The Study on the Contents of PCDDs/PCDFs in Ambient Air, Edible Goods and Human Serum in Korea.

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Introduction

A comprehensive quality survey for PCDDs/PCDFs in ambient air, hamburger and human serum has been studied in Korea. This work was the first aimed at monitoring the ambient air quality on seasons. Monitoring was undertaken at 2 locations throughout Seoul (urban) and Incheon (industrial) on winter and spring over a period of March 16 to 17, 1998 and January 21 to 22, 1999 (Seoul) and March 25 to 26, 1998 and January 18 to 19, 1999 (Incheon). From the results for the contents of PCDDs/PCDFs in hamburgers, fried chicken and human serum, we tried to know the relationship between these samples and survey how much level of PCDDs/PCDFs in edible goods.

Material and Methods

Samples for PCDDs/PCDFs in ambient air was carried out according to USEPA Method TO-9 using high volume sampler. 24 hr samples were taken at each sites giving sampling volumes of approximately 1,000 m^3. For hamburger and fried chicken samples, we bought each 3 sets at same snack bar. Serum samples were taken from 5 persons who are the students in university and resident in Seoul. For ambient air, the analysis was done by the isotope-dilution-method with C^{13} surrogates for all 17 2,3,7,8-substituted congeners. Samples after soxhlet extraction and clean-up procedure were analyzed for contents of PCDDs/PCDFs the measuring with HRGC/HRMS methods. The clean-up procedure and PCDDs/PCDFs analysis were carried out according to USEPA 8290 and 1613. The hamburger and fried chicken samples with spiked C^{13} surrogates for all 17 2,3,7,8-substituted congeners were homogenized in hexane:acetone(1:2.5,v:v) using an Ultra Turrax homogenizer and the homogenates were then extracted with toluene by soxhlet equipment. The clean-up procedure and PCDDs/PCDFs analysis were carried out according to USEPA 1613. The serums to be added spiking solution of C^{13} isotopically-labelled for all 17 2,3,7,8-substituted congeners were digested with potassium oxalate, formic acid and ethanol. After then, we added the same volume to digestion samples of diethyl ether:hexane (2:3,v:v) on three times[1)]. The clean-up procedure and PCDDs/PCDFs analysis were carried out according to USEPA 1613.

Results and Discussions

In the results of the ambient atmosphere air (table 1), the TEQ values (35.81 and 29.57 fgTEQ/m^3) in residual city (seoul) are lower than in industrial city (285.96 and 135.97 fgTEQ/m^3)(incheon). The contents of PCDDs/PCDFs in winter (35.81 and 285.96 fgTEQ/m^3) are higher than in spring (29.57 and 135.97 fgTEQ/m^3). 2,3,7,8-TCDD did not take the quantitation by trace amount. We think that these results are from the increased amount of fuel consumption for

heating. The ratios of total PCDDs/PCDFs in winter are similar to each other as 0.18 and 0.17. But the ratio (0.14) of total PCDDs/PCDFs at residual site in spring is double to industrial site (0.07). If we study much more for the comparison to the trend of seasons, we will be able to specify the reason.

The contents of PCDDs/PCDFs in hamburger (6.02 fgTEQ/g) are lower than in fried chicken (340.23 fgTEQ/g). The ratios of total PCDDs/PCDFs do not have a relation each other (0.02, hamburger and 0.74, fried chicken).

In human serum, the content of PCDDs/PCDFs (8.86 pg/ml) is the highest of various samples. The ratio of total PCDDs/PCDFs is 0.32. We can have the result that the ratios of total PCDDs/PCDFs do not have a relation to some various samples. Figure 1 and 2 are showed the comparison to the contents of PCDDs/PCDFs in some various samples.

References

1) WHO(1987) Quality Control Studies on Levels of PCBs, PCDDs and PCDFs in human milk, ICP/CEH 541/E, Copenhagen, Denmark, World Health Organization, Regional Office for Europe.

