EPA issues strongest statement to date about danger of PFAS in drinking water

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EPA Administrator Michael Regan last month made one of his agency's strongest statements to date about the danger of "forever chemicals." New restrictions on those pollutants in drinking water would "prevent

thousands of deaths and prevent tens of thousands of serious PFAS-related illnesses," Regan said.

Scientists studying the health effects of the chemicals say that while they can't prove any one case of illness is tied to them, the statement isn't an exaggeration. A growing body of scientific research has confirmed early suspicions that PFAS are linked to some cancers, and added new connections between the chemicals and developmental problems.

Jamie DeWitt, an immunotoxicologist at East Carolina University, leads a lab dedicated to discovering how PFAS damage the immune system. She said the link may seem indirect, but it's valid: If increased exposure to PFAS raises the risk of chronic diseases that can lead to death, then reducing the exposure reduces that risk of death.

That's exactly how the agency calculated its avoided deaths. Regan's comments are based on EPA's economic analysis of the costs and benefits of its proposed water standards, according to a statement from Khanya Brann, EPA deputy press secretary. The rules regulate six types of PFAS, though there are thousands of chemicals in the category.

The document estimates that 7,357 deaths would be avoided from reduced bladder cancer, kidney cancer and cardiovascular disease. The calculations also include benefits from reducing disinfection byproducts in water, or the chemicals that are left over once water has been treated. EPA asserts these chemicals will also be removed with the filtering required to handle PFAS.

Sean Lynch, a spokesman for Maplewood-based 3M Co., wrote in an email that EPA's water rules "lack a sound scientific basis" and that the agency hasn't shown they're needed to protect human health or the environment. Messages to the media office for Chemours, a spin-off of DuPont that still produces fluorinated chemicals, were not returned.

Uncovering links

PFAS chemicals were pioneered by 3M in the 1950s. The company and another manufacturer, DuPont, made the oil- and water-resistant chemicals for a dizzying array of applications. Nonstick cookware coatings, waterproof clothing, dental floss and fire-extinguishing foams are just a few where they are used today.

But the carbon-fluorine bonds that enable these uses also make the chemicals persistent. They don't break down in the environment, and some PFAS linger in the body for years.

Documents released after the state of Minnesota sued the company show that 3M knew about toxicity for decades from internal studies it conducted, and DuPont decided to move women out of its production lines in the 1980s because of internal studies showing birth deformities in rats.

But public research on broader health effects has only advanced in roughly the past two decades. A small number of the chemicals have been well-studied, with the most known about the two oldest, and now discontinued, compounds—PFOS and PFOA.

There's now emerging scientific agreement that some PFAS chemicals are linked with several health problems, according to an influential 2022 report from the National Academies of Science Engineering and Medicine. It reported strong enough evidence to link PFAS exposure to developmental problems in children who are exposed before and after birth, increased cholesterol in adults and kids, kidney cancer in adults and reduced antibody response in all ages. More limited evidence suggests increased risk of testicular and breast cancers, hypertension in pregnancy and liver and thyroid issues.

EPA's proposed limit on PFAS in water systems set the standard for PFOA and PFOS almost at the limit of where machines can detect the chemicals. That's in part to protect developing fetuses that are exposed to PFAS in their mothers' bodies through the placenta, and infants, who are exposed through breastmilk.

The evidence for these effects is strong enough that the National Academies report recommends that doctors do additional screening for thyroid issues, cholesterol imbalances, kidney and testicular cancer and the bowel disease ulcerative colitis in patients with significant PFAS exposure. For the most exposed, cholesterol checks should start in children as young as 2; signs of testicular cancer and ulcerative colitis need to be assessed starting at age 15.

"They're saying, 'Hey, doctors, if you're treating patients who live in PFAS-contaminated areas, you need to do more for these patients,'" DeWitt said.

Developmental effects

Much of the energy in the scientific world to look at the effects of these chemicals was spurred by the work of the C8 Science Panel. This broad study of health links to PFAS exposure was part of a settlement with DuPont, after the company was sued for contaminating drinking water in the Ohio River Valley. (C8 is another name for the chemical PFOA, because of the molecule's 8-link chain of carbon-fluorine bonds.)

An influential study completed by Philippe Grandjean, an environmental medicine professor at Southern Denmark University, looked at the immune systems of children exposed to these chemicals.

Grandjean, who also co-leads a center devoted to studying PFAS at the University of Rhode Island, initially recruited some 656 pregnant

mothers in the Faroe Islands to study the effects of other environmental contaminants and continued to follow up with the children for years. He decided to examine PFAS too, after a study on the chemicals in lab mice was published.

They measured the amount of PFAS in the children's blood at different ages, including after typical childhood vaccinations. Grandjean said the results he ultimately published in 2012 in the *Journal of the American Medical Association* shocked him—the more PFAS in a child's blood, the fewer antibodies they would produce after a vaccine, as if their immune systems were suppressed. The same association held when researchers looked at the amount of PFAS in the cord blood of newborns.

Part of the problem for developing children, Grandjean said, is that a mother who breastfeeds for six months can transfer as much as half the PFAS in her body to the baby, where the chemicals concentrate ten times as much.

His work and several consecutive studies on the same cohort of Faroese children left Grandjean to conclude that "we are affecting the most vulnerable life stage of the next generation" with PFAS pollution that could cause still-unknown long term effects.

Other research, including some by Grandjean, has linked the chemicals to issues like low birth weight. Hypertension in pregnancy has also been linked with PFAS, including in the original C8 study.

Stopping the flow

Phil Brown, co-director of the PFAS Project Lab at Northeastern University, said his lab is now working on a study in the United States that will build on some of Grandjean's work studying children. DeWitt said she's investigating how the specific molecule PFOA affects the way

cells use energy, and effectively ages them.

DeWitt said the associations right now might not be as clear as for other environmental pollutants, like fine particles in the air, which extensive research has shown can cause heart attacks and other deadly events from even short-term exposure.

But she said that fine particulate matter, also known as soot, has been a recognized problem for over a century; scientists are still catching up with chemicals like PFAS.

"The way things work in our world, we have to generate lots and lots and lots of data about the negative effects for people to think maybe we should change what we do and move to something else," DeWitt said.