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What Are PFAS Chemicals and Why Are They Dangerous?

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PFAS (pronounced P-Fas) is the short name for a class of human-made chemicals known as per- and polyfluoroalkyl substances. PFAS chemicals are often called “forever chemicals” because they do not easily degrade in the environment or in the body, so they accumulate in both over time.[1] There are over 9,000 types of PFAS chemicals. [2] This article will explain where PFAS chemicals are found, why they are harmful, and how you can reduce your exposure to them.

How Do People Get Exposed to PFAS?

PFAS chemicals are used to make products stain- and grease-resistant, so they are found in many products in your home, such as clothes, carpeting, upholstery, food packaging, non-stick cookware [1,2]. They are also found in many cosmetics, as well as fire-fighting foam, and in any factories that makes these products or uses the chemicals.[1] The chemicals travel easily in water and do not easily break down, so they can enter the water supply and soil around these factories or anywhere that the factories dump the chemicals. A 2016 study found that the drinking water of over 6 million Americans contains PFAS at higher levels than the EPA recommends is safe and in 2023 an environmental study found that 30% of U.S. tap water contains PFAS.[3,4] To see an interactive map developed by the Environmental Working Group that shows areas of the United States known to have PFAS contamination in public or private water systems, click [here](#).

Another source of PFAS exposure is through fish or animals that have the chemicals in their bodies. For example, if a person eats fish from water with high PFAS concentrations, the PFAS can enter that person’s body. For that reason, some lakes have banned or limited fishing due to high levels of PFAS found in the fish.[5]

People can also become exposed to PFAS from their home gardens. A study examining nine brands of fertilizer that are marketed as “eco” or “natural” fertilizers found that eight of them had levels of PFAS chemicals that were higher than the levels that are recognized as safe by the state of Maine.[6] Contaminated wastewater from factories that use PFAS chemicals can enter water treatment plants, contaminating the sewage sludge which may be used to make fertilizer – which in turn contains PFAS. Research has also found that PFAS chemicals can be passed from the blood of one person to another person in a blood donation or transfusion.[7] A 2021 study of 50 breastfeeding first-time mothers in Seattle found that PFAS chemicals were found in 100% of breast milk samples.[2]

What Are the Health Effects of PFAS Exposure?

Researchers have studied the people who have a higher exposure to PFAS chemicals due to their exposure at work as well as the people living near those factories. When they compared the health of people with high PFAS exposure to people who have an average level of exposure, they found that the people with higher PFAS exposure are more likely to develop testicular cancer, kidney cancer, liver disease, heart disease, and developmental delays.[1,8] Pregnant women who were exposed to more PFAS had an increased likelihood of preeclampsia during pregnancy and of having babies with a low birth weight.[1] Children whose mothers were exposed to higher levels of PFAS while pregnant had poorer health outcomes through age 10, including increased rates of infection.[8] Research has also suggested that vaccines could be less effective for the people exposed to higher levels of PFAS, because they have a weaker immune response to vaccines.[1,8]

It would be unethical to conduct clinical trials of PFAS exposure on humans, but research has found that animals exposed to PFAS were more likely to develop liver toxicity, and their offspring were more likely to have developmental problems, such as less developed lungs.[1] More research is needed to further understand the impact of PFAS exposure on human health.

How to Reduce Exposure to PFAS

PFAS are in so many products in the U.S. and most other countries that it is impossible to entirely avoid PFAS exposure. However, there are steps that a person can take to reduce their exposure.

Commercial Products to Avoid

Wall-to-wall carpeting is usually stain-proof, and therefore is a major source of PFAS.

When possible, try to reduce the use of non-stick cookware that are made with PFAS, which unfortunately includes most cookware with non-stick coatings. The rare exception are some pans made with ceramic non-stick coating. [9] Many pans that claim to be “green” (some of which look like a natural stone surface) or that claim to be free of PFAS chemicals have been found to contain other dangerous chemicals, such as PFOA, BPA, or PTFE. Scientists at the Ecology Center also caution against using non-stick cookware coated in silicone enamel, since there is not enough information to know enough about its long-term safety. Instead, they recommend using uncoated cookware, such as stainless steel or cast iron. They also note that non-coated pans are generally more durable and will last longer.

Products that contain grease- and stain-proof coatings are also potential sources of PFAS. Stain-resistant clothes as well as grease-proof food packaging, such as the wrappers at fast food restaurants or microwave popcorn bags, often contain PFAS chemicals. The best way to avoid those exposures is to buy clothes that are not stain-resistant, prepare your own foods as much as possible, and look for restaurant chains and grocery stores that have made commitments to reducing and removing PFAS from their food packaging. You can learn more about which brands have made those commitments on [this](#) website.

Also, try to avoid products such as cosmetics that have “fluorine” or “fluoro” on the label, because that can mean they contain PFAS. [This](#) website provides a database of PFAS-free personal care products. However, it is not a complete list, and there are other products free from these chemicals that are not on the list.

Keep in mind that when you avoid products made with PFAS, you reduce your own exposure and you also reduce the amount of PFAS in factories and nearby communities.

Water Filtration Systems

A person interested in lowering the levels of PFAS in their drinking water can purchase a water filtration system that will help remove some of the PFAS from their home's water. Some water filtration systems are called "point-of-use" systems, since they filter the water that is about to be used at a single fixture in the home, such as an under-the-sink filter that filters the water before it comes out of the sink. Other systems are called "point-of-entry," since they filter the water as it enters the home's main water supply, filtering before it is sent to the individual fixtures in the home. A 2020 study looked at various types of both point-of-use and point-of-entry systems, evaluating which were most effective at removing PFAS from water.[10] All types of under-the-sink dual-stage and reverse osmosis filters tested were found to be effective, removing over 90% of the PFAS chemicals measured from water. Another type of system, called activated carbon filters, removed 60-70% of some types of PFAS, but only 40% of other types. Point-of-entry filters had varying levels of effectiveness; half of the systems that were tested significantly reduced the levels of PFAS, while some systems may have actually increased the levels of PFAS in the home's water.

Although some filters (such as under-the-sink dual-stage and reverse osmosis filter systems) can notably reduce the levels of PFAS in a home's drinking water, unfortunately the filters can be expensive, costing from \$100 to \$500, plus the cost of replacement filters.

The Bottom Line

PFAS are a class of chemicals known to harm human health and people with greater exposure to PFAS are more likely to develop several very serious medical problems. They are found in fabrics, carpeting and other products that contain stain- and grease-proof coatings, as well as in the drinking water of many Americans. Although PFAS cannot be entirely avoided, there are steps a person can take in order to reduce their exposure to these chemicals.

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