PCDD/PCDFs in Humans, Follow up of Background Data for Germany, 1996

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Abstract

180 whole blood samples - collected in 1996 in Germany - have been analysed for polychlorodibenzodioxins (PCDDs) and polychlorodibenzofurans (PCDF) by HRGC/HRMS. The persons involved did not have certain exposure except that resulting from food consumption. The mean and median I-TEQ values are reported for 1996 at 16,5 pg/g and 15,6 pg/g blood lipids respectively. The levels measured follow the decrease of PCDD/PCDF in humans reported previously.

Introduction

There is general agreement that human diet represents the dominant exposure route to PCDD/PCDFs. It has been found that there is only a small variation in the PCDD/PCDF concentrations in the normal population of industrialized contries (1, 2). On the other hand it could be shown that since about 10 years a decrease of PCDD/PCDF levels in residents of industrialized countries could be observed (1, 3, 4). This knowledge resulted in the necessity to use for comparison only current PCDD/PCDF data of the general or normal population when estimating unknown samples for a potential exposure.

We started to publish first background data analysed in blood of German residents in 1988 updating these information regularly (3, 5, 6, 7).

Materials and Methods

Whole blood samples were collected in 1996 originating from individuals living in different areas in Germany with no known additional PCDD/PCDF exposure than food consumption. After collection, the samples were frozen and kept at - 35 °C until analysis. The analytical methods applied have been described elsewhere and will not be reported here (7, 8, 9).

Results and Discussion

The PCDD/PCDF background data in human blood from Germany originating from 180 individual analyses are presented in table 1. The table is devided in four separate sections: statistical data for all 180 persons in one section and for three different age groups in three further sections. As demonstrated in figure 1, the age groups show age ranges as follows:

Table 1: PCDD/PCDF concentrations in human blood, background 1996, Germany

Values in pg/g (ppt), lipid based

Age group Number of samples	All age groups, 18 - 71 years 180				Age group 1, 18 - 30 years 59				Age group 2, 31 - 42 years 68				Age group 3, 43 - 71 years 53			
	Mean	MED	MIN	95 PCT	Mean	MED	MIN	95 PCT	Mean	MED	MIN	95 PCT	Mean	MED	MIN	95 PCT
Age	36.7	36.0	18.0	55.0	25.9	26.0	18.0	30.0	36.3	37.0	31.0	42.0	49.2	47.0	43.0	58.0
