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General discussion

[illegible] OF PCB IN HUMAN BLOOD AND ADIPOSE TISSUE IN THREE DIFFERENT RESEARCH GROUPS

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The concentration of PCB in human blood and adipose tissue in three different research groups

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Today it has been definitely proved that PCB can be found everywhere in our surroundings and in living organisms. We also are learning constantly about its biological effects on different species. Knowledge about the harmful effects on human beings caused by PCB has been obtained chiefly from old sources or from accidents and we have very vague ideas about the doses or tissue concentrations that have any noticeable effect. Much confusion has also arisen because the commercial PCB-products have differences that concern PCB itself and especially impurities in them. In industrial toxicology it is often useful to know the tissue concentration of cumulative compounds and use it as an index of exposure which otherwise may be very difficult to estimate. Therefore we have determined the concentration of PCB in blood and in some cases also in subcutaneous adipose tissue of 29 persons.

Nine persons so far as we know have never been professionally exposed to PCB (group I, persons 1 - 9). Six other persons handle PCB samples in an analytical laboratory (group II, persons 10 - 15) and eleven persons have been working since 1968 at a capacitor factory where Arochlor 1242 is used for impregnation of capacitors (group III, persons 16 - 27). The PCB concentration in the air of this factory has been proved to fulfil internationally accepted limits. Special attention has been given to the protection of the skin.

The PCB concentration in blood and adipose tissue has been determined by gas chromatographic method which is presented in detail in the appendix of Matti Halminen's lecture. In figures 1 and 2 there are the results of the gas chromatograms of the blood and subcutaneous adipose tissue of some

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persons. The observed PCB concentrations have been presented in tables 1 – 5 and the concentrations are given in mg/kg (ppm).

Comments

We are aware of the possible error involved in using only one method. Using only an electron capture detector the identification and quantitative determination of the different PCB compounds is diffucult. The problem is even more complicated since the relative heights of PCB peaks change in biological tissues (Fig. 1 and 2). The gas chromatograms from some human blood and adipose tissue extracts do not resemble those of the technical products. Furthermore it is obvious that several peaks contain different compounds due to overlapping peaks. Using EC detector, concentrations can only be estimated by comparison to the response of a known amount exactly same the compound. However, the relative differences in the concentrations of PCBs of most samples is very high and the reliability of the results is acceptable.

All the examined persons are in good health. However, only the persons in group III have been under special medical observation but in spite of approximately 50 times larger PCB concentration in their blood compared with control-group I we have been unable to detect any biological effect caused by PCB in them.

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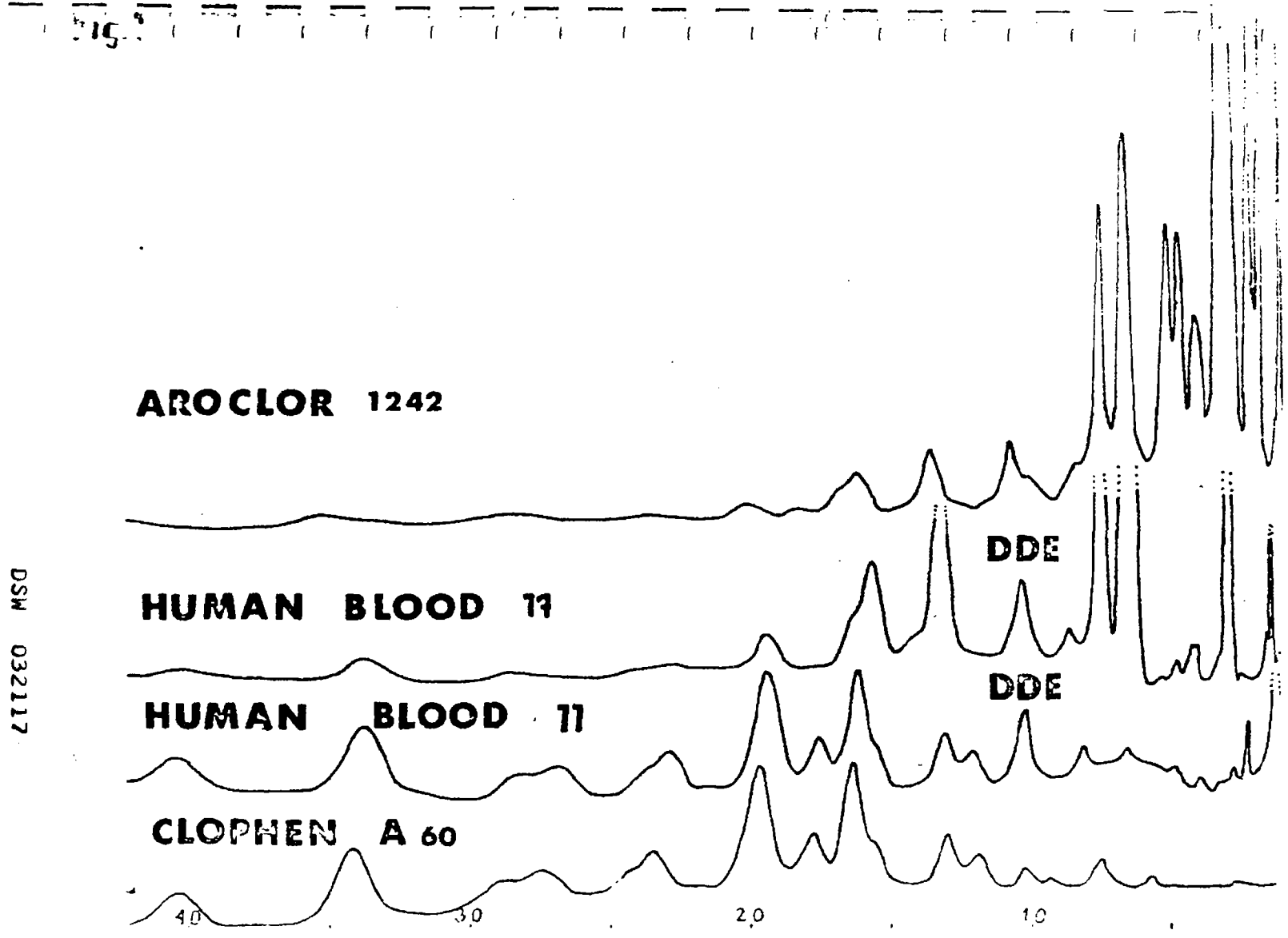

