



# Environmental Health Information

---

## Aqueous Film Forming Foams

December 2008

### What are AFFFs?

Aqueous Film Forming Foams (AFFFs) are used by fire fighters to help extinguish fires that are difficult to fight, particularly petroleum fires (also known as Class B fires). Not all fire fighting foams are classified as AFFF. Some AFFF formulations contain a class of chemicals known as perfluorochemicals.

### 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. PFCs have unique chemical characteristics which make them especially useful for fire fighting foams. These characteristics help the foam flow across burning petroleum, allow water to form a layer on top of burning debris or liquid petroleum which cools the fire. PFCs also help the foam seal in chemical vapors to prevent fire.

The MDH Public Health Laboratory is able to test for seven PFCs, including perfluorobutane sulfonate (PFBS) and perfluorohexane sulfonate (PFHxS) which are often associated with AFFFs. Perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanoic acid (PFBA) have been found in groundwater contaminated by disposal sites in south Washington County, Minnesota.

PFCs are very stable chemicals that do not change or break down in the environment, or in living things. As a result, they may be found in soil, sediments, water or in other places. When spilled or disposed of, PFCs can enter groundwater and easily move long distances, potentially affecting nearby water supplies.

Studies show that nearly all people have some PFCs in their blood, regardless of age. The way PFCs get into human blood is not well understood at this time. People could be exposed through food, drinking water, commercial products or from the environment. Some PFCs stay in the human body for many years. PFCs may be toxic to the liver and thyroid gland and may also affect fetal and neonatal development.

### What are the concerns associated with AFFF use?

When PFC-containing AFFF has been repeatedly used in one location over a long period of time, the PFCs can move from the foam into soil and then into groundwater. The amount of PFCs that enter the groundwater depends on the type and amount of AFFF used, where it was used, the type of soil, and other factors. If private or public wells are located nearby, they could potentially be affected by PFCs from the place where AFFF was used.



This is more likely to occur near places where PFC-containing AFFF has been used repeatedly, such as a fire training area. It is less likely to occur from the one-time use of AFFF to fight a fire. Although some portable fire extinguishers may use PFC-containing AFFF, one time use of such a small amount would be unlikely to pose a hazard to groundwater.

### **What concentrations 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, MDH has developed drinking water criteria, known as Health Risk Limits (HRLs), for PFOA and PFOS. HRLs are criteria that MDH considers safe for human consumption over a lifetime. The current HRLs for PFOA and PFOS are 0.5 parts per billion (ppb or micrograms per liter) and 0.3 ppb, respectively. In February 2008, MDH issued a health Based Value (HBV) for PFBA of 7 ppb. An HBV is developed in the same way as an HRL, but has not been formalized through rulemaking.

Due to limited toxicological research on the other PFCs for which MDH's Public Health Laboratory currently tests, there isn't enough scientific information to develop HBVs. However, based on their chemical characteristics, we anticipate that research will show that the other PFCs are less toxic.

### **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 water will not remove PFCs. MDH has conducted a study of point of use water treatment devices – for more information see the information sheet, “MDH Evaluation of Point-of-Use Water Treatment Devices for Perfluorochemical Removal Final Report” available at <http://www.health.state.mn.us/divs/eh/wells/waterquality/poudevicefinalsummary.pdf>.

### **What is being done to determine if AFFF use is causing contamination of drinking water?**

MDH is working with the Minnesota Pollution Control Agency (MPCA) to investigate this issue. In 2008, the MPCA conducted a survey of fire departments and other potential users around the state to identify locations where PFC-containing AFFF has been repeatedly used for training purposes. MDH and MPCA staff have reviewed this information and identified a number of locations where nearby water supply wells should be tested. This effort will begin in late 2008, with results available in 2009.

MDH and MPCA will work jointly to evaluate the results and communicate them to water system operators, private well owners, and other interested parties.

#### **For more information contact:**

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/pfcs/index.html>.

This information sheet was prepared with partial support from the federal Agency for Toxic Substances and Disease Registry (ATSDR). However, ATSDR has not reviewed or endorsed this information sheet.