

## ENVIRONMENT

# Forever Chemicals Are Widespread in U.S. Drinking Water

Experts hope that with the incoming Biden administration, the federal government will finally regulate a class of chemicals known as PFASs

By Annie Sneed on January 22, 2021



Credit: Thomas Trutschel *Getty Images*

Many Americans fill up a glass of water from their faucet without worrying whether it might be dangerous. But the crisis of lead-tainted water in Flint, Mich., showed that safe, potable tap water is not a given in this country. Now a study from the Environmental Working Group (EWG), a nonprofit advocacy organization, reveals a widespread problem: the drinking water of a majority of Americans likely contains “forever chemicals.” These compounds may take hundreds, or even thousands, of years to break down in the environment. They can also persist in the human body, potentially causing health problems.

A handful of states have set about trying to address these contaminants, which are scientifically known as perfluoroalkyl and polyfluoroalkyl substances (PFASs). But no

federal limits have been set on the concentration of the chemicals in water, as they have for other pollutants such as benzene, uranium and arsenic. With a new presidential administration coming into office this week, experts say the federal government finally needs to remedy that oversight. “The PFAS pollution crisis is a public health emergency,” wrote Scott Faber, EWG’s senior vice president for government affairs, in a recent public statement.

Of the more than 9,000 known PFAS compounds, 600 are currently used in the U.S. in countless products, including firefighting foam, cookware, cosmetics, carpet treatments and even dental floss. Scientists call PFASs “forever chemicals” because their chemistry keeps them from breaking down under typical environmental conditions. “One of the unique features of PFAS compounds is the carbon-fluorine bond,” explains David Andrews, a senior scientist at EWG. “That bond is incredibly strong.” Ultimately this means that if PFASs enter the environment, they build up. These chemicals can linger on geologic time scales, explains Chris Higgins, a civil and environmental engineer at the Colorado School of Mines.

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Because of their widespread use, release and disposal over the decades, PFASs show up virtually everywhere: in soil, surface water, the atmosphere, the deep ocean—and even the human body. The U.S. Centers for Disease Control and Prevention’s Web site says that the agency has found PFASs in the blood of nearly everyone it has tested for them, “indicating widespread exposure to these PFAS in the U.S. population.” Scientists have found links between a number of the chemicals and many health concerns—including

kidney and testicular cancer, thyroid disease, liver damage, developmental toxicity, ulcerative colitis, high cholesterol, pregnancy-induced preeclampsia and hypertension, and immune dysfunction.

Concerned about PFASs' persistence and potential harm, Andrews and his EWG colleague Olga Naidenko set out to assess Americans' exposure to the chemicals via their drinking water. PFASs can get into this water in a variety of ways. For example, industrial sites might release the compounds into the water or air. Or they can leach from disposal sites. They can also percolate into groundwater from the firefighting foams used at airports and military bases. Andrews and Naidenko say there is a need for research into drinking-water levels because the federal government does not require testing water for PFASs. This leaves a gap in scientists' understanding of overall exposure. Andrews and Naidenko focused their analysis on two types of these chemicals —perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS)—because those compounds had the most available data. The two researchers pulled that information together from various sources, including state agencies, the federal government and the EWG's own measurements.

The scientists estimated that more than 200 million people—the majority of Americans —have tap water contaminated with a mixture of PFOA and PFOS at concentrations of one part per trillion (ppt) or higher. Andrews and Naidenko say previous research shows that levels higher than one ppt can increase the risk of conditions such as testicular cancer, delayed mammary gland development, liver tumors, high cholesterol and effects on children's immune response to vaccinations. "It's a calculation of what would be a safe exposure level," Andrews says. Even when the researchers shifted their analysis to a higher level of 10 ppt, they still found some 18 million to 80 million Americans to be exposed. Representatives of the chemical industry have disagreed with such concerns. "We believe there is no scientific basis for maximum contaminant levels lower than 70 ppt," the American Chemistry Council said in statement to *Scientific American*.

Experts not involved in the new research, which was published recently in *Environmental Science & Technology Letters*, say these findings are exactly what they had expected—and that is troubling. "This is going to be kind of sad, but I wasn't at all surprised that they exist in many different water systems and that many, many people are getting exposed through their drinking water," says Jamie DeWitt, an associate

professor of pharmacology and toxicology at East Carolina University's Brody School of Medicine. Zhanyun Wang, an environmental scientist at the Swiss Federal Institute of Technology Zurich, raises concerns about how widespread this class of chemicals is. "It's a little bit scary that it is so prevalent in the U.S., which has quite a big population," he says. "Now that we know that PFAS has a rather low safety level."

And Andrews and Naidenko's study does not even fully capture Americans' exposure to these chemicals because it only looks at two PFAS compounds and one source. "We're also being exposed to many more PFASs via the drinking water," Wang says. The paper omitted other compounds because of a lack of widespread data, "but it means [the study offers] a conservative estimate of how we are being exposed to PFASs," he adds. Higgins notes that people are also exposed to the compounds in substances besides drinking water, such as household products and food. "It's a much broader exposure question," he says. "Those other sources of exposure should not be ignored."

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Andrews and Naidenko agree that the lack of data on other PFAS contamination is a problem. Other tests of drinking water from five systems in Massachusetts showed that levels of specific PFASs researchers looked for have risen over the past few decades. When scientists tested for PFASs as a group (to include compounds for which there are not much individual data), the increase was even larger. It remains unclear whether this trend holds true across the rest of the country. "That is really [because of] an absence of data—where the regulatory bodies have not kept up with the chemical industry, which has really moved away from PFOA and PFOS into hundreds of replacement compounds that are equally persistent and likely do contaminate a significant number of water systems across the country," Andrews says. The Environmental Protection Agency says it is working on the PFAS problem. "Aggressively addressing PFAS in drinking water continues to be an active and ongoing priority for the EPA," an EPA spokesperson wrote to *Scientific American*. "The agency has taken significant steps to monitor for PFAS in drinking water and is following the process provided under the Safe Drinking Water Act to address these chemicals."

Technologies to remove PFASs from drinking water exist on both household and municipal levels. Granular activated carbon filters and reverse osmosis are two options, but they are costly and high-maintenance—and the burden falls on taxpayers. “PFASs are produced by companies, for which they receive a profit,” DeWitt says. “And then residents end up paying to clean up the pollution.” On top of that, PFAS that is removed from drinking water may simply end up elsewhere, such as in a landfill or river.

Some states have instituted or proposed limits on PFASs in drinking water, but experts say federal action is needed to tackle such a widespread problem. President Joe Biden’s administration may finally address that need. His campaign’s [environmental justice plan](#) specifically called out forever chemicals. And the plan said that the president will “tackle PFAS pollution by designating PFAS as a hazardous substance, setting enforceable limits for PFAS in the Safe Drinking Water Act, prioritizing substitutes through procurement, and accelerating toxicity studies and research on PFAS.” The new administration could carry out all of these goals unilaterally through executive action, without Congress’s cooperation. Some experts appear optimistic about this prospect. “I’m hopeful that the incoming administration will reempower the EPA so that it can actually create regulations to protect public health,” DeWitt says. “That is the agency’s charge—that is its mission.”



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