INVESTIGATION OF POLYCHLORINATED BIPHENYLS CONCENTRATION IN WORKERS WITH PRESENT AND PAST EXPOSURE

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Introduction

Due to the fact that polychlorinated biphenyl causes serious health problems, both for occupationally exposed workers and for the population in general, industrial use of commercial oils containing PCBs was banned in the late eighties. PCBs were mainly used as Pyralene and they are still present in old electric transformers.

As chemical stability and low biodegradibility of PCBs cause their persistence in the environment and the human body, we investigated the presence of PCBs in the serum of workers who are currently exposed to them (present exposure) and those who were exposed previously (past exposure), and made a comparison with a control group. The amount of some individual PCB isomers in the investigated groups was also determined.

Material and Methods

In plants applying oils containing PCB under trade name Pyralene, groups of workers which used to be in contact with such oils, and those who still are in contact with them, were identified. The present exposed group consisted of 8 transformer repair workers, and 18 workers in capacitor manufacturing formed the past exposed group. The past exposed group of workers was three years away from exposure. Total PCBs content was

determined in the serum of all the observed workers in our first investigation performed in 1991. The same investigation was performed again two years later (in 1993) for six workers from the past exposure group, i.e. after they have been away from exposure for five years.

At the same time a control group of comparison workers who have never been occupationally exposed to PCBs was chosen. The control and the exposed groups were similar in respect to age, habits of smoking, drinking and nutrition, which were checked by the Questionnaire for PCBs prepared in the Epidemiological Department of the Institute for Occupational Health.

An early morning fasting blood samples were obtained for analysis of PCBs. The samples were extracted with hexane ([1]). Qualitative confirmation of PCBs was carried out by a Varian 3400 gas chromatograph and electron capture detector Ni^{63}, with capillary column SGE OV-101, l=25m, i.d.=0.22 mm. Nitrogen was used as the carrier gas.
Statistical analysis was performed by EPI-INFO , version 5.1. WHO. Means were compared by Student t-test.

Results and Discussion

The results of the total PCBs concentration determined in both the exposed and the control group of workers are shown in Table 1.

Table 1. Total PCBs in serum

Type of exposure	N	Mean (µg/l)	Range (µg/l)
transformer repair workers (present exposed)	8	42.26	13,20-71.00
capacitor workers (past exposed)	18	35.84	4.88-80.23
control	10	10,24	2,56-18,96

From the obtained data presented in Table 1, it can be seen that the mean value of PCBs content for the present exposed group of workers is higher than in the group of workers who were away from exposure for three years, but not significantly. The total PCBs content in both exposed groups, the present exposed and the past exposed, is significantly higher ($p<0.01$) than in the control one. The highest value for the total PCBs (80.23 µg/l) was determined in one individual case in the group of workers which were away from exposure for three years.
The estimated means and range for the total PCBs in serum of past exposed group of workers depending on years away from exposure is shown in Table 2.

Table 2. Total PCBs in the serum of the past exposed group depending on years away from exposure (N=6)

Years	Mean (µg/l)	Range (µg/l)
3	11.54	4.06-23.45
5	8.97	3.95-17.54

As evident from Table 2,the PCB concentration in the serum of the group which was away from exposure for 3 years is higher than in that of the same group of workers two years later, but the difference is not statistically significant.

The results we obtained are in accordance with data published earlier for exposed capacitor manufacturing workers. Maroni ([2]) found 24.4-192 ppb of PCBs with exposure lasting from 1 to 24 years. The average exposure in our present exposed group was 15.8 $\pm$ 5.2 years, and 10.3 $\pm$ 6 years in the past exposed group. Faith ([3]) found 53.7 ppb in the present exposed group, 38.6 in the past exposed group and 20.0 ppb in the control group. Mean values established by our investigation in all the measured groups are lower than those measured by Faith.

In the present exposed group the IUPAC 153 congener (22'44'55') as well as IUPAC 138 (22'344'5) formed the dominant peaks. In the total PCB concentration, IUPAC 153 was represented by 18.94 %, and IUPAC 138 by 31.33 %. The same congeners were detected in the blood samples of the past exposed and the control group.

The obtained results in our investigation indicate that the examined workers were

occupationally exposed to PBCs, and that their level in the blood of these workers is reduced by their removal from the source of exposure.

References

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