

RISK II

Consumption of fish from the Baltic Sea contaminated with persistent organochlorine compounds and low birthweight

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1. Introduction

In Sweden the main exposure route for both polychlorinated biphenyls (PCB) and other persistent organochlorine compounds, as polychlorinated dibenzo-*p*-dioxins (PCDD), and polychlorinated dibenzofurans (PCDF) is through consumption of fatty fish species from the Baltic Sea (the eastern coast of Sweden)^{1,2}. 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, possibly, through breast-feeding as well³. Swedish fishermen have been shown to eat more than twice as much fish than subjects from the general population². The east coast fishermen had, however, two times higher PCB and PCDD/F levels in plasma compared with both the west coast fishermen and referents from the general population. Based on these results, the wives of the east coast fishermen were considered an appropriate study base for health assessments of perinatal exposure to persistent organochlorine compounds.

2. Materials, Methods, and Results

Cohort study

During 1973-91, 757 fishermen's wives from the Swedish east coast gave birth to 1501 infants and 1834 fishermen's wives from the Swedish west coast gave birth to 3553 infants⁴. Telephone interviews performed with small random samples of the east and west coast cohort women indicated that they ate locally caught fish more than twice as often as women from the general population. When comparing

the answers from the east and west coast cohort women, respectively, no differences in the numbers of fatty fish meals per month were observed.

Infants born to fishermen's wives from the Swedish east coast had more frequently a low birthweight (<3000 g, Odds Ratio [OR] 1.4, 95% confidence interval [CI] 1.2-1.8) than infants born to fishermen's wives from the Swedish west coast. The effect was more conspicuous for the boys (OR 2.1) than for the girls (OR 1.1)

Case-referent study

In the cohort study we lacked individual dietary data. Such data are, however, crucial in order to investigate further the hypothesized association between exposure to persistent organochlorine compounds through fish consumption and decreased birthweight. Therefore a case-referent study has been performed within the cohort of east coast women⁵⁾. Cases were selected among the infants born in the cohort according to the following criteria: a single birth infant with a birthweight in the interval 1500-2750 g and without major malformation. Moreover, if a mother had given birth to more than one infant with low birthweight, only the one born first was eligible as case. These criteria resulted in 90 potential cases. The mothers to 72 of these cases participated in the study. For each potential case two referents were randomly selected from the cohort. The 162 referents whose mothers participated, were infants with birthweights between 3250 and 4500 g, and matched to the cases with respect to gender, parity, and calendar-year of birth. Telephone interviews on dietary habits and other relevant factors were performed with the mothers by one interviewer, who was not aware of the pregnancy outcome.

Adjusted for maternal age and smoking habits during year of childbirth, a total current intake of fish from the Baltic Sea of at least four meals per month versus less intake, indicated an increased risk of having an infant with low birthweight (OR 1.9, 95% CI 0.9-3.9), but there was no clear dose-response relationship (see table). When the analysis was restricted to boys, the corresponding OR was 3.4 (95% CI 1.1-11). No such effects were observed when considering the estimated intake of fish during the period in which the infant was born. The ORs were not further enhanced, considering the consumption of fatty fish only. Twenty-five percent of the cases' mothers had grown up in a fishing village as compared with

RISK II

15% among the referents' mothers. After adjustment for maternal age and smoking habits during year of childbirth the effect of growing up in a fishing village was still pronounced (OR 2.1, 95% CI 1.0-4.3). This risk estimate did not differ between male and female offsprings. When we included in the model the indicator *grown up in a fishing village* together with the various measures of fish consumption, respectively, the estimates changed only slightly.

3. Discussion

The main finding in the cohort study was the increased risk among the east coast women for having an infant with low birthweight, which persisted adjustment for potential confounders. A possible explanation for this may be an on average higher body burden of PCB or other persistent organochlorine compounds in the women from the east coast cohort. In the cohort based case-referent study, mothers who reported a high current intake of fish from the Baltic Sea, as well as mothers who had grown up in a fishing village, had an increased risk of having an infant with low birthweight. A further step in this investigation will be to assess the association between individual blood levels of persistent organochlorine compounds in the east coast mothers and the birthweight of their infants. Blood samples have been collected from 192 of the mothers participating in the cohort based case-referent study, and analyses of PCB in plasma are under progress.

4. References

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RISK II

Table Odds ratios (ORs) with 95% confidence intervals (CIs) for current consumption of fish from the Baltic Sea and low birthweight, adjusted for maternal age and smoking habits during the calendar-year of birth.

Fish consumption	All		Boys		Girls	
	OR	95% CI	OR	95% CI	OR	95% CI
Meals/month						
Fatty fish						
0	1.0		1.0		1.0	
1-3	1.7	0.8-3.4	2.1	0.7-6.5	1.9	0.7-4.9
≥ 4	1.4	0.6-3.1	2.7	0.8-9.6	0.9	0.3-2.8
Total						
0-3	1.0		1.0		1.0	
4-6	2.0	0.9-4.5	3.4	0.8-14	1.8	0.6-5.3
≥ 7	1.8	0.9-4.0	3.4	1.0-12	1.2	0.4-3.4