

### Secondary Exposure of Female Partners by Occupationally Exposed Workers to PCDD/Fs and $\beta$ -HCH (home transfer)

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#### Introduction

PCDD/Fs are ubiquitous distributed highly toxic components of anthropogenic origin. These components are found in humans at different concentrations and patterns. In individuals with only environmental (food consumption) exposure typical values and a characteristic pattern can be observed. PCDD/Fs and  $\beta$ -HCH have been analyzed in blood samples of former employees of a plant producing insecticides and herbicides /1/ till 1984 in Hamburg. Dioxin values were observed to be highly elevated in certain chemical production workers showing mostly typical patterns reflecting those of the exposure material /2/. The potential transfer of PCDD/Fs and Hexachlorocyclohexene ( $\beta$ -HCH) by the occupationally exposed workers to their female residential contact persons is described. These data can be compared to concentrations of the components in tissues of the female partner which live or used to live in the same household than the exposed worker. None of the women in question have had – to the best of our knowledge – primarily contact to these chemicals at the production facilities. For some materials like asbestos, Kjaergaard-Jorgensen /3/ and beryllium, Telehy /4/ and Baader /5/ reported on a transfer from persons with direct contact to chemicals in question to persons in the family by secondary exposure. Until now a secondary transfer of dioxins from human to human has not been observed. This possible exposure pathway has been followed after medical consultation of workers of a former production plant of insecticides and herbicides located until 1984 in Hamburg and their close relatives.

#### Material and Experimental

The selected sub - cohort of occupational exposed workers reported on here originates of a number of 1600 employees of the chemical plant in Hamburg. Description of the whole cohort as well as the technical and chemical processes are reported in detail by Flesch-Janys et al. /2/ and Manz et al. /6/7/8/. Until Dec.1997 we were able to provide data for TCDD and  $\beta$ -HCH for 290 workers. The mean value for TCDD was found at 104,7 pg/g lipids, while the highest back calculated concentration (basis: last occupational exposure) was extrapolated at 6374 pg/g lipids, Manz /6/. These values can be compared to the

background contamination for TCDD (age group between 43 and 71 years) found at mean and 95 PCT values of 2,7 pg/g and 4,8 ng /kg lipids respectively, Pöpke /10/11/.

The corresponding data for  $\beta$ -HCH were found for 287 workers at a mean of 58,1  $\mu\text{g/l}$  blood. The highest back calculated concentration (basis: last occupational exposure) was extrapolated at 1337,8  $\mu\text{g/l}$  blood. The background contamination for  $\beta$ -HCH has been found at 1  $\mu\text{g/l}$  blood, Wetzel 1993 /12/

14 workers have been randomly selected from the cohort. To be accepted for the subgroup, their values for TCDD had to exceed 60 pg/g blood lipids. All the selected men lived in a marriage partnership (in one case in a cohabit).

### Results and Discussion

The results for 2,3,7,8-TCDD for the couples participating in this project are presented in table 1. The tables of the corresponding data for I-TEQs and  $\beta$ -HCH will be reported at the conference.

As can be seen in Table 1, the values for 2,3,7,8-TCDD range between 60 and 1294 pg/g blood lipids, the mean was found at 559,2 pg/g, SD 390,8 for men, for women, the corresponding data are between 4,7 and 68,4 pg/g, mean at 19,0 and SD was calculated at 16,1. With one exception (woman 14, 4,7 pg/g) all TCDD-values exceed the background values for 1996.

Quite similar the situation was found for  $\beta$ -HCH. For all men (n=10) the values were found to be elevated when comparing to the background levels. The range was reported between 7,7 and 216  $\mu\text{g/l}$  blood., SD = 59,2.

For the women the situation is not as clear as for the men. Some of the  $\beta$ -HCH – values are in the range of background contamination. The range found in the women lies between 0,2 and 5,4  $\mu\text{g/l}$ , mean value of n = 13 was found at 1,6  $\mu\text{g/l}$ ; SD = 1,36.

When comparing the data for TCDD and for  $\beta$ -HCH found in the occupied workers to the data of their female partners, it can be seen from table 1, that the not occupationally exposed partners show by mean about 10 % of the values of their occupationally exposed male partners.

We suppose that the secondary exposure of these components may happen via e.g. skin, the uptake of contaminated skin surface, a possible transfer by hairs or by cleaning of clothes or pathways not known until now.

There are still some open questions with respect to the transfer pathway. It is not only from scientific point of importance to clarify these open questions, there may be a potential risk for other contact persons in the family, e.g. children.

