

# PFAS Exposure: Information for patients and guidance for clinicians to inform patient and clinician decision making

For people in PFAS-impacted communities

## Purpose

This guidance document is intended for people living in communities with contaminated water or who have had some other source of substantial exposure to PFAS. This guidance document is not targeted to those at average risk from PFAS.

## What is medical screening?

Medical screening is testing for early signs of disease before an individual would normally seek care. Screening for certain conditions or subclinical changes may be advised for those who currently have or previously had elevated exposure to PFAS. Medical screening may identify early indicators of disease and allow you to work with your clinician to determine next steps.

## What are PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a class of over 12,000 human-made chemicals. They are extremely resistant to breakdown, highly mobile in the environment, and have contaminated hundreds of drinking water supplies. PFAS have been found in the blood of over 99% of Americans and some PFAS can remain in the body for years. Exposure to certain PFAS has been associated with several serious health effects.

## How can I be exposed to PFAS?

### At home

- Drinking contaminated water
- Eating food contaminated from environmental sources or from processing and packaging
- Using stain- and water-resistant products, grease-proof food packaging, nonstick cookware, and many other consumer products



### At work

Some people, such as firefighters and those in chemical production and application industries, may be exposed to products containing PFAS at work.



### Early in life

PFAS can cross the placenta and accumulate in breast milk, so children can be exposed in the womb and during early life through breastfeeding.



## How are PFAS regulated in drinking water?

- PFAS are not currently regulated by the U.S. Environmental Protection Agency (US EPA) under the Safe Drinking Water Act. This means there are no federally enforceable standards and public water suppliers are not required to routinely test or treat for PFAS under federal law.
- In 2022, US EPA established non-enforceable Interim Lifetime Health Advisories of 0.004 parts per trillion (ppt) for PFOA and 0.020 ppt for PFOS (two common PFAS chemicals) for municipal drinking water. US EPA plans to finalize enforceable drinking water standards for PFOA and PFOS by the end of 2023.
- Some states have adopted their own drinking water guidelines or enforceable standards for PFOA, PFOS, and other PFAS chemicals (individually or in combinations), mostly in the range of 10 to 20 ppt. The [PFAS Exchange](#) provides more information about national and state drinking water guidelines.
- Northeastern University's [Contamination Site Tracker](#) has documented hundreds of contaminated sites in the U.S., as well as thousands of potential sources of environmental PFAS contamination.

## What are the health effects of PFAS?

Many studies have evaluated harmful health effects of PFOA, PFOS, and a handful of other PFAS. Several national and international health agencies have reviewed the results of peer-reviewed epidemiological (human populations) and toxicological (laboratory animals) research and written scientific assessments based on these studies (see list of sources below). At least one of these assessments concluded that PFAS exposure is associated with:

- Increase in total cholesterol and LDL cholesterol
- Decreased antibody response to vaccines
- Longer time to pregnancy
- Kidney, testicular, and breast cancer
- Thyroid disease and dysfunction
- Liver damage
- Increased risk of pregnancy-induced hypertension and/or pre-eclampsia
- Chronic kidney disease, elevated uric acid, hyperuricemia, and gout
- Immune system disruption
- Adverse developmental outcomes, including small decrease in infant birth weight and altered mammary gland development

As the scientific community continues to study the health impacts of PFAS, preliminary and/or suggestive epidemiologic and animal evidence is regularly emerging. Some studies have found associations with:

- Non-alcoholic fatty liver disease
- Autoimmune disease, such as ulcerative colitis and Type 1 diabetes
- Shortened duration of lactation in mothers
- Decreased male fertility
- Delayed puberty

Sources:

- National Academies of Sciences, Engineering, and Medicine (2022)
- Agency for Toxic Substances and Disease Registry (2021)
- Centers for Disease Control and Prevention (2019)
- European Environment Agency (2019)
- International Agency for Research on Cancer (2017)
- National Toxicology Program (2016)
- C8 Science and Medical Panels (2005-2013)

### A note about these studies

Current strength of evidence ranges from very strong and near certain for lipid, liver, and immune outcomes, to “more likely than not” for others.

### What about COVID-19?

It is currently unknown whether PFAS has any effect on COVID-19 vaccination. There is no evidence that anyone should not be vaccinated against COVID-19 on the basis of prior PFAS exposure. All groups are strongly advised to follow updated advice from the Centers for Disease Control and Prevention on the COVID-19 vaccination, which is based on the latest research findings.

## How can I reduce the amount of PFAS in my body?

For people with known elevated PFAS levels in their body, the most important way to reduce the amount of PFAS in the body is to avoid new exposures. Some PFAS chemicals, like PFOS and PFOA, can remain in the body for years. Currently, there are **no medically approved treatments** to speed up removal of PFAS from the body.