2,3,7,8-Tetra-CDD	2.4	2.2	n.d.	4.2	2.0	1.9	1.0	3.7	2.4	2.3	n.d.	3.8	2.7	2.5	n.d.	4.8
1,2,3,7,8-Penta-CDD	5.7	5.4	1.7	9.5	4.6	4.1	1.7	8.0	5.8	5.6	1.9	8.7	6.8	6.6	3.3	10.3
1,2,3,4,7,8-Hexa-CDD	5.8	5.2	2.0	10.0	4.8	4.3	2.0	9.1	5.8	5.5	2.1	9.3	6.8	6.6	2.0	11.4
1,2,3,6,7,8-Hexa-CDD	22.2	20.1	3.7	40.6	16.3	15.6	3.7	30.1	24.0	24.2	5.7	40.8	26.5	25.8	6.8	44.4
1,2,3,7,8,9-Hexa-CDD	3.9	3.6	1.5	6.5	3.6	3.4	1.8	6.0	4.2	3.8	1.5	6.9	3.9	3.6	1.9	7.4
Total Hexa-CDD	31.9	29.4	8.4	55.1	24.7	23.8	8.4	44.7	34.0	33.2	11.6	56.5	37.3	37.8	14.9	58.9
1,2,3,4,6,7,8-Hepta-CDD	33.7	30.5	8.8	59.7	32.9	33.1	8.8	54.2	36.2	31.3	12.4	74.5	31.5	29.0	9.4	60.2
1,2,3,4,6,7,8,9-Octa-CDD	287.5	270.0	60.7	518.2	271.4	260.9	60.7	505.5	308.2	286.2	110.6	549.3	278.7	239.7	95.7	499.7
2,3,7,8-Tetra-CDF	1.3	1.2	0.5	1.9	1.2	1.2	0.5	1.8	1.3	1.3	0.5	2.0	1.2	1.1	0.5	1.9
1,2,3,7,8-Penta-CDF	0.7	0.5	n.d.	2.0	0.6	0.5	0.5	2.0	0.8	0.5	0.5	2.4	0.6	0.5	n.d.	1.0
2,3,4,7,8-Penta-CDF	11.6	10.1	3.2	20.1	8.1	7.8	3.2	13.8	11.8	10.3	3.9	20.1	15.3	13.9	5.2	24.9
Total Penta-CDF	11.9	10.2	3.8	20.6	8.5	7.9	3.8	14.4	12.1	10.4	3.9	20.1	15.5	14.3	5.2	24.9
1,2,3,4,7,8-Hexa-CDF	6.8	6.1	2.6	11.3	5.8	5.4	2.6	8.9	7.0	6.3	2.8	12.1	7.6	7.0	2.8	12.1
1,2,3,6,7,8-Hexa-CDF	4.9	4.6	2.0	8.4	4.0	3.9	2.2	6.2	5.0	4.8	2.0	8.3	5.7	5.2	2.2	8.8
1,2,3,7,8,9-Hexa-CDF	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
2,3,4,6,7,8-Hexa-CDF	2.4	2.4	0.5	3.7	2.4	2.4	1.4	3.7	2.4	2.4	0.5	3.8	2.5	2.4	1.0	3.7
Total Hexa-CDF	14.1	13.1	6.1	21.6	12.2	11.9	6.5	16.5	14.3	13.3	6.1	22.2	15.8	14.6	6.3	23.9
1,2,3,4,6,7,8-Hepta-CDF	8.5	7.7	3.1	15.0	9.0	8.9	4.2	13.8	8.7	7.6	4.7	16.7	7.6	7.0	3.1	13.9
1,2,3,4,7,8,9-Hepta-CDF	0.8	0.8	0.5	1.4	0.9	0.8	0.5	1.4	0.8	0.8	0.5	1.7	0.7	0.8	0.5	1.0
Total Hepta-CDF	8.8	7.8	3.6	15.3	9.5	9.7	4.2	14.0	8.9	7.8	4.7	17.7	7.8	7.3	3.6	13.9
1,2,3,4,6,7,8,9-Octa-CDF	2.4	2.5	1.5	2.5	2.5	2.5	1.8	2.5	2.4	2.5	1.6	2.5	2.4	2.5	1.5	2.5
Total PCDD	361.1	336.4	85.5	613.4	353.6	321.4	85.5	591.7	386.5	358.5	159.1	686.3	356.8	331.6	128.1	606.8
Total PCDF	38.3	35.4	19.7	56.4	33.8	34.3	19.9	48.1	39.1	35.6	19.7	56.2	42.5	39.6	19.7	61.3
Total PCDD/PCDF	399.4	374.4	107.3	653.8	369.4	352.8	107.3	628.8	425.6	405.4	188.2	733.7	399.3	368.1	148.3	653.7
I-TEQ (Nato/CCMS)	**16.5**	**15.6**	**7.0**	**26.9**	**13.0**	**11.9**	**7.3**	**20.4**	**16.9**	**17.1**	**7.0**	**26.1**	**19.9**	**18.4**	**9.6**	**30.8**
TEQ (BGA/UBA)	**9.6**	**9.2**	**4.5**	**14.8**	**7.8**	**7.7**	**4.5**	**12.0**	**9.9**	**10.1**	**4.6**	**14.2**	**11.1**	**10.5**	**5.7**	**17.1**

