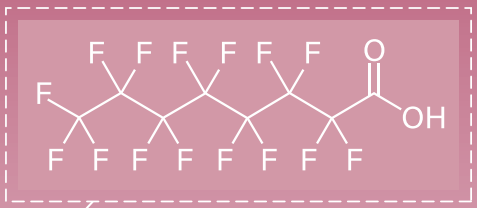
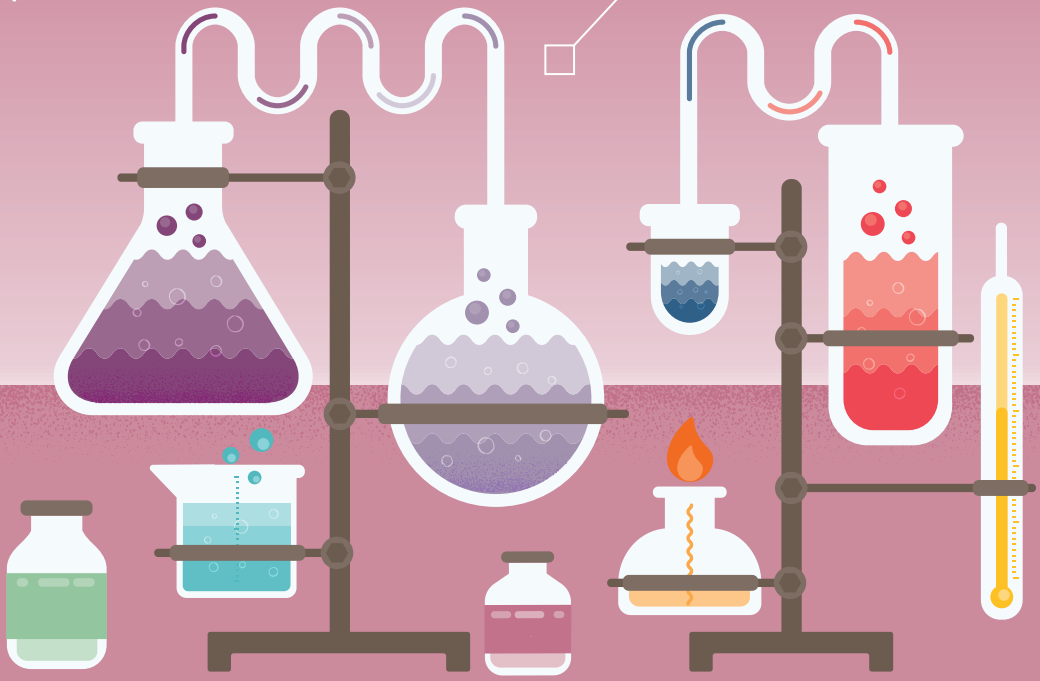
PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS)

WHAT YOU NEED TO KNOW





HBM4EU

science and policy
for a healthy future

What are PFAS?

PFAS is short for per- and polyfluorinated alkyl substances, a large group of more than 4700 man-made chemical substances, ranging from small to very large molecules (called polymers). The substances are characterised by the fact that they contain very strong bonds between carbon and fluorine atoms. These bonds make PFAS so resistant to degradation they are called "forever chemicals". They have been used worldwide since the 1950s to make consumer products resistant to water, oil and grease and prevent staining. PFAS are used in a variety of products, such as firefighting foams, electronics, non-sticky frying pans and cleaning products, as well as in several industrial processes.

