



NC DEPARTMENT OF
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HUMAN SERVICES**

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TO: North Carolina Clinicians
FROM: Zack Moore, MD, MPH, State Epidemiologist
SUBJECT: Updated Guidance for Clinicians with Patients Concerned about Exposures to Per- and Polyfluoroalkyl Substances (PFAS)

Since 2017, the NC Department of Health and Human Services (NCDHHS) has been responding to public health concerns about GenX and other chemicals known as per- and polyfluoroalkyl substances (PFAS). The NCDHHS Occupational and Environmental Epidemiology Branch developed this memo to provide PFAS information and educational materials to clinicians in affected communities to help them address patient concerns, including:

- What are PFAS?
- How can I be exposed?
- What are the health effects?
- How can I measure PFAS in my blood, and what does that mean?

PFAS Basics

PFAS are a large group of man-made chemicals that have been used in industry and consumer products worldwide since the 1950s. These chemicals are used to make products that resist stains, water, and grease and have been used in furniture, cookware, fast food packaging and fire-fighting foam. PFAS are found in water, people, and wildlife all over the world. Most PFAS do not break down easily in the environment and can stay in people's bodies a long time.

There are several ways that one can be exposed to PFAS. Primary exposure routes include working in occupations that utilize PFAS (e.g., textiles, chemical manufacturing, and firefighting) or drinking contaminated water. There are several communities with known contamination in North Carolina, including the area around the Chemours Fayetteville Works Facility and the lower Cape Fear River basin. Secondary exposure routes may include eating contaminated food or breathing contaminated air.⁽¹⁾

Health Concerns Related to PFAS

Research is still being conducted to better understand the health impacts of PFAS exposure. Studies to date have identified a growing list of associated health effects, including:

- Increased cholesterol levels in adults and children;

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- Increased liver enzymes in adults and children;
- Increased risk of high blood pressure for pregnant people;
- Negative impacts on growth for fetus and infants;
- Increased risk of thyroid disease in adults;
- Reduced immune system function, such as reduced antibody response to vaccines in adults and children;
- Increased risk of ulcerative colitis in adults, and
- Increased risk of certain types of cancer, including breast, kidney and testicular.^(1,2,3)

Measuring PFAS Exposure

Although PFAS are not naturally occurring, exposures are so widespread that most people have some detectable PFAS in their blood. Some patients may want to have their blood tested for PFAS to gain information about their exposures, which can be compared with national surveillance like the CDC’s National Health and Nutrition Examination Survey ([NHANES](#)) or results from research studies like the [GenX Exposure Study](#) which represents a more highly exposed population. Higher levels may suggest increased risk for certain adverse health conditions, although it is not generally possible to directly link individual results with specific health outcomes.

In July 2022, the National Academies of Science, Engineering, and Medicine (NASEM) provided the following guidance for helping to interpret PFAS levels in serum and guide clinical follow-up.⁽⁵⁾

PFAS Exposure: Clinical Follow-Up

- Clinicians should offer PFAS testing to patients who are likely to have a history of elevated exposure. In all discussions of PFAS testing, clinicians should describe the potential benefits and harms of PFAS testing and the potential clinical consequences (such as additional follow-up), related social implications, and limitations of the testing so patient and clinician can make a shared, informed decision.
- If testing is done the clinician should compare its results with the chart below and discuss treatment accordingly.

<2 (ng/mL) PFAS*	2–<20 (ng/mL) PFAS*	≥20 (ng/mL) PFAS*
Provide usual standard of care.	Encourage PFAS exposure reduction if a source has been identified, especially for pregnant persons. Within the usual standard of care clinicians should: <ul style="list-style-type: none"> • Prioritize screening for dyslipidemia with a lipid panel (once between 9 and 11 years of age, and once every 4 to 6 years over age 20) as recommended by the American Academy of Pediatrics (AAP) and American Heart Association (AHA). • Screen for hypertensive disorders of pregnancy at all prenatal visits per the American College of Obstetricians and Gynecologists (ACOG). • Screen for breast cancer based on clinical practice guidelines based on age and other risk factors such as those recommended by US Preventive Services Task Force (USPSTF). 	Encourage PFAS exposure reduction if a source of exposure is identified, especially for pregnant persons. In addition to the usual standard of care, clinicians should: <ul style="list-style-type: none"> • Prioritize screening for dyslipidemia with a lipid panel (for patients over age 2) following AAP recommendations for high-risk children and AHA guidance for high-risk adults. • At all well visits: <ul style="list-style-type: none"> – Conduct thyroid function testing (for patients over age 18) with serum thyroid stimulating hormone (TSH), – Assess for signs and symptoms of kidney cancer (for patients over age 45), including with urinalysis, and – For patients over age 15, assess for signs and symptoms of testicular cancer and ulcerative colitis.

* Simple additive sum of MeFOSAA, PFHxS, PFOA (linear and branched isomers), PFDA, PFUnDA, PFOS (linear and branched isomers), and PFNA in serum or plasma

Additional Considerations for Patients with PFAS Exposures in North Carolina

There are some PFAS found in North Carolina that were not part of the NASEM guidance, including GenX. Physicians may want to consider monitoring for additional health effects associated with GenX, although there is no specific clinical testing guidance at this time. Additionally, GenX is difficult to measure in serum even among patients with known exposures,^(2,3) likely due to its short half-life.⁽⁴⁾ Exposure to GenX has been linked to health effects in animals on the liver, the kidney, the immune system, and developmental effects, as well as cancer.⁽⁶⁾

There are other PFAS, such as Nafion byproduct 2, PFO4DA, PFO5DoA, and Hydro-Eve, that have been measured in residents of North Carolina⁽²⁾ but for which we have limited health information at this time.

Reducing PFAS Exposure

It is difficult to fully prevent PFAS exposure because PFAS are present at low levels in some foods and in the environment. However, there are possible steps to reduce PFAS exposure.

- **Drinking water.** People who live near known sources of PFAS contamination or whose drinking water contains PFAS should consider using a different water source or filtering their water before drinking, cooking, and preparing infant formula. Please see the NCDHHS factsheet on [water testing and treatment](#) for more information. We are still learning more about PFAS in food and when these exposures need to be reduced.
- **Consumer products.** People can reduce use of products containing PFAS, including packaged foods, products with non-stick or stain and water resistant coatings, and some personal care products. Information about consumer products which have been identified as PFAS-free can be found at [PFAS Central](#) or [Environmental Working Group](#).
- **Boiling water will NOT remove PFAS.**

Additional PFAS Resources

CME Credit - *AMA PRA Category 1 Credits™* (0.75 hours), *AMA PRA Category 1 Credits™* Designated (0.75 hours), *ABIM MOC Part 2* (0.75 hours)

- [PFAS, GenX, and Other Forever Chemicals: An Update for Clinicians](#)

NCDHHS

- [PFAS Factsheet](#)
- [PFAS Testing and Treatment for Drinking Water Factsheet](#)
- [GenX Factsheet](#)

PFAS-REACH

- [PFAS Blood Testing: What You Need to Know](#)
- [Information about PFAS blood testing laboratories for individuals](#)

For more information about PFAS related health concerns or to discuss serum testing for PFAS, contact the NCDHHS Occupational and Environmental Epidemiology Branch at (919) 707-5900 or OEEB@dhhs.nc.gov.

References

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