

## Kids Exposed to Mercury or Lead More Likely to Experience Attention Deficit

Inuit children exposed to higher levels of these metals are at least three times as likely to be identified as suffering from attention-deficit hyperactivity disorder

By Marla Cone and Environmental Health News | Friday, September 21, 2012 | 7

Children exposed to higher levels of mercury or lead are three to five times more likely to be identified by teachers as having problems associated with Attention Deficit Hyperactivity Disorder, according to a scientific study published today.

The study – of Inuit children in Arctic Quebec – is the first to find a high rate of attention-deficit symptoms in children highly exposed to mercury in the womb. In addition, the Inuit children more often had hyperactivity symptoms if they were exposed to the same low levels of lead commonly found in young U.S. children.

In the United States, one of every 10 children has been diagnosed with ADHD, according to the U.S. Centers for Disease Control and Prevention. It is one of the most common brain disorders of childhood.

Researchers from Laval University in Quebec surveyed teachers of 279 children in Nunavik between the ages of 8 and 14, using standardized questionnaires developed by psychiatrists for diagnosing ADHD.

Developmental psychologist Gina Muckle, the study's senior author, said the findings are important because they show for the first time that mercury's effects on children are not just subtle, but are actually noticeable to teachers.

The effects from exposure in the womb “may be clinically significant and may interfere with learning and performance in the classroom,” says the study, published online in the journal *Environmental Health Perspectives*.

For lead, the Inuit children with the highest levels were four to five times more likely to have teacher-reported hyperactivity than their classmates with low lead levels. “We are seeing those effects at very low blood lead levels,” Muckle said.

Although the findings came from a study of Arctic children, the results likely are universal, Muckle said. “At similar levels of exposure without regard of the source of exposure, the effect should be similar,” she said.

Dr. Bruce Lanphear, a professor at Simon Fraser University in Vancouver, said evidence is mounting that a variety of toxic compounds are “shifting children's behavior.”

“There seem to be a whole host of different toxicants that are associated with ADHD,” said Lanphear, who studies childhood effects of lead, mercury and other contaminants but didn't participate in the Inuit study. That actually “makes sense” biologically, he said, because ADHD is a syndrome of 23 different behaviors. Each toxic chemical could be altering different parts of the brain during different times of its development.

“To me, what this [new study] confirms is that the pre-frontal cortex appears to be particularly vulnerable to environmental toxicants,” he said. That part of the brain controls not just hyperactivity and attention but also learning disorders and anti-social and criminal behaviors.

Whale and fish consumed by their mothers were the sources of the Inuit children's exposure to mercury. The lead came from foods the children ate that contained lead shot from hunting.

One of the most intriguing findings was that mercury was linked to attention deficits while lead was associated with hyperactivity. The difference may be the timing of the exposures: in the womb for mercury and during childhood for lead.

Harvard School of Public Health epidemiologist Joe Braun said the findings “suggest the brain may be sensitive to different environmental chemicals at different times in development.”

“Future research will need to confirm this finding and examine the effect of joint exposure to both prenatal mercury and childhood lead,” said Braun, who was not involved in the study.

Mercury and lead exposures had a stronger effect on ADHD symptoms than mothers who smoked during pregnancy, a link reported by other scientists, Muckle said.

ADHD “is a complex disorder so there are likely many risk factors. We are still far from understanding its etiology and relationship to environmental chemicals,” she said.

Attention-deficit symptoms were three times more frequent among the Inuit children with high mercury exposure than among their classmates with the lowest exposures, according to the study.

Nunavik children are highly exposed to mercury mostly from eating beluga whale meat. Methylmercury accumulates in large fish and marine mammals near the top of food chains.

Such high mercury levels are rare among non-Arctic populations



Children in Iqaluit, Nunavut, CA on a field trip.  
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we think that there is not likely to be a significant proportion of the U.S. or Canada population exposed to the mercury levels where we've seen these effects," Muckle said. But she cautioned that some segments of the population, particularly Asian communities, who eat large quantities of albacore tuna, swordfish and other large predator fish could be equally exposed.

In contrast, the lead levels associated with ADHD symptoms in the Nunavik children are considered low. They are roughly the same as average levels in U.S. children.

Previous studies of U.S. children have linked lead exposure to ADHD.

"Regardless of the population, there are effects [from lead]," Muckle said. "This is another confirmation that really low exposure to lead is associated with greater behavioral difficulties in schools."

Lead shot used by hunters was identified through isotopes as the source in the Inuit kids. In U.S. kids, lead is mostly from old peeling paint and contaminated soil.

"It almost doesn't matter what the source is," Lanphear said. "It looks like lead is associated with certain effects whether it's from paint or it's from lead shot."

The amounts of lead linked to hyperactivity symptoms were far below the advisory level (5 micrograms per deciliter in blood) recently set by the CDC. About half a million U.S. children between the ages of 1 and 5 exceed that level.

"A notable result of this study is that ADHD-type symptoms were found in kids with lead exposures far below the current health-based guidelines. It really reinforces that we need to rethink the guidelines if we're finding effects at levels that are one-third or half of the current guidelines," said Glenys Webster, a postdoctoral fellow at Simon Fraser University who studies prenatal exposure to contaminants. She was not involved in the study.

The research uncovered some important differences between lead and mercury.

For lead, the ADHD effects were linked to post-natal exposures – what the children themselves were exposed to. For mercury, it was their exposures via their pregnant mothers, detected in cord blood collected at birth.

One possible reason that lead was connected to hyperactivity and mercury to attention deficits may be that mercury exposure comes during rapid brain growth in the womb, while lead exposures come when the brain is more robust, Muckle said.

Lanphear said the scientists "did a nice job" of factoring in other influences on brain development, including nutrients from fish and smoking. One weakness of the study, he said, is that there was no information on the parents' rates of ADHD, so the study could not factor in a potential genetic role.

The children in the study were not actually diagnosed by psychiatrists but Lanphear said teacher surveys are a "validated approach" to check for ADHD symptoms. A child is typically diagnosed with ADHD using the surveys at both school and at home.

Funded by the U.S. and Canada governments, the study is part of a two-decade investigation of children in Nunavik, who are exposed to some of the world's highest levels of mercury and industrial chemicals called PCBs or polychlorinated biphenyls. The children have been studied for the effects of contaminants since they were born between 1993 and 1996.

The study found no link between ADHD and PCBs, although previous U.S. studies have reported a link.

Mercury and PCBs migrate long distances via the air and ocean currents, collecting in marine food webs. Beluga, narwhal, seals and other marine animals that are traditional foods for Arctic populations have among the world's highest levels of PCBs and other contaminants. As a result, the Inuit are among the highest exposed people on Earth.

Public health officials in Nunavik last year advised pregnant women to reduce their consumption of beluga because of the chemicals' potential health effects on their children.

Lead in the environment is decreasing, while mercury levels are increasing in many places.

Lanphear, Muckle and Webster agreed that the study is evidence that there should be local as well as international efforts to reduce children's exposure to mercury. A large source is coal-burning power plants, particularly in China.

"This research supports that mercury and lead are a problem, for many health outcomes, one of them being ADHD. The question is, what can be done about it?" Webster said.

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