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PFAS: Per- and polyfluoroalkyl

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What are PFAS

PFAS are a diverse group of synthetic compounds in which hydrogen atoms in carbon chains are partially (polyfluorinated) or completely (perfluorinated) substituted by fluorine. In addition to alkyl chains, these substances often contain a terminal functional group, such as a carboxyl or sulfonic acid group.

According to the latest estimates, this group of substances comprises more than 10,000 different substances which, due to their properties (chemical and thermal stability), do not degrade in the environment. They have been manufactured since the 1940s and are used in many industrial processes and products (in cleaning agents, paints, cosmetics, cookware, paper coatings, textiles, pesticides, firefighting foam, etc.). They enter our bodies through food and drinking water, where they accumulate. About 80% of intake occurs through solid food.

Under natural conditions, PFAS do not degrade, which is why they are also known as 'forever chemicals'.

Contaminated food

According to the EFSA study (Risk to human health related to the presence of perfluoroalkyl substances in food (wiley.com)), the main contributing categories 'fish/meat', 'fruit and fruit products' and 'eggs and egg products' are responsible for the combined exposure to PFOA, PFNA, PFHxS and PFOS for all population groups.

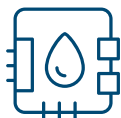
The three PFAS PFOS, PFOA, and PFHxS are detectable in all blood samples from the Swiss population examined in a national biomonitoring study. (akademien-schweiz.ch) According to the EEA, the harmful effects on the body are Emerging chemical risks in Europe – 'PFAS' – European Environment Agency (europa.eu) and EFSA, the harmful effects on health are kidney cancer, liver damage, hormonal disorders, low birth weight in newborns, and a reduced immune response to vaccinations in childhood.

Regulation of PFAS

(Per- and polyfluoroalkyl substances (PFAS) (admin.ch))

Some PFAS have now been identified as substances of very high concern, but for many, the effects on humans and the environment are less well known.

The Chemical Risk Reduction Ordinance (ChemRRV, SR 814.81), perfluorooctane sulfonic acid (PFOS) and its derivatives, perfluorohexane sulfonic acid (PFHxS) and its precursor compounds, as well as perfluorooctanoic acid (PFOA) and other long-chain perfluorocarboxylic acids (C9–C14-PFCA), including their precursor compounds, are currently regulated in Annex 1.16. In addition, maximum levels for PFAS apply to the food categories eggs, fish/ crustaceans, meat, and drinking water in the following ordinances (see following page):



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Regulation of PFAS:

Food

VHK	SR 817.022.15: Contaminants Ordinance (VHK) Meat, eggs, and fish
EU 2023/915	Regulation (EU) 2023/915 on maximum levels for certain contaminants in foodstuffs and repealing Regulation (EC) No. 1881/2006
EU 2022/1431	Recommendation on the monitoring of perfluoroalkyl substances in foodstuffs

Trinkwasser

TBDV	Ordinance of the FDHA on drinking water and water in publicly accessible bathing and showering facilities
EU 2020/2184	Directive on the quality of water intended for human consumption

Food contact materials

EC Regulation 1907/2006	REACH, SVHCs, and POPs, including revision EU 2022/586
Regulation (EU) 2020/784	Delegated Regulation regarding the inclusion of perfluorooctanoic acid (PFOA), its salts, and PFOA precursor compounds
Regulation (EU) 2025/40	Packaging and packaging waste (PPWR)

No maximum values have yet been defined in Switzerland and the EU for fruit and vegetables or milk and milk products. However, EU 2022/1431 defines reference values in the categories of fruit, vegetables, wild mushrooms, starchy roots and tubers, milk, and complementary foods, whereby if these values are exceeded, the cause of the contamination must be investigated and cantonal complaints cannot be ruled out, as these could be classified as unsafe under LMG Art. 7.

Analysis

We determine PFAS using LC-MS/MS on a SCIEX 7500 system via electrospray ionization (ESI). Depending on the matrix, our method covers 22-35 different substances such as PFOS, PFOA, PFHxS, PFNA, PFHxA and is constantly being expanded with new substances. Depending on the substance, the instrumental detection limit is in the low ppt range. For the vast majority of substances, it is in the range of 1-5 ng/l of measuring solution. Our method is accredited according to ISO 17025 for meat, fish, eggs, and milk, with other matrices to follow shortly.

Sampling (order form)

The sampling procedure for the analysis of PFAS is based on Implementing Regulation (EU) 2022/1428 laying down the sampling procedures and methods of analysis for the control of perfluoroalkyl substances in certain foods.

Important points from the regulation summarized for you:

- The composite sample should weigh at least 1 kg or contain 1 l, otherwise this will be noted on the analysis report.
- The person responsible for sampling must take the following precautions:
- To prevent contamination with cosmetics, hand creams, etc., nitrile gloves must be used.
- The materials used for sampling and sample storage must be free of PFAS. The sample should ideally be stored or shipped in sampling containers made of HDPE (high-density polyethylene) or polypropylene.