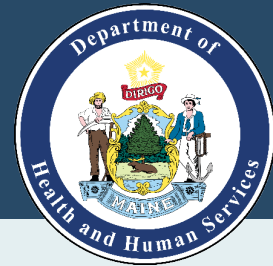


# PFAS Blood Testing: Information for Maine Clinicians



## At A Glance

Environmental exposure to PFAS may increase a person's risk for adverse health effects, including changes in cholesterol, reduced antibody response to vaccines in children, and some cancers. Blood testing is available and can provide guidance for clinical monitoring and exposure reduction.

## PFAS basics:

"PFAS," short for "per- and polyfluoroalkyl substances," comprise a large group of manufactured chemicals used in industry and consumer products, including cosmetics, textiles (e.g., furniture, carpeting, sports equipment), cookware, and food packaging. PFAS have also been incorporated into firefighting foam designed to extinguish fuel fires, which have historically been used at airports and military bases. Conventional wastewater treatment systems do not remove PFAS from either domestic or industrial wastewater. The resulting biosolids (i.e., sewage sludge) may contain high levels of PFAS. The historical spreading of biosolids as fertilizer, banned since 2022, has resulted in the contamination of farmland as well as both ground and surface sources of drinking water in Maine and possibly across the country.

While referred to colloquially as "forever chemicals," PFAS do clear from the body slowly over time, with half-lives for some PFAS ranging from 2 to 8 years.<sup>1</sup> Exposure primarily occurs through ingestion of contaminated water or food, and sometimes through inhalation. Dermal absorption is less likely.

## Health risks associated with PFAS exposure:

PFAS are structurally similar to fatty acids and can bind to various proteins in the body. Unlike other chemicals that are often stored in adipose tissue, PFAS exist largely bound to albumin in the blood. PFAS are distributed to multiple organ systems via the bloodstream and can cross the placenta and enter human milk. Exposure to PFAS rarely presents with clinical toxicity,<sup>2,3</sup> but can be considered a risk factor for later disease, similar to genetic determinants or behavioral factors, such as tobacco use.

Research on the health effects of PFAS is ongoing. In a commissioned report on PFAS exposure, testing, and clinical follow-up, the National Academies of Sciences, Engineering, and Medicine (NASEM) evaluated the weight of evidence for various health effects associated with PFAS exposure based on studies in animals and humans.<sup>4</sup> NASEM identified several health effects that can be associated with PFAS exposure with high or moderate confidence, depending on the strength of the supporting evidence.

Maine CDC thanks the panel of Maine primary care physicians  
who helped contribute to this guidance.

- 1 Li Y, Andersson A, Xu Y, et al. Determinants of serum half-lives for linear and branched perfluoroalkyl substances after long-term high exposure - A Study in Ronneby, Sweden. *Environ Int.* 2022;163:107198.
- 2 Johnston, CJ, Finkelstein, JN, Mercer, P, Corson, N, Gelein, R, Oberdorster, G. Pulmonary effects induced by ultrafine PTFE particles. *Toxicol Appl Pharmacol.* 2000 Nov 1;168(3): 208-15.
- 3 Shusterman, DJ. Polymer fume fever and other fluorocarbon pyrolysis-related syndromes. 1993 Jul-Sep;8(3):519-31.
- 4 National Academies of Sciences, Engineering, and Medicine; Committee on the Guidance on PFAS Testing and Health Outcomes. *Guidance on PFAS Exposure, Testing, and Clinical Follow-Up.* Washington (DC): National Academies Press (US); 2022 Jul 28. PMID: 35939564.

## Health risks associated with PFAS exposure (cont.):

### Moderate Confidence



- Increased risk of breast and testicular cancers
- Liver enzyme alterations
- Increased risk of pregnancy-induced hypertension, pre-eclampsia, and eclampsia
- Thyroid disease and dysfunction
- Increased risk of ulcerative colitis

### High Confidence



- Decreased antibody response to some vaccines
- Serum dyslipidemia
- Decreased infant and fetal growth
- Increased risk of kidney cancer

*Additional health risks have been studied, but due to insufficient evidence, conclusions about possible associations cannot be made at this time.*

## PFAS exposure risk in the United States:

While geometric mean concentrations of certain PFAS in serum have declined since the early 2000s, PFAS are still detectable in over 96% of the U.S. population.<sup>5</sup> Certain populations may be at risk of elevated exposure, which can increase the risk of potential health effects.

