More Evidence of Mercury Effects in Children

In research published last summer, scientists revealed that prenatal exposure to methylmercury, an organic form of mercury that accumulates in animal tissues, may affect the blood pressure and ability to respond to sensory stimuli in exposed children later in life. The team is now also confirming findings of mercury-related neurodevelopmental effects among the Faroese subjects by studying a cohort of Madeiran children.

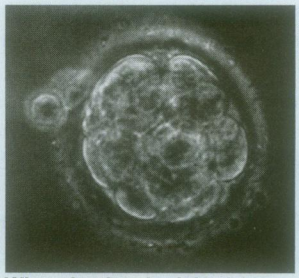
The reports are the latest work of Philippe Grandjean, an adjunct professor of public health at Boston University in Massachusetts, and Pál Weihe, medical director of the Faroese Hospital System in Tórshavn, who, with their colleagues, have performed extensive analysis of a longitudinal study on the effects of prenatal methylmercury exposure among the inhabitants of the Faroe Islands. The Faroe Islands study was funded by the NIEHS along with European grant-making bodies including the European Commission Environment Research Programme and the Danish Medical Research Council. The Faroese were chosen as study subjects because their diet is rich in pilot whale meat, a prime source of methylmercury. In the study of 917 Faroese children, prenatal exposure to methylmercury was assessed by analyzing mercury concentrations in cord blood and maternal hair. At age 7, the children underwent extensive neurobehavioral testing as well as a general health examination.

A whale of a meal. The meat and blubber of the long-finned pilot whale have been staples of the Faroese diet for centuries. People who eat a whale meal may be exposed to methylmercury, which has been found to cause neurodevelopmental and other effects in children exposed *in utero*.

A paper published in the July 1999 issue of *Epidemiology* describes mercury-related cardiovascular risk factors that were identified among the Faroese children during the general health exam. Because of earlier case reports and experimental findings of cardiovascular effects of mercury, the children were examined for blood pressure, heart rate, and heart rate variability. As a whole, the children had normal blood pressure for their age. But among children whose cord blood mercury content had been measured at 1–10 µg/L, the scientists found that blood pressure was raised by an average of 14 points. The effect was magnified in children with lower birth weights, whose blood pressure was raised by as much as 21 points. No additional increase was seen in children whose cord blood mercury concentration had been higher than 10 µg/L.

Implantation: Timing Is Everything

Understanding the many facets of human reproduction has long been considered a guessing game. According to Allen Wilcox, chief of the Epidemiology Branch at the NIEHS, until now, knowing exactly when implantation of an egg into the uterine wall occurs has been impossible because the event has never been observed in humans. However, Wilcox and his team have recently taken some of the guessing out of the process by shedding light on how the timing of implantation may affect a pregnancy's outcome. The results of their research were published in the 10 June 1999 issue of the *New England Journal of Medicine*.



Allen J. Wilcox

When the time is right. A human blastocyst is ready for implantation.

The NIEHS team collected urine samples for up to 100 days from 221 women who were trying to conceive. The scientists pinpointed the time of ovulation by studying the ratio of estrogen metabolites to progesterone metabolites. By studying levels of the hormone chorionic gonadotropin (hCG), the team was able to detect when a fertilized egg was implanted into the uterine lining.

Of the 189 women who yielded sufficient data for the team's analysis, 75% carried their pregnancies at least 6 weeks past their last menstrual cycle. The remaining 25% of pregnancies resulted in early loss that was strongly related to the time of implantation. The initial rise in hCG occurred 6–12 days after ovulation, with 84% occurring specifically 8–10 days after ovulation. On average, surviving eggs were implanted 1 day earlier than nonsurviving eggs—9.1 days versus 10.5 days from fertilization to implantation.

When implantation occurred by day 9, there was only a 13% chance of embryonic loss. By day 10, however, 26% of embryos had died. The percentage of loss rose on day 11 to 52%, and to 82% beyond day 12. In the study, the three implantations that occurred after day 12 ended in early loss. Not only does the receptivity of the mucous membrane lining the uterus decrease, but the body is less responsive to hCG by 11 or 12 days after ovulation. What this shows, according to Wilcox, is that "the uterus may be receptive to pregnancy only during a limited time-window, shutting out defective embryos that arrive too late. This would spare a mother the physiologic burden of supporting a nonviable embryo."

The study says that the data may provide implications for efforts to manipulate receptivity of the uterus, offering new possibilities for infertile women. For example, fertility might be increased by extending the window of time during which implantation could occur.