

ENVIRONMENTAL LEVELS - POSTERS

THE LEVELS OF PCDFS AND PCDDS IN THE 5 KINDS OF FISHES IN KOREA

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Introduction

Food is usually the major exposure of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs) to human. Fish and shellfish are reported to constitute over 60 % of total dietary PCDDs/PCDFs exposure in Japan ¹⁾. And the levels of PCDDs/PCDFs in fish on many countries were reported ²⁻⁵⁾. Korean mainly eat the raw and boiled fishes almost same to Japanese. In this study, we measure the levels of PCDDs/PCDFs in mackerel, walleye, pollack, croaker and cuttle fish, which are mainly consumed in Korea.

Materials and Methods

Sample: The samples measured in this study have been bought 3 sets of each fish from different market in 5 big cities and kept in freezer (-20 °C) until analysis. Edible portion were subjected to analysis.

Analytical Method: The edible portion 50 g of each fish was homogenized with anhydrous sodium sulfate and added 30% KOH solution for base digestion and transferred into the prewashed bottle and, after then, spiked with fifteen carbon-13 labeled isotope compounds (Cambridge Isotope Laboratories, Woburn, MA, USA). Methylene chloride 50 ml, as extracting solvent, was added and ultrasonicated for 20 min. 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 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 μ l was concentrated to 20 μ l. 2 μ l 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

The concentrations and TEQ levels of PCDFs in mackerel, walleye pollack, croaker and cuttlefish were 0~0.561 pg/g, 0~0.095 pg/g, 0~0.178 and 0~0.134 pg/g, respectively (Table 1). And TEQ levels of PCDFs were 0~0.019 pgTEQ/g, 0~0.009 pgTEQ/g, 0~0.005 pgTEQ/g and 0~0.014 pgTEQ/g. The total concentration and TEQ level of PCDFs in walleye pollack (0.158 pg/g and 0.010 pgTEQ/g) is the lowest and in mackerel (1.256 pg/g and 0.047 pgTEQ/g) is the highest. The concentrations and TEQ levels of PCDDs in mackerel, walleye pollack, croaker and cuttlefish were 0~1.216 pg/g, 0~1.793 pg/g, 0~1.189 and 0~2.292 pg/g, respectively (Table 2). And TEQ levels of PCDDs were 0~0.264 pgTEQ/g, 0~0.002 pgTEQ/g, 0~0.048 pgTEQ/g and

ENVIRONMENTAL LEVELS - POSTERS

0~0.030 pgTEQ/g. The total concentration and TEQ level of PCDDs in walleye pollack (1.793 pg/g and 0.002 pgTEQ/g) is the lowest. The total concentration of PCDDs in cuttlefish is highest and the highest total TEQ level is in mackerel (0.316 pgTEQ/g).

References

1. Takayama, K., Miyata, H., Aozasa, O., Mimura, M. and Kashimoto, T., *Syokuhin Eisei Gaakishi*, 32 (1991) 525-532.
2. Bech, H., Droß, A. and Mathar, W., *Chemosphere*, 35 (1992) 1539-1550.
3. Birmingham, B., Gilman, A., Grant, D., Salminen, J., Boddington, M., Thorpe, B., Wile, I., Toft, P. and Armstrong, V., *Chemosphere*, 19 (1989) 637-642.
4. Takayama, K., Miyata, H., Mimura, M. and Kashimoto, T., *Eisei Kagaku*, 37 (1991) 125-131.

Table 1. The Concentrations and TEQ Values of PCDFs in Fishes

Compound	Mackerel (n=15)					
	concentration (pg/g)			pgTEQ/g		
	mean	SD	min-max	mean	SD	min-max
2,3,7,8-TCDF	0.153	0.210	0.000-0.403	0.015	0.021	0.000-0.040
1,2,3,7,8-PeCDF	0.132	0.294	0.000-0.658	0.007	0.015	0.000-0.033
2,3,4,7,8-PeCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,6,7,8-HxCDF	0.190	0.424	0.000-0.949	0.019	0.042	0.000-0.095
1,2,3,7,8,9-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
2,3,4,6,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,6,7,8-HpCDF	0.561	1.254	0.000-2.804	0.006	0.013	0.000-0.028
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
OCDF	0.220	0.493	0.000-1.102	0.000	0.000	0.000-0.001
Total PCDFs	1.256	2.675		0.047	0.091	
Compound	Walleye pollack (n=15)					
	concentration (pg/g)			pgTEQ/g		
	mean	SD	min-max	mean	SD	min-max
2,3,7,8-TCDF	0.095	0.103	0.000-0.225	0.009	0.010	0.000-0.023
1,2,3,7,8-PeCDF	0.026	0.058	0.000-0.131	0.001	0.003	0.000-0.007
2,3,4,7,8-PeCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,6,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,7,8,9-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
2,3,4,6,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,6,7,8-HpCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
OCDF	0.037	0.083	0.000-0.186	0.000	0.000	0.000-0.000
Total PCDFs	0.158	0.244		0.010	0.013	

