

Research by psychology Professors Jacobson continuing

PCBs in fish may adversely affect children's learning abilities

Widespread use of polychlorinated biphenyls (PCBs) is a thing of the past. But the chemicals found their way into the Great Lakes food chain, their effects still remain and may be felt for years to come.

Psychology Professors Joseph and Sandra Jacobson recently found that children exposed before birth to PCBs have cognitive deficits that may adversely affect their learning abilities. The study was sparked by the suggestion of Wayland Swain, a biologist from the Environmental Protection Agency.

The Jacobsons' findings are based on the study of 236 four-year-old children in western Michigan. The children previously had been evaluated for PCB-related deficits in infancy. PCBs are carried, along with nutrients, through the umbilical cord to the fetus.

Mothers in the study are believed to have acquired PCBs through consumption of contaminated Lake Michigan fish.

PCBs, used as a lubricant for heavy electrical transformers from the 1930s until the 1970s, are designed to be stable and resist environmental degradation, Joseph Jacobson says.

Over the years PCBs accumulated in the fatty tissues of fish, reaching unusually high levels in fatty sports fish from Lake Michigan because of its depth, large surface area, low turnover rate and proximity to industry.

Once consumed, PCBs are stored in the mothers' body-fat deposits and, after attaching to fat globules, circulate through the blood.

PCB levels of the children's mothers were determined from blood samples. The children's prenatal exposure was determined by looking at umbilical cord samples obtained at birth. The study then examined the cognitive functioning of the children.

Women who reported consuming large amounts of Lake Michigan fish showed higher PCB levels; others' were lower. Children exposed to higher prenatal PCB levels did markedly worse in tests of short-term memory and visual discrimination than those with lower exposure.

Joseph Jacobson says after ruling out other factors such as quality of parental stimulation and maternal drinking during pregnancy, higher PCB levels appeared to result in more errors on several memory tests and longer time periods to reach correct solutions for visual discrimination problems. However, no apparent differences in attention span were found between the high- and low-exposure groups.

And although 60 percent of the infants received much heavier doses postnatally through breast-feeding

than they did before birth, Joseph Jacobson says, "We were surprised that the cognitive deficits correlated only with prenatal PCB exposure."

As a group, breast-fed babies did better on memory and attention tests than their bottle-fed counterparts. The Jacobsons say the data show that breast-fed children become quicker learners, probably because their mothers are better educated and therefore make greater efforts to provide intellectual stimulation.

The Jacobsons' findings showed no evidence of gross functional impairment in their subjects. However, he says, the poorer memory performance seen in the study indicates diminished potential.

Although PCBs no longer are used in industry, exposure to them continues because of old electrical equipment still in use or deposited in landfills. With this in mind, Joseph Jacobson says his team is doing a follow-up study on prenatally exposed

11-year-olds to determine long-term effects of PCBs on short-term memory and visual acuity.

"At this point, we just don't know what the longer-term effects are," he says. "The deficits could go away or they could get worse."