Health effects of perfluorinated compounds (PFCS)

FREQUENTLY ASKED QUESTIONS

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What are perfluorinated compounds (PFCs)?

PFCs are similar to fatty acids found normally in the body, but where the hydrocarbon chains have been fully substituted with fluorine atoms. They have surfactant (detergent) and stain resistant properties, and have been extensively used in stain resistant coatings for fabrics and furniture, paper sizing coatings, non-stick cookware and in semi-conductor production.

Their widespread use, environmental persistence and the ability to accumulate through food chains has resulted in the detection of trace levels in the blood of most people when studied.

Are PFCs used in fire fighting foams?

Prior to 2002, an aqueous film forming foam (AFFF) known as 3M Lightwater was commonly used by fire fighting agencies. It contained two PFCs:

- Perfluorooctanesulfonate (PFOS) which was used to stabilise the fire fighting foams; and
- Perfluorooctanoic acid (PFOA) which was a minor component in AFFF.

The use of PFOS and PFOA in AFFF was phased out from around 2002 because of these chemicals' persistence in the environment and resistance to degradation.

Are there any overseas and Australian studies about the health risks of both short-term and long-term exposure to PFCs?

There are now many studies focussed on whether there are any health impacts resulting from short and long term exposure to PFCs including:

- conventional controlled exposure studies in rats, mice and monkeys that are used to identify potential toxic effects and to derive estimates of exposures in humans that are unlikely to be dangerous; and
- epidemiological studies in humans who have been exposed to PFCs in situations including: working in production factories (the most highly exposed groups); contact with drinking water near a specific factory that was polluted by PFOA (but where PFOS exposure was low); and exposure of ‘normal’ populations with low levels of PFOS exposure through food, water and house dusts.

What have the studies shown? Is my health in danger from exposure to PFCs?

Overall, at this time, the studies do not clearly establish a causal relationship between PFC exposure and any adverse health effects in humans, even where there have been occupational exposures orders of magnitude higher than those of the general population. The types of exposures in people living near airports is very unlikely to result in any immediate adverse health effects. You would likely need to receive long-term exposure (for example, exposure every day over an entire lifetime) in order to experience any adverse health effects.

In recent years, there have been studies which have compared the disease incidence of people who have both high and low PFC blood levels. Some of these studies suggest an ‘association’ between exposure to some PFCs and certain health effects such as hormonal disturbances, effects on the immune system, effects on blood lipids and effects on normal reproduction. However, ‘associations’ are not necessarily causal. That is, these health effects have not necessarily resulted from PFC exposure. Furthermore, some studies cannot rule out the possibility of ‘reverse causation’, where the higher PFC blood levels are the result of the disease, but not the cause.

I’ve heard you can get cancer from exposure to PFCs – is that true?

The U.S. Agency for Toxic Substances and Disease Registry (ATSDR 2015) said in August 2015:

*There is no conclusive evidence that perfluoroalkyls cause cancer in humans.*

Other studies have reached a similar conclusion. For example, in 2014 a study done by E.T. Chang and others reviewed 18 epidemiological studies of cancer incidence and reached the conclusion that the evidence does not support an ‘association’ between cancer and either PFOS or PFOA.

PFOA (but not PFOS) has recently been classified as ‘possibly carcinogenic to humans’ by the International Agency for Research on Cancer (IARC). However, this IARC classification is based on limited evidence of bladder cancer from studies in factory workers exposed to PFOA. Further, because of confounding factors, it cannot be concluded that PFOA alone had a causal role. For example, most studies did not take into account other potential factors in causing disease such as smoking. There are two higher IARC classifications that could be applied if the evidence is stronger, but these have not been applied to PFOA, PFOS or any other PFC at this time.

To add some further context to the IARC classification, a number of common and everyday products have received higher or similar ratings. For example, coffee has been given the same classification as PFOA (‘possibly carcinogenic’), and the oral contraceptive pill has been given the highest classification (‘carcinogenic to humans’).

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