Lowered birthweight among infants born to women with high intake of fish contaminated with persistent organochlorine compounds

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1. Introduction

Persistent organochlorine compounds (POC) are lipophilic pollutants which accumulate in the food chain. These compounds have been associated with various health hazards, such as cancer, and immunotoxic and reproductive effects[1,2]. In certain geographical areas the main route for human exposure is through consumption of contaminated fish. In Sweden, a high intake of fatty fish from the Baltic Sea (on the eastern coast) constitute such exposure[3-5].

The hypothesis of an association between exposure to POC and decreased birthweight was examined among cohorts of infants born to fishermen's wives from the Swedish east and west coasts[6]. The fish from the Swedish west coast is much less contaminated with POC[7]. Infants from the east coast cohort had an increased risk for lower birthweight compared with infants from the west coast cohort. A nested case-control study within the east coast cohort indicated an increased risk of lower birthweight among infants born to mothers who reported a relatively high current intake of fish from the Baltic Sea[8], as well as among infants born to mothers with a relatively high concentration of 2,2',4,4',5,5'-hexachlorobiphenyl (CB-153) in plasma[9]. Moreover, an increased risk for lower birthweight was also observed among infants born to mothers who had grown up in a fishing village[8]. This latter observation suggested that the sisters of the fishermen, who to a high proportion had grown up in a fishing village, may constitute a proper alternative study population for assessing the association between exposure to POC and birthweight.

The aims of the present study were to investigate whether fishermen's sisters from the Swedish east coast had a relatively high intake of fish from the Baltic Sea and to assess their reproductive outcome.

2. Material and Methods

By linkage to the national Swedish population register, we identified sisters to fishermen from the Swedish east and west coasts. The cohort of sisters were linked

to the Swedish Medical Birth Register (MBR). These linkages resulted in 1719 infants born to 1030 sisters to fishermen from the Swedish east coast during the period 1973-1993, and 2682 infants born to 1537 corresponding women from the Swedish west coast.

Telephone interviews were performed with randomly selected women from the east and west coast cohorts and with randomly selected women from the general population. The interviews were focused on the women's fish consumption.

3. Results

Both the interviewed east and west coast cohort women reported a more frequent intake of locally caught fish as compared with their referents (table 1). Forty-four percent of the interviewed sisters from the east coast cohort and 46 percent of the interviewed sisters from the west coast cohort reported a higher intake of locally caught fatty fish 10-20 years ago as compared with their current consumption. The corresponding figures among the referents were significantly lower (16 and 22 percent, respectively). The sisters were to a significantly higher degree than the referents born in a fisherman's family and grown up in a fishing village (table 1).

A direct comparison between the cohorts showed a significant difference between the birthweight distributions. The median birthweight was 3500 g in the east coast cohort and 3560 g in the west coast cohort. The adjusted cohort difference in mean birthweight was 72 g (95% CI 39-105 g). Moreover, east coast affiliation was an indicator of having an infant with low birthweight (figure 2). When 2500 g was used as the cutpoint the adjusted OR was 1.6 (95% CI 1.1-2.3), whereas for 3000 g as the cutpoint the adjusted OR was somewhat lower (OR 1.3, 95% CI 1.1-1.5). These calculations were performed after the exclusion of multiple births and infants with major malformations. For the outcome small for gestational age (SGA) the results were similar.

4. Discussion

The main findings in the present study were increased risks among fishermen's sisters from the Swedish east coast of having infants with low birthweight and SGA. The quality of the MBR birthweight data is considered to be good, whereas it is more difficult to get reliable estimates of the gestational length[10]

A reasonable explanation to the increased risk of having an infant with low birthweight among fishermen's sisters from the Swedish east coast was an increased intake of fish from the Baltic Sea contaminated with POC. The interviewed sisters from the cohorts reported a somewhat higher current consumption of locally caught fish as compared with women from the general population. However, fish consumption before and during pregnancy is a more

relevant exposure measure than the current consumption. The interviews showed that the sisters from both the east and west coast cohorts had had a higher consumption earlier (10 to 20 years ago), whereas the women from the general population had not changed their dietary habits. Moreover, a high consumption of locally caught fish during early life for the fishermen's sisters, is supported by that a greater fraction of them were grown up in fishing village or in a fisherman's family than their referents.

To sum up, the results from the present study is in accordance with the results obtained among infants born to fishermen's wives, and thereby support the hypothesis of an association between exposure for POC and low birthweight.

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6. References

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Table 1. Current consumption of fish for randomly selected women from the east and west coast cohorts and referent women from the general population. Moreover, the fractions of women grown up in a fishing village and with a fisherman as the father, respectively, are reported.

	Fishermen's sisters			Referents			
	East (N=99)	West (N=116)	p[a]	East (N=106)	p[b]	West (N=117)	p[b]
Locally caught fish (meals/month)							
median	4	5	0.02	3	0.02	4	0.03
(quartiles)	(1, 7)	(2.2, 9)		(0, 5)		(1, 7)	
Living in a fishing village during childhood and adolescence (percent)	34	74	<0.001	10	<0.001	3	<0.001
Born in a fisherman's family (percent)	50	64	0.05	8	<0.001	3	<0.001

[a] P-values for comparison between the cohorts of fishermen's sisters (Mann-Whitney test)
[b] P-values for comparison between the cohort of fishermen's sisters and the referents (Mann-Whitney test)

Table 2. Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI). Multiple births and major malformations were excluded from the analyzed data.

		Crude		Adjusted[a]	
	N_{case}	OR	95% CI	OR	95% CI
<2500 g versus ≥2500 g					
West coast cohort	65	1.0		1.0	
East coast cohort	70	1.7	1.2-2.4	1.6	1.1-2.3
<3000 g versus ≥3000 g					
West coast cohort	293	1.0		1.0	
East coast cohort	246	1.3	1.1-1.6	1.3	1.1-1.5
SGA versus not SGA[b]					
West coast cohort	51	1.0		1.0	
East coast cohort	49	1.5	1.0-2.2	1.4	0.9-2.1

[a] Odds ratios adjusted for maternal age (3 categories: ≤24, 25-29, ≥30 years), parity (2 categories: 1 and ≥2), smoking habits (4 categories: nonsmokers, 1-9 cigarettes a day, ≥10 cigarettes a day, and unknown), and gender of the infant.
[b] Small for gestational age