countries

Table 4. PCDD/Fs level in breast milk samples from regions with different industrial loads (I-TEQ, pg/g lipids).

Countries	**TEQ**	**References**
Cambodia	3.1	Schecter, 1991
South Vietnam	8.8	Schecter, 1991
North Vietnam	34. 0	Schecter, 1991
Japan	13.1-30.8	Hirakawa, 1995
Canada	13.4-28.6	Dewailly, 1992; Ryan, 1993; Schecter, 1994a; WHO, 1996; Yrjanheikki, 1989
USA	9-20	Schecter, 1989, 1994, 1996, Hong, 1994
New Zealand	15-19	Buckland, 1990
Poland	20.4-21.1	Yrjanheikki, 1989, Koppe, 1992
Norway	9.3-15.9	WHO, 1996; Yrjanheikki, 1989; Ciench-Aas, 1992
Sweden	20.6-23.8	Yrjanheikki, 1989; Rappe, 1992a; Noren, 1998; Dahl, 1995
France	20.1	Gonzalez, 1993
Germany	16-33.1	Furst, 1992a; Beck, 1992; Papke, 1994;

		Malich, 1996
Italy	25-31	Schecter, 1992a
The Netherlands	23.5-58.6	Pluim, 1993; Liem., 1995; WHO, 1996; Yrjanheikki, 1989; Cuijpers, 1996; Tuinstra, 1994
UK	21-39.5	Wearne, 1996; Duarte-Davidson, 1992; Startin, 1989
Spain	11.8	Schumacher, 1998
Belgium	40.2-20.8	Yrjanheikki, 1989; WHO, 1996
Israel	12.6-15.4	Schecter, 1997a
Thailand	3	Schecter, 1991
South Africa	9-13	Schecter, 1994a
Pakistan	12. 6	Schecter, 1994a
Denmark	16.7-17.7	Hilbert, 1996; WHO, 1996
USA - Hawaii	13.2	Traag, 1997
Albania	3.8-4.8	WHO, 1996
Austria	10.7-17.2	WHO, 1996
Croatia	8.4-13.5	Yrjanheikki, 1989; WHO, 1996
Estonia	13.5-21.4	Mussalo-Rauhmaa, 1995
Faroes	6.7-11.7	Abraham, 1995
Finland	12-21,5	Yrjanheikki, 1989; WHO, 1996
Hungary	7.8-11.7	Yrjanheikki, 1989; WHO, 1996
Japan	11.8-58	Yrjanheikki, 1989; Hirakawa, 1995; Hashimoto, 1995
Jordan	9.38-110	Alawi, 1996
Latvia	13.3-16.1	WHO, 1996
Slovakia	12.6-15.1	WHO, 1996
Kazakhstan	20. 1	Petreas, 1996
Spain	14.3-25.5	Gonzales, 1996; WHO, 1996
Ukraine	11-13.3	WHO, 1996
Czech Republic	12.1-18.4	WHO, 1996

Until recently, there were no systemic research studies in Russia (Schecter, 1990b). Some scattered results of PCDD/Fs levels in breast milk were available, but in some cases their authors did not specify sampling methods (see Table 5).

Table 5. Levels of PCDD/Fs in breast milk samples in different cities of Russia (pg/g lipids).

Cities	**I-TEQ**	**References**
Moscow	20.6	Schecter (1990)
Baykalsk	10.3	Schecter (1990)
Irkutsk	17.3	Schecter (1990)
Novosibirsk	11.8	Schecter (1990)
Kachug	9.1	Schecter (1990)
Archangelsk*	15.2	Liem (1996)
Kargopol*	5.9	Liem (1996)
Salavat*	11.9	Traag (1997)
Salavat	20.1	Klyuev (1993)
Suzbal*	13.5	Traag (1997)
Dzerzhinsk*	10.7	Traag (1997)
Volgograd*	20.97	Traag (1997)
Sterlitamak	44.6	Klyuev (1995)
Murmansk	15.8	Polder (1996)
Monchegorsk	15.7	Polder (1996)
Kemerovo	56.12	Bodoiev (1997)

* - in compliance with WHO criteria

Using the data available by 1999, we estimated the average level of PCDD/Fs in breast milk samples for cities of Russia as 12.3 ± 6,4 pg TEQ/g lipids (the level is by about 40% lower than the global average).

