

Australian Health Protection Principal Committee

Per- and poly-fluoroalkyl substances (PFAS) FactSheet

What are per- and poly-fluoroalkyl substances?

Per- and poly-fluoroalkyl substances, also known as “PFASs”, are a group of manufactured chemicals that have been used since the 1950s in a range of common household products and specialty applications, including in the manufacture of non-stick cookware; fabric, furniture and carpet stain protection applications; food packaging; some industrial processes; and in some types of fire-fighting foam.

Until recently, this group of chemicals was known as “perfluorinated chemicals”, or “PFCs”. The name change has come about to avoid confusion with another group of chemicals that are relevant to climate change, which are also known as “PFCs”.

There are many types of PFASs. The best known examples are:

- perfluorooctane sulfonate, also known as “PFOS”; and
- perfluorooctanoic acid, also known as “PFOA”.

Perfluorohexane sulfonate (PFHxS) is another chemical of the PFAS group and is also present in some fire-fighting foams.

Are these chemicals manufactured or used in Australia?

The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) has monitored PFOS and PFOA use in Australia through four national surveys, which show that these chemicals are not manufactured in Australia.

PFOS and related compounds are currently imported into Australia, mainly for use as mist suppressants in the metal plating industry, hydraulic fluid in the aviation industry and surfactants in the photography industry.

PFOA and related chemicals were previously imported into Australia and used in the local manufacture of non-stick cookware. These chemicals are not present in the finished cookware.

Until recently, PFOS and PFOA were added to some types of fire-fighting foam to improve the foam’s ability to smother fires. There are believed to be stockpiles of fire-fighting foams containing PFASs still in use.

PFOS and PFOA may be present in a range of imported consumer products, although many countries have phased out, or are progressively phasing out the use of PFOS and PFOA due to concerns about their persistence, bioaccumulation and environmental toxicity.

NICNAS has recommended since 2002 that Australian industries should actively seek alternatives to PFASs and PFAS-related substances. The alternative chemicals should be less toxic and not persist in the environment.

Have PFOS and PFOA contaminated sites in Australia?

Currently there are investigations into environmental contamination with PFOS and PFOA at a number of sites around Australia. These include the Country Fire Authority training facility at Fiskville, Victoria; the RAAF Base at Williamstown, NSW; and the Army Aviation Centre at Oakey, Queensland.

The historic use of PFAS-containing fire-fighting foams has resulted in areas within these sites becoming contaminated with PFOS and PFOA. Over the past decades, these chemicals have worked their way through the soil to contaminate surface and ground water, and have also migrated into adjoining land areas.

There are potentially other contaminated sites around Australia at which PFAS-containing fire-fighting foams have been used, which are being investigated.

How do PFASs enter the environment?

In addition to contamination from the use of fire-fighting foams, PFASs can be released into the environment from landfill sites where products and materials that contain these chemicals are sent for disposal, and into ground and surface water through sewer discharges.

Manufacturing facilities that handle PFASs are also sources of PFAS release into the environment.

The biggest environmental concern about PFOS and PFOA is that they do not break down in the environment and can travel long distances in water and air currents. They have been shown to be widespread global contaminants and many countries are now monitoring and restricting their use.

PFOS and PFOA have been shown to be toxic to some animals, and because they don't break down they can bioaccumulate and biomagnify in some wildlife, including fish. This means that fish and animals higher in the food chain may accumulate high concentrations of PFOS and PFOA in their bodies.

The toxicity, mobility, persistence and bioaccumulation potential of PFOS and PFOA pose potential concerns for the environment and for human health.

How could I be exposed to PFASs?

The general public are exposed to small amounts of PFOS or PFOA in everyday life through exposure to dust, indoor and outdoor air, food, water and contact with consumer products that contain these chemicals.

For most people, food is thought to be the most important source of exposure. Treated carpets and floors treated with waxes and sealants that contain PFASs can be an important source of exposure for babies and infants.

PFOS and PFOA are readily absorbed through the gut and are not metabolised or broken down in the body. These chemicals are only very slowly eliminated from the body. Studies have shown that Australians have small amounts of PFOS and PFOA in their blood. PFOS and PFOA can also be found in urine and breast milk.

People who work in industries that use PFOS and PFOA, or use products containing these chemicals, may be exposed to higher levels than the general public.