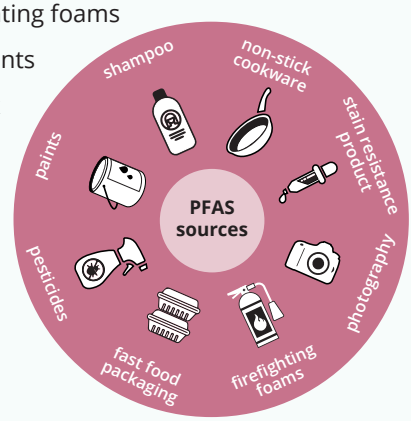
Many PFAS are water-soluble, meaning that they can pass through soil and enter groundwater. They are easily transported in the air and travel long distances from the source of their release. They are persistent in humans and the environment, meaning that they do not easily break down, and can be found in people and in the environment across the world. It is therefore possible that exposure continues long after active releases have stopped. PFAS have also been shown to bioaccumulate in living organisms, which means that they build up over time.

Two PFAS that were widely used in the past, known as PFOA[1] and PFOS[2], are now banned in the European Union because of their persistence, their accumulative properties, and their impacts on human health. Other PFAS chemicals, like PFBs[3], have been developed to replace these chemicals. However, recent studies suggest that these alternatives may cause similar health problems to those PFAS that are banned.

Where are PFAS found?

PFAS are used in some industrial processes and are found in a wide range of consumer products, such as:

- Non-stick pots and pans
- Food packaging, such as fast-food containers and wrappers, microwave popcorn bags, pizza boxes, grease-resistant paper and candy wrappers
- Stain resistant coatings on carpets, upholstery, textiles, and other fabrics
- Water-resistant and chemical-resistant clothing
- Cleaning products, including oven cleaner, grease remover, drain cleaner, and stain remover
- Paints, varnishes, and sealants
- Personal care products, such as shampoo and dental floss, and cosmetics like nail polish and eye makeup
- Firefighting foams
- Lubricants
- Ski wax



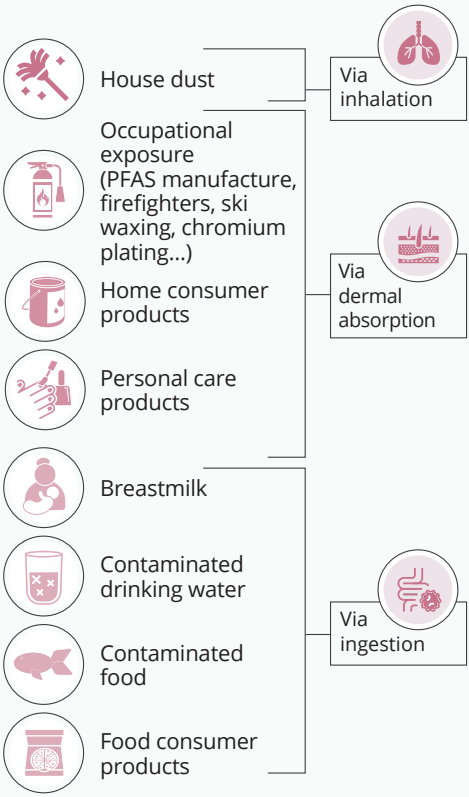
[1] Perfluorooctanoic acid
[2] Perfluorooctance sulfonic acid
[3] Perfluorobutane sulfonic acid

How can PFAS enter your body?

> The widespread use of PFAS over the past decade implies that the vast majority of people are now exposed to these chemicals. We are exposed to PFAS from food, drinking water, house dust, indoor and outdoor air and certain consumer products.

For the general public, exposure may occur via the route described below.

- Consuming food contaminated with PFAS, in particular fish, meat, fruit and fruit products, eggs and egg products may contain PFAS.
- Consuming food stored in food-packaging that contains PFAS.
- Using consumer products containing PFAS, such as non-stick pots and pans, cosmetics, stain-resistant carpets, furniture and textiles, cleaning products and water-repellant clothing.
- Breathing in house dust that contains PFAS released from consumer products.



People may be exposure to high levels of PFAS via the route described below.

- Drinking contaminated drinking water, which may occur near manufacturing facilities that have used PFAS or in areas where the chemicals have been used in firefighting foams, including military bases and training sites.
- Consuming food produced in areas contaminated by PFAS, in particular fish caught in contaminated water.
- Accidentally swallowing soil or dust contaminated with PFAS.
- Breathing in house dust that contains PFAS released from consumer products.