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Table 1: 2,3,7,8-TCDD Concentration in Workers and their Female Partners, Values in pg/g, Lipid based

Years of prim. exposure	Duration of exposure [years]	Collection of blood [year]		Time betw. collect of blood [years]	Last exposure [years]	TCDD-concentration in male worker			TCDD-concentration in female partner		Relation of TCDD-values male/female	
		Male worker	Female partn.			recent	back calculated	adapted	recent	back calculated	Adapted	back calculated
76-84	12	1992	1998	6	8	674,0	1540,8	363,0	37,0	148,0	10,2	9,6
53-84	27	1991	1998	7	7	699,4	1398,8	349,7	68,4	273,6	21,4	19,6
74-84	10	1986	1998	12	2	614,0	789,6	230,3	11,5	46,0	5,0	5,8
77-84	7	1986	1998	12	2	1280,0	1646,1	373,4	21,3	85,6	5,7	5,2
76-84	8	1990	1998	8	6	848,0	1574,7	371,0	5,0	20,0	1,4	1,3
76-84	8	1987	1998	11	3	1294,0	1849,1	411,8	11,2	44,8	2,7	2,4
65-84	19	1989	1998	9	5	506,0	867,3	196,7	17,7	70,8	9,0	8,2
72-84	12	1985	1998	13	1	543,9	621,7	146,4	19,5	78,0	13,3	12,6
77-84	7	1990	1998	8	6	300,2	557,5	131,3	22,9	91,6	17,4	16,4
76-87	11	1987	1998	9	0	585,0	585,0	227,4	20,2	52,0	8,9	8,9
76-87	11	1990	1998	8	3	201,0	287,2	87,9	10,3	32,4	11,7	11,3
67-84	17	1986	1998	12	2	149,0	191,6	43,5	9,0	36,0	20,7	18,8
73-84	11	1986	1998	12	2	60,0	77,2	17,5	6,6	26,4	37,7	34,2
71-84	13	1985	1998	13	1	74,6	85,3	20,1	4,7	18,8	23,4	22,0
n=14)				10,0	3,4	559,2	862,3	212,1	19,0	73,1	13,5	12,6
standard deviation (SD)				2,3	2,4	380,8	602,2	137,1	16,1	65,1	9,5	8,6

**Table 1: 2,3,7,8-TCDD Concentration in Workers and their Female Partners, Values in pg/g, Lipid based**

Couple No.	Years of prim. exposure	Duration of exposure [years]	Collection of blood [year]		Time betw. collect of blood [years]	Last exposure [years]	TCDD-concentration in male worker			TCDD-concentration in female partner		Relation of TCDD-values male/female	
	Male worker	Male worker	Male worker	Female partn.		male	recent	back calculated	adapted	recent	back calculated	Adapted	back calculated
1	76-84	12	1992	1998	6	8	674,0	1540,8	363,0	37,0	148,0	10,2	9,6
2	53-84	27	1991	1998	7	7	699,4	1398,8	349,7	68,4	273,6	21,4	19,6
3	74-84	10	1986	1998	12	2	614,0	789,6	230,3	11,5	46,0	5,0	5,8
4	77-84	7	1986	1998	12	2	1280,0	1646,1	373,4	21,3	85,6	5,7	5,2
5	76-84	8	1990	1998	8	6	848,0	1574,7	371,0	5,0	20,0	1,4	1,3
6	76-84	8	1987	1998	11	3	1294,0	1849,1	411,8	11,2	44,8	2,7	2,4
7	65-84	19	1989	1998	9	5	506,0	867,3	196,7	17,7	70,8	9,0	8,2
8	72-84	12	1985	1998	13	1	543,9	621,7	146,4	19,5	78,0	13,3	12,6
9	77-84	7	1990	1998	8	6	300,2	557,5	131,3	22,9	91,6	17,4	16,4
10	76-87	11	1987	1998	9	0	585,0	585,0	227,4	20,2	52,0	8,9	8,9
11	76-87	11	1990	1998	8	3	201,0	287,2	87,9	10,3	32,4	11,7	11,3
12	67-84	17	1986	1998	12	2	149,0	191,6	43,5	9,0	36,0	20,7	18,8
13	73-84	11	1986	1998	12	2	60,0	77,2	17,5	6,6	26,4	37,7	34,2
14	71-84	13	1985	1998	13	1	74,6	85,3	20,1	4,7	18,8	23,4	22,0
mean (n=14)					10,0	3,4	559,2	862,3	212,1	19,0	73,1	13,5	12,6
standard deviation (SD)					2,3	2,4	380,8	602,2	137,1	16,1	65,1	9,5	8,6