

# Dioxin '97, Indianapolis, Indiana, USA

## The concentration of 2,2',4,4',5,5'-hexachlorobiphenyl (CB-153) in plasma in Swedish female fish consumers as a biomarker for risk for low birthweight

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### Introduction

In Sweden a main exposure route for polychlorinated biphenyls (PCB) and other persistent organochlorine compounds (POC) is through the consumption of fatty fish from the Baltic Sea (on the Swedish east coast) (1-3). In a recent risk assessment of PCB it was concluded that present exposure of Nordic populations is of the same magnitude as that at which subtle health effects may occur in children exposed in utero and, possible through breast-feeding as well (4). The wives and ex-wives of fishermen from the Swedish east and west coast have reported that they consume more than twice as much fish than women from the general population (5, 6). In a previous cohort study it was shown that infants born to fishermen's wives from the Swedish east coast during the period 1973-1991 had a higher frequency of low birthweight in comparison to infants born to fishermen's wives from the Swedish west coast, where the fish is much less contaminated (6). The present nested case-control study within the east coast cohort aimed to examine the hypothesized association between the body burden of PCB and other POC in women and the risk of low birthweights for their infants.

### Material and Methods

In 1995, blood samples were collected from fishermen's wives and ex-wives from the Swedish east coast (N=192) who had given birth during the period 1973-1991. Case mothers (N=57), who had given birth to an infant with low birthweight (1500-2750 g), were matched to control mothers (N=135; the birthweight of their infants were 3250-4500 g) on gender, parity, and calendar year of birth. The concentration of 2,2',4,4',5,5'-hexachlorobiphenyl (CB-153) in plasma was analyzed by gas chromatography - electron capture detection. CB-153 has been suggested as a relevant biomarker of exposure to POC (7). A mother's concentration of CB-153 in plasma during year of childbirth was *estimated* using some alternative plausible kinetic models that accounted for the impact of elimination rates during lactation and non-lactation periods, and the decrease of CB-153 concentration of fatty fish from the Baltic Sea over calendar time. The models considered to be most plausible a priori assumed a 3 or 5% yearly reduction of CB-153 in fish and a 33% reduction of body burden of CB-153 at each period of lactation. The figure illustrate the model for back-calculation of CB-153, for some different biological half-lives of CB-153 during non-lactating periods.

## Results and Discussion

The median for the lipid-adjusted plasma concentration of CB-153 in 1995 was, for the whole study group, 160 ng/g lipid (range 20-780).

For the alternative estimated exposure data sets, an increase in the risk for a low birthweight was observed at a CB-153 concentration during the year of childbirth around 300-400 ng/g lipid weight (adjusted odds ratios between 1.8 and 2.3, with lower 95% confidence limits between 0.8 and 1.0, see table).

The results are in accordance with previous analyses, which indicated an increased risk of low birthweight among infants born to mothers who reported a relatively high current intake of fish from the Baltic Sea, as well as among mothers who had grown up in a fishing village (8). Thus, the results from the present analysis support an association between prenatal exposure to POC and low birthweight.

## Acknowledgements

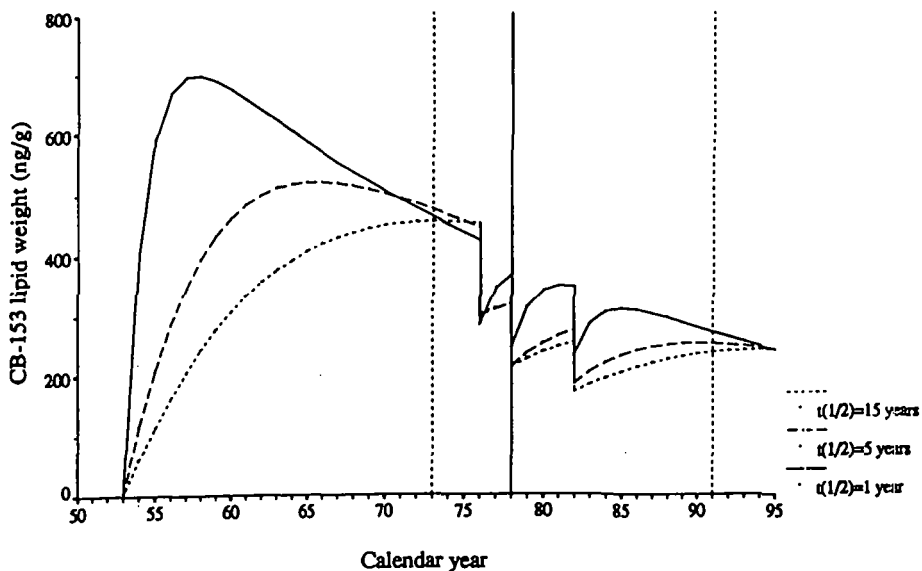
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Figure. Illustration of the back-calculation model under the assumptions of a 3% yearly reduction of CB-153 concentration in the fish and a 33% reduction in body burden of CB-153 at each period of lactation, for some different biological half-lives of CB-153 during non-lactating periods. The woman was born in 1953 and had lactated in 1976, 1978 and 1982; the infant of interest for the present study was born in 1978.



# EPIDEMIOLOGY

**Table.** Distribution of the cases and controls according to their mothers' estimated lipid-adjusted concentration of CB-153 in plasma in year of childbirth, and corresponding adjusted odds ratio (OR) estimates.

Estimated lipid-adjusted plasma concentrations of CB-153 in year of childbirth (ng·g <sup>-1</sup> )	Number		OR <sup>a</sup>	95% CI <sup>b</sup>
	Cases	Controls		
<i>3% yearly reduction in the fish and 33% reduction in body burden at each period of lactation</i>				
<i>t<sub>1/2</sub>=1 year</i>				
≤ 300	33	93	1.0	
> 300	24	42	1.8	0.8-4.4
<i>t<sub>1/2</sub>=5 years</i>				
≤ 300	29	90	1.0	
> 300	28	45	2.1	1.0-4.7
<i>t<sub>1/2</sub>=15 years</i>				
≤ 300	29	89	1.0	
> 300	28	46	1.9	0.9-4.1
<i>5% yearly reduction in the fish and 33% reduction in body burden at each period of lactation</i>				
<i>t<sub>1/2</sub>=1 year</i>				
≤ 400	32	88	1.0	
> 400	25	47	2.1	0.8-5.8
<i>t<sub>1/2</sub>=5 years</i>				
≤ 400	31	91	1.0	
> 400	26	44	2.3	0.9-5.9
<i>t<sub>1/2</sub>=15 years</i>				
≤ 400	30	89	1.0	
> 400	27	46	1.9	0.9-4.4

<sup>a</sup> Odds ratio adjusted for, in addition to the matching factors (gender, parity, and calendar year of birth), maternal age (3 categories: ≤24, 25-29, and ≥30 years) and smoking habits during year of childbirth (2 categories: non-smokers and smokers)

<sup>b</sup> Confidence interval