Workers involved in producing PFAS and materials that contain PFAS may inhale the substances. Additionally, firefighters can be exposed when using foams to extinguish fires. Exposure through the skin and accidental swallowing are less likely.

If a pregnant woman is exposed to PFAS, then the substance can pass through the placenta and reach the unborn child. Nursing mothers also transfer PFAS to their babies via breastfeeding. Nursing mothers should continue to breastfeed as the benefits of breastfeeding outweigh the risks for infants exposed to PFAS via breast milk, except in cases where the mother's exposure is particularly high.

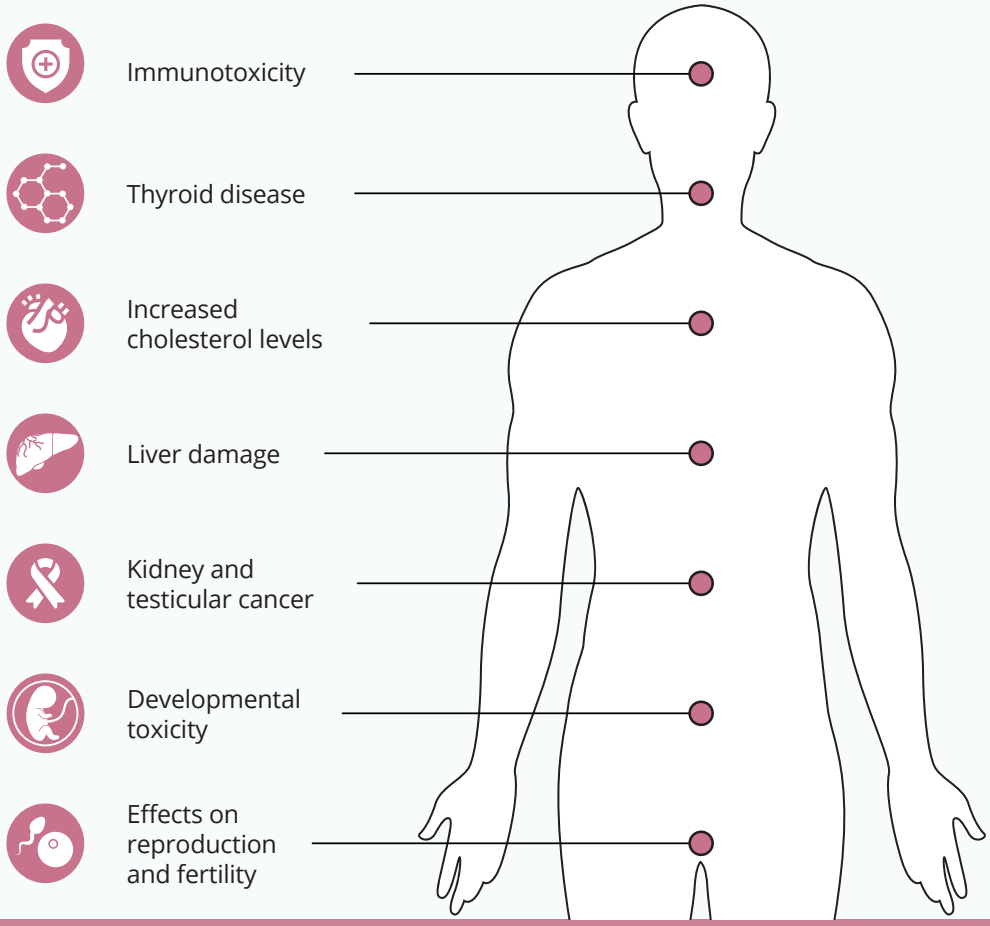
Only a small amount of PFAS can enter the body through the skin. Therefore, showering and bathing or washing dishes in water containing traces of PFAS is not likely to increase exposure.

