ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

PERFLUOROALKYLS

Division of Toxicology and Environmental Medicine ToxFAQs™ May 2009

This fact sheet answers the most frequently asked health questions (FAQs) about perfluoroalkyls. For more information, call the ATSDR 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 is important you understand this information because these substances 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. Workers exposed to perfluoroalkyls have not shown significant adverse health effects. Little research has been done on the general population to determine whether these chemicals may cause adverse health effects. A few studies of pregnant women found higher levels in maternal blood to be associated with slightly lower weight of the babies.

What are perfluoroalkyls?

Perfluoroalkyls are stable, synthetic chemicals. Perfluoroalkyls are unique because they repel oil, grease, and water. The two perfluoroalkyls made in the largest amounts in the U.S. are perflurooctanoic 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.

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.
❏ Perfluoroalkyls break down very slowly in air, but fall to the ground within days to weeks.
❏ Perfluoroalkyls do not break down in water and may be carried over great distances by ocean currents.
❏ Perfluoroalkyls do not break down in soil and may be carried through soil by groundwater.

How might I be exposed to perfluoroalkyls?

❏ Breathing air contaminated with these substances. Ingestion of contaminated dust may also occur.
❏ Drinking water or touching contaminated soil near facilities that may have released these substances to the environment.
❏ Contaminated food can be also an important source of exposure. Perfluoroalkyls have been found in breast milk, which can be a source of exposure for babies who suckle.
❏ 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.

How can perfluoroalkyls affect my health?

Perfluoroalkyls tend to remain unchanged in the body for a long time. PFOA and PFOS can stay in the body for many years.

Workers who inhaled and probably had skin contact with perfluoroalkyls for a long time have not shown significant adverse health effects. However, two studies in workers found changes in sex hormones and cholesterol associated with the levels of PFOA in blood.

A single study of people whose drinking water contained perfluoroalkyls did not find problems in a number of clinical measures tested. The study did not, however, examine developmental risks for children or cancer.

Laboratory animals exposed to very high levels of PFOA in the air suffered irritation of the eyes and nose. Animals that ate food or capsules containing perfluoroalkyls suffered alterations

in the liver and slower growth. Application of large amounts of PFOA to the skin of animals caused skin irritation and changes in the liver, which indicates that PFOA can enter the body through the skin.

How likely are perfluoroalkyls to cause cancer?

There is no conclusive evidence that perfluoroalkyls cause cancer in humans. Some increases in prostate and bladder cancer have been seen in workers, but the cause is not certain.
Rats that ingested PFOA and PFOS for a long time developed tumors. However, based on differences between rats and humans, scientists have not determined for certain whether this could also occur 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?

A study of people, including children, whose drinking water was contaminated with PFOA found no short-term adverse health effects associated with PFOA. The study did not look for cancer or delays in childhood development. The people in the study had levels of PFOA in their blood much higher than those in the U.S. general population

Three studies of pregnant women found an association between higher levels of PFOA in the mother's blood and slightly lower birth weight. However, another study that looked at levels of PFOA in drinking water did not find such an association.

Some mice exposed to high amounts of PFOS during pregnancy gave birth to babies with birth defects. Exposure to PFOS and PFOA has also resulted in early death and delayed development in mice and rat pups; this did not occur with perfluorobutyric acid (PFBA) or perfluorohexane sulphonic acid (PFHxS).
Perfluoroalkyls have been found in breast milk of women, but there are no studies that looked at whether the health of the babies was affected by drinking this milk. Perfluoroalkyls are not concentrated in the milk during the production of the mother's milk.

How can families reduce the risks 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 determine 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 3.9 and 20.7 µg/L of PFOA and PFOS, respectively, were measured in blood samples from members of the U.S. general population.

Members of a community whose drinking water was contaminated with PFOA from a nearby industrial facility had a median serum PFOA concentration of 354 µg/L. 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

Agency for Toxic Substances and Disease Registry (ATSDR). 2009. Toxicological Profile for Perfluoroalkyls (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-62, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. 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.