

In Millions of Homes, High Fluoride in Tap Water May Be a Concern

In communities across the U.S., water contains levels of fluoride some experts say could be harm developing brains.

Top: Water tower in Comfort, Texas. Visual: Marcus Wennrich/iStock/Getty Images Plus

**BY MICHAEL
SCHULSON
([HTTPS://
UNDARK.ORG/
UNDARK-AUTHOR/
MICHAEL-
SCHULSON/](https://undark.org/undark-author/michael-schulson/))
05.06.2024**

THE TOWN of Seagraves sits on the high plains of West Texas, not far from the New Mexico border. Nearby, water pumped from the Ogallala Aquifer irrigates fields of peanuts and cotton.

Dissolved in that West Texas water are copious amounts of fluoride. The tap water in Seagraves contains levels of the mineral that many experts believe could have neurotoxic effects, lowering children's IQs

research is needed. But nearly everyone agrees that at some point, high fluoride levels ought to be a matter of greater concern — even if they don't always agree on what that point is.

Many cities add low levels of fluoride to drinking water in a bid to prevent tooth decay, but the policy has long been controversial. Lost in that debate (<https://undark.org/2024/03/06/fluoride-drinking-water/>) are the roughly 3 million Americans whose water naturally contains higher concentrations of fluoride — often at levels that even some fluoridation advocates now acknowledge could have neurodevelopmental effects.

RELATED

Baring Teeth: The Fight over Fluoride (<https://undark.org/2024/03/06/fluoride-drinking-water/>)

People in Seagraves and similarly affected communities are unlikely to be notified of those potential risks. Federal and state regulations require water utilities to tell customers receiving high-fluoride water that it could leave brown patches on children's teeth, or even, at high levels, cause a rare skeletal condition.

But, at least so far, the emerging science on neurological effects is not reflected in regulations. Consumer notices rarely, if ever, mention the possibility that fluoride could affect brain development. Nor do they

including some federal government researchers, now say there's substantial evidence that such elevated fluoride levels can be harmful to developing fetuses.

Perhaps nowhere is the issue more pervasive than Texas, where, according to data supplied to Undark by the Texas Commission on Environmental Quality, hundreds of communities have elevated fluoride levels, and several dozen are in clear violation of EPA regulations.

Lost in that debate are the roughly 3 million Americans whose water naturally contains higher concentrations of fluoride — often at levels that could have neurodevelopmental effects.

As a result, children across Texas, and in hundreds more communities around the United States, may routinely be exposed to potentially neurotoxic levels of a common mineral, while their caregivers receive little notification about those potential risks.

In a recent interview, Anne Nigra, an environmental health scientist

evidence of harm as “robust” and “very compelling,” even at levels far below those found in Seagraves.

“If I was speaking to someone from one of these communities, and it’s someone who was pregnant, or thinking about becoming pregnant, or who had a young child, I would certainly want them to have that information,” she said.

