

# Perfluoroalkyl Substances (PFAS) and Health

## ALSO REFERRED TO AS PERFLUOROCHEMICALS (PFCS)

PFAS are a family of manmade chemicals that were used for decades to make products that resist heat, oil, stains, grease, and water. PFAS are extremely stable and do not breakdown in the environment. Common uses of PFAS include 1) nonstick cookware, stain-resistant carpets and fabrics, 2) coatings on some food packaging (especially microwave popcorn bags and fast food wrappers), 3) components of fire-fighting foam, and 4) many industrial applications.

Our understanding and ability to detect PFAS in the environment has evolved since the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health (MDH) began investigating them in 2002. Laboratories at that time only identified a few PFAS and could not detect very low concentrations. The science in the past also suggested that exposure to very small amounts of PFAS were not a health concern. We are now able to measure extremely small amounts (parts per trillion in water) of a number of PFAS and newer studies suggest that long-term exposure to PFAS in this range might affect the most vulnerable members of the population. MDH continues to monitor the growing body of science about PFAS and we will adjust our health advice as needed.

## What do we know about PFAS in the environment?

- In the environment: Because PFAS are so stable, they may be found in soil, sediments, water or other places. Studies show some PFAS travel through soil and easily enter groundwater, where they may move long distances. Some experts suggest PFAS also travel long distances in air. PFAS have been released to the environment through spills and disposal in the past. For information about where PFAS have been found in Minnesota, see the MPCA [Perfluorochemicals](#) webpage.
- In wildlife: PFAS have been found in many species of wildlife around the world, including fish, bald eagles, and mink in the mid-western U. S.
- In fish: PFOS is a specific PFAS that accumulates to levels of concern in fish. Most fish have low levels of PFOS. However, fish in some Minnesota lakes have levels of PFOS that require restrictive fish consumption advice. Information about PFAS in fish and site-specific meal advice are available on the MDH [Site-Specific Meal Advice for Tested Lakes and Rivers](#) webpage.
- In Minnesota lakes and rivers: PFAS may be present in lakes and rivers at very low levels. MDH has determined that exposure to PFAS through swimming is not of concern. PFAS are poorly absorbed through skin and swallowing small amounts of water while swimming will not result in significant exposure. Also, because there is little evaporation of PFAS from water into the air, breathing them in while swimming or bathing is not a health concern.
- In people: Studies show nearly all people have some PFAS in their blood, regardless of their age. The PFAS most commonly found in human blood are PFOS, PFOA, PFHxS, and PFNA. People are exposed through food, water, dust or consumer products. Some PFAS can build up and stay in the human body for many years. They can also slowly decline if the exposure stops. MDH has conducted three studies that measured PFAS in the blood of East Metro residents. Results showed that PFAS levels in the blood of longer-term residents dropped between 2008 and 2014 after public health interventions were put in place to reduce drinking water exposures. For information about the studies, see the MDH [PFC Biomonitoring: East Metro](#) webpage.

## Are PFAS harmful to people?

Scientists are actively studying whether PFAS cause health problems in people. Researchers have found links between PFAS and some human health outcomes. In some studies, higher levels of PFAS in a person's body were associated with higher cholesterol, changes to liver function, reduced immune response, thyroid disease, and increased kidney and testicular cancer. More work needs to be done to determine if PFAS or other factors caused the health outcomes.

There are several different PFAS and health effects are different for each PFAS. For specific information about PFAS with MDH health-based values, use the links in the table below. Following is a summary of PFAS health effect information. Studies in animals have shown some health effects such as changes in development, liver and thyroid function, immune response, increased kidney weight and cellular changes, and increased tumors in certain organs. Research continues on PFAS and health effects such as birth outcomes, hormone balance, cholesterol levels, immune response, and carcinogenicity.

- While we believe the immediate health risks for people exposed to PFAS are low, the latest information indicates that fetuses and infants are more vulnerable. Long term exposure to PFOA and PFOS leads to a buildup of these chemicals in women of child bearing age that results in more exposure to the fetus and breastfed infants. Breastfeeding provides many health benefits to both a mother and infant. MDH recommends that women currently breastfeeding, and pregnant women who plan to breastfeed, continue to do so. For information about breastfeeding, see the MDH [Breastfeeding Your Baby: The Benefits of Breastfeeding](#) webpage.
- Bottle-fed infants are also of concern because they drink more water per body weight than adults. If you are concerned about exposure through bottle feeding, consider using bottled water as your water source until you have filtered drinking water. This can lower exposure to PFAS for your infant.

Water with PFAS levels above health concern is safe for bathing, showering, swimming or washing clothes and cleaning, but should not be used for drinking or cooking.

## What levels of PFAS are safe to drink?

MDH is responsible for ensuring safe drinking water for all Minnesotans. One way we do this is through regular testing of public water supplies for contaminants. MDH also works with the MPCA to investigate situations where groundwater contaminants may affect private drinking water wells.

MDH has developed health-based guidance values to represent levels for various PFAS in drinking water that MDH considers safe for people, including sensitive populations. The guidance values apply to short periods of time as well as over a lifetime of exposure. The table below shows the PFAS that the MDH Public Health Laboratory can test for and the health-based drinking water guidance values (in parts per billion, or ppb) MDH uses to evaluate drinking water samples. More information can be found on the MDH [Guidance Values and Standards for Contaminants in Drinking Water](#) webpage.

