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PFAS Pose a Serious Threat to Human Health

Unique and durable structure of these "forever chemicals" causes long-lasting harm

Overview

Per- and polyfluoroalkyl substances (PFAS) are a large group of synthetic chemicals that were created in the mid-20th century and quickly became popular for their water-, grease-, and stain-resistant properties.

A growing body of research has linked certain PFAS to various health issues, including reduced fertility; immune system suppression; some cancers; and metabolic changes, including altered cholesterol and liver enzyme levels and increased potential for insulin resistance.[1] Studies also show that PFAS transfer from mother to fetus, sometimes with multigenerational impacts, and that PFAS can build up in people's bodies faster than they can be removed.[2]

Further, PFAS are very mobile—moving easily through the environment and frequently detected far from where they were first introduced—and last a long time because their chemical structure makes them highly resistant to breaking down, earning them the moniker, "forever chemicals."

Although government and industry largely phased out two of the most well-studied PFAS—perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS)—thousands of others remain in use in everyday products and industrial applications, such as nonstick pans, water- and stain-resistant textiles, firefighting foam, and building materials. Most of these have not been individually studied for health effects—and chemical manufacturers continue to introduce new PFAS.[3]

How people are exposed to PFAS

PFAS are often released into the air, water, and soil when they or products containing them are made, used, or discarded. People are then exposed to PFAS by eating or drinking contaminated food and water; through skin contact, such as touching PFAS-treated products; and by breathing in contaminated dust or air.

As a result, PFAS are commonly found in human blood and urine, as well as breast milk, semen, and umbilical cord blood. Virtually all Americans—at least 99%—have detectable levels of PFAS in their blood.[4]

Certain populations—including firefighters; people who work in PFAS manufacturing facilities; and people who live, work, or play near or downstream of military bases, airports, and industrial sites—are at heightened risk of exposure and potential harm.

PFAS act as endocrine disruptors

One way that some PFAS harm human health is by interfering with the endocrine system—a complex network of glands and organs that make and release hormones that are essential for biological functions including growth, development, metabolism, mood, sleep, and reproduction. (See Figure 1.) PFAS are just one class of chemicals that behave in this manner, known collectively as endocrine-disrupting chemicals (EDCs).

Some notable features of PFAS and other EDCs

- **Low-dose toxicity.** Substantial evidence suggests that even relatively low PFAS exposures can be harmful—including some concentrations measured in parts per trillion (ppt), where 1 ppt is equivalent to a single drop of water spread across 20 Olympic-sized swimming pools.[5]
- **Time delay.** Negative health impacts linked to PFAS can emerge long after exposure and affect not only the people exposed directly but also their children and even later generations.[6]
- **Cumulative effects.** Because of the large number and ubiquity of PFAS, people are commonly exposed to multiple PFAS, which can compound the health risks.[7]

Looking forward

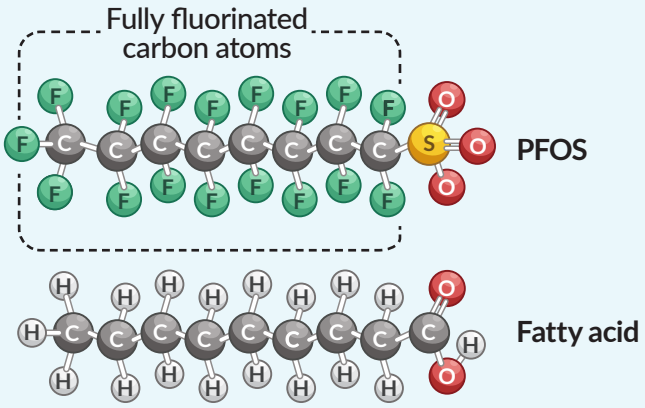
Community members, scientists, industry, and public health advocates are contributing to monitoring programs, pollution restrictions, and other federal and state government efforts to limit PFAS' manufacture, import, use, and disposal. Government and industry can help further protect public health by reducing exposures, improving transparency, and supporting the development of safer alternatives.

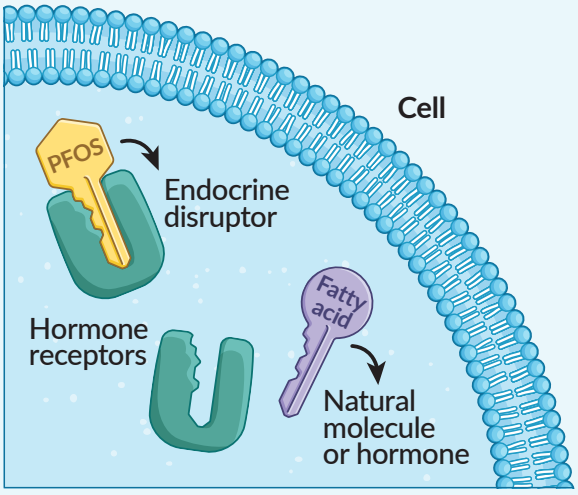
Figure 1

How PFAS Harm Human Health

They fool the body by appearing as or disturbing natural hormones

PFAS are long-lasting because of their distinct chemical structure, which is characterized by at least one carbon (C) atom that is "fully fluorinated," that is, has the maximum number of fluorine (F) atoms attached. Carbon and fluorine form one of the strongest chemical bonds, preventing PFAS from readily breaking down.





PFAS and other EDCs can mimic, block, or otherwise interfere with the body's natural hormone signals. For example, by imitating the molecular structure of naturally occurring fatty acids, PFOS and certain other PFAS are associated with metabolic disorders, such as elevated cholesterol, increased insulin resistance, and liver injury.

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Endnotes

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Pew's safer chemicals project

Pew is seeking to measurably reduce Americans' exposure to EDCs by supporting impactful scientific research, partnering with nonprofit organizations and companies to increase transparency on EDC use, support a shift to safer chemicals and products, and identify policies and practices that help to protect people from the health harms that EDCs cause.

For more information, please visit: pew.org/safer-chemicals

The Pew Charitable Trusts

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