Levels of PCBs and Some Organochlorine Pesticides in the Human Population from Selected Areas of the Slovak Republic. *Part I. Blood Serum*

Petrík, J., Kočan, A., Drobná, B., Chovancová, J.
Institute of Preventive and Clinical Medicine, Limbová 14, 833 01 Bratislava, The Slovak Republic

It is estimated that > 90% (90-98%) of the content of polychlorinated aromatic compounds (PCACs), such as polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs), DDE, DDT, etc. in the nonoccupationally exposed human population comes from food[1-3].

From the litle data available on PCAC levels in humans from the Slovak or Czech Republic it is evident that these levels are high, often considerably exceeding findings from other countries. For example, HCB concentrations in human adipose tissue[4,5] ranged from 4.8 to 8.4 $mg.kg^{-1}$. PCB concentrations in mother's milk[6,7] were in the range of 2.4-3.5 $mg.kg^{-1}$ on fat basis and in human adipose tissue[8] from autopsies 0.4-31.4 $mg.kg^{-1}$.

Levels of some individual PCBs and several organochlorine pesticides (HCB, γ-HCH, p,p'-DDE and p,p'-DDT) in human blood serum have been used as an indicator of the exposure of the general population to these compounds in selected model areas of the Slovak Republic.

The following areas with a probability of increased nonoccupational exposure have been chosen:

Michalovce district (15-year PCB production stopped in 1984), *Veľký Krtíš* district (overstepped contamination of dairy products), *Bratislava* (chemical industry, dense automobile traffic, municipal, industrial and hospital waste incineration[9,10])

plus three background areas:

Nitra district (agricultural district), *Myjava* and *Sobotište* (highland regions, characterised by home-made food, including cow's milk, butter, eggs, pork, etc.).

Experimental

20ml of blood was taken from each volunteer (Table 1) living in the selected area (nonoccupationally exposed persons were preferred). Sera obtained by centrifugation were stored in glass vials with PTFE caps at -20°C till analysis.

Table 1. Characteristics of the Population Studied

Locality	Sex	No. of Samples	Age [yrs.] mean / range	Domicile	
				Urban	Rural
Michalovce	M[1]	5	44.8 / 25-70	3	2
	F[2]	5	41.2 / 21-57	3	2
Veľký Krtíš	M	5	44.6 / 37-62	2	3
	F	5	42.2 / 20-61	3	2
Bratislava	M	5	44.2 / 23-63	3	2
	F	5	44.6 / 23-64	5	0
Nitra	M	5	48.6 / 29-77	3	2
	F	5	44.6 / 28-66	1	4
Sobotište	M	6	41.8 / 21-67	0	6
	F	9	47.7 / 23-67	0	9
Myjava	M	5	44.2 / 30-52	2	3
	F	5	39.4 / 22-56	1	4

[1] Male [2] Female

Nine PCB congeners (28, 52, 101, 138, 153, 180, 105, 118, 156) and four organochlorine pesticides (HCB, γ-HCH, p,p'-DDE and p,p'-DDT) were determined. Blood serum samples (5 ml) were denatured with methanol and extracted twice with a mixture of n-hexane:diethylether (1:1). After evaporating, lipids were weighted then cleaned-up using a florisil-H_2SO_4/silica column. PCACs were separated on a DB-5 column and detected by ECD (HP 5890A). Along with the serum samples, blank and recovery samples (plant oil spiked with PCBs and organochlorine pesticides) were analysed. HRGC/ECD chromatograms were evaluated by calibration curves of the individual PCAC standard mixtures: 28, 52, 101, 138, 153, 180, 105, 114, 118, 123, 156, 157, 189, 77, 126, 169, HCB, γ-HCH, pp'-DDE and pp'-DDT at four different concentration levels.

Conclusions

- Three PCB congeners (138, 153 and 180) were dominant in all the analysed blood serum samples.

- HCB and p,p'-DDE are present in higher concentrations than individual PCB congeners and p,p'-DDT (see Figure 1).
- The results from all the areas correspond with the data obtained previously from autopsy adipose tissues[8], meaning that increased PCB levels occurred in the human population of Michalovce district (PCBs were produced for 24 years in this district) in comparison with the other areas.
- Concentrations of most pollutants analysed reached higher values for men than for women. For example, PCB-138 and 153 average levels (lipid basis) in the male blood sera were 520 (a range of 140-2030), and 780 (260-2830) $ng.g^{-1}$, respectively, while 138 and 153 average levels in female sera were 410 (120-1570), and 600 (210-2250) $ng.g^{-1}$, respectively.
- The general population from Myjava highlands shows, as expected, the lowest PCAC levels from the monitored areas. However, the blood sera from Sobotište village (blood donor have ingested almost no commercial food) contained substantially higher PCAC levels. In these samples tri- and tetraCB were also unexpectedly found. These data point to a possibility of occupational exposure (some volunteers worked in a furniture firm) or a significant PCB source in the village.