**Table of Health-based Values for PFAS**

PFAS Detected in Minnesota PFAS Specific Information Sheet Available	Drinking Water Guidance Value (ppb)
perfluorobutane sulfonate (PFBS) <a href="#"><i>PFBS and Drinking Water</i></a>	2
perfluorohexane sulfonate (PFHxS)	0.027 <sup>1</sup>
perfluorooctane sulfonate (PFOS) <a href="#"><i>PFOS and Drinking Water</i></a>	0.027
perfluorobutanoic acid (PFBA) <a href="#"><i>PFBA and Drinking Water</i></a>	7
perfluoropentanoic acid (PFPeA)	Not established
Perfluorohexanoic acid (PFHxA)	Not established
perfluorooctanoic acid (PFOA) <a href="#"><i>PFOA and Drinking Water</i></a>	0.035

<sup>1</sup> MDH recommends using the health-based value for PFOS (0.027 ppb) as a surrogate for PFHxS until more toxicological research on PFHxS is available.

Water samples often contain multiple chemicals. Chemicals in combination may cause effects that would not be predicted based on separate exposures to the individual concentrations of each chemical present. When more than one PFAS for which guidance values are available are present in drinking water, MDH evaluates their “additive” risk.

## How can I reduce my exposures to PFAS?

Completely stopping exposure to PFAS is not practical, because they are so common and present throughout the world. If you live where drinking water sources are contaminated, you can take the steps below to lower your exposure to PFAS.

- Reverse osmosis and activated carbon filter treatment systems can reduce the levels of PFAS in drinking water in your home. The MDH website has information about inexpensive and easy to use systems you can install in your home to reduce your exposure to PFAS through drinking water. You may choose to use bottled water for drinking and cooking for a short time, but long-term bottled water use will be more expensive than installing a treatment system.
  - [\*Water Treatment Using Carbon Filters: GAC Filter Information\*](#)
  - [\*Home Water Treatment\*](#)
  - [\*Evaluation of Perfluorochemical Removal by a Small, Point-of-Use Filter \(PDF\)\*](#)
- PFOS may also be present in the fish people catch and eat. The MDH website provides [\*Site-Specific Meal Advice for Tested Lakes and Rivers\*](#) for eating fish, including fish caught in areas affected by PFOS contamination.
- Ingestion of household dust can also be a significant route of exposure, especially for infants and young children. Dust household surfaces regularly to lower the amount of dust in the house.

## Website links from text above:

1. MPCA webpage: [Perfluorochemicals](http://www.pca.state.mn.us/waste/perfluorochemicals-pfcs)  
[www.pca.state.mn.us/waste/perfluorochemicals-pfcs](http://www.pca.state.mn.us/waste/perfluorochemicals-pfcs)
2. MDH webpage: [Site-Specific Meal Advice for Tested Lakes and Rivers](http://www.health.state.mn.us/divs/eh/fish/eating/sitespecific.html)  
[www.health.state.mn.us/divs/eh/fish/eating/sitespecific.html](http://www.health.state.mn.us/divs/eh/fish/eating/sitespecific.html)
3. MDH webpage: [PFC Biomonitoring: East Metro](http://www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/emetro-landing.html)  
[www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/emetro-landing.html](http://www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/emetro-landing.html)
4. MDH webpage: [Guidance Values and Standards for Contaminants in Drinking Water](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/index.html)  
[www.health.state.mn.us/divs/eh/risk/guidance/gw/index.html](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/index.html)
5. MDH webpage: [PFBS and Drinking Water](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfbsinfo.pdf)  
[www.health.state.mn.us/divs/eh/risk/guidance/gw/pfbsinfo.pdf](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfbsinfo.pdf)
6. MDH webpage: [PFOS and Drinking Water](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfosinfo.pdf)  
[www.health.state.mn.us/divs/eh/risk/guidance/gw/pfosinfo.pdf](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfosinfo.pdf)
7. MDH webpage: [PFBA and Drinking Water](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfbainfo.pdf)  
[www.health.state.mn.us/divs/eh/risk/guidance/gw/pfbainfo.pdf](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfbainfo.pdf)
8. MDH webpage: [PFOA and Drinking Water](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfoainfo.pdf)  
[www.health.state.mn.us/divs/eh/risk/guidance/gw/pfoainfo.pdf](http://www.health.state.mn.us/divs/eh/risk/guidance/gw/pfoainfo.pdf)
9. MDH webpage: [Water Treatment Using Carbon Filters: GAC Filter Information](http://www.health.state.mn.us/divs/eh/hazardous/topics/gac.html)  
<http://www.health.state.mn.us/divs/eh/hazardous/topics/gac.html>
10. MDH webpage: [Home Water Treatment](http://www.health.state.mn.us/divs/eh/water/factsheet/com/pou.html)  
<http://www.health.state.mn.us/divs/eh/water/factsheet/com/pou.html>
11. MDH PDF: [Evaluation of Perfluorochemical Removal by a Small, Point-of-Use Filter](http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/poueval.pdf)  
<http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/poueval.pdf>

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To obtain this information in a different format, call: 651-201-4897.