

PFAS Problems & Prevention—Q&A

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Q: What does PFAS stand for?

Since the 1940's, manufacturers have used synthetic chemicals known as **PFAS**. That stands for **per-and polyfluoroalkyl substances**. Composed of molecules containing chains of carbon covered with fluorine atoms, they form one of the strongest known chemical bonds on Planet Earth. PFAS chemicals are exceptionally durable, which makes them useful for a wide variety of products. They repel fire, water, and oil, and are designed to withstand heat, grease, water, and stains.

Q: Why are these chemicals called “toxic forever chemicals?”

All of the PFAS chemicals studied have been found to be harmful to the human body. They are environmentally persistent. Their strong chemical bonds make them extremely resistant to degradation or destruction. They can remain in the environment in water, ground water, wastewater, soil, and landfill for hundreds of years—for years and years in a human body.

Q: What is the big deal about PFAS chemicals?

PFAS chemicals are more problematic than originally believed. Current estimates are that between 9,000-12,000 are in a plethora of products used on Planet Earth. They can contaminate water supplies, including drinking water. In 2020, the environmental working group (EWG), a nonprofit organization, tested major water supplies across the country. In one study, they reportedly found PFAS in all samples except for one. They have identified 41,828 industrial and municipal sites in the U.S. that are known or suspected of using PFAS. The big deal is that PFAS chemicals are bio-accumulative—meaning they can build up in the human body with repeated exposure, often being absorbed faster than the body can eliminate them, if at all.

Q: In addition to water, what else might contain PFAS?

It's used extensively in fire-fighting foam, which then gets into waste water supply, that eventually can find its way into streams, rivers, lakes, and drinking water. PFAS coatings are used in a variety of products. These include clothing, furniture, adhesives, food packaging, heat-resistant non-stick cooking surfaces, and the insulation of electrical wire. You may absorb them in food prepared in some nonstick cookware. They are reported to be found in fast-food wrappers, pizza boxes, stain-resistant materials, pesticides, water-proof candy wrappers, microwave popcorn bags, clothing, some upholstery products, and the list goes on.

Q: What makes PFAS so chemicals harmful?

Several things. They are ubiquitous—commonly occurring—on planet Earth. They have been linked to a variety of health problems and can contribute to them even when individuals are exposed to barely detectable amounts of PFAS. Studies have shown PFAS can lead to a

higher risk for kidney cancer, testicular cancer, increased cholesterol levels, damage to the liver due to changes in liver enzymes, changes in the onset of puberty, increased risk of high blood pressure or pre-eclampsia in pregnant women, small decreases in infant birth weights, decreased vaccine response in children, and damage to the immune system. It appears possible to absorb some compounds through the skin.

Q: As a nurse epidemiologist, how do you understand the immune system connection?

Actually, the impact on the body's immune system and the brain's immune system of lymphatic vessels— just discovered in 2016—is of major concern. Animal models and human studies in 2021 reported that these toxic forever chemicals, delivered through water, food, air, and other products, can alter immune system functions, potentially diminishing their ability to fight disease. PFAS can prevent the body from producing the desired levels of antibodies in response to a vaccine. With COVID-19 and its variants, this is not a welcome discovery. A new American Heart Association study found that middle-aged women in particular with high blood concentrations of PFAS are 70% more likely to develop high blood pressure than their peers who had lower levels of the chemicals. Post menopausal women already have a drop in estrogen that impacts their immune system response, triggering a proinflammatory state, which increases their risk for atherosclerosis and stroke. Add PFAS to that and it becomes even more concerning.

Q: If PFAS are in our water supply what is being done about them?

In June of 2022, the United States Environmental Protection Agency (EPA) issued a warning against what they called 'toxic forever chemicals' in drinking water. The EWG reported finding PFAS contamination in drinking water systems across all 50 states and two U.S. territories, Guam and Puerto Rico. The EPA is making available \$1 billion dollars in grant funding to help communities that are on the frontlines of PFAS contamination. First on the list is to reduce PFAS in drinking water in communities facing disproportionate impacts. Strategies to clean up drinking water reportedly include technical assistance, water quality testing, contractor training, and installation of centralized treatment technologies and systems.

