Per- & Polyfluoroalkyl Substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals.

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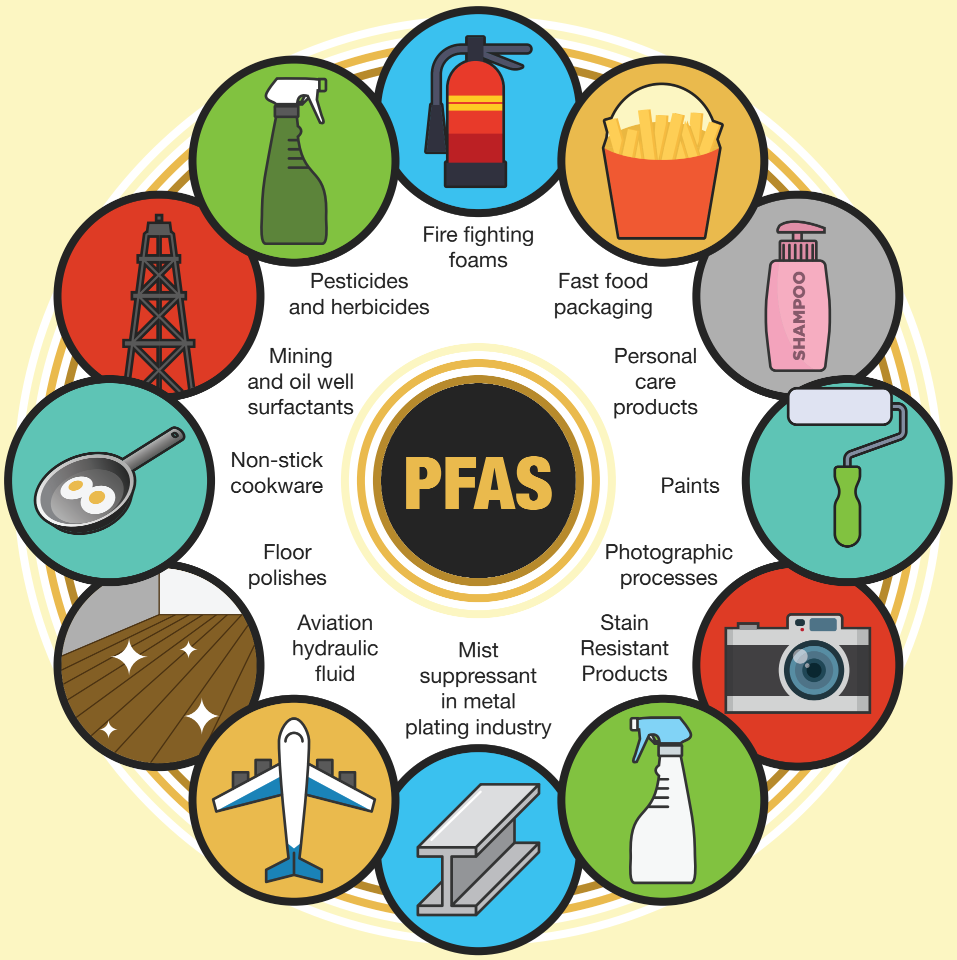

Regulation

In the **United States** there are **no federal drinking water** standards for PFOA or PFOS as of early 2021.

Sources

Although PFOA and PFOS are no longer manufactured in the United States, they are still produced internationally and can be imported into the United States in consumer goods such as carpet, leather and apparel, textiles, paper and packaging, coatings, rubber and plastics.

Health & Effects

EPA's health advisories are based on the best available peer-reviewed studies of the effects of PFOA and PFOS on laboratory animals (rats and mice) and were also informed by epidemiological studies of human populations that have been exposed to perfluoroalkyl substances (PFASs). These studies indicate that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), thyroid effects and other effects (e.g., cholesterol changes). There is limited information identifying health effects from inhalation or dermal exposures to PFOA or PFOS in humans and animals.

Removal From Drinking Water

Granular Actived Carbon

Granular Activated Carbon (GAC) has been shown to effectively remove PFAS from drinking water when it is used in a flow through filter mode after particulates have already been removed. EPA researcher Thomas Speth says, “GAC can be 100 percent effective for a period of time, depending on the type of carbon used, the depth of the bed of carbon, flow rate of the water, the specific PFAS you need to remove, temperature, and the degree and type of organic matter as well as other contaminants, or constituents, in the water.”

High-Pressure Membranes

High-pressure membranes, such as nanofiltration or reverse osmosis, have been extremely effective at removing PFAS. Reverse osmosis membranes are tighter than nanofiltration membranes. This technology depends on membrane permeability. A standard difference between the two is that a nanofiltration membrane will reject hardness to a high degree, but pass sodium chloride; whereas reverse osmosis membrane will reject all salts to a high degree. This also allows nanofiltration to remove particles while retaining minerals that reverse osmosis would likely remove.

Anion Exchange Treatment

Negatively charged ions of PFAS are attracted to the positively charged anion resins. AER has shown to have a high capacity for many PFAS; however, it is typically more expensive than GAC. Of the different types of AER resins, perhaps the most promising is an AER in a single use mode followed by incineration of the resin. One benefit of this treatment technology is that there is no need for resin regeneration so there is no contaminant waste stream to handle, treat, or dispose.

Sources: epa.gov & cancer.org