United States Environmental Protection Agency

Basic Information about Per- and Polyfluoroalkyl Substances (PFASs)

Includes Information on Perfluorooctanoic Acid (PFOA), Perfluorooctyl Sulfonate (PFOS), and All Other PFASs, and on PFCs

**One Group of Chemicals,
Many Names**

Different types of scientists may refer to the same class of chemicals by different names. This is often the case for PFASs. You may see some commonly used terms for PFASs and subgroups of chemicals within PFASs, including:

- Per- and polyfluoroalkyl substances (PFASs)
- Perfluorinated chemicals
- Perfluorochemicals
- Perfluoroalkyls
- Perfluorinated alkyl acids
- Long-chain perfluorinated chemicals (LCPFCs)
- Polyfluorinated chemicals
- Polyfluorinated compounds

Two key PFAS chemicals are **PFOS**, or perfluorooctyl sulfonate, and **PFOA**, or perfluorooctanoic acid. In the past, PFOA has sometimes been referred to as C8 (because it has eight carbon atoms).

Related information: What are PFCs and How Do They Relate to PFASs?

Basic Information

On this tab:

On related pages:

- Per- and polyfluoroalkyl substances (PFASs): What EPA is doing
- What are PFCs and how do they relate to PFASs?

What are perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS) and other perfluoroalkyl substances (PFASs)?

Per- and polyfluoroalkyl substances (together, PFASs) are a class of man-made chemicals. They are not found naturally in the environment. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body.

Molecules in all PFASs chemicals contain carbon and fluorine atoms; some PFASs also include oxygen, hydrogen, sulfur and/or nitrogen atoms. One characteristic that differentiates molecules of one PFASs from those of another is the *chain length*, or the number of carbon atoms, in the molecule. For example, PFOA has eight carbon atoms, which is why it is sometimes referred to as C8.

Scientists sometimes study PFASs as a group because of potential similarities in their chemical properties and their toxicity. Some studies compare one PFAS chemical to another to understand the relationship between the chemical's chain length and its toxicity. Scientists are also investigating:

- how the toxicity of one PFAS is similar or different to the toxicity of other PFASs, and
- toxicologically, what all PFASs have in common.

Related: What are PFCs and How Do They Relate to PFASs?

What are PFASs used for?

PFASs have been widely used to make products more stain-resistant, waterproof and/or nonstick. For example, PFASs have been used in the manufacture of products that:

- keep food from sticking to cookware,
- make upholstered furniture, carpets and clothing resistant to soil, stains and water,
- make shoes, clothes and mattresses more waterproof,
- keep food packaging from sticking to food, and
- help fight fires at airfields and other places where petroleum-product-based fires are a risk.

Because they help reduce friction, they are also used by a variety of industries such as aerospace, automotive, construction, and electronics factories or businesses.

Where are PFASs made?

- Certain PFAS chemicals, including PFOA and PFOS, are no longer manufactured in the United States as a result of voluntary phaseouts and the PFOA Stewardship Program, with a few exceptions for limited industrial uses. As part of the Stewardship Program, eight major chemical manufacturers committed to eliminate by 2015:
    - the use of PFOA and PFOA-related chemicals in their products, and
    - PFOA and PFOA-related chemical emissions from their facilities.

  All eight companies have indicated that they have met the PFOA Stewardship Program goals. Learn more about the PFOA stewardship program.
- Although PFOA and PFOS are no longer manufactured in the U.S., they are still produced in other locations around the globe, and they may continue to be imported into the United States in consumer goods such as carpets, leather and apparel, textiles, paper and packaging, coatings, and rubber and plastics.

How widespread are these chemicals in the environment?

PFOA, PFOS and other PFASs are widespread around the globe, primarily due to their current and/or historical manufacturing, processing and use here in the U.S. and internationally. They are widespread in part because they are *persistent* in the environment – that is, they do not break down when exposed to air, water or sunlight. As a result, people may become exposed to PFASs manufactured months or years in the past.

Due to their persistence, PFASs can travel long distances through the air; monitoring in the Arctic has shown levels of PFASs in air, water, and living things. As a result, people may become exposed to low levels of PFASs manufactured or emitted from production facilities thousands of miles away.

Because these chemicals have been used in an array of consumer products, most people have been exposed to low levels of them. Studies have found PFOS and PFOA in blood samples of humans and wildlife nationwide. Using data from CDC's 2003–2004 National Health and Nutrition Examination Survey (NHANES), scientists detected PFASs in over 98% of the thousands of blood samples collected during the survey. In more recent years, blood sampling data indicate that exposures are declining in the U.S. population, most likely due to the decline in U.S. manufacturing resulting from the PFOA Stewardship Program.

<