# PCDD/PCDF Levels in Children from Southern Germany

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## Introduction

Investigations of polychlorinated dibenzo-p-dioxin and dibenzofuran (PCDD/PCDF) body burden during the last years suggest an age dependence. Lower body burdens for children than for adults were expected. For breast-fed infants higher PCDD/PCDF concentrations may result from the contamination of mother's milk. In order to obtain a broader data base PCDD/PCDF body burdens were combined of different age groups of children in Southern Germany which were investigated during the last years.

## Material and Methods

Three study groups were investigated. The first study population consisted of 11 not especially exposed children at the age of 9 to 15 years. The children lived in the urban area of Stuttgart (Baden-Württemberg, FRG). The blood samples were collected in 1991 as a reference group for children in contaminated areas. PCDD/PCDF in this group were measured in blood fat of individual samples.

The second study population consisted of 20 infants at the age of 0 to 44 weeks. The samples (adipose and liver tissue) were collected by the Institut für Rechtsmedizin, Ludwig-Maximilians-Universität München, Germany. 17 infants died of Sudden Infant Death Syndrome (SIDS), 3 infants were still births. The sampling period was from 1991 to 1992. The investigation was carried out to get an idea about the influence of breast feeding.

In the third study group PCDD/PCDF blood fat concentrations were measured in pooled samples. Individual samples were obtained from

pupils (fourth-graders, normally 10 years old) in three different survey areas of Baden-Württemberg. Survey areas included an urban industrial area, an industrial area within rural setting, and a rural area. Two pooled samples were prepared from each region, one for boys and one for girls. The two samples consisted of blood aliquots from a random selection of participating children who had been resident in the survey area for a minimum of two years, and were born in Germany. The sampling period was from October 1994 to March 1995. The analytic part of this third group has not been finished until now. The PCDD/PCDF data on this group will be compared with the data from a similar investigation reported by us on Dioxin 94 [1]. All parents had given their informed consent on the participation of their children.

PCDD/PCDF were determined by analytic methods nearly identical to those applied for the successful participation in the WHO interlaboratory validation studies (round II and III) on human blood [2,3,4]. TEQ values for PCDD/PCDF have been calculated as proposed by NATO-CCMS and the former German Federal Health Office (FHO).

**Results**

Table 1 summarizes blood fat standardized PCDD/PCDF congener concentrations for the 11 children of group 1.

Figure 1 shows the 2,3,7,8-TCDD concentrations in adipose tissue of the investigated infants (group 2), divided into three subgroups (still birth (n=3), breast-fed (n=10) and formula-fed (n=7) infants).

Table 2 shows some basic data of the investigated infants and I-TEQ concentrations of the adipose tissue of group 2.

The PCDD/PCDF concentrations of liver samples of group 2 as well as the data for the third group will be presented at the meeting.

**Conclusions**

- PCDD/PCDF were found in still birth. There is a diaplacental transfer of PCDD/PCDF.
- Breast-feeding has an impact on the PCDD/PCDF concentrations of infants.
- Formula-fed infants had lower PCDD/PCDF concentrations than breast-fed infants.
- The measured I-TEQ values of breast-fed infants mounted up to the lower values published for adults [5].
- In children from the reported age group (9 to 15 years) the investigated PCDD/PCDF concentrations and I-TEQs were lower than in adults [5].

**References**


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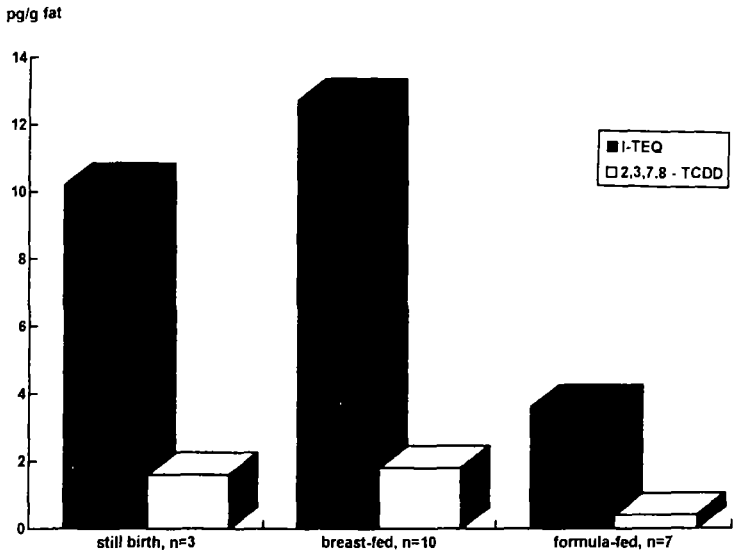
**Table 1: PCDD/PCDF blood fat concentrations and TEQ values in 11 children from Southern Germany**

