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Perfluoroalkyl and Polyfluoroalkyl Substances: The 'Forever' Chemicals

What are perfluoroalkyl and polyfluoroalkyl substances?

Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a large group of human-made chemicals that have been used worldwide in consumer products and in some industrial applications, including in the United States. PFAS chemistry was discovered in the late 1930s.

Since the 1950s, many products commonly used by consumers and industry have been manufactured with or from PFAS. PFAS are used to make products that resist heat, oil, stains, grease and water. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) were the two most commonly produced and most studied of the group.

PFOA and PFOS are no longer manufactured in the U.S. However, one common characteristic of concern of PFAS is that many break down very slowly and can build up in people, animals and the environment over time.

Chemicals in the PFAS class:

- Do not occur naturally yet are widespread in the environment because of their broad uses;
- Are found in people, wildlife and fish worldwide;
- Are stable and do not break down easily in the environment (they are persistent); and
- Can build up in biological tissues over time (people, wildlife, fish) if exposure continues; they bioaccumulate.

How can I be exposed to PFAS?

Although some PFAS have been manufactured since the 1950s, PFAS were not widely documented in environmental samples until the early 2000s, because PFAS testing was not widely available until that time. Since the 2000s, methods have been, and continue to be, developed with lower detection limits in water that are commensurate with levels of potential human health effects.

Common products where PFAS was used and may still be used in their production include some:

- Nonstick cookware;
- Food packaging (e.g., microwave popcorn bags, fast-food wrappers, sliced cheese wrappers, pizza boxes);
- Stain-resistant carpets and fabrics and water-resistant clothing;
- Paints, varnishes and sealants;
- Cosmetics;
- Dental floss; and
- Firefighting foams.

Ingestion (swallowing) of food or water containing PFAS is the exposure route of primary concern. Exposure to PFAS by contact with products using PFAS compounds through dermal absorption (by touching and passing through the skin) and inhalation during showering/bathing are lesser human health concerns at this time.

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People are most likely exposed to PFOA by drinking contaminated water sources, and possibly by using products that contain PFOA. Workers in the perfluorochemical industry can be exposed to greater amounts of PFOA than people in the general population. Because PFAS are human-made, they can be found near areas where they are manufactured; in some industrial applications (e.g., electroplating, textiles, pulp and paper); and/or, in some manufactured products. Although PFOA and PFOS are no longer manufactured in the U.S., some consumer and industrial products still contain PFAS.

Are PFAS harmful?

The human health effects from exposure to low environmental levels of PFOA are unknown. PFOA can remain in the body for long periods of time. In laboratory animals given large amounts, PFOA affected growth and development, reproduction, and injured the liver. Studies have shown that exposure to some PFAS may affect developmental stages (growth, learning, behavior) of infants and older children; lower a person's chance of getting pregnant; disrupt the body's hormones; increase cholesterol; and increase cancer risk (for PFOA). More research is needed to assess the human health effects of exposure to PFOA.

In the [Fourth National Report on Human Exposure to Environmental Chemicals](#), scientists at the Centers for Disease Control and Prevention measured PFOA in the serum (a clear part of blood) of 2,094 participants age 12 and older who took part in the National Health and Nutrition Examination Survey during 2003–04. Serum PFOA levels generally reflect exposure that has occurred over several years. By measuring PFOA in serum, scientists can estimate the amount of PFOA that has entered people's bodies.

CDC scientists found PFOA in the serum of nearly all the people tested, indicating that PFOA exposure is widespread in the U.S. population.

Finding measurable amounts of PFOA in serum does not imply that the levels of PFOA cause an adverse health effect. Biomonitoring studies on levels of PFOA provide physicians and public health officials with reference values so that they can determine whether people have been exposed to higher levels of PFOA than are found in the general population. Biomonitoring data can also help scientists plan and conduct research on exposure and health effects.

What is a lifetime health advisory?

The U.S. Environmental Protection Agency (EPA) issued a drinking water lifetime health Advisory for PFOA and PFOS in 2016. A lifetime health advisory (LHA) is just that: an advisory. It is not an enforceable regulatory standard as is a primary drinking water standard (also called a maximum contaminant level, or MCL) under the Safe Drinking Water Act. The LHA for PFOA and PFOS is 70 parts per trillion (ppt), individually or combined. This LHA is protective of most typical water users, including people who are pregnant and nursing, young children and the elderly. Currently, EPA is working on a formal regulatory determination to conclude whether it will develop an enforceable MCL for PFOA, PFOS or any other PFAS.

How do PFAS get into drinking water?

Exposure to PFAS by way of drinking water occurs if the source water supply has been contaminated by a PFAS source such as a PFAS manufacturer, some types of wastewater treatment facilities, landfills or firefighter training facilities.

How can I reduce my exposure to PFAS?

Because PFAS are present in so many different consumer products and throughout our environment, one cannot reasonably expect to prevent PFAS exposure altogether. However, some steps can be taken to reduce your exposure.

- If your drinking water contains PFOA or PFOS greater than the EPA LHA of 70 ppt, either individually or combined, consider using an alternative or treated water source for any activity in which you might swallow water. These activities include drinking, food preparation, brushing teeth or preparing infant formula.

- Water with a PFAS level greater than the LHA is safe for bathing, showering or washing clothes and cleaning.
- Activated carbon filtration or reverse osmosis membranes are effective in reducing PFOS and PFAS in water supplies.
- Read consumer product labels and avoid using those with PFAS.

Where can I find more information?

- U.S. Environmental Protection Agency: Basic Information about PFAS: <https://www.epa.gov/pfas>
- Contact the AFT health and safety team at 4healthandsafety@aft.org [May 2022]