

# PCB-CONGENERS IN HUMAN BREAST MILK RELATED TO THE DURATION OF NURSING

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## Abstract:

In order to estimate the possible intake of polychlorinated biphenyls (PCB) and chlororganic pesticides through breast feeding over extended periods, the PCB and pesticide concentrations were determined in milk fat throughout a lactation period of up to six months. The material examined contained primarily the high-chlorinated congeners Nos. 138, 153 and 180 as well as residues of  $\beta$ -HCH, HCB and DDE. Among the low-chlorinated PCBs, No. 101 dominated, followed by No. 49. After a small decrease in the first two weeks post partum, the concentrations of the high-chlorinated congeners as well as of  $\beta$ -HCH, HCB and DDE remained nearly constant throughout the duration of nursing.

## Introduction:

An estimation of the possible uptake of polychlorinated biphenyls as a contaminant of human breast milk over an extended nursing period, knowledge of the PCB concentration in milk throughout the duration. To date, no studies of this type have been performed for PCB congeners. As a consequence, in the study presented here, we have examined the excretion of selected PCBs throughout a lactation period of six months. In addition to the six indicator congeners that were established by the German Guidelines for Maximal Concentrations of Contaminants [1], 2,2',4,5'-tetrachlorbiphenyl (PCB No. 49) was included as a low-chlorinated congener which can be metabolically activated and which showed tumour-initiating properties in vivo [2].

## Experimental Part:

Samples of human breast milk were extracted with petroleum benzene, purified by column chromatography on aluminium oxide and silica gel and analysed by gas chromatography using two capillary columns of different polarity. In order to test the reliability of the results, random samples were examined by mass spectrometry [3].

## Results and Discussion

Table 1 shows the concentration of chlororganic pesticides and DDE as well as the seven PCB-congeners tested in the fat contents of the milk:

Table 1. Chlororganic pesticides, DDE and PCB congeners in human breast milk on day 4 p.p. ( $\mu\text{g}/\text{kg}$  Milk fat, n = 96)

	HCB	$\beta$ -HCH	DDT	DDE	28	49	PCB No.					Total PCB <sup>§</sup>
							52	101	138	153	180	
x	342	84	62	1097	4	9	2	19	236	314	153	737
min	10	0	0	70	0	0	0	0	30	40	10	80
q1	120	50	30	600	0	0	0	0	180	240	100	
x	260	70	50	925	0	0	0	10	240	320	150	720
q3	440	100	90	1370	0	15	0	35	290	375	190	
max	1960	1170	390	5750	40	70	60	120	660	750	400	2100

0 represents < 1  $\mu\text{g}/\text{kg}$  fat

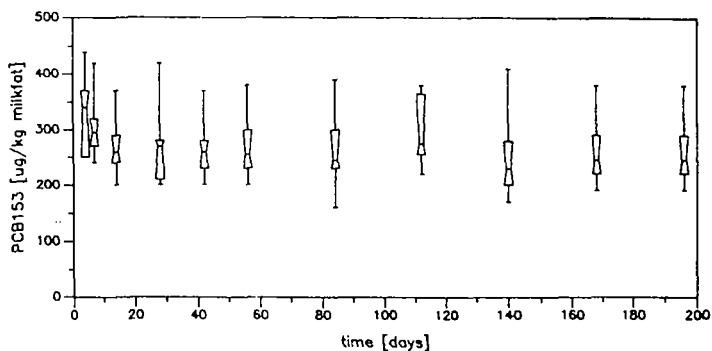
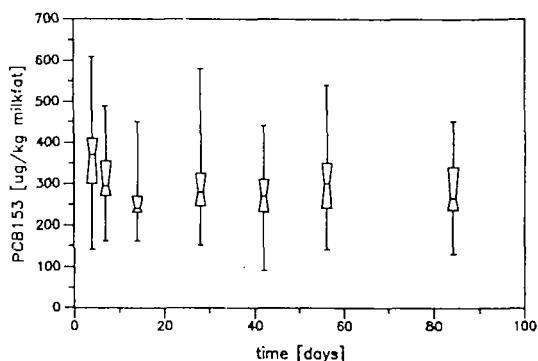
<sup>§</sup> Sum of the concentrations of PCB Nos. 28, 49, 52, 101, 138, 153 and 180

The data show that, in regard to the chlororganic substances tested, the milk samples were primarily contaminated with HCB,  $\beta$ -HCH, DDE and high-chlorinated biphenyls. Of the low-chlorinated PCB congeners, PCB No. 101 dominated, followed by the double-para-substituted congener No. 49.

While the polychlorinated biphenyls in milk fat demonstrate an almost normal distribution, we see that the pesticides  $\beta$ -HCH, HCB as well as DDE present a left-slope distribution. A possible explanation for this effect may be the continuing addition of polychlorinated biphenyls in the food chain, but a reduced load of chlororganic pesticides in foodstuffs in this country.

For evaluation of a more extended exposure of the chlorohydrocarbons studied here, a series of time studies was carried out on women who nursed for longer periods of time. The kinetics throughout a nursing period of 84 and 196 days for PCB No. 153 are shown in Figs. 1 and 2, respectively. The kinetics for a 196 day nursing period for DDE are shown in Fig. 3. In the first two weeks after beginning nursing, a small decrease in the concentration of contaminants in the milk can be observed. Thereafter, throughout the rest of the lactation period, the concentrations of PCBs and pesticides in the milk remained approximately constant. A corresponding curve was found for PCB Nos. 101, 138, 180 as well as for HCB and  $\beta$ -HCH.

The concentrations of contaminants in human breast milk measured here varies only slightly from the overall average values for the Federal Republic of Germany [4]. Thus, the results of the kinetic studies can safely be generalised. Therefore, the long-term exposure of nursing children to the PCB congeners that make up the major portion of PCB contaminants in mother's milk is known. An assessment of risk would be possible on the basis of these results, however, due to a lack of threshold values, such an estimation cannot be carried out at this time.



**Figs. 1 and 2: Kinetics of excretion of PCB No. 153 in human breast milk over a period of 84 (n=36) and 196 (n=10) days p.p. respectively ( $\mu\text{g}/\text{kg}$  milk fat). A corresponding curve was found for PCB Nos. 101, 138 and 180.**

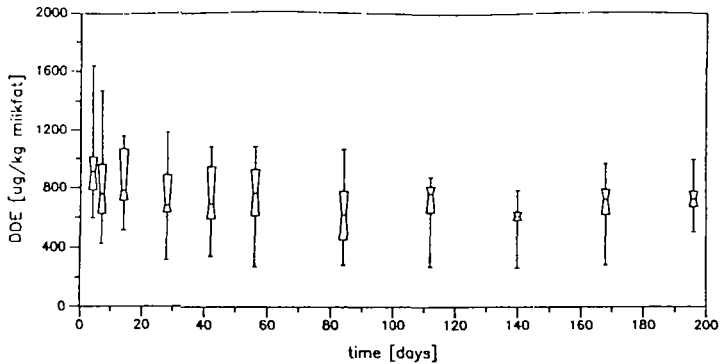


Fig. 3: Kinetics of excretion of p,p'-DDE in human breast milk over a period of 196 days p.p. ( $\mu\text{g}/\text{kg}$  milk fat,  $n=10$ ). A corresponding curve was found for the chlororganic pesticides.

## References

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2. R.J. Laib, N. Rose, H. Brunn (1990): This volume.
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4. K.H. Hahn (1985): *Untersuchungen über Vorkommen und Eintragswege persistenter chlorierter Kohlenwasserstoffe sowie von Blei und Cadmium in Frauenmilch.* Dissertation Universität Kiel.