Groups at risk of **HIGH** exposure include:

- Individuals, especially those relying on private wells, who live in areas with known PFAS contamination or near sites where contamination may have occurred (e.g., farms where biosolids have been applied, facilities that use PFAS, commercial airports, military bases, or wastewater treatment plants)
- Military personnel
- Firefighters
- Factory workers in industries that produce or use PFAS in their products (e.g., carpeting, paper mills)
- Infants consuming contaminated breastmilk or formula mixed with contaminated water
- Individuals consuming fish or game from contaminated areas. Follow the link below for additional resources on consumption advisories in Maine.

The degree of risk depends on many factors, including overall health, and how much and how long a person has been exposed to the chemicals. While NASEM recommends offering PFAS blood testing to people likely to have elevated exposure, the Agency for Toxic Substances and Disease Registry (ATSDR) – a public health agency under the U.S. Department of Health and Human Services – does not make specific recommendations about testing.

<sup>5</sup> Botelho JC, Kato K, Wong LY, Calafat AM. Per- and polyfluoroalkyl substances (PFAS) exposure in the U.S. population: NHANES 1999-March 2020. *Environ Res.* 2025;270:120916. doi:10.1016/j.envres.2025.120916

## What blood testing can provide:

Blood testing can identify individuals with elevated PFAS exposure who therefore may be at increased risk for adverse health outcomes. Clinicians are encouraged to engage in shared, informed decision-making about blood testing with their patients. Discussions about PFAS testing should always include information about how PFAS exposure occurs, potential health effects, and the benefits and limitations of PFAS testing.

### A blood test CAN:

- ✓ Provide the levels of PFAS in blood at the time of testing
- ✓ Show how levels compare to the general population
- ✓ Help guide strategies for exposure reduction
- ✓ Inform whether additional health monitoring may be beneficial

### A blood test CANNOT:

- ✗ Explain how or when exposure has occurred
- ✗ Predict whether future health issues will occur
- ✗ Determine if any past or current health issues are attributable to PFAS

## How to order a PFAS blood test in Maine:

PFAS blood serum tests can be ordered through a diagnostic laboratory. In some health systems, clinicians can order tests through their hospital laboratory. The number of analytes can vary across tests but should include, at a minimum, the nine NASEM-recommended analytes (i.e., NASEM-9).<sup>6</sup> The test will require a blood draw and a few weeks for results. For all lab orders, use **ICD-10 code Z13.88**. Specific CPT and test codes depend on both the billing method and the particular PFAS test ordered. For individuals who are eligible for free blood testing through the Department of Agriculture Conservation and Forestry's PFAS Fund, use the test code provided in the patient's authorization form. Otherwise, contact [PFASTesting@questdiagnostics.com](mailto:PFASTesting@questdiagnostics.com) to verify the account associated with the order and obtain the correct test code. If ordering through NorDx or another hospital laboratory, order as a *miscellaneous reference test* and select the following options:

Specimen Type	Blood
Specimen Source	Venous
Performing Lab	Other
Performing Lab	"Quest"
Performing Lab Test Code and Test Name	Contact Quest Diagnostics at <a href="mailto:PFASTesting@questdiagnostics.com">PFASTesting@questdiagnostics.com</a> to confirm appropriate test information

## PFAS in serum is a notifiable condition:

As of June 4, 2025, PFAS detectable in serum is a notifiable condition. The Control of Notifiable Diseases and Conditions Rule specifies that clinicians and medical laboratories are required to report results with positive PFAS detections to the Maine CDC. Laboratory reporting must be completed electronically through HL7 messaging. Otherwise, health care providers can fax results to the Maine CDC Disease Surveillance reporting line at 1-800-293-7534.

<sup>6</sup> The 9-panel "Forever Chemicals" test measures the nine NASEM-recommended analytes (PFOA (linear and branched isomers), PFOS (linear and branched isomers), PFHxS, PFNA, PFDA, MeFOSAA, PFUnDA) but excludes other commonly detected PFAS, such as PFHpA. The expanded 24-panel "Perfluoroalkyl Substances (PFAS), Serum/Plasma" test includes the NASEM-9 plus additional short-chain and replacement PFAS. Note: individual tests cost approximately \$525-\$620; insurance coverage varies.

