

Perfluorochemicals and Health

What are Perfluorochemicals?

Perfluorochemicals (PFCs) are a family of manmade chemicals that have been used for decades to make products that resist heat, oil, stains, grease and water. Common uses include nonstick cookware, stain-resistant carpets and fabrics, coatings on some food packaging (especially microwave popcorn bags and fast food wrappers), as components of fire-fighting foam, and some industrial applications.

Some of the chemicals in the PFC group are perfluorooctane sulfonate (PFOS; $C_8F_{17}SO_3$), perfluorobutane sulfonate (PFBS; $C_4F_9CO_3$), perfluorooctanoic acid (PFOA; $C_8F_{15}O_2H$), perfluorobutanoic acid (PFBA; $C_4F_7O_2H$), and perfluorohexane sulfonate (PFH_xS ; $C_6F_{13}SO_3$). The chemical structures of PFCs make them extremely resistant to breakdown in the environment.

Do PFCs occur naturally or are they manmade?

PFCs are manmade chemicals, and do not occur naturally. Minnesota is one of the few states in the United States where these chemicals were made. The 3M Company made PFCs at its Cottage Grove facility beginning in the late 1950's. Wastes from the production process were placed in several local disposal sites.

Are PFCs found in everyday products used by people?

PFCs are used both as an ingredient in the manufacturing process as well as being part of some finished products. It is unclear if PFCs are released from commercial products during normal use.

What do we know about PFCs in the environment? ...in fish? ...in people?

PFCs are very stable in the environment. As a result, they may be found in soil, sediments, water or in other places. Studies indicate that some PFCs easily enter groundwater and may move long distances. Some experts suggest that PFCs can also travel long distances in air, deposit on soil and leach into groundwater.

PFCs have been found in the blood of many species of wildlife around the world, including fish, bald eagles and mink in the mid-western United States.

Some areas of the Mississippi River, several metro area lakes and a couple of lakes near Duluth have been tested for PFCs. PFOS is the only PFC that accumulates to levels of concern in fish. Most fish, even in these areas, have low levels of PFOS, so that the Minnesota Department of Health (MDH) Fish Advisory recommends unrestricted consumption or one meal per week for many species. However, four metro area lakes (Twin Lakes, Calhoun, Johanna and Lake Elmo) had levels of PFOS that require the more restrictive advice of only one fish meal per month. More information on fish consumption guidelines is available on the MDH Web site at <http://www.health.state.mn.us/divs/eh/fish/index.html>. The Minnesota Pollution Control Agency is investigating the sources of perfluorochemicals in fish to determine if there is a pattern to the findings.

PFCs may be present in lakes and rivers at very low levels. The MDH has determined that exposure to PFCs through swimming is not of concern. PFCs are poorly absorbed through skin and incidental ingestion of surface water while swimming will not result in a significant exposure. Also, because there



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is very little evaporation of PFCs from water into the air, breathing them in while swimming or bathing is not a health concern.

Studies show that nearly all people have some PFCs in their blood, regardless of age. The PFCs most commonly found in human blood are PFOS, PFOA, and PFH_xS. People could be exposed through food, water, use of commercial products or from the environment. Some PFCs stay in the human body for many years.

Are PFCs harmful?

The PFC family of chemicals is the focus of active scientific research. In laboratory animal studies, high concentrations of PFCs cause harmful changes in the liver and other organs. Developmental problems have been seen in the offspring of rats and mice exposed to PFCs during pregnancy.

A study of 70,000 people exposed to PFOA in drinking water in Ohio and West Virginia is evaluating the apparent correlation of PFOA and PFOS levels in the participants' blood and clinical health measures, such as cholesterol and thyroid hormone levels. At present, these studies have not shown a direct link between PFCs and human diseases. (for more information on these studies visit www.c8sciencepanel.org) The MDH continually reviews ongoing research on PFCs to ensure that our guidelines reduce exposures and protect public health. As new studies and science become available, our advice may be revised to reflect additional information.

What levels of PFCs in water are safe to drink?

MDH is responsible for ensuring safe drinking water for all Minnesotans. One way MDH does this is through regular testing of public water supplies for contaminants. MDH also investigates situations where groundwater contaminants may affect private wells. Because PFCs are known to be in the environment in Minnesota, the MDH has developed drinking water criteria, known as Health Risk Limits (HRLs), for PFOA and PFOS. HRLs represent levels of chemicals in water that MDH considers safe for people to drink. A HRL value of 0.3 micrograms per liter (ug/L) has been set for PFOA and PFOS. In addition to HRLs, which are set through a formal rulemaking process, MDH also develops human health-based guidance called Health Based Values (HBVs) to provide advice for contaminants that do not have HRLs. MDH has set HBVs of 7 ug/L for PFBA and PFBS. In January, 2009 the United States Environmental Protection Agency (EPA) set short-term provisional health advisory values for PFOA and PFOS of 0.4 and 0.2 ug/L, respectively. These values were issued in response to EPA Region 4's request for assistance after finding elevated levels of PFOA and PFOS in sewage sludge in Alabama.

Due to limited toxicological research on the remaining PFCs for which MDH's Public Health Laboratory currently tests, there isn't enough scientific information to develop HBVs. MDH continues to follow ongoing research activities and may develop HBVs if sufficient toxicological data becomes available. Levels of these other PFCs have been very low in area groundwater samples.

How can PFCs be removed from water?

Filters containing activated carbon or reverse osmosis units have been shown to be effective at removing PFCs from water supplies where they have been used and tested. Other types of common water treatment systems, such as water softeners, are not likely to remove PFCs. Boiling the water will not remove the PFCs. MDH has conducted a study of point of use water treatment devices – for more information see the information sheet entitled, "MDH Evaluation of Point-of –Use Water Treatment

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Devices for Perfluorochemical Removal Final Report.”

(<http://www.health.state.mn.us/divs/eh/wells/waterquality/poudevicefinal.pdf>)

If you are interested in installing a water treatment system of any sort, be sure to work with a reputable supplier and check references.

How can I reduce my other exposures to PFCs?

Fish are an excellent source of low-fat protein and most fish are healthy to eat. People can reduce their exposure to PFCs in fish by following the MDH's site specific advice

(<http://www.health.state.mn.us/divs/eh/fish/index.html>). Special cleaning and cooking precautions used to reduce contaminants like polychlorinated biphenyls (PCBs) that concentrate in fat are not effective with PFOS.

At this time, other than removing PFCs from water and following the fish consumption advice, we are not aware of any more steps that most people can take to reduce exposures to PFCs.

The US Environmental Protection Agency (EPA) is engaged in a major effort with companies that have made or used PFCs to investigate the ways that PFCs enter the environment, and ultimately how people and animals are exposed to them. In addition, the EPA has announced an initiative to phase out 95% of the uses of PFOA by 2010 and entirely by 2015. PFOA and PFOS production were eliminated by 3M in 2002.

For more information contact:

MDH/Fish Consumption Advisory: call Pat McCann at (651) 201-4915.

MDH/Site Assessment and Consultation: (651) 201-4897 or 1 (800) 657-3908, press “4” and leave a message.

To request this document in another format, call (651) 201-5000 or TDD: (651) 201-5797

More information is available on the MDH Web site at
<http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcshealth.html> .

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