

UNDERSTANDING PFAS (aka Forever Chemicals)
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PFAS, or per- and polyfluoroalkyl substances, are a group of manmade chemicals that have been used extensively across various industries due to their unique properties. As the Environmental Protection Agency (EPA) phased out perfluorooctane sulfonate (PFOS), which is a specific member of the PFAS group, production of other PFAS increased exponentially.

PFAS have become a focal point of regulatory and public concern within the last four (4) years. Recently, residents of the Gray's Creek community were informed by North Carolina State Professor, Jane Hoppin, that PFAS levels detected in the blood of 500 participants were decreasing. However, PFAS was still detected in the participants at concerning levels. Since PFAS are regularly detected in the blood of "nearly every American," this makes them a target for concern as well^{1,2}.

What Are PFAS?

Discovered through the processes of electrochemical fluorination (ECF) and fluorotelomerization in the 1930s, PFAS are a group of over 14,000 synthetic chemicals characterized by their carbon-fluorine bonds, which are of the strongest organic bonds due to fluorine possessing the most electronegativity of any element^{3,4}. The chemical identity of PFAS provides the following physical attributes: remarkable resistance to heat, water, and oil. These physical properties are ideal for applications in firefighting foams, non-stick coatings, hydrophobic fabrics and cosmetics, and

various industrial processes. The same characteristics which make PFAS appealing for industrial applications earn the chemical group its "forever chemicals" nickname. Environmental and health issues are posed as PFAS are released into biosystems because they are nearly difficult to destroy.

The Environmental and Health Impact

Some of the ways PFAS directly enters the body are through skin absorption, drinking potable water, and applying certain cosmetics (i.e., eye makeup, moisturizers, or rouges containing PFAS)^{5,6}. Studies have linked PFAS exposure to a range of health issues, including cancer, liver damage, immune system disruption, and developmental problems in children.

One of the most pressing concerns surrounding PFAS is their environmental persistence. For example, cigarette butts can take 10 years to degrade in the environment, whereas PFAS break down over the course of hundreds to thousands of years^{7,8}. PFAS spread throughout ecosystems from the bottom up since they accumulate in soil, water, and living organisms. One (1) of the most pressing concerns surrounding PFAS is their environmental persistence.

Cancers: The National Cancer Institute (NCI) Working Group categorized perfluorooctanoic acid (PFOA), a PFAS, as a "possible human carcinogen" in 2023. The NCI has also researched the relationship between PFAS and kidney, testicular, breast, ovarian, endometrial, prostate, and thyroid cancer⁹.

Regulatory Landscape

In the US, research highlights the widespread contamination of water sources with PFAS, often originating from industrial facilities (e.g., Chemours), military bases, and wastewater treatment plants. PFAS contamination has led to increased attention from regulatory agencies and public involvement.

Historically, PFAS were largely unregulated. As the issues PFAS create were unknown, their presence in consumer products and industrial processes went unchecked for decades. Slowly but surely, regulations are beginning to mitigate PFAS contamination. Evidence and awareness of PFAS's health and environmental impacts call for policy response from governing bodies. Regulatory framework has been established, which provides the first steps in controlling exposure.

Federal Regulations: PFAS contamination is addressed at the federal level. In 2016, the EPA issued a health advisory for two (2) common PFAS compounds, PFOA and PFOS, recommending that their levels in drinking water do not exceed 70 parts per trillion (ppt). Considering constituents of drinking water are typically examined in parts per million (ppm), decreasing the release of PFAS is imperative.

More recently, the EPA has proposed more stringent regulations and has been developing enforceable limits for PFAS in drinking water, etc. This is being accomplished, as the EPA is successfully limiting the production of PFAS through the Toxic Substance Control Act (TSCA). In 2023, the EPA directed Inhance Technologies LLC to halt the production PFAS, which were molded into plastic containers. Under a significant new use rule (SNUR) finalized in January 2024, any business with the goal of manufacturing or processing 329 designated PFAS must undergo EPA review¹⁰.

State Regulations: Spanning from Alaska to Florida, 34 states adopted their own PFAS regulations¹¹. State regulations must meet or go beyond federal standards. For instance, California, New York, and Michigan enacted stricter limits for PFAS in drinking water and initiated state-level investigations into contamination sources. The state legislations – or lack thereof – reflect the level of urgency at which states are addressing PFAS contamination.

When it comes to state bureaucracies, the Minnesota Pollution Control Agency (MPCA) is the leader in air emissions guidance and resources regarding PFAS. The MPCA now requires facilities to report PFAS on annual Emission Inventory Reports (EIRs). Facilities submitting EIRs, of course, are mandated to do so by their individual air permit.

Local Municipalities: Even cities municipalities have dipped their hand in trying to managing PFAS. For instance, the City of Crowley, Texas conducted a survey beginning in 2020 to identify businesses known to use, store, or manufacture PFAS. Recently, the Town of Crowley, Colorado released a Consumer Drinking Water Notice (PWSID CO0113300) that shows PFOA is nondetectable. However, the document states that PFOS were detected at 0.02 ppt. The Town of Crowley advises those who read it to inform tenants, nursing homes, schools, etc. to share the sampling results and filter PFAS from their water supply¹².

Industry Response: Many industries are seeking substitutions, alternatives, and ways to eliminate PFAS due to the growing regulatory pressure. For example, companies in the firefighting foam sector have been transitioning to PFAS-free formulations, especially for Class A/B and B extinguishers¹³. Manufacturers of non-stick cookware are exploring alternative materials as well.

Conclusion

"Forever chemicals" present a significant challenge for the world as they linger in our bodies, which negatively impacts our health – not to mention PFAS's affect on other organisms and bioaccumulative presence. Addressing this requires a multifaceted, dynamic approach; strategies to reduce exposure to PFAS include implementing regulatory compliance; adopting alternative technologies; and transfer of vital information. As awareness and regulations continue to evolve, industries must remain vigilant and adaptable to mitigate the impact of PFAS. Thanks to dedicated third-party companies like Vanguard Environmental, Inc., businesses can navigate the complexities of PFAS and contribute to a safer, healthier future. Stay tuned for the next issue to read about how PFAS regulations affect specific industrial practices.

