LEVELS OF TOTAL PCBS AND MARKER PCBS IN FOODSTUFF AND HUMAN INTAKE IN KOREA

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Introduction

Polychlorinated biphenyls(PCBs) are ubiquitous contaminants, which persist and bioaccumulate through the food chain.[1] Human exposure to PCBs occurs mainly from eating foodstuffs that contain this chemicals. It has been reported that the contribution of meat and meat products, dairy products, and fish and other seafood may surpass the 90% of the total exposure to PCBs.[2]

The objectives of this study were to measure the concentrations of PCBs, including total PCBs(62 PCBs congeners) and marker PCBs(indicator 7 congeners) in common food items collected in the five cities and to assess the potential health risks to human consumers due to dietary food consumption.

Materials and Methods

In the five regional cities(Seoul, Busan, Gwangju, Deagu, and Kangnung) of Korea, commodities were randomly purchased from retail market over a period of March to April 2007. All samples were kept frozen at -20^{o}C and analysis were done by the KFDA. A total of 60 samples tested for total PCBs(IUPAC numbers 1, 3, 4, 8, 10, 15, 18, 19, 22, 28, 33, 37, 44, 49, 52, 54, 70, 74, 77, 81, 87, 95, 99, 101, 104, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 155, 156, 157, 158, 167, 168, 169, 170, 171, 177, 178, 180, 183, 187, 188, 189, 191, 194, 199, 201, 202, 205, 206, 208 and 209) and marker PCBs(IUPAC numbers 28,52,101,118,153,138 and 180 the most abundant) respectively. Commodities analysed (for each city and 15 food items) were: creal(rice), meat(beef, pork, chicken), eggs, fish(pacific mackerel, hair tail, eel, spanish mackerel, alaska pllack, yellow croaker, oyster, crab, milk and dairy products(milk, cheese).

HRGC/MSD was performed for all samples for total PCBs and marker PCBs in the isotope dilution methods. All the composite samples were homogenized and were spiked with the $^{13}C_{12}$-

labelled PCBs congeners and then samples extracted with Soxhlet extractor for total PCBs and Accelerated Solvent Extraction(ASE) for marker PCBs. Extracts were purified on "combination column" containing alternate layers of acidified and basic silicagel, separated by neutral gel and topped layer of anhydrous sodium sulfate.[3,4] The extracts were then further purified and the total PCBs separated through an activated Florisil column and elution of fraction for HRGC/MSD analysis. The average molecular ion response was quantify the PCBs of each chlorinatd class and the total PCBs. The detection limits were 0.1ppb for all PCBs at S/N >3. Fat contents were determined gravimetrically.

Results and Discussion

The results of total PCBs and sum of marker PCBs are summarized in Table 1 giving the levels of dietary intakes in foodstuffs. And Fig1 shows concentrations of total PCBs and marker PCBs congeners in fishes positive significant correlations. Regarding the results of the monitoring 2007, it is obvious that Korean Products are contaminated only to a minor degree. The exceeding arise due to the limits of detection(LOD) of the analytical method and assuming the concentrations of non-detected congeners equal the limit of determination. The estimates of dietary intakes of total PCBs are based on the combination of food consumption data[5] and of analysed total PCBs concentrations in 15 food items. This estimated dietary intake is about 0.7% of TDI. It has to be noted that estimates of dietary intakes are limited because of the lack of food consumption data and because of uncertainties related to existing consumption data. Furthermore, there are uncertainties related to analytical methods and to methods used to estimate to dietary intake. In conclusion, The retail food in Korea was safe although the data is limited.

Table 1. Results of the total PCBs and marker PCBs in 2007(Estimated daily exposure to total PCBs).

Food Items	Number of Samples	Level(mean)		Food intake (g/day)	Estimated daily Exposure(pgTEQ/day)
		Marker PCBs (ng/g ww)	Total PCBs (ng/g ww)		
Rice	5	0.21	0.23	205.7	47.31
Beef	5	0.62	1.38	17.8	24.56
Pork	5	0.25	1.15	37.2	42.78
Chicken	5	0.06	0.93	15.2	14.14
Egg(york only)	5	0.35	2.43	25.3	61.48

Milk	5	0.04	0.43	66.5	28.60
Cheese	5	0.40	1.33	0.6	0.80
Pacific mackerel	5	7.64	8.67	5.8	50.29
Spanish mackerel	5	4.58	9.47	0.6	5.68
Yellow croker	5	5.78	7.66	3.5	26.81
Alaska pollack	5	0.11	0.84	3.3	2.77
Hair tail	5	18.85	21.35	2.2	46.97
Eel	5	2.10	6.10	0.6	3.66
Crab	5	0.55	1.36	2.1	2.86
Oyster	5	0.65	1.53	0.8	1.22
Sum	60				359.93

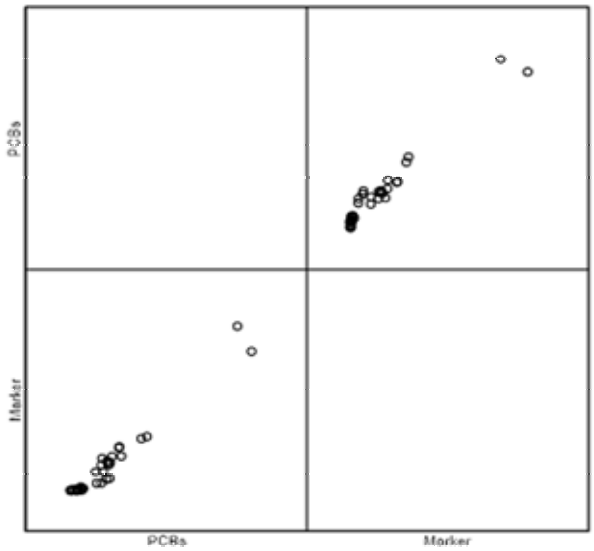

Fig 1. The Correlation plot of total PCBs and marker PCBs in Fishes.

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