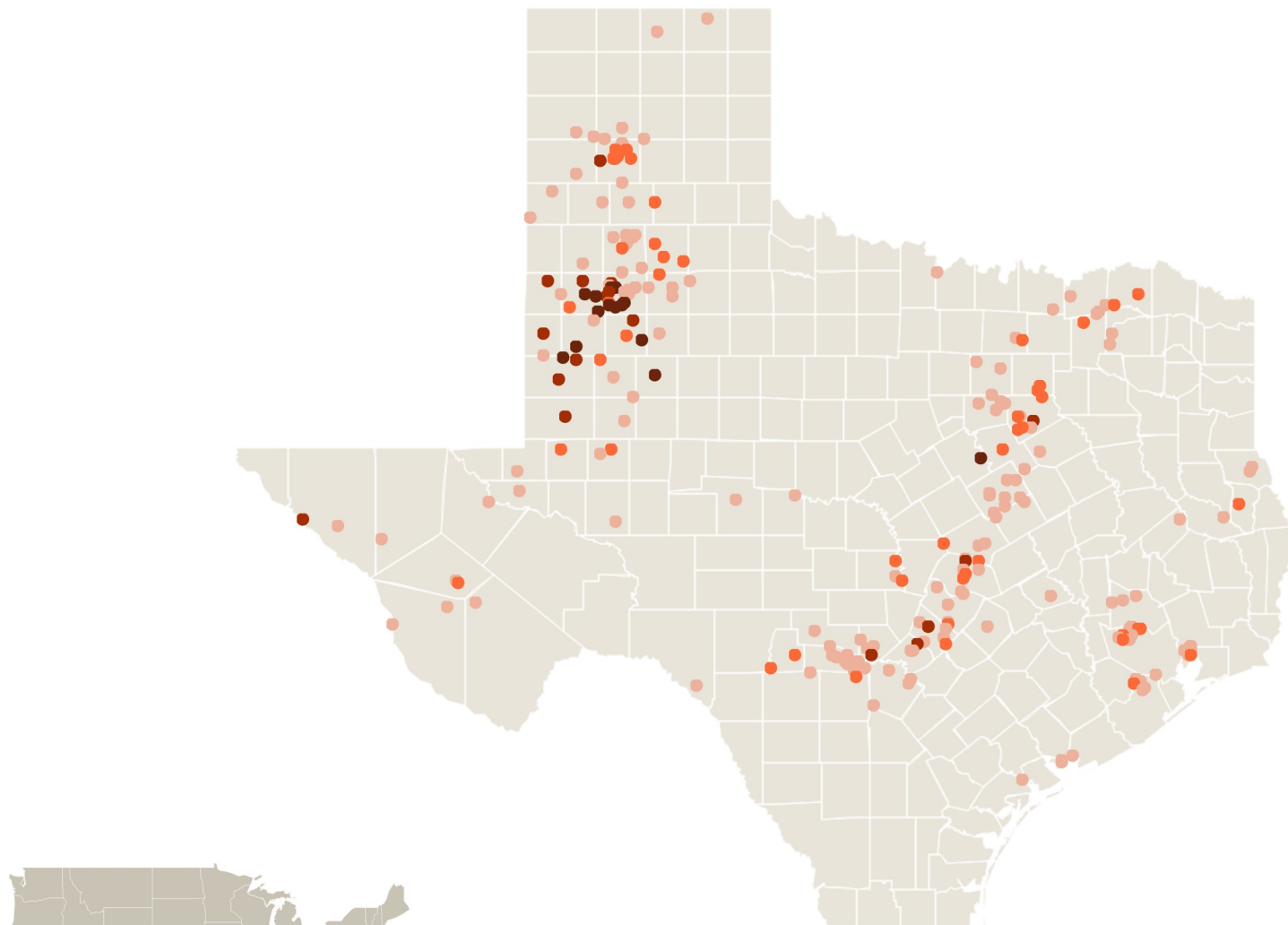
N MOST OF the United States, water sources contain little or no naturally occurring fluoride. But in some places, fluoride leaches from rocks into the groundwater. In West Texas, for example, the groundwater of the Ogallala Aquifer soaks through layers of fluoride-rich volcanic ash, hundreds of feet below the arid plains. By the time it comes out of the ground, water there may have concentrations of fluoride upwards of 5 milligrams per liter — more than seven times higher than the levels recommended for communities that add fluoride to their water.

Without specialized testing, consumers could never know it was there. “Fluoride is odorless and tasteless and totally transparent,” said Joel Podgorski, a geoscientist at the Swiss Federal Institute of Aquatic Science and Technology. In a 2022 paper (<https://www.nature.com/>

distribution of natural fluoride hotspots. Around 180 million people worldwide, they estimated, get water with natural fluoride levels above what the World Health Organization recommends. Hotspots include eastern Brazil, large areas of northwestern India, and pockets of North America, mostly west of the Mississippi River.

