

Arsenic in US Well Water Threatens Child Development

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April 15, 2014

Exposure to arsenic in well water may contribute to reduced brain functioning in children, according to a new study from Maine.

The study of more than 200 children in grades 3 to 5 found that exposure to even low levels of arsenic in well water was associated with lower scores on intelligence tests by as much as 5 to 6 points, which may translate into problems in school.

Investigators led by Joseph Graziano, PhD, professor of environmental health sciences at Columbia University's Mailman School of Public Health in New York City, note that their findings in Maine build on earlier studies conducted by the same team in South Asia, and Bangladesh in particular, which showed similar results.

The study was [published online](#) April 1 in *Environmental Health*.

Investigators assessed 272 children from 3 school districts in Maine where household wells are the predominant source of water for drinking and cooking. The Augusta area in particular was studied because of earlier research indicating higher than normal exposures. The children were 10 years old on average and had lived in the current home for 7.3 years (roughly 75% of their lives).

Water samples from the garden hose and kitchen sink were tested for arsenic levels. The researchers also considered drinking habits, length of residence in the home, well construction, and use of filtering procedures.

On average, water arsenic levels measured at the kitchen tap were 9.88 µg/L, with almost a third of samples exceeding 10 µg/L, the maximum contaminant level guideline of the World Health Organization and the US Environmental Protection Agency. The highest level of water arsenic was 115.3 µg/L.

In analyses adjusting for relevant factors, including maternal IQ, education, and home environment, arsenic in well water was "significantly negatively" associated with most index scores on the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV).

Strong Association

Compared with children with exposure to a water arsenic level < 5 µg/L, exposure to water arsenic ≥ 5 µg/L was associated with reductions of approximately 5 to 6 points in both Full Scale IQ index ($P < .01$) and the Perceptual Reasoning Index, the Working Memory Index, and the Verbal Comprehension Index (all $P < .05$).

The researchers note that the "magnitude" of the association between well water arsenic and child IQ raises the possibility that levels of water arsenic ≥ 5 µg/L, which are not uncommon in the United States, "pose a threat to child development."

"The strength of associations found in this study is comparable to the modest increases that have been found in blood lead, an established risk factor for diminished IQ," Dr. Graziano said in a statement.

"Our findings of adverse impact in a US sample, particularly in performance-related functioning, gives confidence to the generalizability of findings from our work in Bangladesh, where we also observed a steep drop in intelligence scores in the very low range of water arsenic concentrations," Dr. Graziano added.

"Collectively, our work in Bangladesh and in Maine suggests that aspects of performance intelligence, particularly perceptual reasoning and working memory, are impacted by exposure to arsenic in drinking water," he said.

"Even though purchasing a standard filter at the hardware store is inadequate for treating well water, the good news is that there are steps one can take to ameliorate the situation," noted Dr. Graziano. Although somewhat expensive, Dr. Graziano and other experts recommend installing a reverse osmosis system to alleviate the effects of water arsenic.

A series of outreach programs are also under way to educate families in the region, the researchers note.

The study was supported by the National Institute of Environmental Health Sciences. The authors report no relevant financial relationships.

Environ Health. Published online April 1, 2014. [Full article](#)

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Cite this article: Arsenic in US Well Water Threatens Child Development. *Medscape*. Apr 15, 2014.