

THE CONCENTRATIONS AND TEQ LEVELS OF CO-PCBS, PCDFS AND PCDDS IN THE BREAST MILK OF KOREAN

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Abstract

The study was conducted to determine the dioxins and Co-PCBs in human breast milk for the purpose of exposure assessment in human. Dioxins (17 congeners) and Co-PCBs (3 congeners) were determined by high resolution gas chromatograph/high resolution mass spectrometer (HRGC/HRMS) according to the method adopted from US EPA method 1613 and CDC (Centers for Disease Control & Prevention) Method. All the samples are collected in the year of 2001 from some organizations.

For the average concentrations of total PCDD/F and Co-PCBs in breast milk were 12.716 pgTEQ/g lipid (n=66) collected at 5th day after delivery, 8.540 pgTEQ/g lipid (n=50) at 30th day, 10.261 pgTEQ/g lipid (n=34) at 60th day, and 10.000 pgTEQ/g lipid (n=27) at 100th day, 9.693 pgTEQ/g lipid (n=20) at 150th day, and 8.505 pg TEQ/g lipid (n=7) at 200th day.

Introduction

Various environmental contaminants have the potential to disrupt sex hormone function in exposed organisms, which may result in adverse effects on reproduction, sexual differentiation, growth and development. And dioxins, PCBs and other related compounds constitute a group of persistent environmental contaminants exhibiting a broad spectrum of biological and toxic effects. Due to their lipophilic character and metabolic stability they accumulate in the food chain and biological matrices including human adipose tissue, blood and milk. Dioxins have been proved to have carcinogenic activities in many animal species and also have a capability of disrupting reproductive and endocrine function in human beings and animals. In the last years concern about possible adverse health effects in breast-fed infants arose because of relatively high polychlorinated biphenyl, dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs) concentrations in mother's milk¹⁾. However, in Korea, partitioning between mother's blood, milk, adipos tissues and placenta dioxin levels as well as tissue levels in the fetus and new born has not been fully characterized. This paper reports co-PCBs and dioxin levels in 66 breast milks of Korean mothers.

Materials and Methods

Sample: The samples measured in this study have been collected and treated by donors in each area. After collection, the breast milk samples were frozen and kept at -20 °C until analysis.

Analytical Method: The milk samples 10 ml were transferred to separating funnel and spiked with fifteen carbon-13 labeled isotope compounds (Cambridge Isotope Laboratories, Woburn, MA, USA). In this funnel Sodium Oxalate 1 g, formic acid 10 ml, NaCl 2 g and ethanol 25 ml are added and shaken for 20 min. 50 ml n-hexane, as extracting solvent, was added and shaken for 30min. The extraction was done 3 times. Extracts were concentrated to about 10 ml and passed through the activated florisil column and sep-pak cartridge for solid phase extraction (Waters, Milford, MA), with more two times of

HUMAN EXPOSURE II

Table 1. Dioxin levels of Breast Milk depending on the days after delivery in Korean women (n=66) Sampled in 2001

	Unit : pgTEQ/g, lipid					
Days after delivery (day)	5	30	60	100	150	200
Number of donors (person)	66	50	34	27	20	7
Lipid Contents (%)	3.58	4.04	3.87	3.77	3.61	3.44
PCDDs & PCDFs	10.146	6.893	7.921	7.988	7.872	7.121
Co-PCBs	2.570	1.647	2.340	2.012	1.821	1.384
Total	12.716	8.540	10.261	10.000	9.693	8.505

Table 2. Dioxin levels of Breast Milk depending on Areas and the days after delivery in Korean women.

	Unit : pgTEQ/g, lipid					
Days after delivery (day)	5	30	60	100	150	200
<Seoul Area>						
Number of donors	31	26	19	14	11	5
Lipid Contents (%)	3.69	4.19	3.82	3.64	3.36	3.35
PCDDs & PCDFs	12.349	7.133	7.414	9.536	10.263	7.784
Co-PCBs	2.016	1.468	2.571	2.169	1.783	1.128
Total	14.365	8.601	9.985	11.705	12.046	9.902
<Chunbuk Area>						
Number of donors	35	24	15	13	9	2
Lipid Contents (%)	3.47	3.88	3.90	3.90	3.90	3.67
PCDDs & PCDFs	8.194	6.633	8.562	6.321	4.951	5.466
Co-PCBs	3.060	1.841	2.048	1.842	1.867	2.022
Total	11.254	8.474	10.610	8.163	6.818	7.488

n-hexane 10 ml. Eluent concentrated to about 20ml by nitrogen stream and washed with conc. sulfuric acid, 5 % NaCl and 20 % KOH. Washed extracts passed through anhydrous Na₂SO₄ and concentrated to 10 ml for solid phase clean-up; silica, alumina and carbon column by USEPA 1613 method. Eluent to be spiked recovery standards 20 µl was concentrated to 20 µl. 2 µl was injected to HRGC/HRMS.

GC/MS analysis; Determination were performed with HP 5890 series II gas chromatograph and Finnigan MAT 95S mass spectrometer at resolution 10,000 using Ultra 2 capillary column (Hewlett Pacard).

Results and Discussions

For the average TEQ levels of total PCDD/F and Co-PCBs in breast milk were 12.716 pgTEQ/g lipid (n=66) collected at 5th day after delivery, 8.540 pgTEQ/g lipid (n=50) at 30th day, 10.261 pgTEQ/g lipid (n=34) at 60th day, and 10.000 pgTEQ/g lipid (n=27) at 100th day, 9.693 pgTEQ/g lipid (n=20) at 150th day, and 8.505 pg TEQ/g lipid (n=7) at 200th day (Table 1).

The total TEQ levels of Dioxin and Co-PCBs in Breast Milk depending on Areas and the days after delivery were 14.365 pgTEQ/g lipid (n=31) at 5th day, 8.601 pgTEQ/g lipid (n=26) at 30th day, 9.985 pgTEQ/g lipid (n=19) at 60th day, 11.705 pgTEQ/g lipid (n=14) at 100th day, 12.046 pgTEQ/g lipid (n=11) at 150th day and 9.902 pgTEQ/g lipid (n=5) at 200th day on seoul area. 11.254 pgTEQ/g lipid (n=35) at 5th day, 8.474 pgTEQ/g lipid (n=24) at 30th day, 10.610 pgTEQ/g lipid (n=15) at 60th day, 8.163 pgTEQ/g lipid (n=13) at 100th day, 6.818 pgTEQ/g lipid (n=9) at 150th day and 7.488 pgTEQ/g lipid (n=2) at 200th day were on chunbuk area.

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References

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