



# PFOS

PERFLUOROOCTANE SULFONATE

## HIGHLIGHTS

- PFOS is not found naturally in our environment. It is a synthetic compound used primarily as a water repellent.
- It was recently discovered that PFOS is a widespread global contaminant.
- Canada has placed PFOS and its salts on the Virtual Elimination List under the Canadian Environmental Protection Act.
- PFOS accumulates in the tissues of humans and animals, primarily in the blood, liver and gallbladder.
- PFOS does not accumulate in fats.
- The human body is slow to rid itself of PFOS.
- The effects of PFOS on human health are largely unknown.
- PFOS is one of the most prominent toxic chemicals in the Arctic.
- In the Yukon, PFOS levels are well below Health Canada guidelines.

## WHAT IS PFOS?

Perfluorooctane Sulfonate (PFOS) is an organic compound produced synthetically in a process known as electrochemical fluorination. PFOS is used primarily as an ingredient of household waterproofing compounds like sprays for repelling water and keeping clothes, furniture and carpets from staining.

PFOS is used in coatings for candy wrappers and food containers because it is formulated to repel oil, grease and water. Scotchgard™ is probably the best-known product to have contained PFOS, but has removed PFOS from its formulation. PFOS can also be found in paper plates, shower curtains, linen, footwear and upholstery.

Manufacturing and use of PFOS has been widespread since the 1940s. Concerns over PFOS's toxic effects on human health and the environment began in the 1970s, but only recent analytical techniques have been able to clearly identify its toxic characteristics.

The United States is the major manufacturer of PFOS, although production and use of PFOS is being phased out because of concerns over its environmental toxicity.

## HOW DOES PFOS ENTER THE ENVIRONMENT?

It is now known that PFOS is widely distributed on a global scale. PFOS is found in animal tissues around the world, even in remote areas.

Although globally widespread, PFOS concentrations are greater in industrialized regions. PFOS is believed to be transported by winds to remote areas of the world such as the Arctic and Antarctic, far from where it was manufactured or used.

## HOW TOXIC IS PFOS?

There is still very limited information on the effects of PFOS on human health.

PFOS does not accumulate in fats. Instead, this organic compound binds to blood proteins and accumulates in the liver and gallbladder.

PFOS is readily absorbed orally by the body, is very slowly eliminated, and is not well metabolized. Due to good oral absorption, poor elimination and extensive protein binding, the more PFOS a human being consumes, the more will build up in that person's liver and blood.

The greatest concern when it comes to PFOS is the length of time it stays in the body—its persistence. Toxicological studies show that liver enlargement is one way the body responds to high doses of PFOS.

It is not known if PFOS affects post-natal development, although there is evidence that PFOS crosses the placenta and occurs in milk.

Government of Canada scientists found that current levels of exposure for PFOS are below levels that would harm human health, but that some wildlife such as polar bears and fish-eating bird species could be

at or near levels that could cause harmful effects.

In the Yukon, PFOS levels in Kusawa Lake and Lake Laberge are monitored by the Northern Contaminants Program and levels are well below the Health Canada guidelines. A study ending in 2008 demonstrated that lake trout livers have very low levels of PFOS.

## WHAT ARE THE EFFECTS OF PFOS ON OUR ENVIRONMENT?

The release of PFOS into the environment can occur during its manufacture, during its commercial application and after the disposal of the end product. During domestic application with aerosol containers, as much as 34 percent of the PFOS in a product is lost to the atmosphere. Most waste products containing PFOS are either incinerated or disposed in landfills. Smaller amounts are released into waste water and into the air.

Recent studies have found concentrations of PFOS in polar bears in northern Alaska, seals in the Baltic Sea

and the Arctic Ocean, dolphins in Florida and sea otters in California. Measurable quantities of PFOS have been detected in both freshwater and saltwater fish, including Chinook salmon, lake whitefish, brown trout, carp and tuna. PFOS has also been found in a number of fish-eating birds such as loons, cormorants, ospreys, eagles, pelicans, herons, gannets and gulls. Albatross in the mid-Pacific Ocean have also been affected.

Unlike some of the persistent organochlorines, such as DDT and PCBs, PFOS contamination appears to be lower in remote regions of the world. PFOS concentrations are greater in developed and industrialized locations. Although there is a surprisingly widespread distribution of PFOS in mammals, birds and fish—and PFOS has shown to be persistent and bioaccumulative in various food chains—the amounts found in wildlife are small relative to those shown to cause damage to animals in laboratory tests.

The biggest concern about PFOS in the environment is its extreme persistence. PFOS does not break down in the environment. In 2009, Canada added PFOS to a list of chemicals in legislation that must be eliminated from use.

## WHERE TO FIND MORE INFORMATION ON THE WEB:

- **Health Canada**  
[http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/perflurooctane\\_sulfonate-eng.php](http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/perflurooctane_sulfonate-eng.php)  
<http://www.hc-sc.gc.ca/sr-sr/finance/tsri-irst/proj/persist-org/index-eng.php>
- **Environment Canada**  
<http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/pfos-eng.php>  
[http://www.ec.gc.ca/TOXICS/EN/mainlist.cfm?par\\_actn=s2](http://www.ec.gc.ca/TOXICS/EN/mainlist.cfm?par_actn=s2)  
<http://www.ec.gc.ca/default.asp?lang=En&n=FD9B0E51-1>
- **Indian and Northern Affairs Canada, Northern Contaminants Program**  
[www.inac-ainc.gc.ca/ncp/index\\_e.html](http://www.inac-ainc.gc.ca/ncp/index_e.html)
- **Arctic Borderlands Ecological Knowledge Society**  
[www.taiga.net](http://www.taiga.net)
- **Government of Yukon, Environment**  
<http://www.environmentyukon.gov.yk.ca/monitoringenvironment/>
- **United States Environmental Protection Agency**  
[http://www.epa.gov/safewater/contaminants/dw\\_contamfs/toxaphen.html](http://www.epa.gov/safewater/contaminants/dw_contamfs/toxaphen.html)

## REFERENCES

- Department of Indian and Northern Affairs. *Canadian Arctic Contaminants Assessment Report II: Sources, Occurrence, Trends and Pathways in the Physical Environment*. T. Bidleman, R. Macdonald, and J. Stow, eds. 2003.
- Department of Indian and Northern Affairs. *Canadian Arctic Contaminants Assessment Report II: Human Health*. J. Van Oostdam, S. Donaldson, M. Feeley and N. Tremblay, eds., 2003.
- G.A. Stern, "Trace metals and organohalogen contaminants in fish from selected Yukon lakes: A temporal and spatial study", in *Synopsis of Research, Northern Contaminants Program*, Department of Indian and Northern Affairs, Ottawa, 2008.

The Yukon Contaminants Committee co-ordinates the Northern Contaminants Program for the territory. Its members represent Canada, Yukon and the Council of Yukon First Nations, Yukon Conservation Society, and Yukon College.

Since its establishment in 1991, the Committee has acted as a link between the scientific community and Northerners on contaminants issues. Please direct any comments to the Yukon Contaminants Committee (867) 667-3283 or toll-free 1 (800) 661-0451 ext. 3283

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