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Letter to the Editor

Comparing fish-mercury exposed Amazonian children: Should not we consider thimerosal-preserved vaccines?

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Two outstanding research groups pooled data in a unique study comparing French Guiana and Brazil regarding subtle (subclinical) neurotoxic effects of Hg exposure attributed to fish consumption (Chevrier et al., 2008): there were increased risks of making rotation or simplification errors in the drawings by children with an increased level of Hg. The Brazilian children of Rio Tapajos (Sai Cinza, Brasilia Legal, and Santana do Ituquí) had twice the mean levels of hair-Hg concentrations compared with the Wayama children of French Guiana; thus indicating a higher mean fish intake.

We fully agree with this basic assumption, but, when assuming sources of Hg exposure there could be other differences between the two countries (French Guiana and Brazil) regarding organic-mercury, such as ethylmercury derived from thimerosal-containing vaccines (TCVs). Although "all the children were chemically exposed to meHg during gestation and into childhood" there is a strong possibility that the Brazilian children could be additionally exposed to ethylmercury, both during gestation and infancy, as a result of serial injections of TCV. Additionally, there are other environmental factors that act as effect modifiers of neurocognitive outcomes.

Brazil has an efficient immunization program using TCVs in young children (Dórea, 2007). Moreover, vaccines against diphtheria and tetanus (DT) are also part of pre-natal care widely available for mothers in Brazil starting at the second month of pregnancy. After birth, both hepatitis B and DTP vaccines are given to young children (Dórea, 2007). In Brazil all these vaccines are preserved with thimerosal at concentrations that depend on the vaccine manufacturer (Dorea and Marques, 2008). According to the Brazilian immunization schedule, a 6-month-old infant can receive six shots (three hepatitis B, and three DTP) of TCVs. Coupled with maternal TCV taken during pregnancy, this substantial Hg load (in the fetus and in infancy) occurs at critical windows of central nervous system vulnerability.

Unlike Brazil, French Guiana is an oversea territory of France, and Amazonian children there are probably vaccinated with thimerosal-free vaccines. Indeed, in France, according to Freed et al. (2002), "the first dose of the hepatitis B vaccine is recommended at 2 months of age, not at birth, for children born to mothers whose hepatitis B surface antigen status is negative. The only vaccines in France containing thimerosal are the hepatitis B and influenza vaccines, and there were always thimerosal-free options for these vaccines. Therefore, a thimerosal-free hepatitis B vaccine was available for at-risk infants who received the hepatitis B vaccine at birth." In Brazil, neonates take thimerosal-preserved hepatitis-B vaccine within the first day after birth with a wide range of TCV-Hg doses (10 times), depending on birth weight and the vaccine manufacturer (Dórea and Marques, 2008).

Although the small dose of thimerosal in vaccines is considered safe, the recent work of Gallagher and Goodman (2008) showed an increased risk from hepatitis B vaccination in American children associated with special educational needs. In the context of fish-Hg exposure of Amazonian children, the ethylmercury load is never taken into consideration. Instead, the issue of proximity to alluvial gold extractuin has always taken precedence; while TCV-Hg exposure is universal in the Brazilian Amazon gold mining is only relevant for families occupationally engaged in gold amalgamation activities.

It is well documented that malaria is endemic in most of the Amazon forest, regardless of country boundaries. In Brazil, there is information pertaining not only to malaria, but also to intestinal parasites in the children of the Munduruku villages and other *ribeirinhos*; malaria affects 100% of the adult population and presumably a relative proportion of their children. Besides the differences in overall nutritional status between children of the two countries we were also not informed of differences in malaria incidence between French Guianan and Brazilian communities. Some of the sample of the children from the French Guiana dataset was from the Galipi community living in Awala on the Atlantic coast.

Indirectly, malaria can cause iron deficiency, and malnutrition secondary to intestinal parasites can slow intelligence development in children. In this regard, we compared *ribeirinho* children of the Amazon with agrarian children (non-fish consumers) and found very minor differences in psychometric tests. In these isolated communities there was a disparity of mean hair concentrations (66 times higher in *ribeirinhos*) and only minor differences in the poor performance of both groups (Fonseca et al., 2008). Therefore we agree with Chevrier et al. that for neurocognitive-performance tests there could be determinants other than fish-MeHg exposure.

Regardless of confounders and environmental differences, Chevrier et al.'s work remains an important contribution to realizing that cognitive development may take longer in the more Hg-exposed group resulting in unpredictable consequences. My comments are meant to stimulate further research on all aspects of Hg exposure that might affect neurocog-

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