Table1. The Contents of PCDDs and PCDFs in Some Various Samples

		Ambient Air (fgTEQ/m^3)				Hamburger (n=3) (fgTEQ/g)	Fried Chiken (n=3) (fgTEQ/g)	Human Blood (n=5) (pgTEQ/ml)
		Seoul (n=3)		Incheon (n=3)				
		winter	spring	winter	spring			
PCDDs	2,3,7,8,-TCDD	–	–	–	–	–	16.92	1.11
	1,2,3,7,8-PeCDD	2.18	–	12.72	3.19	–	73.51	0.28
	1,2,3,4,7,8-HxCDD	0.53	0.82	4.36	0.57	–	19.12	–
	1,2,3,6,7,8-HxCDD	0.97	0.58	7.42	2.33	–	18.40	0.15
	1,2,3,7,8,9-HxCDD	1.35	1.68	14.52	0.56	–	14.28	0.21
	1,2,3,4,6,7,8-HpCD	0.52	0.45	3.02	1.75	0.12	2.52	0.21
	OCDD	0.02	0.01	0.46	0.17	0.01	0.07	0.21
Total PCDDs		5.57	3.54	42.5	8.57	0.13	144.81	2.17
PCDFs	2,3,7,8-TCDF	8.84	6.17	45.45	33.39	0.59	3.60	0.14
	1,2,3,7,8-PeCDF	0.14	0.4	5.41	1.63		7.36	0.28
	2,3,4,7,8-PeCDF	7.13	7.09	94.27	41.51	3.24	82.64	1.19
	1,2,3,4,7,8-HxCDF	5.99	5.06	37.74	19.80	0.68	19.21	–
	1,2,3,6,7,8-HxCDF	2.73	1.21	21.89	9.62	0.53	16.96	1.60
	1,2,3,7,8,9-HxCDF	2.67	2.26	23.86	11.94	0.78	23.44	0.71
	2,3,4,6,7,8-HxCDF	0.12	0.48	6.03	2.87	–	35.75	2.09
	1,2,3,4,6,7,8-HpCDF	1.99	2.81	6.77	5.87	0.06	2.16	–
	1,2,3,4,7,8,9-HpCDF	0.36	0.38	2.04	0.60	–	4.23	0.20
	OCDF	0.27	0.17	–	0.17	–	0.08	0.48
Total PCDFs		30.24	26.03	243.46	127.4	5.89	195.42	6.69
PCDDs/PCDFs		0.18	0.14	0.17	0.07	0.02	0.74	0.32
Total		35.81	29.57	285.96	135.97	6.02	340.23	8.86

