ATTACHMENT 6

REVIEW OF RECENT SCIENTIFIC STUDIES

The US EPA established the US Reference Dose for methylmercury in 1999, based on the best evidence then available, using data from a long-term epidemiological study in the Faeroe Islands carried out by researchers at Harvard and elsewhere. Research since then has sharpened scientific understanding of the benefits of maternal fish consumption for prenatal cognitive development, of the harm done by methylmercury to that cognitive development, and of improved research designs for separating the two effects. Several recent studies suggest more strongly than ever that public health concern over methylmercury exposure is completely justified, and that the effort to guide women to pick low-mercury fish must be expanded and improved.

In 2007, the Faeroe Islands research team reanalyzed their data to adjust for maternal fish intake, and determined that after adjusting for nutritional effects of fish consumption, cognitive deficits attributed to methylmercury were actually about twice as large as had originally been reported.[1] Similarly, a research team doing another long-term study, in the Seychelles Islands, which had previously reported no significant adverse effects of methylmercury on cognitive development, did a new analysis focused on measuring benefits of maternal fish consumption. In 2008, for the first time, the Seychelles researchers reported observing adverse mercury effects, which they concluded were probably masked by beneficial effects in their earlier analyses.[2]

Two US studies have shown that developmental benefits of fish intake and adverse effects of methylmercury occur in babies whose mothers consume average American amounts of fish. A study in Boston[3] has assessed verbal development at the ages of six months and three years; high fish consumption during pregnancy improved scores, while higher mercury exposure (from the higher-mercury fish those women ate) reduced scores. The effects were of roughly comparable magnitude in the affected groups, about 5 points on a 100-point scale. A New York City study[4] tested children's cognitive development at the ages of 12, 24, 36 and 48 months, using standard tests, and found similar results: High fish consumption enhanced performance, while elevated mercury exposure decreased performance on the same tests.

The populations in the Faeroes and Seychelles have high-fish diets, and the Faroese in fact get most of their methylmercury exposure from pilot whale meat. But the women in the Boston and New York studies had ordinary levels of fish consumption and mercury exposure. Only 7 percent of the Boston women ate two or more fish meals per week; about 5 percent of US women eat fish that often, according to CDC. The Boston research team classified a child as having high prenatal mercury exposure if his mother's hair mercury value was above the 90th percentile, which was 1.2 ppm in the study population. The 90th percentile hair NHANES mercury level is 1.1 ppm. Oken et al. did not measure blood mercury, but NHANES regional data show that the 90th percentile blood mercury level for women in New England is 5.2 µg/l.[5] The New York study measured blood mercury, but not fish consumption. The geometric mean blood mercury level in the women included in the study was 0.91 µg/l, while the geometric mean for the national NHANES sample was 0.92 µg/l.

Further research is needed to better document the complex relationships between fish intake during pregnancy and cognitive development. But the available evidence strongly suggests that methylmercury exposure can have adverse effects even at doses associated with just one or two fish meals per week. There is no evidence of a threshold for this toxic effect. Since women are advised to consume fish while pregnant, for the nutritional benefits, it seems vitally important that advice also be provided that helps women identify and buy low-mercury fish, so they (and their babies) can simultaneously enjoy the nutritional benefits and minimize their exposure to methylmercury.

[1] Budtz-Jorgensen, E., Grandjean, P., Weihe, P., 2007b. Separation of risks and benefits from fish consumption. Environ. Health Perspect. 115, 323-327.

[2] Davidson, P.W., Strain, J.J., Myers, G.J., Thurston, S.W., Bonham, M.P., Shamlaye, C.F., et al., 2008. Neurodevelopmental effects of maternal nutritional status and exposure to methylmercury from eating fish during pregnancy. Neurotoxicol. 29, 767-775.

[3] Oken, E., Wright, R.O., Kleinman, K.P., Bellinger, D., Amarasiriwardena, C.J., Hu, H., et al., 2005. Maternal fish consumption, hair mercury, and infant cognition in a U.S. cohort. Environ. Health Perspect. 113, 1376-1380. Also, Oken, E., Radesky, J.S., Wright, R.O., Bellinger, D.C., Amarasiriwardena, C.J., Kleinman, K,P., et al., 2008. Maternal fish intake during pregnancy, blood mercury levels, and child cognition at age 3 years in a US cohort. Am. J. Epidemiol. 167, 1171-1181.

[4] Lederman, S.A., Jones, R.L., Caldwell, K.L., Rauh, V., Sheets, S.E., Tang, D., et al., 2008. Relation between cord blood mercury levels and early childhood development in a World Trade Center cohort. Environ. Health Perspect. 116, 1085-1091.

[5] Mahaffey, K.R., Clickner, R.P., Jeffries, R.A., 2009. Adult women's blood mercury concentrations vary regionally in the United States: Association with patterns of fish consumption (NHANES 1999-2004). Environ. Health Perspect. 117, 47-53; doi:10.1289/ehp.11674 [Online 25 August 2008].