Dioxin And Furan (PCDD/PCDF) Levels In Human Blood From Persons Living In A Contaminated Area.

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Introduction

During the last years increased PCDD/PCDF levels could be detected in soil from some residential areas of a town in Southern Germany with chemical industry. Two local sources were identified for the soil contamination: residues of pentachlorphenol production and chlorine alcaline processes.
On some of these sites vegetables were produced for private consumption. To get an idea about the body burden of the persons living there PCDD/PCDF were determined in 14 blood samples.
As there are no data for comparing PCDD/PCDF levels in blood and milk, in one woman PCDD/PCDF concentrations were analysed in blood and milk.

Material and Method

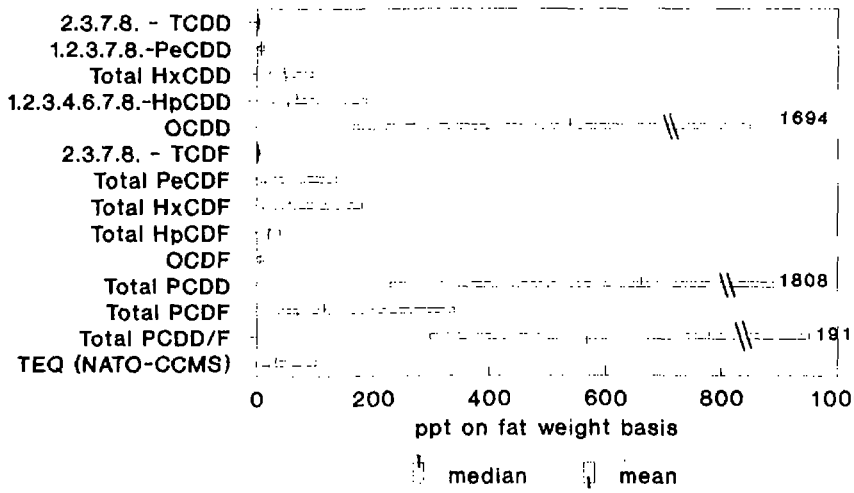
Soil was analysed at the Institute of Organic Chemistry, "Institut Berghof", Tübingen, "Biocontrol Laboratories", Mainz and "Institut Dr. Jäger", Tübingen. The analysis of food is just being carried out. Blood and human milk analyses were performed by "ergo Forschungsgesellschaft". The 14 volunteers were interviewed with the aid of a questionnaire.
Toxic equivalents (I-TEQ) were calculated as proposed by NATO-CCMS.

Results and Discussion

The soil concentrations at the sites of the participants are up to approximately 25000 ng I-TEQ/kg. Soil concentrations in the kitchen gardens range between 127 and 1264 ng I-TEQ/kg. In this area two typical patterns of congeners could be detected in soil. One pattern with elevated octa-dioxin and low penta- and

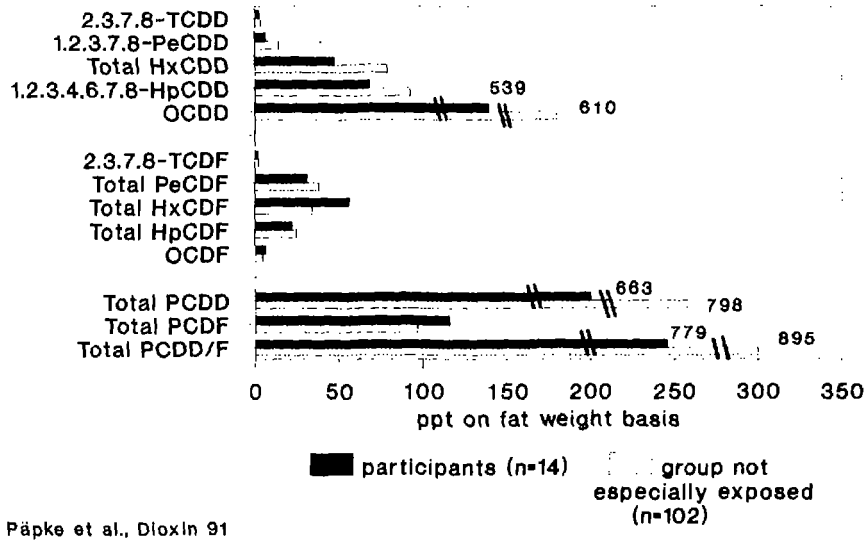
hexa-CDF levels (pentachlorphenol as possible source), the other with low octa-dioxin and elevated penta- and hexa-furan concentrations (residues of chlorine production as possible source).
The 14 participants, 13 to 81 years old, had been living in the area at least for a period of 11 years, one person even up to 61 years. 6 of the participants declared regular or occasional consumption of vegetables from a kitchen garden.
In Figure 1 the results of blood fat analyses are shown.