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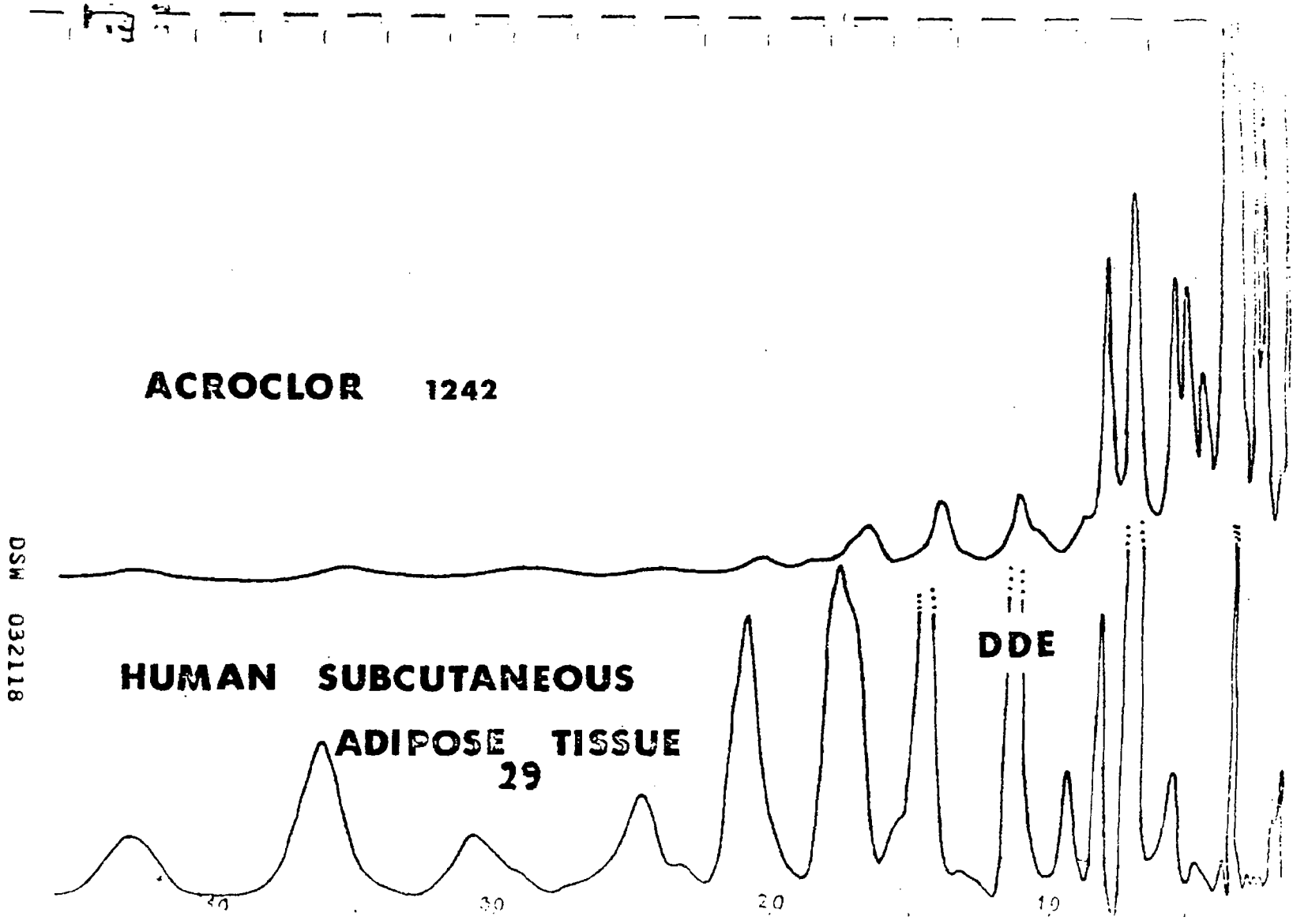

