

This fact sheet answers the most frequently asked health questions (FAQs) about perfluoroalkyls. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure can occur from ingesting contaminated food or drinking water or breathing contaminated air. Treated carpets can be an important source of exposure for children. Studies in humans suggest an association between increases in blood cholesterol and higher PFOA or PFOS blood levels. High blood levels of PFOA and PFOS may also be associated with increased uric acid levels and liver damage

What are perfluoroalkyls?

Perfluoroalkyls are a family of human-made chemicals that do not occur naturally in the environment. The two perfluoroalkyls which were made in the largest amounts in the U.S. are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS).

Perfluoroalkyls have been used in surface protection products such as carpet and clothing treatments and coating for paper and cardboard packaging. They have also been used in fire-fighting foams. Companies have stopped production or have begun changing manufacturing practices to reduce releases and the amounts of these chemicals in their products.

What happens to perfluoroalkyls when they enter the environment?

- Perfluoroalkyls can be found in air, soil, and water after release from the manufacture, use, and disposal of products that contain these chemicals, and during the manufacturing process. They may also be formed in the environment when other related chemicals break down.
- They break down very slowly in air, but fall to the ground within days to weeks.
- They do not break down in water or soil and may be carried over great distances.

How might I be exposed to perfluoroalkyls?

- Exposure to perfluoroalkyls is widespread. PFOA, PFOS, perfluorononanoic acid (PFNA), and perfluorohexane sulfonic acid (PFHxS) have been detected in 95-100% of samples of people's blood in 1999-2000 and 2003-2004. More recent monitoring data still show widespread exposure; however, the levels of these substances in people's blood appear to be declining.

- You may be exposed to perfluoroalkyls from the air, indoor dust, food, water, and various consumer products. Food is expected to be the most important source of exposure to perfluoroalkyls such as PFOA and PFOS. Human breastmilk may contribute to the exposure of infants since perfluoroalkyls have been detected in breast milk.
- Carpets treated with perfluoroalkyls can be an important source of exposure for children.
- Workers in facilities that make or use perfluoroalkyls can be exposed to higher amounts and have increased levels of these chemicals in their blood. Some communities near facilities where PFOA and PFOS were previously manufactured were exposed to high levels of these substances in drinking water.

How can perfluoroalkyls affect my health?

A large number of human studies have examined possible relationships between levels of perfluoroalkyls in blood and adverse health effects. It is difficult to interpret these results because they are not consistent; some studies have found an effect and others have not found the same effect. Even though some studies have found associations between serum perfluoroalkyl levels and adverse health effects, it does not mean that perfluoroalkyls caused these effects; they may be due to other factors not considered by researchers. The available human studies suggest that increases in blood cholesterol levels are associated with higher PFOA or PFOS blood levels. There is also some indication that serum PFOA or PFOS may be associated with increased uric acid levels, which may be associated with an increased risk of high blood pressure. PFOA or PFOS exposure may also cause liver damage.

Humans and animals react differently to PFOA and PFOS and not all effects observed in rats and mice may occur in humans. The liver appears to be the most sensitive target in animals ingesting perfluoroalkyls. Studies in mice found that the immune system is a sensitive target of PFOA and PFOS.

Perfluoroalkyls

How likely are perfluoroalkyls to cause cancer?

There is no conclusive evidence that perfluoroalkyls cause cancer in humans. Some increases in prostate, kidney, and testicular cancers have been seen in individuals exposed to high levels. These results should be interpreted cautiously because the effects were not consistently found and most studies did not control for other potential factors such as smoking.

Rats that ingested PFOA and PFOS for a long time developed tumors. However, some scientists believe that based on the way this happens in rats and the differences between rats and humans, humans should not be expected to get cancer. Others believe that it is possible for perfluoroalkyls to cause cancer in humans.

The International Agency for Research on Cancer and the Department of Health and Human Services have not yet evaluated the carcinogenicity of perfluoroalkyls. The EPA has begun an evaluation.

How can perfluoroalkyls affect children?

No associations between serum PFOA and birth defects were observed in children of mothers living in an area with high PFOA in the water. Some studies of the general population and people living near a PFOA manufacturing facility have found that higher levels of serum PFOA or PFOS are associated with lower infant birth weights. However, the decrease in birth weight is small and may not affect the infant's health. A study of children exposed to high levels of PFOA in drinking water found increases in blood cholesterol, which is similar to the findings in adults.

Birth defects, delayed development, and early deaths have been observed in mouse and rat pups exposed to PFOA or PFOS, but not in animals exposed to perfluorobutyric acid (PFBA) or PFHxS. Scientists believe that some of the effects observed in rats and mice exposed to PFOA or PFOS may not be relevant to humans.

How can families reduce the risk of exposure to perfluoroalkyls?

- Families may choose to use consumer products that do not contain perfluoroalkyls.
- Families whose tap or well water that contains perfluoroalkyls may choose to drink or cook with bottled water or to install activated carbon water filters.

Is there a medical test to show whether I've been exposed to perfluoroalkyls?

Perfluoroalkyls can be measured in blood, but this is not a routine test that can be performed in a doctor's office. Mean serum concentrations of 3.07 and 9.32 µg/L of PFOA and PFOS, respectively, were measured in blood samples from members of the U.S. general population in 2009-2010.

Members of a community whose drinking water was contaminated with PFOA from a nearby industrial facility had a mean serum PFOA concentration of 83.6 µg/L in 2005. Fluorochemical product workers had mean serum PFOA and PFOS levels of 1,760 and 1,320 µg/L, respectively.

The presence of perfluoroalkyls in your blood may indicate that you have been exposed to and absorbed these chemicals into your body. However, it does not necessarily mean that you will suffer adverse health effects.

Has the federal government made recommendations to protect human health?

The EPA has established a provisional drinking water advisory for PFOA and PFOS of 0.4 and 0.2 µg/L, respectively.

References

This ToxFAQs™ information is taken from the 2015 Toxicological Profile for Perfluoroalkyls (Draft for Public Comment) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ on the web: www.atsdr.cdc.gov/toxFAQs.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.