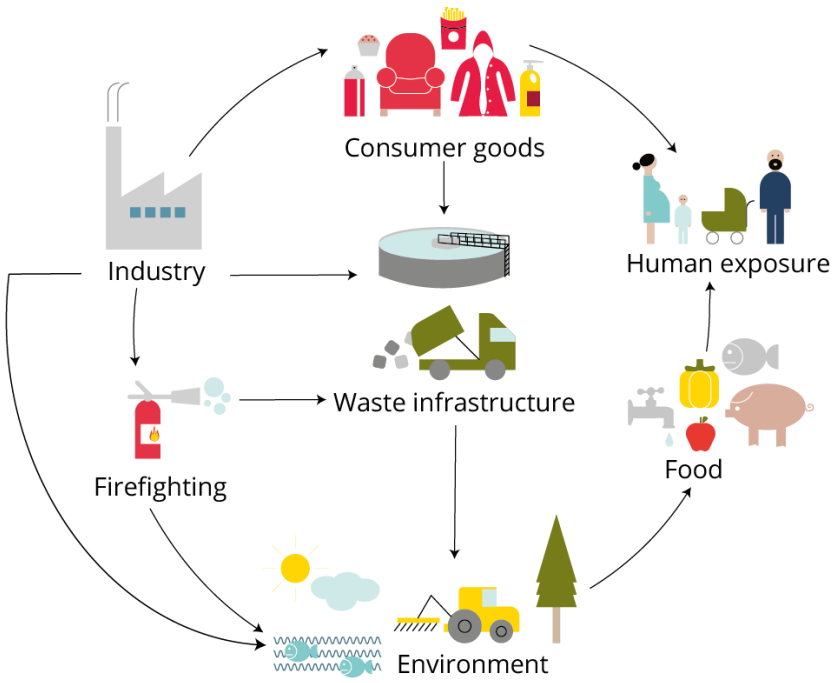
All About PFAS

What are PFAS?

The per-and polyfluoroalkyl substances (PFAS) are a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water. Fluoropolymer coatings can be in a variety of products. These include clothing, furniture, adhesives, food packaging, heat-resistant non-stick cooking surfaces, and the insulation of electrical wire. These are a group of man-made chemicals with thousands of different varieties.

(https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html)



Typical PFAS exposure pathways

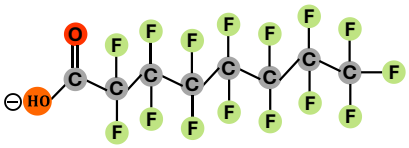
(Image source: European Environment Agency (EEA), Emerging chemical risks in Europe — 'PFAS', 2019, CC-BY license.)

Where do they come from?

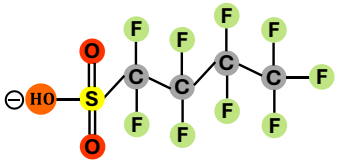
- Fire extinguishing foam - in aqueous film-forming foams (or AFFFs) used to extinguish flammable liquid-based fires. Such foams are used in training and emergency response events at airports, shipyards, military bases, firefighting training facilities, chemical plants, and refineries.
- Manufacturing or chemical production facilities that produce or use PFAS – for example at chrome plating, electronics, and certain textile and paper manufacturers.
- Food packaging – for example in grease-resistant paper, fast food containers/wrappers, microwave popcorn bags, pizza boxes, and candy wrappers.
- Household products – for example in stain and water-repellent used on carpets, upholstery, clothing, and other fabrics; cleaning products; non-stick cookware; paints, varnishes, and sealants.
- Personal care products – for example in certain shampoo, dental floss, and cosmetics.
- Biosolids – for example, fertilizer from wastewater treatment plants used on agricultural lands can affect ground and surface water and animals that graze on the land.

(https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas)

PFAS molecules are made up of carbon and fluorine atoms, along with either a sulfonic group ($-SO_3H$) or a carboxylic group ($-CO_2H$).