How might PFAS affect health?

Exposure to PFAS has been linked to a range of health outcomes, including thyroid disease, increased cholesterol levels, effects on reproduction and fertility, liver damage, kidney and testicular cancer. PFAS affects the functioning of our immune system, even at very low concentrations and has been found to reduce the immune response to vaccination in children. According to the European Food Safety Authority, there is currently not enough evidence to confirm several other suspected health effects of certain PFAS, such as asthma and allergies, carcinogenicity in humans, diabetes and obesity, reduced kidney function and osteoporosis.

The European Food Safety Authority recently defined a limit for the volume of four PFAS that may be safely consumer in food in a one-week period. The safe weekly intake aims at protecting against health impacts in humans, including reduced birth weight, reduced fertility and elevated cholesterol levels.

Gaps remain in our knowledge of the health effects of PFAS. As a considerable number of PFAS chemicals persist in humans and the environment, research is ongoing to better understand possible effects on health. As a precaution, exposure should be minimised.



UNDERSTANDING CHEMICAL RISK

The risk of harm from any chemical results from the hazard associated with the chemical, combined with exposure to the chemical. Hazard refers to the properties of the chemical that make it toxic, meaning it can cause harm to human health. Exposure describes the amount of a chemical that an individual comes into contact with, as well as the frequency of exposure. The term threshold is used to indicate the concentration, or level, of a chemical to which people can according to current knowledge be exposed without suffering negative health effects. Exposure up to this level is considered safe. Some chemicals can cause health effects at any concentration and are considered as having no threshold. For such chemicals, no level of exposure is safe.

How can you reduce your exposure to PFAS?

PFAS are widely present at low levels in food and in air, water, soil. It is therefore not possible to completely avoid being exposed to PFAS. People can choose to minimize their use of consumer products that contain PFAS.

✗ **Avoid** fast-food wrapped in grease-proof papper

✗ **Avoid** fast-food sold in PFAS-containing cardboard, such as some pizza boxes

✗ **Avoid** using optional waterproofing sprays on clothing and footwear

✓ **Check** whether a particular product contains PFAS or not in online applications

✓ **Ask** for PFAS-free products when purchasing products that may contain PFAS. Ensure that products are free of all PFAS (and not just PFOS and PFOA)

✓ **Instead** of non-stick cookware, opt for ceramic, stainless steel, or cast iron

If you live in or near areas known to be contaminated with PFAS, you may reduce your risk of exposure by:

✗ **Avoid** fishing and consuming fish from these areas

✓ **Avoid** consuming home-grown fruits and vegetables from these areas. Ask local authorities to assess the PFAS levels to reassure yourself that it is free of PFAS

✓ Please **follow** the advice from authorities for water use

Human exposure to PFAS in Europe

Human biomonitoring measures levels of PFAS in human blood, urine and breast milk. These measurements are performed in specialised laboratories and may be part of a broader surveillance programme or a smaller health study.

Such studies provide physicians and public health officials with an overview of PFAS levels in the general population. Finding PFAS in an individual does not necessarily imply that the health of that individual will be affected. To determine whether there is a risk to health, levels can be compared with human biomonitoring guidance values, thresholds that set safe limits for levels in human samples.

Biomonitoring data have shown that people are substantially exposed to several PFAS worldwide. Some studies have found that levels of PFAS increase with age and that women tend to have lower levels of PFAS in their bodies than men. This is due to differences in how the body produces urine, as well as the elimination of PFAS form the body through blood donation, menstruation, childbirth, and breastfeeding.