## Clinical management:

Lab test results will indicate which PFAS chemicals were tested, concentrations of each PFAS chemical in nanograms per milliliter (ng/mL), or “not detected” if concentrations are too low to measure. Clinicians can compare each patient’s PFAS concentrations to levels in a representative sample of the the U.S. population.<sup>7</sup> While there is general consensus that PFAS blood testing can be beneficial for some individuals in guiding exposure reduction and providing greater awareness for PFAS-associated health effects, recommendations for clinical follow-up can vary.<sup>8,9,10</sup> In its commissioned report, NASEM recommends age-appropriate screenings within the usual standard of care for PFAS levels between 2- < 20 ng/mL. For PFAS blood levels  $\geq 20$  ng/mL, NASEM recommends additional preventative screening for cholesterol, thyroid function, ulcerative colitis, and testicular and kidney cancer.

PFAS Blood Level <sup>a</sup>	Recommended follow-up <sup>b,c</sup>
< 2 ng/mL	<ul style="list-style-type: none"> <li>• Adverse health effects not expected</li> <li>• Provide usual standard of care</li> </ul>
2- < 20 ng/mL	<ul style="list-style-type: none"> <li>• Potential for adverse health effects</li> <li>• Encourage exposure reduction if source can be identified, especially for people who are pregnant</li> <li>• <b>Within the usual standard of care</b>, prioritize screening for:               <ul style="list-style-type: none"> <li>• Dyslipidemia for children and adults as recommended by the American Heart Association (every 4-6 years for normal individuals)</li> <li>• Hypertensive disorders of pregnancy during prenatal visits</li> <li>• Breast cancer based on age and other risk factors</li> </ul> </li> </ul>
>20 ng/mL	<ul style="list-style-type: none"> <li>• Increased risk of adverse health effects</li> <li>• Encourage exposure reduction if source can be identified, especially for people who are pregnant</li> <li>• <b>In addition to the usual standard of care, prioritize screening for:</b> <ul style="list-style-type: none"> <li>• Dyslipidemia for patients over 2 as recommended by American Academy of Pediatrics for high-risk children and American Heart Association for high-risk adults</li> </ul> </li> <li>• At all well visits:               <ul style="list-style-type: none"> <li>• Conduct thyroid function/TSH testing for patients over 18</li> <li>• Assess for signs and symptoms of kidney cancer for patients over 45 with urinalysis</li> <li>• Assess for signs and symptoms of testicular cancer and ulcerative colitis for patients over 15</li> </ul> </li> </ul>

7 U.S. CDC. 2022. National Health and Nutrition Examination Survey (NHANES) Biomonitoring Data Tables for Environmental Chemicals. [www.cdc.gov/exposurereport/data\\_tables.html](https://www.cdc.gov/exposurereport/data_tables.html)

8 Wendel CA, Hansen L, Bernstein A. PFAS Information for Clinicians From ATSDR. J Environ Health. 2024 Jun;86(10):32-34. PMID: 40390762; PMCID: PMC12087759.

9 PFAS-REACH. See <https://pfas-exchange.org/resources/> (accessed June 24, 2025)

10 National Academies of Sciences, Engineering, and Medicine; Committee on the Guidance on PFAS Testing and Health Outcomes. Guidance on PFAS Exposure, Testing, and Clinical Follow-Up. Washington (DC): National Academies Press (US); 2022 Jul 28. PMID: 35939564.

a Simple additive sum of 9 PFAS: MeFOSAA, PFHxS, PFOA (linear and branched isomers), PFDA, PFUnDA, PFOS (linear and branched isomers), and PFNA

b Clinicians may repeat PFAS blood testing after 1 year for individuals with elevated exposure to ensure that exposure reduction interventions are effective and levels are decreasing.

c Based on U.S. levels represented by NHANES in 2017-2018, 98% of people had PFAS levels  $\geq 2$  ng/mL; 9% had levels  $\geq 20$  ng/mL.

## PFAS exposure reduction:

Research is ongoing on interventions to reduce PFAS body burden. The bile acid sequestrant cholestyramine has been shown to be effective at reducing serum concentrations for many PFAS in multiple studies, including one randomized controlled trial.<sup>11</sup> However, whether this reduction improves health outcomes has yet to be demonstrated. Two Maine hospitals have developed evidence-based protocols for the use of cholestyramine to reduce PFAS body burden. Data have also shown that repeated phlebotomy may reduce PFAS concentrations, but with less certain safety and ethical implications.<sup>12</sup>

Mitigation should focus on reducing ongoing exposure:

