

Methylmercury and fish consumption: weighing the risks

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In this issue (page 1439) Dr. Charles Dumont and colleagues report a substantial fall in mercury levels (as measured by the concentration of methylmercury in hair samples) from 1988 to 1993 among Crees living in the James Bay area of Quebec. Fish in hydroelectric reservoirs had been found to be contaminated with mercury and, in 1988, 14.2% of the population of the area had levels of 15.0 mg/kg or greater. By 1993/94, this proportion had fallen to only 2.7%. Dumont and colleagues conclude that this reduction was achieved by a number of educational activities, chief among which was an effort to encourage the Cree to avoid contaminated species of fish while maintaining their traditional way of life and continuing to eat traditional food.

Concern over the contamination of fish by mercury first arose in Canada with a report in 1971 of elevated levels in fish in Lake St. Claire.¹ At about the same time, a report by a Swedish expert group² evaluated the health risks posed by methylmercury in fish. They concluded that the threshold for toxic effects in adults corresponded to a hair level of 50 mg/kg. To take into account the presumed greater sensitivity of the developing brain, a safety factor of 10 was applied to the adult threshold by the World Health Organization to cover exposure of the general population. Thus, a level of 5 mg/kg in hair was taken as the upper "tolerable" limit.³ This limit has been consistently supported by subsequent epidemiologic studies, including those involving the James Bay Cree and studies now in progress in the Seychelles.⁴⁻⁶

Dumont and colleagues conclude on the basis of mercury levels in hair that the health risks posed by mercury contamination in the region are low. Even before the intervention, only 5% of adults had hair mercury levels exceeding 30 mg/kg. Few indeed must have exceeded the adult threshold of 50 mg/kg. They did find, however, that mercury levels increased with the age of the study participants. In addition, levels found in husbands and wives had a strong positive correlation with one another but not with those found in other members of the family. This may reflect a difference in lifestyle between older and younger Crees.

The question the authors raise as to whether "seasonal life-long exposure . . . may cause effects at doses lower than those observed with shorter-term exposure" has haunted public health authorities for many decades, since current estimates of health risks for adults are based on data from short-term exposures of a few months to a year or so.⁴ Although age-related increases in the neurologic signs of mercury poisoning have been reported among the James Bay Cree,⁵ no association with mercury levels could be detected. Other studies involving adults with lifetime exposures have failed to reveal health risks any greater than those resulting from short-term exposures.⁴

With respect to prenatal risks, no women of childbearing age had levels exceeding 30 mg/kg in 1988, and 1.1% had levels higher than 15 mg/kg in a tested population of 1285 (which also appears to have been the total or "target" population). At these levels, the actual risks are probably small. Effects on child development have not been demonstrated in studies in Canada or elsewhere involving fish-eating populations among whom hair levels were found to be below 15 mg/kg.^{4,6} In Dumont and colleagues' study, most of the 1.1% (i.e., a total of about 14 in all) of women of childbearing age stated to have hair mercury levels in the



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range of 15 to 30 mg/kg could be expected to be closer to 15 rather than 30, given the expected decrease in the population affected as levels depart further from the mean.

This study raises important and timely questions about intervention programs directed at populations exposed to environmental contaminants in fish. Exposure to contaminants in food presents unique problems from both a toxicologic and a nutritional perspective. The health risk posed by contaminants in fish must be balanced against the nutritional benefits of this food and, in the case of native populations, against the loss of traditional lifestyles.^{7,8} Similar concerns have been expressed with respect to the exposure of the Inuit to polychloride biphenyls (PCBs) in "country food."⁹

Given the low risks even at the pre-intervention levels of mercury exposure, a question arises as to the need for intervention programs, as successful as this one has been. The critical health risk from methylmercury is impaired child development. This outcome has many causes other than mercury poisoning, such as exposure to alcohol, solvents and PCBs, as well as socioeconomic conditions, the quality of the home environment and nutrition.

Nutrition is an especially important consideration when fish are the vehicle of exposure to contaminants. Changes in nutritional quality of the diet must be carefully considered. Dumont and colleagues state, "It is likely that Crees have changed the type of fish eaten, from contaminated to less contaminated fish, or have decreased their total fish consumption considerably, or both." This is a crucial question. *Was* there a considerable fall in fish consumption? What were the alternative food sources? Apart from providing high-quality protein, fish tissues contain constituents protective against cardiovascular disease and, perhaps more pertinent, also supply polyunsaturated fatty acids (especially the omega-3 subgroup) that are essential for normal brain development.¹⁰

Wheatley⁷ has discussed at length the changes in lifestyle that may result from the disruption of the traditional diet of aboriginal peoples, a concern recently echoed by Egeland and Middaugh¹¹ with respect to Alaskan communities that rely heavily on subsistence fishing. Fortunately, in Dumont and colleagues' study, steps were taken to encourage Crees to avoid contaminated species of fish while still maintaining their traditional way of life. One hopes that future interventions will take the same care.

Their results reflect a successful intervention to reduce human body burdens of methylmercury among the Cree of James Bay. The publication of their findings is also timely in view of new and more stringent regulations that are now emerging. Health Canada has recently revised its

guidelines for daily intake of mercury for women of child-bearing age and children under 10 years of age to 0.2 µg/kg, down from the previous standard of 0.47 µg/kg.¹² For a 60-kg woman of childbearing age with long-term exposure to mercury-contaminated fish, this guideline would correspond to a maximum level in hair of approximately 2 mg/kg. Given the data presented by Dumont and colleagues, this would imply that most of the Cree are still at risk. Applying the safety factor of 5 that appears to have been used in the Health Canada recommendation (to allow for the greater sensitivity of the fetus to mercury exposure), the revised guideline would indicate that there is a risk for the general population, in which hair levels average at about 1 mg/kg. The effect of this guideline on fish consumption could be catastrophic and will surely raise the question of intervention in other communities exposed to contaminants in fish.

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