PFOA: A long-chain perfluorinated carboxylic acid with 8 carbons



PFBS: A short-chain perfluorinated sulfonic acid with 4 carbons

These molecules are often classified based on their functional groups:

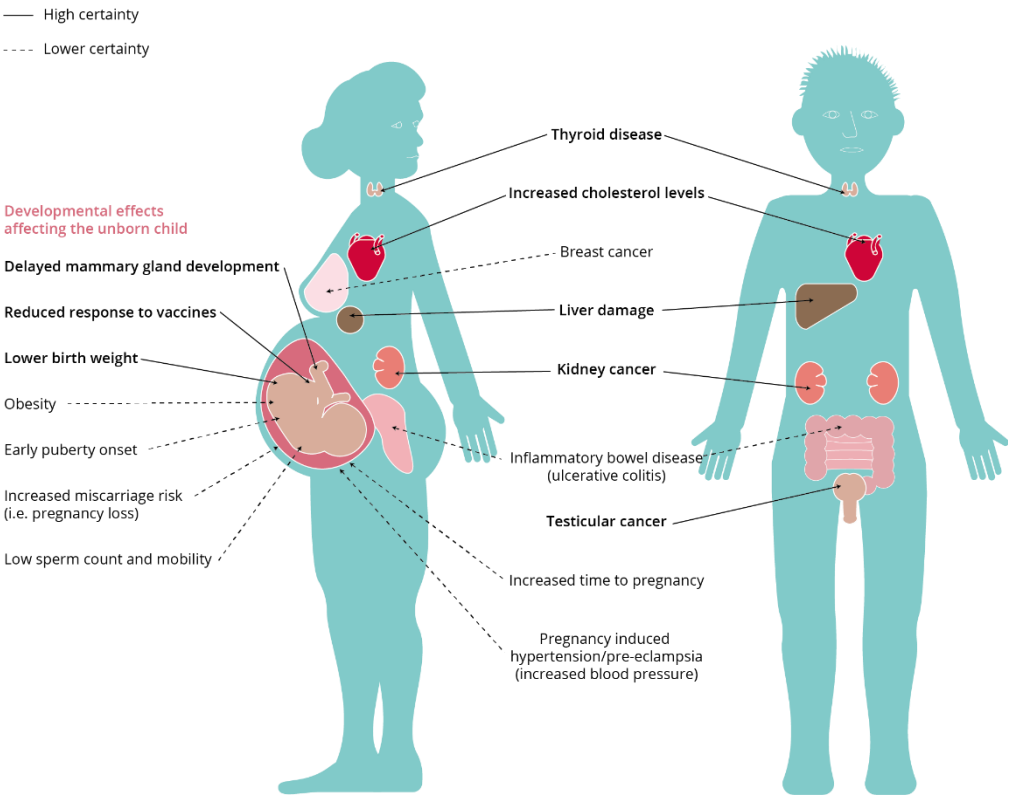
- Perfluorinated sulfonic acids (PFSAs): Contain a sulfonic group ($-SO_3H$).
- Perfluorinated carboxylic acids (PFCAs): Contain a carboxylic group ($-CO_2H$).

PFAS can also be categorized by the length of their carbon chain:

- Short-chain PFAS: Contains six or fewer carbon atoms ($C \leq 6$).
- Long-chain PFAS: Contains more than six carbon atoms ($C > 6$).

What can your family do?

- Test water for PFAS
- Check state standards of safe levels
- Install water treatment systems
- Do not eat fish from polluted lakes and rivers (https://fishadvisoryonline.epa.gov/Contacts.aspx)
- Contact your representatives. You are a citizen with the power of your voice and your vote when you turn 18.



Effects of PFAS on human health
(Image source: European Environment Agency (EEA), Emerging chemical risks in Europe — 'PFAS', 2019, CC-BY license.)

Additional sources

Paper Science and Chemical Engineering Department, UWSP

Freshwater Collaborative of Wisconsin