Q: How do we prevent ingesting PFAS?

Since PFAS chemicals are ubiquitous, it is impossible to prevent all exposure. However, you can avoid whatever is possible to avoid and better manage what you cannot control. Personally, I drink the cleanest purified water available to me, use clean filtered water for cooking, and carry water with me glass or stainless-steel containers. I avoid drinking tap water or water bottled in plastic. I read labels and use a small magnifying glass for ridiculously small print. I read the composition of cookware and the labels on shampoo and make up. I shop carefully and avoid products wrapped in aluminum. I look for companies that state their products are free from specific types of PFAS.

Q: What about plastic products that store food and water?

According to an announcement made in 2021 by the Environmental Defense Fund (EDF), "... Fluorinated high-density polyethylene (HDPE) containers used for pesticide storage contained a mix of short and long-chain per- and polyfluorinated alkyl substances (PFAS),

including PFOA, that leached into the product.” This likely contributed to the recommendation to wear a mask when using the product and avoid getting it on your skin. The EDF also indicated that “To provide context, consider a one-liter bottle of fluorinated HDPE where only 1% of the PFAS made from the fluorination process was PFOA (a type of PFAS). An adult consuming one liter of beverage each day would be exposed to more than 300 times the Minimal Risk Level[3] that FDA, EPA, and Centers for Disease Control and Prevention or CDC have established for intermediate-duration exposures.” Reportedly, this is an area of EDF investigation.

Q: Exposure can include more than ingesting PFAS, right?

Definitely. Exposure can occur by breathing the chemicals in from the air if a person works with or around PFAS (e.g., manufacturing chemicals or using fire-fighting foam), or by using products that contain PFAS. They can be absorbed through the skin from treated clothing, furniture upholstery, and skin products including sunscreens, eye makeup, nail polish, treated dental floss, shampoo, and many others. A recent peer-reviewed study found elevated levels of organic fluorine, an indicator of PFAS, in more than half of 231 makeup and personal care samples. You may have heard that the cosmetic maker CoverGirl was recently hit with a lawsuit that alleged PFAS were found in makeup products the company labels as “sustainable.”

Q: Can PFAS be removed from drinking water?

Reportedly, the EPA is investigating machines that can remove PFAS from drinking water supplies. Some machines are reported able to remove 99%. This is important. A 2021 study led by Johns Hopkins researchers found 39 out of 100 bottled waters tested contained PFAS. Personally, I choose to avoid drinking tap water if at all possible. I carry a supply of Hydrogen-Rich-Water with me in my car in stainless steel containers. I drink HRW exclusively at home and carry a supply in my car in stainless steel containers. I

Q: Are machines available for consumers and, if so, do you use one?

Yes, water purification machines are available. My understanding is that the EPA, CDC, and Environmental Science have made recommendations for removing PFAS from drinking water. My 501(c)(3) nonprofit corporation prohibits me from endorsing specific products. However, I can tell you what I use. According to the manufacturer (KYK) of the ION Thrive machines, they meet or exceed the recommendations made by all three of three organizations for removing PFAS from drinking and cooking water. There may be others. The more I learn about PFAS, and other chemical or undesirable substances often found in tap water, the happier I am to use an ION Thrive machine.

Q: You cannot prevent everything, so what to do?

Although it is impossible to prevent all exposure to every harmful person, place, thing, or illness on Planet Earth, you can avoid some of them altogether and minimize exposure to others. The inoculum level is a term used in epidemiology referring to the amount of something to which you are exposed. The higher the inoculum level of a virus, bacteria, or

parasite, the higher your risk of becoming ill. The higher your level of exposure to PFAS the higher your risk of experiencing negative consequences. This is no time for anxiety, worry, and fear, however. Every strategy you embrace helps reduce the inoculum level of PFAS. Cumulatively, that all adds up toward prevention.
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