MED = Median n.d. = not detected, detection limit in ( ) MIN = Minimal value 95 PCT = 95 Percentile

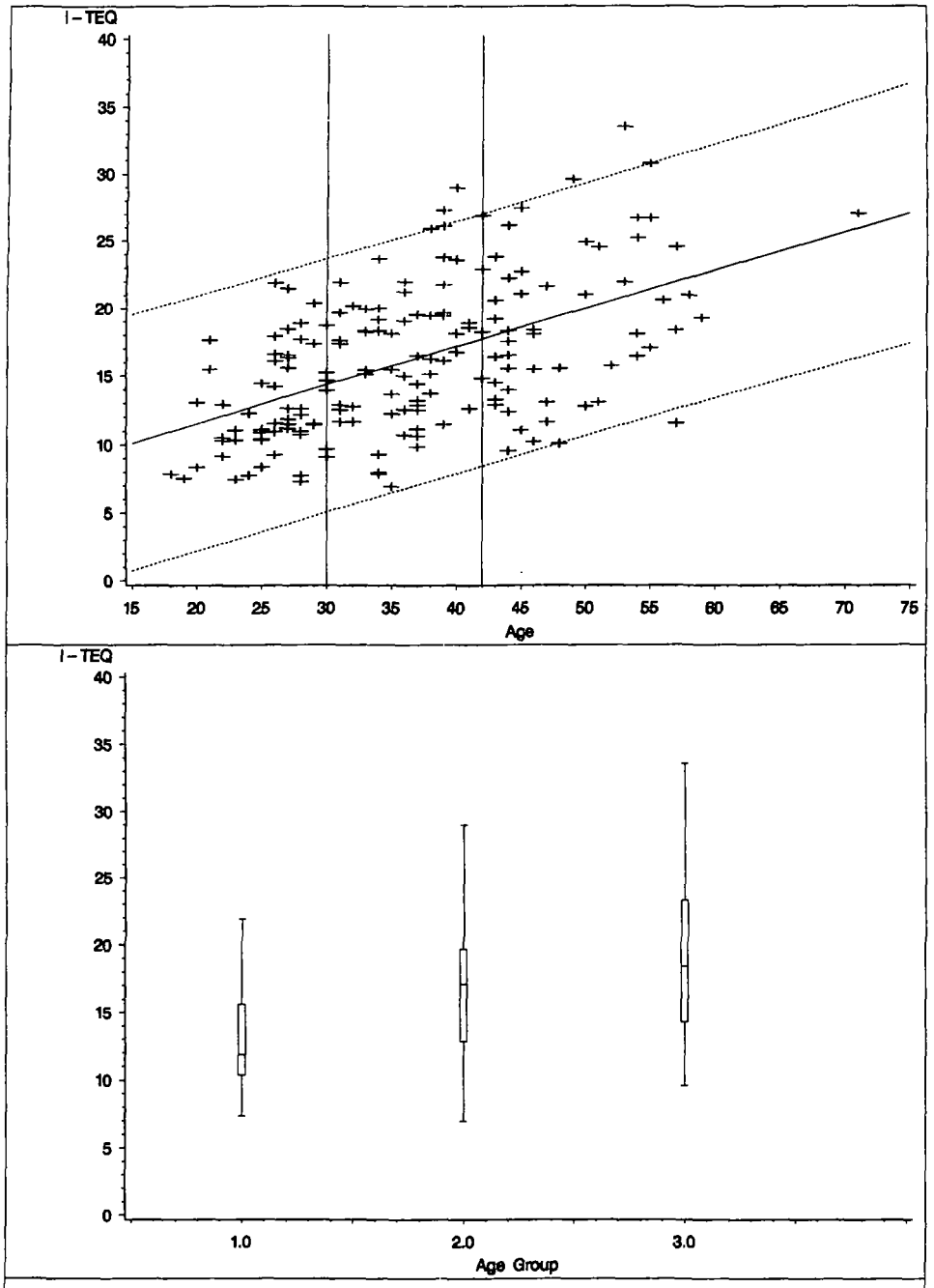

Figure 1: PCDD/PCDF – Backgrounddata by Age – Groups, 1996, 1 – 12
Values in I – TEQ (pg/g, lipid based)

Group 1: 18 - 30 years
Group 2: 31 - 42 years
Group 3: 43 - 71 years

The three groups consist of 59, 68 and 53 individual persons. From this figure a mean I-TEQ increase is calculated at 0,3 pg/year. This is somewhat lower compared to an age increase of 0,4 pg I-TEQ/ year calculated the years before.

The dotted lines in the upper part of figure 1 indicate the 95 confidence internal. The box plots in the lower part of figure 1 describe the 95, 75, 50 (Median), 25 and 5 percentiles of the data.

As shown in earlier observations (3, 4) the time trend of PCDD/PCDF levels in humans - demonstrated in figure 2 - is still indicating a decrease over a period of 11 years.

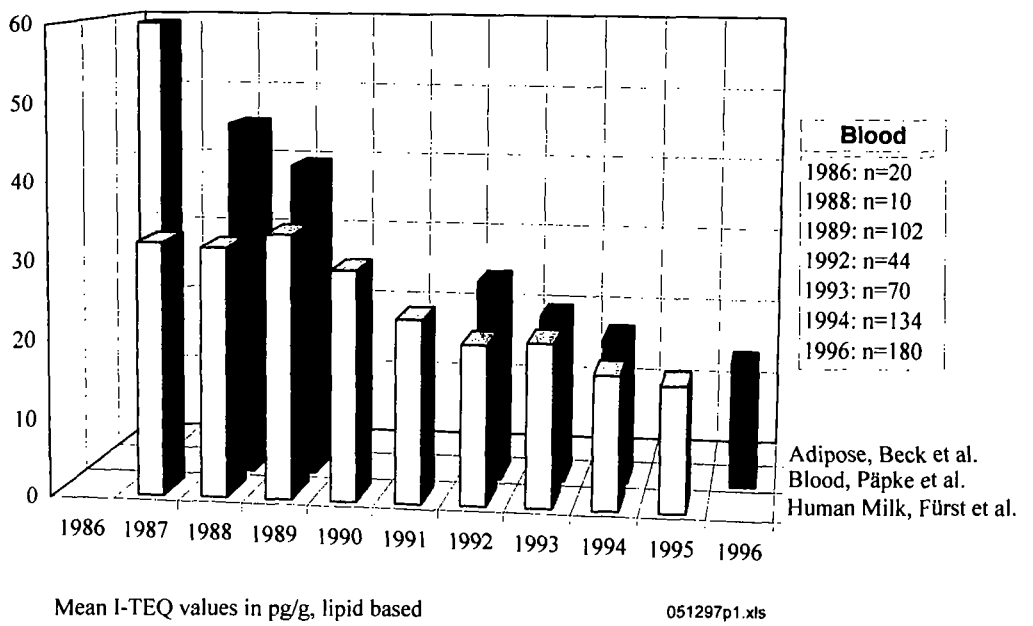

Figure 2: Time trend of PCDD/PCDF mean values, 1996, Germany

Comparing our mean data from 1994 at 19,1 pg I-TEQ/g blood lipids to the recent data found at a mean of 16,5 pg I-TEQ/g, a decrease of 2,6 pg I-TEQ/g can be observed between 1994 and 1996. The decrease observed in blood is similar to the decrease calculated by the data reported by Fürst et al. for human milk (10).

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