

PROMOTING HEALTHY  
ENVIRONMENTS FOR CHILDREN

# PFAS: Perfluoroalkyl and Polyfluoroalkyl Substances



## KEY POINTS

- PFAS are a large group of human-made chemicals produced in the US since the 1950s. They have been used in thousands of products due to their resistance to water, oil, fire, stains, and friction.
- Due to the strong chemical bond between the fluorine and carbon atoms in PFAS, these compounds are persistent in the environment, resistant to degradation, and can readily migrate through soil into groundwater and drinking water sources.
- The 2 most commonly studied PFAS are Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), which have been mostly phased out of production and use in the US but are still found in the environment.
- The most likely exposure route for these chemicals is ingestion of food and drinking water. While exposure to PFOA and PFOS from today's consumer products is thought to be low, other PFAS are still found in consumer products such as fast-food containers, stain-repellent textiles, and water-repellant clothing.
- Due to their ubiquitous nature, PFAS can be detected in the blood of nearly all people. The biological half-life depends upon the characteristics of the PFAS (eg, length of the carbon chain) and, for some PFAS, is quite long, sometimes years.
- Epidemiologic studies in humans suggest a link with PFAS exposure and high cholesterol, increases in liver enzymes, altered thyroid function, increased risk of high blood pressure or pre-eclampsia in pregnant women, decreased immune response to some vaccines, small decreases in birth weight, and certain cancers (eg, kidney, testicular).

## CLINICAL GUIDANCE

In epidemiologic studies, as noted above, PFAS have been associated with human health effects. The most important step for families is to reduce sources of exposure when possible.

Prevention is key!

- For contaminated water:
  - In *known cases* of drinking water contamination, using PFAS-free bottled water for drinking and mixing formula may help reduce exposure until the drinking water system has addressed the PFAS contamination. Families using bottled water should consult their child's pediatrician about the need for supplemental fluoride, if the water used does not contain adequate concentrations of fluoride to prevent dental caries.
  - Water filters that are certified to remove PFAS are also available for homes. Installing a home water filtration system, if monitored, maintained, and used properly, can reduce PFAS levels. However, these filters may not reduce PFAS below guidance levels. How much PFAS is removed by filtration is determined by 1) the PFAS levels, 2) the type of filter, and 3) how well the filter is maintained.

- Families who are using water to prepare their infant's daily formula should switch to PFAS-free bottled water or switch to filtered water using a filter certified to remove PFAS. As above, the pediatrician should be consulted regarding the need for supplemental fluoride.
- Alternative water sources for showering or bathing are not necessary because these chemical contaminants are not absorbed through the skin.
- Families can limit exposure from consumer and food products by:
  - Routine wet dusting and wet mopping in the home to get rid of household dust (as PFAS and other chemicals and allergens can build up in dust).
  - Cut back on the use of certain fast food nonstick containers, such as microwave popcorn packaging.
  - Replace old/cracked or flaking nonstick cookware (use safer alternatives like iron or stainless steel).
  - Check local fish, wildlife, meat, and dairy advisories if consuming locally sourced foodstuffs.
- For patients with concerns about PFAS exposure, important components of the patient visit include identifying and reducing current sources of environmental exposure, and promoting standard, age-appropriate preventive care measures for health and wellness.
- Some states require municipal water systems to test for the presence of several PFAS, given the absence of federal regulations (as of January 2023) and notify customers if the municipal water system tests positive for elevated levels of PFAS (or any other regulated contaminant). However, families may not receive the notice or, if they do, may not understand its implications or ignore it.
- Breastfeeding is recommended for infants, even when it has been learned that drinking water may have been contaminated with one or more PFAS. Although some environmental pollutants, such as PFAS, can pass to the infant through human milk, the advantages of breastfeeding continue to far outweigh any known risks in nearly every circumstance. However, if a family is known to have been chronically exposed to PFAS in highly contaminated drinking water or other known sources, the clinician should have a discussion with them, weighing their preferences and the advisability of breastfeeding.
- Although PFAS can be measured in blood, these tests are generally only available from relatively few, specialized laboratories. Other testing barriers include costs of testing and questions of health insurance coverage, complex technical issues regarding laboratory testing proficiency, and access of disadvantaged families living in environmental justice communities to such testing. Routine measurement of serum PFAS is not recommended as the results do not provide clinical information to guide medical management or predict future health effects. However, if a family is known to have been chronically exposed to high levels of PFAS in drinking water or other sources, the clinician should have a discussion with them, weighing their preferences and the advisability of such testing.
- Regardless of PFAS blood level, the best next step for concerned patients is to reduce future sources of exposure. There are currently no evidence-based treatments for removal of PFAS from the body.
- If a family is known to have been chronically exposed to high levels of PFAS in drinking water or from other known sources, monitoring of blood lipid profile and cholesterol levels should be conducted once in children ages 9-11 years old and again between ages 17-21 years on the schedule recommended by the American Academy of Pediatrics (<https://www.healthychildren.org/English/healthy-living/nutrition/Pages/Cholesterol-Levels-in-Children-and-Adolescents.aspx>). For families chronically exposed to high levels of PFAS who have a family history of dyslipidemia, cholesterol and lipid profile screening of children 2 years and older is advisable, unless they have already been screened within the preceding 5 years or are already diagnosed and receiving treatment.
- Currently, there is no evidence to support obtaining blood work to look for end-organ effects of PFAS exposure in otherwise healthy, asymptomatic children. Laboratory testing should be dictated by standard of practice- the patient's medical history, physical exam findings, and age (standard preventive services and screening tests are recommended).

### **FOR MORE INFORMATION**

The following resources offer additional information regarding PFAS:

- [Guidance on PFAS Exposure, Testing, and Clinical Follow-Up \(2022\)](#) – National Academies of Sciences, Engineering, and Medicine
- [Pediatric Environmental Health, 4<sup>th</sup> Edition](#) – AAP Policy Manual
- [PFAS: Limiting Children’s Exposure to “Forever Chemicals”](#) – HealthyChildren.org
- [PFAS Resources](#) – PEHSU Program
- [PFAS and Children’s Health](#) – NIEHS
- [Per- and Polyfluoroalkyl Substances \(PFAS\) and Your Health](#) – ATSDR