| Isomer | Min. | Max. | Mean | Median |
|---|---|---|---|---|
| 2.3.7.8-Tetra-CDD | 1.0 | 3.2 | 1.7 | 1.6 |
| 1.2.3.7.8-Penta-CDD | 1.4 | 7.3 | 3.4 | 3.1 |
| 1.2.3.4.7.8-Hexa-CDD | 1.8 | 5.9 | 3.0 | 2.5 |
| 1.2.3.6.7.8-Hexa-CDD | 8.9 | 30.0 | 15.6 | 13.7 |
| 1.2.3.7.8.9-Hexa-CDD | 1.7 | 5.7 | 3.1 | 2.4 |
| Σ Hexa-CDD | 12.6 | 41.0 | 21.7 | 18.9 |
| 1.2.3.4.6.7.8-Hepta-CDD | 15.3 | 44.8 | 28.5 | 30.4 |
| Octa-CDD | 125.2 | 449.7 | 224.9 | 197.2 |
| 2.3.7.8.-Tetra-CDF | 0.8 | 2.2 | 1.3 | 1.1 |
| 1.2.3.7.8-Penta-CDF | n.n. | 0.2 | 0.1 | n.n. |
| 2.3.4.7.8-Penta-CDF | 2.7 | 14.2 | 6.7 | 6.3 |
| Σ Penta-CDF | 2.7 | 14.3 | 6.8 | 6.3 |
| 1.2.3.4.7.8-Hexa-CDF | 3.8 | 8.4 | 6.3 | 6.3 |
| 1.2.3.6.7.8-Hexa-CDF | 1.4 | 5.2 | 3.1 | 2.8 |
| 1.2.3.7.8.9-Hexa-CDF | n.n. | n.n. | n.n. | n.n. |
| 2.3.4.6.7.8-Hexa-CDF | 0.2 | 2.2 | 1.0 | 0.9 |
| Σ Hexa-CDF | 5.4 | 15.4 | 10.4 | 10.7 |
| 1.2.3.4.6.7.8-Hepta-CDF | 7.3 | 23.7 | 12.8 | 10.9 |
| 1.2.3.4.7.8.9-Hepta-CDF | 0.2 | 2.6 | 1.0 | 0.5 |
| Σ Hepta-CDF | 7.7 | 25.2 | 13.8 | 12.9 |
| Octa-CDF | 1.5 | 10.6 | 3.6 | 2.6 |
| Σ PCDD | 160.7 | 546.0 | 280.1 | 249.5 |
| Σ PCDF | 19.8 | 65.4 | 35.9 | 31.6 |
| Σ PCDD/PCDF | 189.9 | 611.4 | 316,0 | 279.9 |
| I-TEQ (NATO/CCMS) | 5.4 | 20.8 | 10.7 | 9.6 |
| TEQ (FHO) | 3.8 | 12.2 | 6.7 | 6.1 |

Figure 1: 2,3,7,8-TCDD and I-TEQ concentrations from infants (means ± s.d., lipid based)




| | | | |
|---|---|---|---|
| I-TEQ | 10.2 ± 0.6 | 12.7 ± 9.5 | 3.6 ± 3.3 |
| 2,3,7,8-TCDD | 1.6 ± 0.4 | 1.8 ± 1.3 | 0.4 ± 0.3 |

Table 2: Basic data for the investigated infants of group 2 (mean and range)

| infants | I-TEQ (pg/g fat) | body weight (kg) | age (weeks) | breast feeding period (weeks) |
|---|---|---|---|---|
| still birth (n=3) | 10.2. 9.7 - 10.8 | 2.3 2.1- 2.6 | - | - |
| formula-fed (n=7) | 3.6 1.6 - 10.7 | 5.5 3.0 - 7.0 | 17.0 9.9 - 26.3 | - |
| breast-fed (exclusively and partly (n=10) | 12.7 2.4 - 29.6 | 5.7 3.2 - 8.6 | 17.5 0.4 - 43.7 | 7.9 0.4 - 18.9 |