

## POP ACCUMULATION IN INFANTS DURING BREAST-FEEDING

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### Introduction

The accumulation of persistent organic pollutants (POPs) in the food chain and the following contamination of mother's milk with these compounds causes a relatively high exposure of breast-fed infants. Theoretically, substantially higher levels of these compounds can be expected in infants compared to their mothers following several months of breast-feeding<sup>1</sup>. Indeed, clearly higher PCDD/F concentrations were measured in a few 11-month-old infants after six to seven months of full breast-feeding<sup>2,3</sup>. To get a better data basis for the accumulation of POPs in infants during breast-feeding, a new study with more participants was performed.

### Study design

The study group consisted of 11-month-old healthy infants who had been fully breast-fed for at least four months (n=80) or who were formula-fed (breast-fed for less than 2 weeks, n=21). The main aim was to measure an extensive test program for biological parameters possibly influenced by the POP exposure<sup>4</sup>. In contrast to other studies, this exposure could be directly determined by measurement of POP concentrations in blood fat. This was also done in the mothers (11 months after delivery), allowing the comparison of concentrations in mother and child.

### Material and Methods

Heparin blood was taken by the same person in the morning before breakfast from the infants (15 ml) and their mothers (40 ml) who were also interviewed for anamnestic data e.g. regarding possible PCDD/PCDF/PCB exposure and children's medical history during pregnancy, birth and the first year of life. Of the infants' blood, a part was used for the determination of biological parameters<sup>4</sup>. Infants' plasma (3 to 5 ml) as well as maternal plasma (about 18 ml) was frozen at -20°C for analysis of PCDDs, PCDFs, PCBs, pp-DDE, HCB and  $\beta$ -HCH. Measurements were performed at the ERGO Forschungsgesellschaft, as described previously<sup>5</sup>. Concentrations were based on total fat, calculated from cholesterol and triglyceride values<sup>6</sup>.

### Results and Discussion

Of the 80 breast-fed infants, 27 were from the region Ilseburg/Harz with higher average PCDD/PCDF contamination of mother's milk due to a copper recycling plant closed 1990<sup>7</sup>. I-TEQ concentrations (Nato TEFs, PCBs not included) were between 2.0 and 107 ppt (median 25.3 ppt). Of these children, 6 had I-TEQ concentrations higher than 50 ppt, five of them came from the region Ilseburg. From the 21 formula-fed infants, individual PCDD/PCDF analyses were performed in five children. I-TEQ concentrations were found between 1.9 and 3.2 ppt. From POP concentrations of infants and their mothers, concentration ratios were calculated and are listed in Table 1 for some of the compounds (mean for groups with different duration

of breast- **Table 1** Mean of concentration ratios (infant/mother) for some POP compounds 11 months after births, depending on the duration of breast-feeding (equivalent time of full breast-feeding).

Duration of breast-feeding (weeks)	<	16-24	25-32	33-40	41-48
	n= max. 5*	11	29	33	7
<b>Compound</b>					
23478-P5CDF	0.31	1.24	2.53	3.74	4.63
OCDD	0.70	0.58	0.98	1.35	1.92
I-TEq	0.24	1.12	2.12	3.20	3.73
PCB118	*	1.46	2.72	4.57	4.33
PCB126	0.42	1.20	2.28	3.28	3.49
Sum PCBs 138,153,180	0.18	0.85	1.83	2.92	3.50
pp-DDE	0.30	1.20	2.45	3.64	4.35
$\beta$ -HCH	0.14	1.72	3.16	4.61	5.84
HCB	0.14	1.12	2.22	3.55	3.90

\* some compounds were not detectable in all formula-fed infants

feeding). As expected, ratios were clearly lower than 1.0 in the formula-fed group. Surprisingly, accumulation in the group of infants fully breast-fed for 16 to 24 weeks was not very pronounced at the end of the first year of life: for most compounds, concentrations were about the same in child and mother (mean ratio for I-TEq: 1.12). With a longer period of breast-feeding, the accumulation of most compounds became more and more evident. This is not only due to increasing concentrations in of infant, but also due to decreasing concentrations in the mothers (mean ratio for I-TEq in the group breast-fed for 41-48 weeks: 3.73). Comparing the different POP compounds, the accumulation effect was lowest for OCDD (as expected: lower transfer from mother's body fat to milk, lower intestinal absorption<sup>2</sup>). For the other compounds listed in Table 1, the extent of accumulation varied somewhat, with highest ratios for  $\beta$ -HCH. Data will be used for development of a model regarding the accumulation of different POPs during breast-feeding.

### Acknowledgements

This investigation was supported by grants from Forschungszentrum Karlsruhe, Baden-Württemberg (PUG U 96 005).

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