- Patients with high levels of PFAS in their private well water should use bottled water for drinking or install a filtration system. For eligible individuals, the Maine Department of Environmental Protection (DEP) can assist in installing filters. Filtration systems and commercial filters with the code NSF/ANSI 53 or NSF/ANSI 58 for reverse osmosis systems can reduce concentrations of PFOA, PFOS and other PFAS below 20 ng/L (per filter certification standards as of October 2024).
- Follow local fish and game consumption advisories – limit or avoid consumption of fish from inland rivers, lakes, and streams. In some areas, eating wild-caught deer and turkey is also not recommended.
- For individuals with work-related exposures, consult with occupational health and safety professionals about reducing exposure.
- Research on PFAS in human milk is ongoing. The U.S. Centers for Disease Control and Prevention and the American Academy of Pediatrics recommend most people continue to breastfeed. Current science suggests the benefits outweigh the potential risks of PFAS exposure through breastmilk.<sup>13</sup>

## Additional information about PFAS:

Additional Resources	
Talk to a toxicologist at Maine CDC for help understanding test results and identifying possible sources of exposure	Call 866-292-3474 (toll-free in Maine), 207-287-4311, or Maine Relay 711
Maine CDC PFAS website	<a href="http://www.maine.gov/dhhs/mecdc/healthy-living/health-and-safety/pfas-in-maine">www.maine.gov/dhhs/mecdc/healthy-living/health-and-safety/pfas-in-maine</a>
Maine Department of Environmental Protection resources for private wells	<a href="http://www.maine.gov/dep/spills/topics/pfas/?utm_s.html">www.maine.gov/dep/spills/topics/pfas/?utm_s.html</a>
<i>NASEM Guidance on PFAS Exposure, Testing, and Clinical Follow-Up</i> (Report highlights)	<a href="http://nap.nationalacademies.org/resource/26156/PFAS%20Guidance%20Highlights.pdf">nap.nationalacademies.org/resource/26156/PFAS%20Guidance%20Highlights.pdf</a>
JAMA Viewpoint: Clinical Implications of New Drinking Water Regulation for “Forever Chemicals” (Criswell et al., 2024)	<a href="https://doi.org/10.1001/jama.2024.12705">doi.org/10.1001/jama.2024.12705</a>
Maine Department of Inland Fisheries and Wildlife Wild Game Consumption Advisory	<a href="http://www.maine.gov/ifw/hunting-trapping/hunting/laws-rules/pfas-related-consumption-advisory.html">www.maine.gov/ifw/hunting-trapping/hunting/laws-rules/pfas-related-consumption-advisory.html</a>
Maine CDC Fish and Seafood Safe Eating Guidelines	<a href="http://www.maine.gov/dhhs/mecdc/healthy-living/health-and-safety/food-safety/fish-and-seafood">www.maine.gov/dhhs/mecdc/healthy-living/health-and-safety/food-safety/fish-and-seafood</a>
<i>For Clinicians: Frequently Asked Questions about PFAS</i> (ATSDR, 2025)	<a href="http://www.atsdr.cdc.gov/pfas/hcp/faqs/index.html">www.atsdr.cdc.gov/pfas/hcp/faqs/index.html</a>
<i>PFAS and Your Health</i> (ATSDR, 2024)	<a href="http://www.atsdr.cdc.gov/pfas/index.html">www.atsdr.cdc.gov/pfas/index.html</a>

11 Møller JJ, Lyngberg AC, Hammer PEC, et al. Substantial decrease of PFAS with anion exchange resin treatment - A clinical cross-over trial. *Environ Int.* 2024;185:108497. doi:10.1016/j.envint.2024.108497

12 Gasiorowski R, Forbes MK, Silver G, Krastev Y, Hamdorf B, Lewis B, Tisbury M, Cole-Sinclair M, Lanphear BP, Klein RA, Holmes N, Taylor MP. Effect of Plasma and Blood Donations on Levels of Perfluoroalkyl and Polyfluoroalkyl Substances in Firefighters in Australia: A Randomized Clinical Trial. *JAMA Netw Open.* 2022 Apr 1;5(4):e226257. doi: 10.1001/jamanetworkopen.2022.6257. PMID: 35394514

13 Breastfeeding and PFAS, ATSDR. 2024. [www.atsdr.cdc.gov/pfas/prevent-exposure/breastfeeding.html](http://www.atsdr.cdc.gov/pfas/prevent-exposure/breastfeeding.html)



To learn more about PFAS and health impacts on ME CDC's website, follow the link in this QR code.