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## Basic Information on PFAS

### What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a group man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940's. 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 – meaning they don't break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects.

PFAS can be found in:

- **Food** packaged in PFAS-containing materials, processed with equipment that used PFAS, or grown in PFAS-contaminated soil or water.
- **Commercial household products**, including stain- and water-repellent fabrics, nonstick products (e.g., Teflon), polishes, waxes, paints, cleaning products, and fire-fighting foams (a major source of groundwater contamination at airports and military bases where firefighting training occurs).
- **Workplace**, including production facilities or industries (e.g., chrome plating, electronics manufacturing or oil recovery) that use PFAS.
- **Drinking water**, typically localized and associated with a specific facility (e.g., manufacturer, landfill, wastewater treatment, firefighter training facility).
- **Living organisms**, including fish, animals and humans, where PFAS have the ability to build up and persist over time.

Certain PFAS chemicals are no longer manufactured in the United States as a result of phase outs and the [PFOA Stewardship Program](#) in which eight major chemical manufacturers agreed to eliminate the use of PFOA and PFOA-related chemicals in their products and as emissions from their facilities. Although PFOA and PFOS are no longer manufactured in the United States, they are still produced internationally and can be imported into the United States in consumer goods such as carpet, leather and apparel, textiles, paper and packaging, coatings, rubber and plastics.

### Why are PFAS important?

PFAS are found in a wide range of consumer products that people use daily such as cookware, pizza boxes, stain repellants, firefighting foam. Most people have been exposed to PFAS. They can accumulate and stay in the human body for long

periods of time. There is evidence that exposure to PFAS can lead to adverse health outcomes in humans. The most-studied PFAS chemicals are PFOA and PFOS. Studies indicate that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemicals have caused tumors in animals. The most consistent findings are increased cholesterol levels among exposed populations, with more limited findings related to:

- low infant birth weights,
- effects on the immune system,
- cancer (for PFOA), and
- thyroid hormone disruption (for PFOS).

## What is the difference between PFOA, PFOS and GenX and other replacement PFAS?

PFOA and PFOS are made up of “chains” of eight carbon atoms that are attached to fluorine and other atoms. Replacement chemicals, like GenX, tend to have fewer carbon atoms in the chain, but have many similar physical and chemical properties as their predecessors (e.g. they both repel oil and water). Industries in the United States have phased out production of PFOA and PFOS because of concerns about health risks to humans and have been using replacement PFAS, such as GenX. There is a substantial body of knowledge for managing risk from PFOS and PFOA, but much less knowledge about the replacement PFAS.

## How are people exposed to PFAS?

There are a variety of ways that people can be exposed to these chemicals and at different levels of exposure. For example, people can be exposed to low levels of PFAS through *food*, which can become contaminated through:

- Contaminated soil and water used to grow the food,
- Food packaging containing PFAS, and
- Equipment that used PFAS during food processing.

People can also be exposed to PFAS chemicals if they are released during normal *use, biodegradation, or disposal of consumer products* that contain PFAS. People may be exposed to PFAS used in commercially-treated products to make them stain- and water-repellent or nonstick. These goods include carpets, leather and apparel, textiles, paper and packaging materials, and non-stick cookware.

People who *work* at PFAS production facilities, or facilities that manufacture goods made with PFAS, may be exposed in certain occupational settings or through contaminated air.

*Drinking water* can be a source of exposure in communities where these chemicals have contaminated water supplies. Such contamination is typically localized and associated with a specific facility, for example,

- an industrial facility where PFAS were produced or used to manufacture other products, or

- an oil refinery, airfield or other location at which they were used for firefighting.

PFOA, PFOS, and GenX have been found in a number of drinking water systems due to localized contamination. You can view more information about exposures to PFAS through drinking water on our [Drinking Water Health Advisories for PFOA and PFOS page](#).

## Are there health effects from PFAS?

There is evidence that exposure to PFAS can lead to adverse health outcomes in humans. If humans, or animals, ingest PFAS (by eating or drinking food or water than contain PFAS), the PFAS are absorbed, and can accumulate in the body. PFAS stay in the human body for long periods of time. As a result, as people get exposed to PFAS from different sources over time, the level of PFAS in their bodies may increase to the point where they suffer from adverse health effects.

Studies indicate that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemicals have caused tumors in animal studies. The most consistent findings from human epidemiology studies are increased cholesterol levels among exposed populations, with more limited findings related to:

- infant birth weights,
- effects on the immune system,
- cancer (for PFOA), and
- thyroid hormone disruption (for PFOS).

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