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Evidence mounts for IQ link to manganese

Research from Canada prompts call to revise drinking water standards

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Evidence of a link between chronic exposure to low levels of manganese and cognitive deficits in children was strengthened this week with the results of a study published in *Environmental Health Perspectives*.

The authors, led by Maryse Bouchard, found that for children living in a Canadian community served by groundwater, a drop in IQ scores was associated with elevated concentrations of the metal in water they drank at home.

The water coming from their tap contained manganese at an average concentration of 34µg/L — much lower than levels currently considered safe by the US Environmental Protection Agency and the World Health Organization, at 300µg/L and 400µg/L respectively.

"The association between water manganese concentration and IQ scores was strong," write Bouchard and colleagues. "Because of the common occurrence of this metal in drinking water... we believe that national and international guidelines for safe manganese in water should be revised."

The research is the first to assess the risk of exposure to the metal through drinking water in North America. It comes on the heels of two **studies conducted in Mexico** that suggested a link between low-level exposures to manganese and cognitive impairment in children.

In this study, Bouchard and colleagues measured the concentration of manganese in the drinking water and hair of 362 children between six and 13 years old who lived in Quebec district between 2007 and 2009. They also asked them about their dietary habits, including food portions, and estimated how much tap or bottled water they drank — information they used to work out how much manganese the children consumed.

The researchers selected eight areas of the district with different levels of the metal in their water, and assessed the children's verbal and performance IQ with standard tests. To rule out the effect of other factors on the relationship between the exposure and effect, they also collected data on of the mothers' cognitive abilities and the water concentrations of other metals associated with intellectual function.

They found that children in the lower and higher exposure categories were separated by 6.2 IQ points, based on verbal and performance scores put together.

"IQ scores decrease steadily with increasing MnW [water manganese]," write the authors. For every 10-fold increase in concentrations of the metal, the IQ score of children in the community dropped by an average of 2.4 points.

The level of manganese they measured in the children's hair, which indicates long-term exposure, increased with their intake of water but not with diet. This suggests that waterborne manganese was responsible for the deficits.

The study area had no industrial sources of manganese, pointing to natural leaching of the metal from minerals and rocks as the source of contamination. The water levels measured in the study are typical of some parts of the USA, but much higher levels are not uncommon in other parts of the world.

Bouchard and colleagues point to a handful of previous studies with similar results. But citing their study's cross-sectional design, they caution against concluding that the exposure is responsible for the cognitive deficits until research with prospective data can confirm the link.

Reference and links

1. Bouchard MF, Sauvé S, Barbeau B, Legrand M, Brodeur ME, Bouffard T, *et al*. Intellectual impairment in school-age children exposed to manganese from drinking water. *Environ Health Perspect* 2010. **doi**: **10.1289/ehp.1002321**

World Health Organization information on manganese in drinking water

US Environmental Protection Agency drinking water health advisory for manganese

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