LEVELS OF POLYCHLORINATED BIPHENYLS (PCBs) IN HUMAN BLOOD SERUM COLLECTED FROM ENVIRONMENTALLY AND OCCUPATIONALLY EXPOSED POPULATIONS IN ZAGREB, YUGOSLAVIA

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ABSTRACT

The presence of PCBs was found in samples of human serum taken from environmentally and occupationally exposed populations. Higher levels were determined in occupationally exposed workers.

INTRODUCTION

Zagreb is the city in Croatia, Yugoslavia, with the largest number of industry. Earlier studies have shown that human milk samples from the Zagreb population all contain PCBs (Krauthacker et al. 1986, Krauthacker et al. 1989). The present monitoring was undertaken in order to obtain information concerning PCB levels in human serum samples collected from the same area.

EXPERIMENTAL

Blood samples were collected from 39 environmentally exposed persons from the general population (17 men and 22 women), and from 26 workers in a power distribution company (all men) who were occupationally exposed to PCB-containing material. Blood was taken by venipuncture, coagulated, the serum was separated and kept frozen until analysis. Serum was extracted with n-hexane and extracts were purified with sulphuric acid (Krauthacker et al. 1980). Gas chromatographic analysis was done on a Varian 1440 with an ^{3H}Sc electron-capture detector and Pye Unicam 204 with a ^{63}Ni electron-capture detector. The follow-

ing packed columns (2 m, 2 mm i.d.) were used: a) 1.3% SF-96 + 5.3% QF-1 on Supelcoport 100/120 mesh and b) 5% OV-101 on Chromosorb W DMCS/AW 80/100 mesh. All samples were chromatographed on both columns. Total PCBs were determined by comparison with Ar 1260 and Ar 1016 + Ar 1260 (1:1 mixture). When the standard was Ar 1260 quantitation was done by comparing seven major peak heights (when chromatographed on column a) and twelve major peak heights (column b). With Ar 1016 + Ar 1260 as the standard quantitation was done on column b only using the Varian 4400 integrator. The peaks with $RRT_{DDE} \times 100$ = 28, 32, 37, 40, 47, 54, 58, 70, 84, 117, 125, 146, 160, 174, 203, 232/244, 280, 332, 360/372, 448 and 528 were quantitated by comparing the peaks' area and concentrations of individual peaks. The concentrations of individual peaks in standard were calculated using the weight per cent content determined for those peaks on the same column by Sawyer (1978). The average recovery was 71% and all results were corrected for recovery and reagent blank. The detection limit was 1 µg/L.

RESULTS AND DISCUSSION

The environmentally exposed individuals were placed into three groups: two groups by the year of sampling and one group whose samples were collected in 1987 but analysed in 1989 using both Ar 1260 and the mixture Ar 1016 + Ar 1260 as standard. The occupationally exposed workers were all monitored in the same year; they were employed in the same company for 4 - 37 years. At their workplaces handled materials and oils containing PCB mixtures which corresponded to Ar 1016 and Ar 1260.

The PCBs concentrations are given in Table 1. Only two samples out of the 65 analysed contained no PCBs (environmental exposure, sampling year 1987). For a given sample, the PCBs concentration was the same when analysed on columns a and b, and quantified against Ar 1260 standard. The mean values obtained on these two columns were therefore presented. However, when quantitation was done against standard Ar 1016 + Ar 1260 higher concentrations were found in all samples. The ratio of the median concentrations was about 1 : 3 (Table 1) and

Table 1. Total PCBs levels in human serum. Zero stands for values below detection limit. N is the number of analysed samples.

Type of exposure and year of sampling	(N)	Age/yr (Range)	PCBs/µg L^{-1} Ar 1260 Median (Range)	Ar 1016+Ar 1260 Median (Range)
Environmental				
- 1985/1986	(15)	(17-63)	4 (3-30)	-
- 1987/1988	(17)	(25-40)	3 (1-26)	-
- 1987	(7)	(23-47)	2 (0-5)	17 (0-34)
Occupational				
- 1989	(26)	(22-55)	8 (4-210)	25 (5-283)

generally the same ratio applied on average to the individual samples. In two persons PCBs concentrations were exceptionally high: 73 and 210 μg L^{-1} compared to Ar 1260, and 150 and 283 μg L^{-1} compared to Ar 1016 + Ar 1260. The reason is not clear because no accidental exposure occurred to these workers.

The median concentrations in the general population (environmental exposure) were lower than in the occupationally exposed individuals. Similar concentrations due to environmental exposure were reported for two groups of women from Voivodina (Yugoslavia) (Rončević et al. 1987, Pavkov et al. 1987) and for two groups from Slovenia (Yugoslavia) (Jan and Tratnik 1988). The concentrations reported in this paper for the occupationally exposed workers agree well with those found in occupationally exposed persons in other countries (Jensen 1989) and also with the concentrations measured in residents along the river Krupa gorge (Slovenia, Yugoslavia) after a serious environmental contamination caused by PCB - containing waste disposals (Jan and Tratnik 1988).

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