

PFAS – The Problem That Won't Go Away...



What are PFAS?

PFAS (Per/Polyfluoroalkyl Substances) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many others, that have been manufactured and used in a variety of industries around the globe since the 1940s.²



Today, more than 3,000 synthetic chemicals are classified as PFAS. The most commonly used PFAS (PFOA and PFOS) have been the most extensively produced and studied of these chemicals. These chemicals once ingested may stay in the human body for many years.

PFAS and human health

PFAS enter the environment through production or waste streams.¹



Manufacturing of domestic and industrial products also leads to discharge of PFAS into drinking and wastewater treatment plants and then into the environment.



The use of PFAS in firefighting foams is one major use where PFAS enter the environment. Due to their unique chemical properties, they do not break down and accumulate over time.

Due to their widespread use, and their prevalence in the environment many people throughout the world have been exposed to PFAS, with drinking water one of the most common routes through which exposure occurs.¹

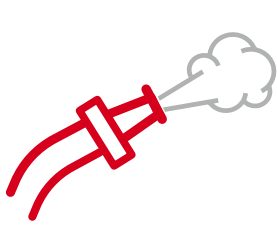


There is suspicion that some PFAS may have adverse effects in humans, and have potentially been linked with cancer, hormone disruption, infertility, high cholesterol, obesity, a compromised immune system, to name a few.

Where are PFAS found?

PFAS chemicals are found in a wide array of consumer and industrial products, and have been highly utilized in various industries due to their unique properties.¹

They can be found in commonly used products such as nonstick cookware, stains and water repellents, paints, cleaning products, food packaging, and also firefighting foams.



Firefighting foams



Nonstick cookware



Markers



Cleaning products



Food packaging

Where are PFAS important to industrial and commercial products?



PFAS are considered important in industrial and commercial products due to their extremely stable chemical structure and unique chemical properties, making them long-lived substances (hence the nickname 'Forever Chemicals').⁵

With the ability to repel both water and oil, this has made them extremely useful in a variety of industries and products.

What is the issue with PFAS?

The very characteristics that have made them attractive for use in an array of products, are the ones that have led to their wide-spread contamination of the environment and humans.⁵

They have wide-ranging applications, such as in grease resistant food packaging, stain resistant carpets, and as mentioned firefighting foam which is very effective at extinguishing flammable liquid fires.



Useful

vs



Harmful

This is because certain types of PFAS, for example PFOA and PFOS, do not break down in the environment, or in the blood of humans, and can potentially cause health problems.

How are humans exposed to PFAS?

Human exposure occurs because when PFAS enter into the water supply, and they do not breakdown, they are then ingested either directly, or through the contamination of the water used in an agricultural or manufacturing processes. Humans are also exposed through food contact materials and household and personal care products. Many people throughout the world have been exposed and have one or more specific PFAS in their blood, especially PFOA and PFOS.^{4,6}

Exposure examples include: _____



Contaminated soil or water

Food processed with equipment using PFAS or grown in PFAS-contaminated soil or water.



Commercial products

Commercial products including, nonstick cookware, food packaging, personal care products, and stain resistant chemicals for apparel and carpets.



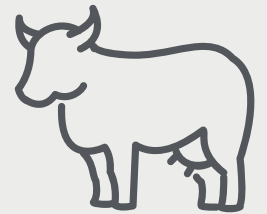
Industrial uses

Industrial uses included photo imaging, metal plating, semiconductor coatings, firefighting aqueous film-forming foam, car wash solutions, and rubber and plastics.



Drinking water

Drinking water from run off and sewage.



Eating tainted meat and seafood

Ingestion of living organisms, including fish and animals, where PFAS have built up and persist over time.

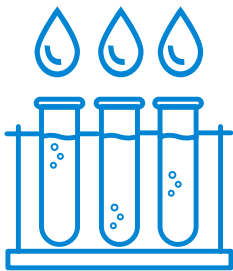
How are PFAS monitored and analyzed?



Researchers measure PFAS in air, drinking water, soils, etc., to understand how and to what degree humans might be exposed. They are seen and can be measured at low ng/L (or parts per trillion) level.^{7,8}

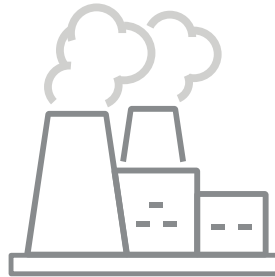
This research includes modeling human population exposures to better understand the relative contributions of different sources and pathways for PFAS.

The development and validation of laboratory methods to detect and quantify selected PFAS includes:



Water

Validated methods that measure certain PFAS in groundwater, surface water, wastewater, drinking water, and solids (e.g., soils, sediments, and sewage).



Stack emissions

Sampling and analytical methods for identifying and quantifying PFAS in air and stack emissions.



soil/biologicals/ biota

The use of non-targeted chemical analysis for identifying new and breakdown products of PFAS in air emissions, water bodies and solids.



These methods can be used by federal agencies, states, municipal/contract testing labs and local communities to analyze PFAS in the environment and determine safe levels.

These tested and validated methods are important for ensuring that government and private testing laboratories can accurately and consistently measure PFAS in the environment, which is critical for estimating exposure and risk. These methods can be used by federal agencies, states, municipal/contract testing labs and local communities.

Agilent solutions for the detection and analysis of PFAS

Agilent provides complete end-to-end workflows for extraction, quantification, and reporting of PFAS in the environment. This includes sample containment, sample preparation tools, extraction products, and ultra-high performance liquid chromatography coupled to mass spectrometry.

Instruments



**Agilent Ultivo
Triple Quadrupole
LC/MS (LC/TQ)**



**Agilent 6495C
Triple Quadrupole
LC/MS**



**Agilent
6546 LC/Q-TOF**

Consumables



Routine and regulatory quantification of PFAS can be achieved with the use of Agilent's extremely sensitive, reliable and robust tandem quadrupole LC/MS (LC-MS/MS) instrumentation while identification of new and novel PFAS in the environment is possible with the accurate mass, high resolution quadrupole time of flight (Q-TOF) instrumentation.

Sources:

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5. Food and Water Watch: These Chemicals Are Forever: Water Contamination from PFOA, PFOS, and other PFAS. <https://www.foodandwaterwatch.org/insight/these-chemicals-are-forever-water-contamination-pfoa-pfos-and-other-pfas>. Accessed June 2019 AND ATSDR: PFAS Blood Testing. <https://www.atsdr.cdc.gov/pfas/pfas-blood-testing.html>. Accessed June 2019 AND LiceScience: What Are PFAS. <https://www.livescience.com/65364-pfas.html>. Accessed June 2019
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8. United Nations Environment Programme: PFAS analysis in water for the Global Monitoring Plan of the Stockholm Convention. https://unitar.org/cwm/sites/unitar.org.cwm/files/uploads/wd.5_guidance_on_pfas_in_water.pdf. Accessed June 2019

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