New Hampshire
Department of
Health and Human Services

Fact Sheet

Perfluorinated Chemicals (PFCs)

What are Perfluorinated Chemicals (PFCs)?

Perfluorochemicals (PFCs) are a class of synthetic chemicals that are not found naturally in the environment. PFCs are used to make products and special coatings that resist heat, oil, stains, grease, and water. PFCs can be found in a variety of products including furniture and carpets treated for stain resistance, adhesives, food packaging materials, heat-resistant non-stick cooking surfaces, and electrical wiring insulation. PFCs have also been used in the production of firefighting foams. Many chemicals in this group, including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), have been a concern because they do not break down in the environment.

In most cases, PFCs are not regulated by the Environmental Protection Agency (EPA). Since PFCs have been so widely used over the years, most people in the United States are believed to have some level of PFCs in their body. Once PFCs have been absorbed into a person's body, it may take up to several years for PFC levels to decrease by one-half, even if the person is no longer being exposed to the chemicals.
Answer.

How are people exposed to PFCs?

People are most likely to be exposed to PFCs by consuming contaminated water and food, and possibly by using consumer products that contain PFCs. Workers in the chemical industry who manufacture certain types of products can be exposed to PFCs at much greater amounts than the general public.

Do PFCs affect a person's health?

The human health effects from exposure to low levels of PFCs in the environment, especially PFOA and PFOS, are not known. PFOA and PFOS can remain in the body for extended periods of time. In laboratory studies, animals that had been given large amounts of these chemicals have been shown to have problems with their growth and development, reproduction, and liver damage. More research is needed to assess the human health effects of exposure to PFOA and PFOS.

Are there health effects, either through short-term exposure to PFCs or long-term exposure to PFCs?

There are no known human health effects associated with short-time exposure to PFOA or PFOs. Animals exposed to very high amounts of PFCs had decreased body weight and liver effects. One study of humans exposed to higher PFC levels in their workplace or from contaminated drinking water have found this exposure associated with higher than normal cholesterol levels, thyroid disease, ulcerative colitis and pregnancy-induced high blood pressure. However, these effects were not seen in several other studies.

Animals given very high amounts of PFCs in food had toxic effects to the liver, delays in growth and development, and changes in normal levels of thyroid hormones and blood fat levels.

Are there any known Cancer effects from exposure to PFCs?

One large study of humans exposed to high levels of PFCs either through their work or from contaminated drinking water showed that exposure may be associated with increases in kidney and testicular cancer. This association has yet to be conclusively proven. Cancer types seen in animals given large amounts of PFCs were liver, testicular, and pancreatic. Additional studies

are needed to determine whether the carcinogenic effects seen in animals are relevant to humans.

EPA has not yet formally classified PFCs for their cancer potential to humans. However, they appear to fit into the "suggestive evidence of carcinogenic potential" category based on limited positive animal evidence although there is no conclusive human evidence.

How much is known about levels of PFCs in the US Population?

In a report issued by the U.S. Centers for Disease Control (CDC), 12 different PFCs in the blood serum of some 2,000 adult participants were measured in 2003-2004. By measuring PFCs in serum, scientists were able to estimate the amount of PFCs that had entered people's bodies. CDC found four PFCs (including PFOA and PFOS) in the blood serum of nearly all of the people tested, indicating that exposure to these PFCs is widespread in the U.S. population.

Exposure to PFCs can be assessed by measuring for the chemicals in blood, but it is not a routine doctor's office test. Finding measurable amounts of PFCs in blood serum does not mean that these levels of PFCs cause harmful health effects. Additional biomonitoring is necessary to determine if blood serum levels are elevated or if they represent the background levels of PFCs to which everyone is exposed. There are reference values for PFOA and PFOS in the U.S. adult population, but none for children.

Has the EPA set any health standards for PFCs?

The EPA has developed provisional drinking water health advisories for PFOA and PFOS based on effects seen in animals that were given large amounts of these substances. The PFOA health advisory of 0.4 micrograms per liter (ug/L = parts per billion) is based on findings of liver effects in adult animals and developmental effects seen in their young. The PFOS health advisory of 0.2 ug/L is based on effects to the liver, thyroid, and changes in body weight and blood fats.

The PFOA and PFOS health advisories were calculated using child exposure values. The resulting health advisories are 3.5-times lower than if adult values were used. Additionally, health advisories were developed so that the contribution from water is only 20% of the total allowable exposure (i.e., the actual total allowable exposure is 5-times higher than the health advisory values). These health advisories are conservative values intended to be protective of health.

Additional resources and references for PFCs:

Casarett and Doull's Toxicology: The Basic Science of Poisons, Sixth Edition. Klaassen, C.D., ed. McGraw-Hill Publishing Co., Inc., New York, 2001.

Toxicological Profile for Perfluoroalkyls (Draft). Agency for Toxic Substances and Disease Registry (ATSDR). Atlanta, GA. 2009
http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=1117&tid=237

Provisional Health Advisories for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) Environmental Protection Agency (EPA). Washington, D.C. January 8, 2009.
http://www.epa.gov/region4/water/documents/d_pha_phoa_pfos_final_010809.pdf

Frisbee et al. 2009. The C8 Health Project: Design, Methods, and Participants. Environ Health Perspect. Dec 2009; 117(12): 1873–1882. December, 2009.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2799461/

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