High Fluoride Levels in Texas Drinking Water

In hundreds of Texas communities — small cities, rural water districts, mobile home parks, suburban developments — the tap water contains concentrations of fluoride above 2 mg/L, reaching levels some experts say may harm fetus' and children's neurological development. Shown below are 1 where concentrations exceeded 2, 3, 4, or 5 mg/L at any time between January 2020 and May 2024



We use cookies to ensure that we give you the best experience on our website. If you continue to use this site we will assume that you are happy with it.



Hover over icon to isolate a category.



Concentration of fluoride in mg/L

Note: Fluoride levels may vary depending on the time and sampling point. For updated figures, consult the [Drinking Water Watch database](#).

Source: Texas Commission on Environmental Quality, via Robert Reedy.

There's widespread scientific agreement that ingesting too much fluoride can cause teeth to have a mottled appearance or become pitted, a condition called dental fluorosis. At very high exposures, fluoride can also weaken and deform bones.

The science is less clear-cut regarding effects on brain development. Starting in the 1990s, some studies from China suggested that children exposed to high levels of fluoride tended to have lower IQ scores. More recent research, conducted in Canada and Mexico, has suggested that even lower exposures — of the kind a person gets by drinking artificially fluoridated water at 0.7 mg/L — could be harmful to young children and developing fetuses. That evidence has prompted pitched debates among scientists and policymakers about the consequences of artificial water fluoridation. (The evidence of

But many scientists, including some who say the evidence is inconclusive at lower levels of fluoride exposure, say there's stronger evidence of harm as the concentration climbs.

“If I was speaking to someone from one of these communities, and it's someone who was pregnant, or thinking about becoming pregnant, or who had a young child, I would certainly want them to have that information.”

Since 2016, for example, a team of scientists at the U.S. National Toxicology Program has conducted a systematic review of fluoride research. In a recent draft report, they conclude “with moderate confidence, that higher fluoride exposure” — meaning levels at or above 1.5 mg/L — “is consistently associated with lower IQ in children.”

“I think that there is pretty convincing evidence that at relatively high doses, fluoride exposure can have some impact on children's IQ,” said David Eaton, a toxicologist and professor emeritus at the University

The public “should be aware of the science,” said Howard Hu, a physician and epidemiologist at the University of Southern California who has studied fluoride exposure. The evidence of some kind of effect, he said, “is pretty darn strong.”

T'S NOT CLEAR how much of that scientific conversation reaches residents of towns like Seagraves, where fluoride levels consistently top the legal limit of 4 mg/L.

The U.S. Environmental Protection Agency sets those limits, and officials there are aware of recent research on fluoride and brain development. During a recent court case, an EPA scientist said that higher levels of fluoride likely had neurotoxic effects — although he did not specify what level constituted a hazardous dose.

Any such concerns are not currently reflected in EPA regulations. Water providers with levels of fluoride above 2 mg/L have to tell consumers about the potential dental issues, and at even higher levels they have to include a warning about skeletal effects. But they're not required to provide any special notifications for pregnant women, or to mention potential neurological effects. Two major medical organizations, the American College of Obstetricians and

have guidance on neurodevelopmental risks from fluoride.

SENT
WEEKLY

GET OUR NEWSLETTER

Your Email Address

SUBMIT

The EPA has not published a review of its fluoride policy since 2017, and the agency did not directly answer questions from Undark about whether it now believes that higher concentrations of fluoride could pose a risk to children’s neurodevelopment. According to a statement emailed by Shayla Powell, an EPA spokesperson, regulations are currently under review, as part of a routine process mandated by federal law. “As a part of this review,” the statement said, “EPA will be considering the best available information, peer reviewed science and data” before making a decision about whether to change the rules.

That review is expected later this year.

