Risks and benefits of fish consumption in an Italian population moderately exposed to methylmercury

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Abstract: Environmental studies have identified mercury pollution in the Northern Adriatic sea. Possible sources of Hg in this area are maritime traffic, a local chlor-alkali plant, and especially the former Idrija mercury mine (Slovenia), through the Isonzo river. Although, the neurological toxicity of prenatal high-dose mercury (Hg) exposure has been described globally, different studies did not reach univocal conclusions about the fetal lowest effect level and the exposure-effect relation at levels <10 parts per million (ppm) is controversial. On the other hand, in a recent Danish prospective follow-up study, low consumption of fish was a strong risk factor for preterm delivery and low birth weight. Therefore, in women with zero or low intake of fish, small amounts of n-3 fatty acids—provided as fish or fish oil—may confer protection against preterm delivery and low birth weight.

We conducted an epidemiologic cohort study to assess risks and benefits of fish consumption in an Italian population moderately exposed to methylmercury.

From April 1, 1999 to September 30, 2001, we identified all the children born from women who were resident in three Italian coastal fishing towns on the Northern Adriatic sea. A comparison group was identified in the inland. A total of 243 children were enrolled. Their mothers were interviewed approximately two months after delivery. Interviews were conducted following a structured questionnaire. Information was collected on socio-demographic characteristics, medical, pregnancy, and occupational history, number of dental amalgam fillings, and lifestyle factors such as smoking, alcohol drinking and diet. Detailed information was collected about type, quantity and origin of fish consumed during pregnancy. Total mercury (THg) and methylmercury (MeHg) were assessed in maternal hair and milk and in child hair. THg was determined by gold amalgamation cold vapor atomic absorption spectrometry. MeHg was determined by aqueous phase ethylation, room temperature precollection, GC separation and cold vapor atomic fluorescence spectrometry. On children who reached 18 months of age by November 30, 2001,a first follow-up visit was conducted, including a physical examination and the Denver Developmental Screening Test II (DDST II).

THg mean concentration in maternal hair was 1.33 ppm (standard deviation (STD): 1.22, median: 0.93, range: 0.06-8.03). THg in maternal hair was positively correlated with THg in both babies' hair and in milk, as well as with MeHg in maternal and babies' hair and in milk (range of Pearson's correlation coefficients: 0.334-0.785, all p-values <0.01). Frequency of consumption of fresh and carnivore fish during pregnancy, and fish origin from the contaminated lagoon were directly associated with maternal hair THg. During pregnancy, less than 50% of the women enrolled in our study ate at least 150 g of fresh fish per week. After adjustment for potential confounders such as child's sex, mother's age at delivery, and maternal smoking and alcohol drinking during pregnancy, women who ate more than 150 g of fresh fish during pregnancy were 85 % less likely to give birth to low birth weight (<2500 g) children (Odds Ratio: 0.15, 95 % Confidence Interval: 0.03-0.69). Child's performances in the DDST II personal-social area, language area, and gross motor area were not significantly associated with Hg

levels. A significant inverse association was found between Hg levels and performance in the DDST II fine motor-adaptive area. The mothers of 17 children with performance above standard had lower levels of hair THg.
In our study, none of the mothers had hair Hg concentrations as high as 10 ppm. However, we found an association between lower maternal hair THg level and a performance in the DDST II fine motor-adaptive area above standard. At the same time, the majority of pregnant women in our area ate very low amounts of fish. Those who ate more than 150 g of fresh fish were associated with a much lower risk to give birth to a low birth weight child. While fish consumption during pregnancy could increase the levels of fetal Hg exposure, it also represents a source of n-3 long chain fatty acids and a protective factor against low birth weight. Therefore, depending on the level of Hg contamination, recommendations that pregnant women do not eat fish may not be always appropriate.

Key words: methylmercury, fish, NEURODEVELOPMENT, n-3 long chain fatty acids, Adriatic sea