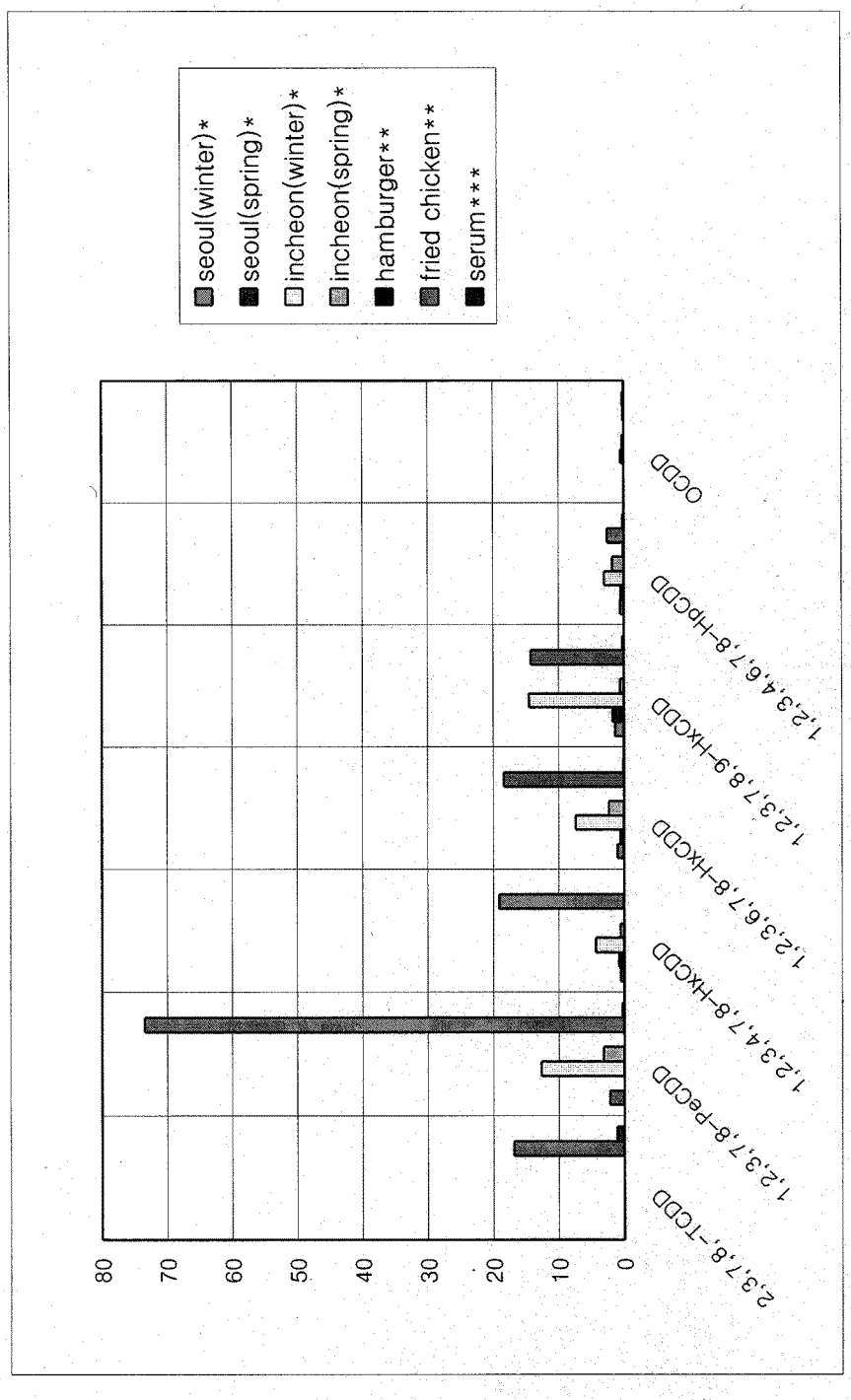

Fig1. Comparison to PCDDs in Some Various Samples

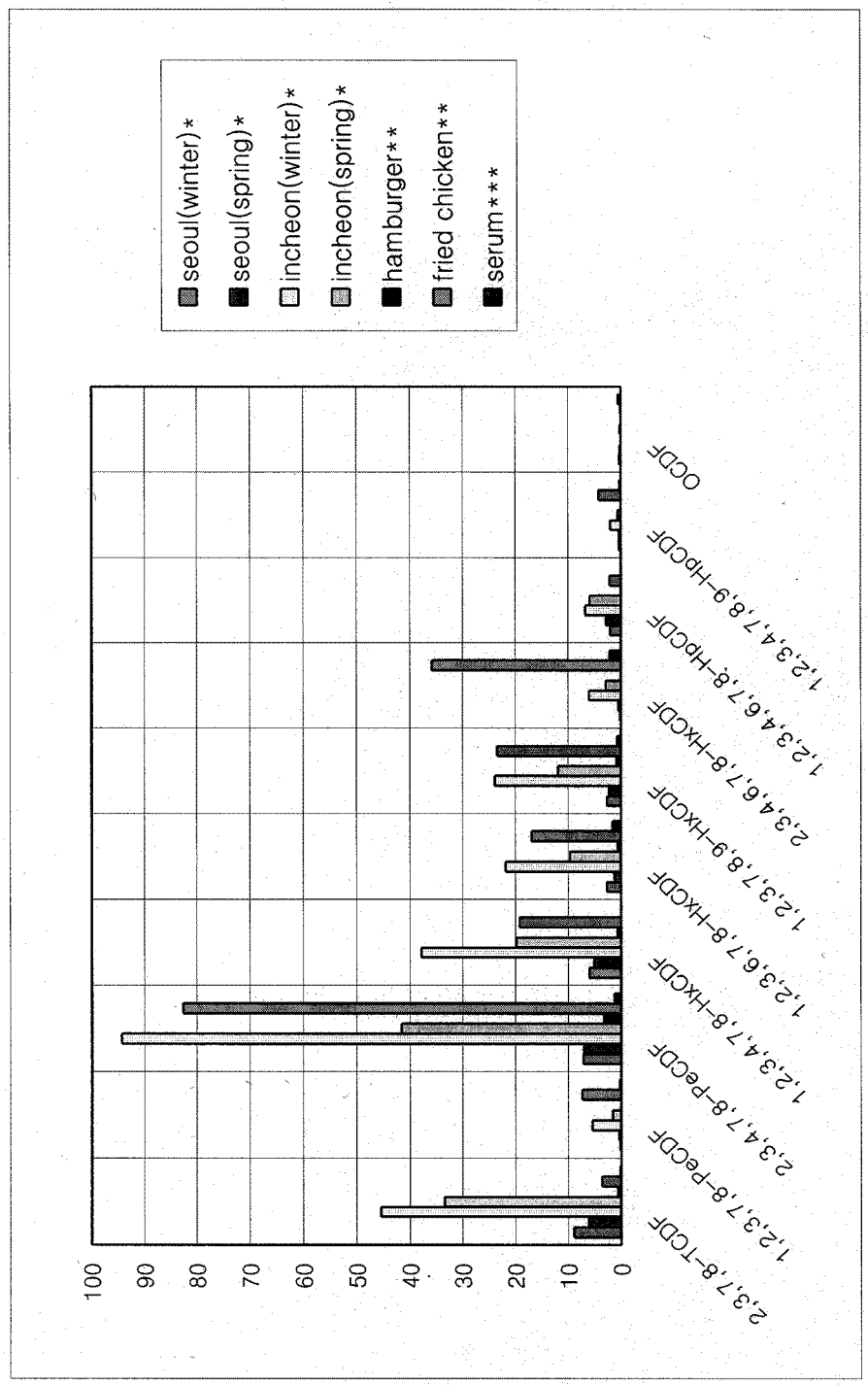

Fig2. Comparison to PCDFs in Some Various Samples