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Table 1. DDE and PCB in human blood.

Group 1. Persons without any special exposure to PCB.

No			Wet weight basis mg/kg DDE	PCB	Fat %	Fat basis mg/kg DDE	PCB	
1.	♂	Tampere	0,0046	0,012	0,13	3,6	9,9	
2.	♀	"	0,0011	0,0095	0,14	0,77	6,6	
3.	♂	Helsinki	0,0014	0,0073	0,14	1,1	5,4	
4.	♂	"	0,0016	0,0061	0,16	1,1	3,9	
5.	♀	Tampere	0,0007	0,0041	0,07	0,91	5,5	
6.	♀	"	0,0008	0,0049	0,13	0,60	3,7	
7.	♂	"	0,0018	0,011	0,15	1,2	7,0	
8.	♀	"	0,0005	0,0031	0,08	0,55	3,8	
9.	♀	"	0,0041	0,0056	0,15	2,7	3,6	
Group 2. Persons handling PCB in an analytical laboratory.								
10.	♀	Helsinki	<0,005	0,036	0,10	1) n.c.	35	2) 5,5
11.	♀	"	<0,005	0,040	0,12	n.c.	33	5,5
12.	♀	"	<0,005	0,046	0,10	n.c.	46	2,5
13.	♀	"	<0,005	0,050	0,08	n.c.	61	1,0
14.	♀	"	<0,005	0,063	0,09	n.c.	71	<1
15.	♀	"	<0,005	0,062	0,09	n.c.	70	<1

1) n.c. = not calculated

2) Years of reasearch work with PCB.

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Table 2. DDE and PCB in human blood.

Group 3. Workers of a capacitor factory.

No		Wet weight basis, mg/kg		Fat %	Fat basis mg/kg	
		DDE	PCB		DDE	PCB
16.	♂	0,005	0,78	0,26	1,8	305
17.	♂	0,008	1,9	0,27	3,2	700
18.	♂	<0,005	0,38	0,09	2,7	415
19.	♂	<0,005	0,49	0,10	3,0	515
20.	♀	<0,005	0,32	0,08	3,1	380
21.	♀	<0,005	0,34	0,09	4,2	400
22.	♂	0,005	0,45	0,22	2,1	205
23.	♂	<0,005	0,22	0,06	3,5	350
24.	♀	<0,005	0,11	0,09	1,9	125
25.	♂	<0,005	0,11	0,11	1,5	105
26.	♀	<0,005	0,074	0,08	2,0	100
27.	♂	<0,005	0,11	0,07	n.c.	165

n.c. = not calculated

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Table 3. DDE, DDT and PCB in human blood and subcutaneous adipose tissue.

	Blood					Adipose tissue		
	Wet weight basis, mg/kg			Fat basis mg/kg		Fat basis mg/kg		
No	DDE	PCB	Fat %	DDE	PCB	DDE	DDT	PCB
1.	0,005	0,012	0,13	3,6	9,9	2,7	1,5	2,3
2.	<0,005	0,010	0,14	0,77	6,6	0,81	0,35	1,5
28.	<0,005	0,11	0,15	2,3	76	1,2	1) n.d.	11
29.	2) n.a.	n.a.	n.a	-	-	3,8	n.d.	200
16. (atheroma)	0,005	0,78	0,26	1,8	305	3) n.c.	n.d.	285
21.	<0,005	0,34	0,09	4,2	400	3,4	n.d.	160
17.	0,008	1,9	0,27	3,2	700	2,9	n.d.	635

1) n.d. = not detected
2) n.a. = not analysed
3) n.c. = not calculated

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