

# PFAS the “Forever Chemicals”

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It shouldn't be a surprise that there is a high probability you have been exposed to these silent killer chemicals, called PFAS. PFAS has recently gained significant attention worldwide after the scientific research document released by the United States Environmental Protection Agency (US EPA, 2021). As a result, the US EPA and Food and Drug Agency (FDA) have announced to launch a broad strategy to regulate toxic industrial chemicals, including PFAS associated with severe health effects. So, what are these mysterious chemicals, why should we be worried, how can we be exposed, what are the major health concerns, and how do we avoid these chemicals? Let's take a good look.

## What are PFAS?

PFAS are manmade chemicals and were first discovered in the 1930s accidentally by scientists and later patented as Teflon by the chemical company DuPont in the United States. They belong to a class of per- and polyfluoroalkyl substances that possess one or multiple fluorine (F) atoms perfectly attached to carbon (C) atoms to create the carbon-fluorine bond, which is one of the strongest bonds around. Due to their vehemently strong bonding nature and fitting for harsh conditions, PFAS have been widely considered to make

various consumer, commercial, and industrial commodities over the last 80 years. PFAS are employed in aerospace, agriculture, automobile, construction, healthcare, textile, electronics and military.

PFAS are highly stable chemicals and commonly found in an astonishing amount of water, heat, and oil-resistant products. PFAS inherit the unique ability to repel water and oil from absorbing or sticking to surfaces. Therefore, these chemicals are found in a diverse range of consumer products, including:

- Non-stick cookware
- Waterproof and stain-resistant garments including clothing, jackets, carpets and mattresses
- Food packing materials such as fast-food wrappers, microwave popcorn bags, pizza and ready-made cake boxes
- Paints, sealants, waxes, taps, and varnishes



- Cosmetics including sunscreen, hair conditioners, foundation cream and shaving cream
- Cleaning products including dishwasher and laundry detergents, dental floss
- Electronics including laptops, TVs, and smartphones
- Fire-fighting foams (non-consumer product)

## Why should we be worried about PFAS?

Due to the long-lasting characteristics of PFAS, these chemicals do not easily break down in the environment. Moreover, it is challenging to estimate an environmental half-life for PFAS, which is the amount of time it requires 50% of the chemical to degrade. As a result, PFAS, are commonly known as the Forever Chemicals.



Furthermore, PFAS are very mobile in the environment, allowing them to be travelled over long distances. For instance, PFAS have been found in places all around the globe, including the least populated areas such as deserts and the arctic. Concerns about PFAS have arisen for the following reasons:

- Increasing numbers: There are over 9,000 synthetic PFAS are manufactured and used all around the world.
- Widespread usage: PFAS are used in almost every household item we use.
- Numerous exposures: PFAS are found everywhere and can be exposed via multiple routes, including water, air, soil, and food.
- Persistent: PFAS remain in the environment for an extended time.
- Bioaccumulation: Once enter the food chain, PFAS can gradually accumulate in a biological organism over time.

## How can we be exposed to PFAS?

The most common ways of exposing to PFAS are as follows:

- Drinking contaminated water
- Inhaling or swallowing contaminated soil, air, or dust
- Eating seafood caught from water contaminated by PFAS
- Eating food wrapped with materials that contain PFAS
- Wearing and using textiles that contain PFAS

- During breastfeeding from mothers exposed to PFAS

## What are the major health concerns of PFAS?

PFAS have recently emerged as an invisible killer, causing imminent danger to humanity due to their persistence in the environment and humans. The potential adverse health effects associated with PFAS include:

- Thyroid disease
- Liver damage
- Obesity
- Hormone suppression
- Weaken immune system and reduced response to vaccines
- Decreased fertility
- Increased cholesterol levels
- Prenatal development effects
- Delayed mammary gland development
- Lower birth weight
- Cancer

## How can we avoid PFAS?

The toxicological effects of the PFAS are currently regulated under several global regulatory bodies, including the Stockholm Convention on Persistent Organic Pollutants, European Union Chemical Regulation REACH (acronym as "registration, evaluation, authorization of chemicals"), US EPA, and FDA. Albeit many regulations are in place, the accumulation of PFAS in the environment is escalating as

over 9,000 humans engineered PFAS available, and the industries keep producing different types of PFAS. Therefore, limiting the usage of PFAS is a global challenge. However, there are several steps that can be implemented to reduce the exposure to PFAS at the public and government levels as follows:

### At the public level:

- Avoid using non-stick cookware
- Eat home-prepared meals and limit takeaways or fast-foods
- Avoid using products containing chemicals with the name “fluoro” or PTFE (refer to the ingredient label)
- Use PFAS- or PFC-free textile and other consumer products

### At the Government level:

- Respective regulatory agencies and authorities should try to identify potential human exposure pathways of PFAS
- Instruct industries to limit the usage of PFAS containing materials
- Regular testing of the PFAS levels in foods and drinking water
- Improve laboratory facilities to measure the amount of PFAS present in the environment and other sources
- Propose PFAS remediation technologies to industries
- Introduce new legislation to set a national drinking water standard for PFAS chemicals
- Conduct public awareness programmes

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