



Wang SX, ZH Wang, XT Cheng, J Li, ZP Sang, XD Zhang, LL Han, SY Qiao, ZM Wu and ZQ Wang. 2007. **Arsenic and fluoride exposure in drinking water: children's IQ and growth in Shanyin County, Shanxi province, China.** [Environmental Health Perspectives 115\(4\):643-7.](#)

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Synopsis by [Dr. Sheela Sathyanarayana](#) and [Wendy Hessler](#)

Chinese children drinking well water with very high levels of fluoride scored poorly on intelligence testing compared to those with lower exposures.

This is one of the first studies in humans to find that too much fluoride is associated with low performance on intelligence tests. More information is needed to ascertain if the sum total amount of ingested fluoride from tap water, consumer products and other sources are enough to inhibit brain development in children living in the US and other countries where fluoridation is common.



Context: Fluoride is a recommended additive to public water supplies to promote healthy teeth. The Centers for Disease Control and Prevention [reports](#) that 66% of the US population receives fluoridated water through the taps in their homes. Fluoride combats tooth decay in two ways. It strengthens tooth enamel, and it allows teeth damaged by acid to repair, or remineralize, themselves.

Excessive fluoride intake can have negative consequences on bone, teeth and the brain. Too much of the ion can lead to skeletal fluorosis, a condition in which teeth have weak enamel and bones have poor mineralization.

Exposure to high levels of fluoride may also alter brain development, according to recent studies of Chinese populations. Studies from rural China, albeit done with inappropriate controls, suggest fluoride may harm the developing brain ([Grandjean and Landrigan 2006](#)). Young children are the most vulnerable to the

What did they do? Wang *et al.* examined 524 children (exposed and controls) aged 8 to 12 years old in China's Shanxi province for fluoride exposures in relation to intellectual functioning and growth. The families were exposed to naturally occurring high concentrations of fluoride through well water. The children were compared to control children who were recruited from three nearby villages with uniformly low concentrations of fluoride in well water. All children lived in areas with similar geography, cultural conditions and socioeconomic development.

The authors obtained urine samples for fluoride analyses and conducted physical exams. Medically trained professionals administered standardized neurodevelopmental tests.

What did they find? Very high fluoride concentrations -- as high as 8.3 milligrams per liter (mg/L) -- were measured in the well water of the high fluoride group while the control group's well water had just 0.5 mg/L of fluoride.

The percentage of children with IQ scores less than 70 increased from 0 in the control group to 4% in the high fluoride group. The percentage of children with IQ scores greater than

times higher in the high fluoride exposed children than in the controls (5.1 mg/L versus 1.5 mg/L in controls). All of these associations were statistically significant.

neurodevelopmental effects from too much fluoride ([Xiang et al. 2003](#)).

What does it mean? Fluoride may affect brain development in growing children exposed to high levels of the ion through drinking water. Lower overall IQ scores, a greater number of lower scores and fewer higher scores were found in the group of children drinking high fluoride well water when compared with children who drank well water with lower amounts of fluoride. The observed differences in testing could affect a child's ability to perform in school.

The results have significant public health implications given that tap water and many other products contain fluoride. It may be that many children are receiving high of doses of fluoride in the US. The drinking water concentrations of fluoride observed in this study are likely well above concentrations in US public drinking water supplies, but children may be receiving excess fluoride through multiple sources (drinking water, soft drinks/bottled water, toothpaste, mouth rinses).

At this time, there are no studies quantitating the sum of all fluoride exposures for an average child in the US. The American Dental Association [has recommended](#) that infants not be given formula reconstituted with fluoridated water to prevent excess exposures. Further studies should measure all fluoride exposures to children to prevent fluorosis and potential neurodevelopmental toxicities.

Fluoride in the news

Resources:

American Dental Association. [Interim Guidance on](#)



[Reconstituted Infant Formula](#) [PDF].

Centers for Disease Control and Prevention. [Water Fluoridation](#).

Grandjean P and PJ Landrigan. 2006. [Developmental neurotoxicity of industrial chemicals](#). Lancet. 368 (9553):2167-78.

Xiang Q, *et al.* 2003. Effect of fluoride in drinking water on children's intelligence. Fluoride 36: 84-94; 198-199.

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5 July [Drinking bottled water affects our environment](#). If you are drinking bottled water because you think that it is purer, safer than community water, or better for your health you are probably not getting your money's worth. [Lake Forest Lake Forester](#), Illinois.

5 July [High fluoride in drinking water is associated with poor performance on intelligence tests](#). Chinese children drinking well water with very high levels of fluoride scored poorly on intelligence testing compared to those with lower exposures. [Environmental Health News](#).

1 July [Hidden hazards](#). Congress should adopt measures to promote safe alternatives to dangerous industrial chemicals. [Houston Chronicle](#), Texas.

29 June [Potentially dangerous toothpaste still on shelves](#). A brand of Chinese toothpaste already pulled off shelves in the United States and Singapore over fears of chemical contamination can easily be bought in a Toronto store. [Toronto Globe and Mail](#), Ontario.

29 June [Fluoridate our water? No thanks](#). Water fluoridation is a half-baked idea which most of the civilized world rejected long ago. [Juneau Empire](#), Alaska.

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