We use cookies to ensure that we give you the best experience on our website. If you continue to use this site we will assume that you are happy with it. [Ok](#)

out that regulations often move slowly. “It’s challenging, because, broadly in the public health space, we want to be really, really confident before we start communicating confidently that there are adverse outcomes associated with particular exposures,” she said. At the same time, people should be informed about research: “Communities deserve knowledge. They deserve to know the best available scientific evidence.”

Many scientists, including some who say the evidence is inconclusive at lower levels of fluoride exposure, say there’s stronger evidence of harm as the concentration climbs.

Last year, Nigra and several colleagues published a paper estimating (<https://www.nature.com/articles/s41370-023-00570-w>) that around 3 million Americans live in places where tap water has natural levels of fluoride above 1.5 mg/L. Those communities, the team found, are disproportionately Hispanic and Latino.

It’s not always clear that residents are aware of the issue. (“That’s

” • 1 . 1 1 1 . 1 1 . . 1 . .

fluoride in the city's water, which recently ranged as high as 2.85 mg/L.) Some communities take steps to reduce their levels of fluoride. Others do not.

In Texas, tens of thousands of people get water from unregulated wells with high levels of fluoride, according to a 2021 report (<https://www.beg.utexas.edu/files/content/beg/research/water/2021%20Assessment%20of%20Fluoride%20in%20Groundwater%20and%20Public>) by Bridget R. Scanlon and Robert C. Reedy, both hydrogeologists at the Bureau of Economic Geology at the University of Texas at Austin. As Reedy put it: "That's kind of the 800 pound gorilla, is all these people who are on their own domestic well system, who are literally flapping in the wind."

ATER TREATMENT options exist, including sophisticated filtration systems. They're expensive, though, and operating them can be a challenge. "You buy this Cadillac, and nobody can drive it," said Scanlon. The result is that many small, rural water districts struggle to bring down high levels of fluoride. Many of those communities also deal with high levels of arsenic (<https://undark.org/2017/08/16/bangladesh-arsenic-poisoning-drinking-water/>), which can cause a range of health issues including cancer

In Andrews, Texas — population 13,000 — city leaders recently spent \$5.5 million on a facility (<https://my.matterport.com/show/?m=w8HWGWQ9J6i>) that removes arsenic and fluoride from the water by running it through a porous material called activated alumina, which strips some of the minerals from the water. Mike Aguero, the assistant public works director for waste and wastewater, said groundwater comes into the system at 4.8 mg/L fluoride.

The activated alumina helps them get within the legal limit, but fluoride levels there are still far higher than most other communities in the U.S. The state government, Aguero said, “allows us to put out 4.0 or less.” The water delivered to local taps now registers around 3.2 mg/L.

Aguero grew up in Andrews, and he said the water tastes strange to some people, perhaps because it’s so hard. Others have health concerns. Many locals opt for bottled water. Aguero said. “People

Around 2017, Seagraves, Texas, acquired a filtration system, as part of a larger overhaul of its aging water infrastructure. The project's multimillion-dollar pricetag could have represented a large outlay for the town of 2,800, where one in seven residents live below the poverty line. The city received a \$3.3 million grant from the EPA, and also took a loan from the Texas Water Development Board.

Some seven years later, though, the filtration system is still not operational, beset with technical issues. And fluoride levels continue to top (https://dww2.tceq.texas.gov/DWW/JSP/NonTcrSampleResultsbyAnalyte.jsp?tinwsys_is_number=1857&tinwsys_st_code=TX&wsnumber=TX0830001%20%20%20, 4 mg/L, violating federal regulations.

People in Seagraves still drink the water, said Goodger: “Most of the people have the attitude of, well, we’ve been drinking this water ever since we were born, and it hasn’t killed us yet.”

SHARE THIS STORY

We use cookies to ensure that we give you the best experience on our website. If you continue to use this site we will assume that you are happy with it.

Michael Schulson is a contributing editor for Undark. His work has also been published by Aeon, NPR, Pacific Standard, Scientific American, Slate, and Wired, among other publications.