Table 6. Average levels of PCDD/Fs in breast milk in Russia, pg/g lipids.

PCDD/Fs	**Average values**	**Median**	**Max**	**Min**
2378-TCDD	3.9	3.4	8.7	1.9
12378-PCDD	3.2	3.3	6.3	1.5
123478-HCDD	1.7	1.1	4.0	0.7
123678-HCDD	5.0	4.0	14.0	1.9
123789-HCDD	1.0	0.8	2.0	0.0
1234678-hepta-CDD	6.3	5.0	16.0	1.5
OCDD	33.5	30.0	33.0	9.0
2378-TCDF	2.0	1.5	6.3	0.7
12378-PCDF	0.7	0.5	2.3	0.2
23478-PCDF	9.6	8.4	19.0	5.0
123478-HCDF	5.3	4.0	15.0	1.4
123678-HCDF	2.4	2.3	5.0	0.9
123789-HCDF	0.5	0. 6	1.8	0.0
234678-HCDF	0. 6	0.5	1.1	50.1
1234678-hepta-CDF	1.4	1.4	2.6	0. 6
1234789-hepta-CDF	0.3	0.1	0.5	0.0
OCDF	0. 6	0.4	2.0	0.0
TEQ PCDD/Fs	**12.3**	**11.8**	**20.6**	**5.9**

For the first time, breast milk samples from Russia were analysed under the international WHO program in the Netherlands, in 1993/4 (Yufit, 1996) .

Table 7. Levels of PCDD, PCDF and dioxin-like PCBs in breast milk. Results of the third wave of research studies under the WHO program (2001/2002).

Countries	**WHO-TEQ PCDD/Fs, pg/g fat**		**WHO-TEQ, PCBs, pg/g fat**	
	median	**range**	**median**	**range**
Australia	5.65	5.5-5.79	3.09	2.48-3.69
Brazil	3.93	2.73-5.34	1.81	1.30-12.30
Bulgaria	6. 14	5.08-7.11	4.21	3.74-4.70
Croatia	6.40	5.99-6.80	7.17	6.82-7.52
The Czech Rep.	7.78	7.44-10.73	15.24	14.32-28.48
Egypt	22. 80	17.16-51.50	6. 01	4.43-8.26
Finland	9.44	9.35-9.52	5.85	5.66-6.03
Hungary	6.79	5.26-7.46	2.87	2.38-4.24
Ireland	6.91	6.19-8.54	4. 66	2.72-5.19
Italy	12.66	9.4-14.83	16.29	11.02-19.33
New Zealand	6.86	6.08-7.00	3. 92	3.50-4.71
Norway	7.30	7.16-7.43	8.08	6.56-9.61
Romania	8.86	8.37-12.00	8.06	8.05-8.11
Russia	8.88	7.46-12.93	15. 68	13.38-22.95
Slovakia	9. 07	7.84-9.87	12.60	10.72-19.49
Spain	11.90	10.41-18.32	11.65	9.96-16.97
Sweden	9.58	—	9.71	—
The Netherlands	18.27	17.09-21.29	11.57	10.90-13.08
Ukraine	10.01	8.38-10.16	19.95	14.10-22.00

Data for Russia were estimated as the average for several Russian cities (see Table 8). We added our new research results for Magnitogorsk to the Table.

Table 8. Levels of PCDD/Fs and PCBs in Russian cities (Khudoley V., 2002).

Cities	WHO-TEQ PCDD/Fs pg/g fat	WHO-TEQ PCBs pg/g fat
Suzdal	8.40	13.40
Volgograd	7.46	15.82
Astrakhan	9.36	15.52
Kamyzyak	12.92	22. 95
S. Petersburg	11.00	13.03
Anadyr	7.16	12.94
Perm * *	6.83-7.64	8.68-10.58
Magnitogorsk	**7.16**	**11.41**

* - data for Magnitogorsk were determined in this research study

** - data for Perm were determined by Bashkir Republican R&D Environmental Centre in 2003.

6. Conclusions

Notwithstanding a limited number of Russian cities, where full analysis data were obtained (including PCDD/Fs and PCBs), similarly to our research results for Magnitogorsk, data of Table 8 suggest average levels of both PCDD/Fs and PCBs.

