**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
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.

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

Additional Expertise

More Resources

- ATSDR PFAS Information for Clinicians (full document)
- American College of Medical Toxicology
- American College of Occupational and Environmental Medicine
- 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

Last updated 1/18/2024