Fig.1: PCDD/PCDF concentrations in blood fat (mean, median and range) of the 14 participants



When comparing these results with the PCDD/PCDF concentrations of a group not especially exposed (1) (total amount of PCDD/PCDF: 268.7 - 2134.2 pg/g fat, and 11.6 - 93.5 pg I-TEQ/g fat) only one participant is out of the range of I-TEQ. Elevated hexa-CDF and total PCDF levels become obvious when the congeners pattern are compared (Fig.2). With regard to the elevated congeners in soil of this area (octa-CDD, penta-and hexa-CDF) one participant had an elevated octa-CDD level and 3 other participants had elevated penta- and/or hexa-CDF levels. The blood fat concentrations of

Fig.2: Comparison of PCDD/PCDF levels (means) of participants and of a group not especially exposed (*)



(*) Päpke et al., Dioxin 91

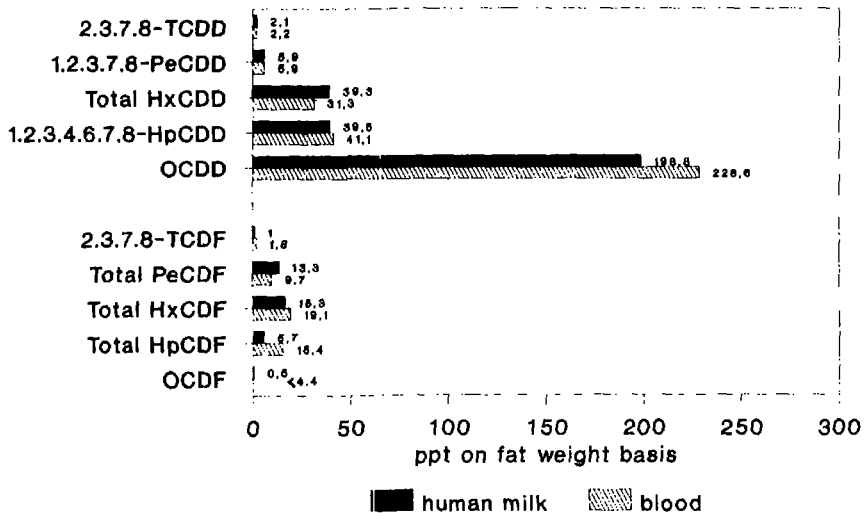
these persons are shown in the table. Two of them (no. 10 and 21) declared regular or occasional consumption from a kitchen garden of this area. One participant (no. 10) had been working for 40 years in the administration of the pentachlorphenol plant.

Tab.:Blood fat concentrations of participants with elevated octa-CDD or penta- and/or hexa-CDF levels

sample no. congeners	4	10	21	50
2378-TCDD	1.2	3.1	2.4	2.8
12378-PeCDD	5.8	11.0	9.3	8.1
Total HxCDD	51.2	96.0	58.1	50.0
1234678-HpCDD	55.9	188.7	89.3	139.5
OCDD	1693.9	1004.5	462.7	1087.3
2378-TCDF	n.d.	<8.3	1.3	2.8
Total PeCDF	45.0	89.8	137.7	26.3
Total HxCDF	33.9	166.4	181.2	141.3
Total HpCDF	25.2	39.8	16.8	33.0
OCDF	5.2	9.3	3.6	6.7
Total PCDD	1807.9	1303.4	621.7	1287.6
Total PCDF	109.4	309.4	340.6	212.0
Total PCDD/PCDF	1917.3	1612.8	962.3	1499.7
TEQ (NATO-CCMS)	37.8	82.5	101.5	39.8

ppt on fat weight basis

Fig.3:Comparison of PCDD/PCDF levels in blood and human milk of the same woman



In one case PCDD/PCDF levels in blood and in milk of one woman were investigated. The comparison of PCDD/PCDF concentrations in blood and milk is shown in Figure 3. The data show good agreement for all congeners.

Conclusions

- Regarding the total amount of PCDD/PCDF levels no person is out of the range of a not especially exposed group. Taking the toxicity equivalents into consideration one person is out of this range.
- With regard to the mean, hexa-CDF and total PCDF levels are increased. In 4 participants specific isomers (octa-CDD, penta- and/or hexa-CDF blood fat levels) are out of the range of a not especially exposed group. This corresponds to the pattern throughout the contaminated area.
- Good agreement between blood and milk concentrations in one woman could be detected.

References

1 Päpke O, Ball M, Lis A. Various PCDD/PCDF patterns in human blood resulting from different occupational exposure. Dioxin 91