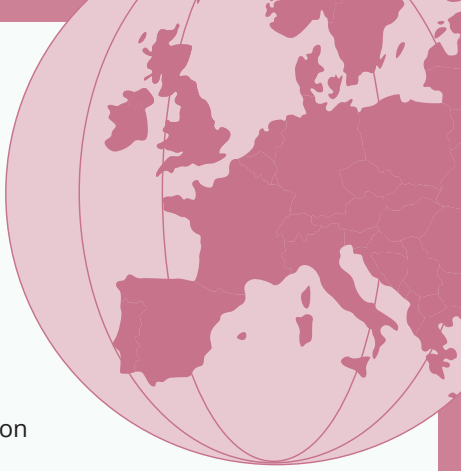
Human exposure to chemicals is measured through human biomonitoring. This involves taking samples of blood, urine or hair and measuring the concentration of a chemical in the sample. The measurement reflects the total amount of a chemical in the body at a certain moment, representing past input from all possible sources. Samples are preferably taken from a large number of people, in order to get a picture of the variability of exposure in the general population and in certain social groups that may have been exposed to high levels of a chemical. Besides measuring exposure, health effects and individual susceptibility can also be investigated using human biomonitoring.

What is HBM4EU doing on PFAS?

HBM4EU, the Human Biomonitoring Initiative in Europe, is currently working to answer questions on PFAS, to understand possible risks to human health and support policies to reduce those risks.

- ☑ What is the current level of exposure of the EU population to PFAS?
- ☑ Are there differences in the exposure of the EU population to PFAS that are now banned for use in the EU and PFAS that are still legally used?
- ☑ Are people predominately exposed to PFAS in their diet, from consumer products, at work or via polluted environments?
- ☑ What are the levels of PFAS and the associated health effects in vulnerable population groups?

How is the European Union protecting citizens?



The EU has taken action to reduce people's exposure to PFAS.

- Under the **Stockholm Convention** on persistent organic pollutants (POPs), all 184 parties (EU and non-EU) have committed to eliminating the production and use of the PFOS and PFOA.
- PFOS, its salts and derivatives as well as PFOA, its salts and PFOA-related compounds are banned under the **Regulation on Persistent Organic Pollutants**.
- In July 2021 the Parties of the Stockholm Convention considered to include PFHxS, its salts and PFHxS-related compounds in the list of POPs in Annex A.
- Perfluorocarboxylic acids containing 9 to 14 carbon atoms in the chain (C9-C14 PFCAs), their salts and C9-C14 PFCA-related substances are banned under the **Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)**.
- PFBS and its salts, PFHxS and its salts and HFPO-DA its salts and its acyl halides are on the REACH list of Substances of Very High Concern (SVHC), signaling the need for their progressive replacement by less dangerous substances.
- The European Food Safety Authority has defined a limit (TWI of 4.4 ng/kg bw) for the volume of four PFAS (PFHxS, PFOS, PFOA and PFNA) that may be safely consumer in food in a one-week period. This **safe weekly intake** aims to protect health.
- The **Drinking Water Directive** sets limit values of 0.1 µg/L for the sum of 20 individual PFAAs (C4-C13 PFCAs and C4-C13 PFSAs) and 0.5 µg/L for the total PFAS concentration in water for human consumption.
- PFOA and PFOS are priority hazardous substances under the **Water Framework Directive**, meaning that countries monitor the presence of these substances in lakes, rivers, groundwater and coastal waters.
- The Cosmetic Product Regulation includes and prohibits the use of PFOS and its potassium, ammonium, and lithium salts, PFOA, PFNA and its sodium, and ammonium salts and Diethanolaminperfluoroctansulfonat in cosmetic articles.

Most recently, the **Chemicals Strategy for Sustainability** sets out a **range of actions to regulate PFAS as a group**, including phasing out the use of PFAS in the EU, unless their use is essential.

Finally, the European Commission supports research projects, like HBM4EU, that investigate people's exposure to PFAS and possible effects on health.

For further information on PFAS, please see the infographic on the HBM4EU webpage.

www.hbm4eu.eu

HBM4EU coordinator:
German Environment Agency hbm4eu@uba.de

Knowledge Hub coordinator:
European Environment Agency hbm4eu@eea.europa.eu

HBM4EU
science and policy for a healthy future

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 733032.