

PFAS



Information for Clinicians



Properties



- Per- and polyfluoroalkyl substances (PFAS) are a family of thousands of synthetic chemicals; relatively few have been studied for their effect on health
- Used widely to reduce friction or resist oil, water, and stains
- Widespread and persistent in the environment
- Among studied PFAS: absorbed in intestines and lungs; bind to serum and tissue proteins; most not metabolized; half-lives range from a few days to 8+ years

Human Exposure



- Nearly all people in the U.S. have had exposure to PFAS
- PFOS, PFOA, and PFHxS exposure is decreasing in the U.S. population, in part because of production phase-outs
- Population exposures to substitute PFAS (e.g., GenX) are not well studied
- Communities with PFAS contamination of water or food are often near facilities that have manufactured, used, or handled PFAS
- Ingestion of PFAS in water and food is a main route of exposure; ingestion of dust and residue from PFAS-containing products can also result in exposure
- Inhalation is not a typical route of exposure for the general population but can occur with PFAS-containing dust, aerosols, or fumes
- Children can be exposed by drinking formula mixed with PFAS-containing water, drinking breastmilk from persons exposed to PFAS, ingesting dust or dirt, and through hand to mouth behaviors with textiles treated with stain protectants
- Some PFAS cross the placenta and enter umbilical cord blood

Health Effects



- Research is ongoing to understand the mechanisms of PFAS toxicity
- The epidemiological evidence suggests associations between increases in exposure to (specific) PFAS and certain health effects
 - Increases in cholesterol levels (PFOA, PFOS, PFNA, PFDA)
 - Small decreases in birth weight (PFOA, PFOS)
 - Lower antibody response to some vaccines (PFOA, PFOS, PFHxS, PFDA)
 - Kidney and testicular cancer (PFOA)
 - Pregnancy-induced hypertension or preeclampsia (PFOA, PFOS)
 - Changes in liver enzymes (PFOA, PFOS, PFHxS)
- The risk of health effects associated with PFAS depends on
 - Exposure factors (e.g., dose, frequency, route, and duration)
 - Individual factors (e.g., sensitivity and chronic disease burden)
 - Other determinants of health (e.g., access to safer water and quality healthcare)

Clinical Evaluation and Management



- Main goals are to
 - Identify and reduce PFAS exposures
 - Promote standard age-appropriate preventive care measures for physical health, mental health, and wellness
- Clinical presentation: PFAS toxicity is not associated with characteristic signs or symptoms
- Taking an exposure history can help identify PFAS exposures and determine actions to reduce exposures; ask about possible current and past PFAS exposure sources, durations, frequency, and magnitude

Clinical Evaluation and Management

(continued)



- Exposure reduction strategies follow from the exposure history; examples include
 - Installing water filtration system or using an alternative water source
 - Limiting or avoiding consumption of contaminated fish, meat, eggs, or dairy
 - Choosing products without PFAS when possible
- Breastfeeding is optimal due to its many benefits; clinicians can assist patients in their decision to breastfeed based on factors specific to the patient and child
- Clinicians can counsel patients on whether to pursue blood testing with an understanding of the benefits and limitations of PFAS testing:
 - Results (current levels of PFAS in the blood) could reflect recent exposures or past exposures in the case of PFAS with long half-lives
 - PFAS blood test results do not identify sources of exposure
 - Results do not indicate whether a current illness can be attributed to PFAS exposure or predict future health problems
 - Comparing PFAS results across laboratories can be difficult
 - Potential relief from psychological distress if PFAS levels are normal
 - Having information that could guide exposure reduction decisions
 - Potential for false positives from screening based on PFAS blood test results and iatrogenic complications from additional evaluation and treatment
- ATSDR has not developed health-based screening blood levels for PFAS
- No approved medical treatments are available to remove PFAS from the body

Additional Expertise



- Other professionals can help with exposure histories and reduction methods, and patient evaluation and monitoring/treatment plans:
 - Board-certified clinicians specializing in occupational and environmental medicine, medical toxicology, and pediatric environmental health
 - Occupational health clinicians
 - State or local health/environmental departments

More Resources



- [ATSDR PFAS Information for Clinicians \(full document\)](#)
- [American College of Medical Toxicology](#)
- [Association of Occupational and Environmental Clinics](#)
- [ATSDR Toxicological Profile for PFAS](#)
- [ATSDR PFAS and Your Health](#)
- [ATSDR PFAS Blood Level Estimation Tool](#)
- [ATSDR Minimal Risk Levels for PFAS](#)
- [CDC's Breastfeeding: Why it Matters](#)
- [CDC National Report on Human Exposure to Environmental Chemicals](#)
- [EPA's Meaningful and Achievable Steps You Can Take to Reduce Your Risk](#)
- [NASEM Guidance on PFAS Testing and Health Outcomes](#)
- [National Institute for Occupational Safety and Health PFAS webpage](#)
- [Pediatric Environmental Health Specialty Units](#)

Acronyms:

PFAS: Per- and polyfluoroalkyl substances

PFDA: Perfluorodecanoic acid

PFHxS: Perfluorohexane sulfonic acid

PFNA: Perfluorononanoic acid

PFOA: Perfluorooctanoic acid

PFOS: Perfluorooctane sulfonic acid