ENVIRONMENTAL LEVELS - POSTERS

Table 2. The Concentrations and TEQ Values of PCDDs in Fishes

Compound	Mackerel(n=15)					
	concentration (pg/g)			pgTEQ/g		
	mean	SD	min-max	mean	SD	min-max
2,3,7,8-TCDD	0.033	0.074	0.000-0.66	0.033	0.074	0.000-0.66
1,2,3,7,8-PeCDD	0.527	0.722	0.000-1.34	0.264	0.361	0.000-0.67
1,2,3,4,7,8-HxCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,6,7,8-HxCDD	0.155	0.347	0.000-0.76	0.016	0.035	0.000-0.78
1,2,3,7,8,9-HxCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,4,6,7,8-HpCDD	0.189	0.424	0.000-0.97	0.002	0.004	0.000-0.09
OCDD	1.216	0.798	0.664-2.66	0.001	0.001	0.001-0.03
Total PCDDs	2.120	2.365		0.316	0.475	
Compound	Walleye polack (n=15)					
	concentration (pg/g)			pgTEQ/g		
	mean	SD	min-max	mean	SD	min-max
2,3,7,8-TCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,7,8-PeCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,4,7,8-HxCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,6,7,8-HxCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,7,8,9-HxCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
1,2,3,4,6,7,8-HpCDD	0.000	0.000	0.000-0.00	0.000	0.000	0.000-0.00
OCDD	1.793	1.412	0.450-3.79	0.002	0.001	0.000-0.04
Total PCDDs	1.793	1.412		0.002	0.001	

Continued.

ENVIRONMENTAL LEVELS - POSTERS

Croaker (n=15)						
Compound	concentration (pg/g)			pgTEQ/g		
	mean	SD	min-max	mean	SD	min-max
2,3,7,8-TCDF	0.052	0.056	0.000-0.132	0.005	0.006	0.000-0.013
1,2,3,7,8-PeCDF	0.037	0.082	0.000-0.184	0.002	0.004	0.000-0.009
2,3,4,7,8-PeCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,6,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,7,8,9-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
2,3,4,6,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,6,7,8-HpCDF	0.095	0.213	0.000-0.476	0.001	0.002	0.000-0.005
1,2,3,4,7,8,9-HpCDF	0.178	0.397	0.000-0.888	0.002	0.004	0.000-0.009
OCDF	0.015	0.034	0.000-0.075	0.000	0.000	0.000-0.000
Total PCDFs	0.377	0.782		0.010	0.016	
Cuttlefish (n=15)						
Compound	concentration (pg/g)			pgTEQ/g		
	mean	SD	min-max	mean	SD	min-max
2,3,7,8-TCDF	0.134	0.145	0.000-0.348	0.013	0.015	0.000-0.035
1,2,3,7,8-PeCDF	0.059	0.131	0.000-0.293	0.003	0.007	0.000-0.015
2,3,4,7,8-PeCDF	0.019	0.042	0.000-0.094	0.009	0.021	0.000-0.047
1,2,3,4,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,6,7,8-HxCDF	0.037	0.084	0.000-0.187	0.004	0.008	0.000-0.019
1,2,3,7,8,9-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
2,3,4,6,7,8-HxCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,6,7,8-HpCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
1,2,3,4,7,8,9-HpCDF	0.000	0.000	0.000-0.000	0.000	0.000	0.000-0.000
OCDF	0.040	0.091	0.000-0.202	0.000	0.000	0.000-0.000
Total PCDFs	0.289	0.493		0.029	0.051	