# Perfluoroalkyl (or polyfluoroalkyl) substances (PFAS) and human health

# Information for General Practitioners

(Guidance initially developed in February 2018, updated in November 2023)

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| **In late 2017, the Ministry for the Environment – Manatū Mō Te Taiao – began an all-of-Government programme to help councils and landowners to investigate the extent of PFAS contamination in New Zealand, and to guide them on managing this emerging contaminant. The Ministry of Health – Manatū Hauora – supported this work.**  **Crown sites, such as New Zealand Defence Force – Te Ope Kātua o Aotearoa – bases that have historically used fluorinated firefighting foams, undertook investigations. Regional councils around the country also undertook their own investigations into PFAS to understand the sites that may pose a risk to their communities, alongside other contaminated land issues.**  **More information about this work is available at:** <https://environment.govt.nz/publications/pfas-per-and-polyfluoroalkyl-substances/>  **The following information is adapted from the information provided to GPs in 2018.** |

**What are PFAS?**

Perfluoroalkyl or polyfluoroalkyl substances (PFAS) are manmade compounds produced since the 1950s. Their oil, grease, soil, and water repellent and resistant properties led to a wide range of uses so their presence in the environment is ubiquitous. Sources of general population exposure include air, water, soil, food, indoor dust, and PFAS-containing consumer products. PFAS are very persistent in the environment and bioaccumulate.

PFAS bind to proteins in plasma and the liver and are excreted mainly in the urine. Their half-life in humans is uncertain but studies suggest that it could range from two to nine years.

Most of what is known about the health effects of PFAS comes from studies of two compounds, perfluorooctane sulphonic acid (PFOS) and perfluorooctanoic acid (PFOA).

PFOS and PFOA were in class B firefighting foams for fighting flammable liquid fires used by the New Zealand Defence Force from the 1970s until 2002. In 2017/18 the New Zealand Defence Force started investigating offsite surface and groundwater contamination from the historic use of these firefighting foams at RNZAF Bases at Ohakea and Woodbourne. At this time, the drinking-water source for some households near Ohakea and Woodbourne was found to be contaminated with PFOS and/or PFOA above Manatū Hauora interim guidance levels.

**PFAS in drinking-water**

The guidance levels for PFOS and PFOA in drinking-water were derived from effects found at certain doses in animal studies. The calculation of the guidance levels included appropriate uncertainty factors to take account of issues like differences between humans and animals. The guidance levels are based on a person weighing 70 kg drinking 2 litres of water every day over a lifetime without any significant risk to health. Although there is no consistent evidence that the effects in animals also occur in humans, Manatū Hauora recommended that an alternative drinking-water source be used to protect health if the interim guidance levels were exceeded.

At the time, Manatū Hauora also funded a free GP consultation for people with PFAS-contaminated drinking-water who had health concerns about their PFAS exposure and had been referred by a medical officer of health. This approach was precautionary as the health effects of PFAS are uncertain. The GP consultations provided an opportunity for general health to be assessed, irrespective of cause. For patients with no pre-existing health conditions, the examination focused on maintaining and improving their general health (eg, ensuring immunisations and screening programme participation were up-to-date, checking BMI, blood pressure, etc). For patients with pre-existing health conditions, the examination focused on maximising their health status. Ordering of laboratory or other tests was at the GP’s discretion.

Any abnormal findings were to be managed following usual practice.

**Human health effects of PFAS**

There is no consensus about any human health effect of PFAS, although studies have investigated many human health effects. Study populations have included general populations with background exposure, PFAS-exposed workers and residents exposed from a point source such as a production plant. However, the evidence is inconsistent across studies and the PFAS analysed. Many studies also have methodological issues such as bias and a small study size. In some instances, study authors have also raised the possibility of reverse causality (i.e., the observed health effect results in reduced PFAS clearance resulting in increased PFAS blood levels).

To date there are no accepted causal associations between PFAS and any specific health effect.

Where statistical associations have been found between PFAS and a specific health effect they have often not been consistent in magnitude and direction across studies, and/or chance, bias and confounding cannot be confidently excluded as accounting for the association.

The best current evidence is suggestive only. This may change in the future as further studies are published and systematic reviews, including meta-analyses, continue to be undertaken. Evidence suggests potential health effects from PFAS include:

* Increased cholesterol
* Increased uric acid
* Effects on immune function
* Effects on sperm level and quality
* Effects on reproductive hormones
* Decreased birth weight
* Renal cancer
* Testicular cancer
* Diabetes mellitus.

There is also some inconsistent evidence of effects on thyroid hormones and on neurodevelopment. Some reported effects, such as increased uric acid and cholesterol, may not be clinically significant.

A United States community was exposed to PFOA in drinking-water from the 1950s to the early 2000s from emissions from a nearby production plant. This highly-exposed population was extensively studied during 2005-2013. The investigators (known as the C8 Science Panel) concluded a probable link to high cholesterol, ulcerative colitis, thyroid disease, testicular cancer, renal cancer, and pregnancy-induced hypertension. On the basis of epidemiological and other data available, the investigators concluded that there was not a probable link between PFOA exposure and hypertension, coronary artery disease, stroke, chronic renal disease, liver disease, Parkinson’s disease, osteoarthritis, common infectious diseases, neurodevelopmental disorders in children, asthma, chronic obstructive respiratory disease, diabetes mellitus, birth defects, miscarriage or stillbirth, and preterm birth or low birth weight.

**Carcinogenicity of PFAS**

PFOA was classified by the International Agency on Cancer as possibly carcinogenic in 2014. This classification was based on limited evidence of testicular and renal cancer from studies of fluoropolymer production plant workers and the highest exposed nearby residents to the production plant, and limited animal evidence of carcinogenicity.

**Pregnancy and breastfeeding**

PFAS cross the placenta. However, there is no consistent evidence of effects in pregnancy. PFAS are present in breast milk at low levels. The levels are generally lower than those in maternal serum. Lactating mothers are advised to continue breastfeeding as the benefits outweigh potential health risks.

**Serum PFAS testing**

Advice to patients during the programme was that a serum PFAS test was not recommended because it:

* cannot give a likely cause for a current health condition
* cannot help manage a current health condition
* cannot reliably help to predict whether or not a health condition will develop in the future
* could mislead a person about their past exposure to PFAS
* could mislead a person about their current health risks.

There are also some difficulties in interpreting test results as New Zealand population data are only available for people aged 19 to 64 years. These data are from a national serum study of persistent organic pollutants from blood taken in 2011-2013. All New Zealanders are expected to have some measurable PFAS in their blood given the widespread use of PFAS since the 1950s.

An information sheet for those enquiring about blood PFAS testing is available (*Serum Perfluoroalkyl Substances Testing*).

**Further advice**

If required, further advice on PFAS and health effects is available from Health New Zealand – Te Whatu Ora. Please contact your local medical officer of health if you wish to arrange this. You can also try Healthline 0800 611 116.

Information about the Ministry for the Environment led programme is available at: <https://environment.govt.nz/what-government-is-doing/areas-of-work/land/per-and-poly-fluoroalkyl-substances-pfas/>

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