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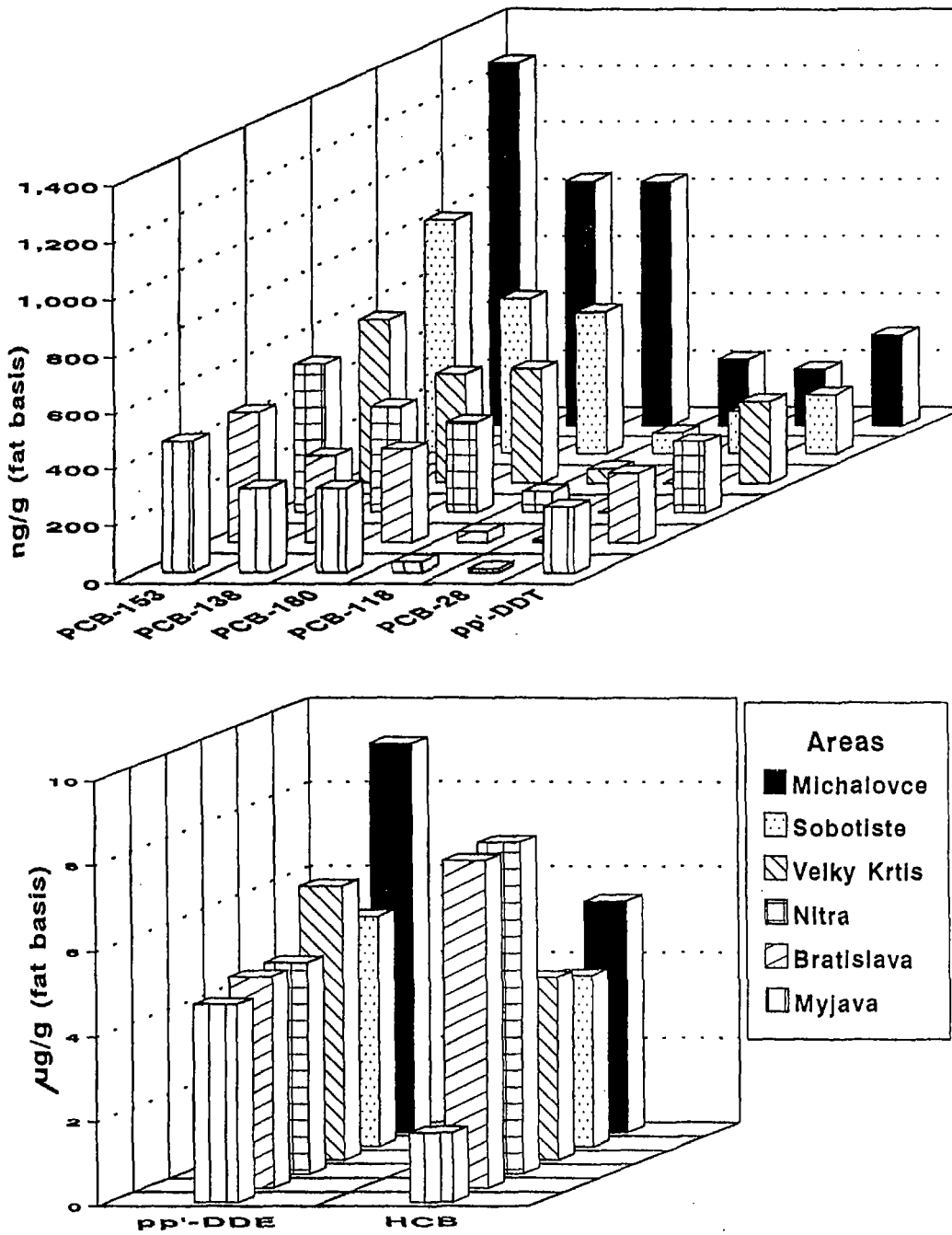

Figure 1. Content of Some PCB Congeners (ng.g^{-1}, Fat Basis), p,p'-DDE and HCB (µg.g^{-1}, Fat Basis) in Human Blood Samples from Six Selected Areas of Slovakia