Dioxin contamination of breast milk raised a question of whether to substitute breast feeding with formula or bottle feeding. Researches show that it is impossible to exclude breastfeeding. The primary benefit of breast milk is nutritional. While greater knowledge about human milk has helped scientists improve infant formula, it has become "increasingly apparent that infant formula can never duplicate human milk," write John D. Benson, Ph.D, and Mark L. Masor, Ph.D., in the March 1994 issue of Endocrine Regulations. "Human milk contains living cells, hormones, active enzymes, immunoglobulins and compounds with unique structures that cannot be replicated in infant formula." The composition of infant formula is similar to breast milk, but it isn't a perfect match, because the exact chemical makeup of breast milk is still unknown.

Many psychologists believe the nursing baby enjoys a sense of security from the warmth and presence of the mother. Nursing becomes more than a way to feed a baby; it's a source of warmth and comfort. It is crucial for developing psychological linkage between mother and the baby, mother-baby-family.

Thus the need for breast feeding for both the physical and mental health of the baby raises the question of dioxin elimination and environment sanitation from industrial pollutants. It will become a necessary pledge of conservation of the major evolutionary mechanism of maintaining human health.

7. References

1. Khudolei V.V., Gusarov E.E., Klinskiy A.V., Livanov G.A., Startsev A.A. Persistent Organic Pollutants: Options to Address the Problem, S.Pt.: Chemical R&D Institute of St.Pt. University, 2002, p. 363.

8. Annex 1

The protocol of quantitative chemical analysis of PCDD/Fs and PCBs-WHO, No. 31/2004.

9. Annex 2

1	**Education**	
	secondary	11
	higher incomplete	7
	higher	7
2	**Monthly family income per person (roubles)**	
	under 5 000	19
	over 5 000	6
	failed to answer	0
3	**Children's allowance**	
	paid	11
	unpaid	14
4	**A resident of Magnitogorsk**	
	from birth	13
	more than 5 years	5
	less than 5 years	7
5	**Are parents residents of Magnitogorsk**	
	yes	17
	no	8
6	**Occupational exposure**	
	yes	6
	no	19
7	**Worked at Magnitogorsk Metal Works**	
	yes	3
	no	22
8	**Smoking**	
	smoker	5
	non-smoker	20

9	**Altered diets at pregnancy**	
	yes	4
	no	21

10	**Consumption of fish**	
	none	2
	1-2 times/week	21
	more than 2 times in a week	2

11	**Consumption of milk**	
	1-2 times/week	5
	every day	20

12	**Fat content in milk consumed**	
	low (0.5-1.9%)	1
	medium (2.0-2.9%)	6
	high (3.0% or higher)	18

13	**Daily milk consumption**	
	250-499 ml	11
	500 ml or higher	14

14	**Cheese consumption**	
	none	4
	1-2 times/week	14
	every day	7

15	**Meat consumption**	
	none	2
	1-2 times/week	23
	more than 2 times/week	0

№	Names of mothers - donors of breast milk samples for determination of POPs	Age (years)
1	Anistchenko Natalia Nikolaevna	28
2	Arapova Marina Anatolievna	22
3	Akhmetova Alia Ulzhabekovna	21
4	Bakshinova Maya Aleksandrovna	20
5	Vdovichenko Anastasia Vladimirovna	23
6	Guzainova Filyuza Ilyasovna	21
7	Logeiko Tatyana Antonovna	25
8	Margevich Anna Sergeevna	23
9	Makhametzyanova Venera Rafaelievna	17
10	Morozova Svetlana Nikolaevna	36
11	Nasledova Natalia Anatolievna	19
12	Rakhmatullina Alfia Fatikhovna	33
13	Rudenskaya Anna Vasilievna	22
14	Savinova Marina Mikhailovna	25
15	Saldanova Ksenia Ratmirovna	20
16	Sergeeva Anastasia Aleksandrovna	21
17	Sivukhina Natalia Valentinovna	42
18	Sokolova Irina Yurievna	29
19	Tanasenko Olga Nikolaevna	26
20	Farkash Natalia Vladimirovna	24
21	Shilnikova Olga Vladimirovna	30
22	Shumakova Gyulnara Tailovna	27
23	Shur Larisa Ivanovna	24
24	Yusupova Menzelya Muratovna	33
25	Yamlokhina Albina Akhmatovna	24