Where larger quantities of PFOS and PFOA have been released into the environment, communities located near those sites may be exposed to higher levels than the general public. It is important to understand how people living near contaminated areas may come into contact with PFOS and PFOA so that exposure may be minimised. This could include by examining in detail the pathways through which people could be exposed to these chemicals.

How do PFASs affect human health?

Whether PFOS or PFOA cause health problems in humans is currently unknown, but on current evidence from studies in animals the potential for adverse health effects cannot be excluded. Because the elimination of PFASs from the human body is slow there is a risk that continued exposure to PFOS and PFOA could cause adverse health effects.

Adverse health effects have been demonstrated in animal studies, but at higher levels than are found in people. As well, the applicability of the effects in animals to humans is not well established.

The existing limited studies on PFHxS suggest that this chemical can cause effects in laboratory test animals similar to the effects caused by PFOS. However, based on available studies, PFHxS appears to be less potent in animal studies than PFOS.

Much of the research on humans has been done with people who were exposed to relatively high levels of PFASs through their work. Workers involved in the manufacture or use of PFASs usually have higher blood PFAS levels than the general public. Studies on PFAS workers have looked for effects on cholesterol levels, male hormones, heart disease, liver changes and other effects, including cancer. These studies have not consistently shown that PFAS exposure is linked to health problems.

As a precaution, people living in or near an area that has been identified as having been contaminated with PFOS, PFOA or PFHxS should take steps to limit their exposure to these chemicals. Your state or territory health department can provide you with advice on how to limit your exposure to these chemicals specific to your location and circumstances.

Can PFOS or PFOA cause human cancers?

In humans, there is no conclusive evidence that PFASs cause any specific illnesses, including cancer.

Studies in laboratory animals suggest that PFOS and PFOA may cause some cancers in those animals following prolonged exposure to relatively high levels. However, no existing studies have found a causal link between exposure to PFOS and PFOA and cancer in humans.

Studies of workers involved in the manufacture or use of PFOS and PFOA have looked at whether there is any link between these chemicals and the development of prostate, bladder and liver cancer in humans. There have been no consistent findings in these studies.

The International Agency for Cancer Research (IARC) has classified PFOA as possibly causing some cancers. Other studies have concluded that the evidence does not support an association between human cancer and either PFOS or PFOA exposure.

Does exposure to PFASs during pregnancy pose an increased health risk?

PFOS and PFOA are not known to cause adverse health effects on unborn babies. However, as a precaution, pregnant women living in or near an area that has been identified as having been contaminated with PFOS or PFOA should take steps to limit their exposure to these chemicals.

Your state or territory health department can provide you with advice regarding PFOS and PFOA specific to your location and circumstances.

Should I breastfeed if I have been exposed to PFASs?

Although there is evidence that PFOS occurs in breast milk, it is unclear what, if any, the risks to the baby may be from PFOS or PFOA exposure through breast milk.

The significant health benefits of breast feeding are well established and far outweigh any potential health risks to an infant from any PFOS or PFOA transferred through breast milk.

Breast feeding of babies should not be discontinued due to concerns about PFOS and PFOA exposure.

Should I get a blood test if I think I have been exposed to PFOS or PFOA?

Blood tests are not recommended to determine whether any medical condition is attributable to exposure to PFOS or PFOA and have no current value in informing clinical management, including diagnosis, treatment or prognosis in terms of increased risk of particular conditions over time.

The value of blood testing is limited to assessing exposure at a population level, such as monitoring over time, which may help determine the success of exposure reduction measures. However, given the long biological half-life of PFASs, frequent blood monitoring is of no value.

If you think you have been exposed to PFOS or PFOA and you have any health concerns, please consult your general practitioner.

Are blood tests useful at a population level?

Various organisations around the world have collected blood samples from people as part of ongoing investigations into PFAS contamination of soil and water. The purpose of these tests was either as part of a defined research program, or to determine how much of these chemicals may be entering a person's body.

A blood test can tell a person if they have PFOS or PFOA in their blood and at what levels. These levels can be compared with the levels seen in the general Australian population.

Blood tests can also inform a community if they have been exposed to PFASs at a level above or below that of the general population.

The monitoring of pooled community blood samples over time may help determine the success of exposure reduction measures.