- X** Agents or processes known to remove PFAS from the body, such as cholestyramine, phlebotomy, hemodialysis, or apheresis, are not medically approved treatments for PFAS exposure specifically.
- X** Chelation and “alternative” medicine programs, such as detoxes and cleanses, are not known to remove PFAS from the body. Many of these can also pose their own health risks.

## How can I avoid PFAS exposure?

PFAS exposures are widespread, so it is difficult to avoid PFAS entirely. However, you can take steps to reduce your personal exposure going forward:

- If you know or suspect PFAS to be in your drinking water, you can use a filter to lower the levels. Visit the PFAS Exchange’s [drinking water fact sheet](#) to learn about finding a test lab and selecting water filters.
- Check with local environmental or health agencies to learn about any local fish consumption advisories.
- Avoid stain-resistant carpets, treatments, and waterproofing sprays. Green Science Policy Institute’s [PFAS Central](#) maintains a current list of PFAS-free products.
- Avoid take-out containers and other food packaging that may contain PFAS by eating more fresh foods and home-cooked meals.

For more suggestions, visit the PFAS Exchange’s [exposure reduction tips](#) and download Silent Spring Institute’s [Detox Me smartphone app](#).

### About this guidance document

This guidance is intended to inform discussion and decision making for physicians and their patients. Many of these tests and screenings are part of basic primary care annual appointments. In 2019, the American Medical Association (AMA) resolved to support research and policy to address the effects of PFAS exposure.

The following suggestions for medical screening tests are based on those previously developed and implemented for a PFAS-impacted community and on peer-reviewed research and scientific assessments using weight of evidence approaches from the National Academies of Sciences, Engineering, and Medicine (NASEM, 2022), Agency for Toxic Substances and Disease Registry (ATSDR, 2021), C8 Science and Medical Panels (2005-2013), and other agencies (see references on reverse side).

**Note:** These recommendations are intended for those living in communities with contaminated water or who are exposed to other sources of PFAS that substantially increases their internal burden of PFAS. These recommendations are not targeted to those with average levels of PFAS exposure.

### Guidance for adult patients

#### PFAS blood and water tests

- **PFAS blood tests.** A 2022 NASEM report recommended making PFAS blood tests available to people who likely had elevated PFAS exposures and offering additional medical screening for those with elevated levels. The PFAS-REACH Exchange provides resources for obtaining PFAS blood tests ([bit.ly/pfas-blood-test](https://bit.ly/pfas-blood-test)).
- **Water testing.** PFAS water testing is advisable in areas with known or suspected water contamination. PFAS water filtration is recommended when PFAS levels exceed drinking water guidelines.

#### Laboratory tests

- **Lipid panel (cholesterol, LDL, HDL, triglycerides).** PFAS exposure has been associated with higher total and LDL cholesterol and fatty liver.
- **Liver function tests (ALT, AST, GGT).** PFAS exposure has been associated with higher-than-normal liver function tests, as well as hepatotoxicity, including hepatocyte and liver architecture damage.
- **Serum creatinine, urine protein, and urine albumin.** PFAS exposure has been associated with chronic kidney disease and kidney cancer. There is enhanced excretion of PFAS in moderate-to severe kidney disease, especially if there is albuminuria.
- **Thyroid tests (TSH with or without FT4).** PFAS exposure has been associated with thyroid disease.

#### Clinical examinations

- **Regular examinations for testicular cancer.** Exposure to high levels of PFAS has been associated with increased risk of testicular cancer.
- **Screening for breast cancer (consistent with usual standard of care based on age and other risk factors).** There is some evidence that exposure to PFAS can lead to increased risk of breast cancer.
- **Screening for ulcerative colitis.** Exposure to high levels of PFAS has been associated with increased risk of ulcerative colitis.
- **Blood pressure monitoring during pregnancy.** PFAS are associated with elevated blood pressure during pregnancy and preeclampsia. Encourage home BP monitoring during pregnancy for highly exposed people.

#### Counseling topics

- **Vaccine response.** PFAS exposure has been associated with decreased antibody response to vaccines. However, there is currently no consensus on whether to measure antibody titers or to revaccinate patients with low vaccine titers. For more information, see the PFAS-REACH [fact sheet](#) on PFAS and vaccines.
- **Breastfeeding.** PFAS can cross the placenta and pass from mother to child during pregnancy. PFAS also accumulate in breast milk, so infants can be exposed through breastfeeding. However, breastfeeding provides clear benefits to both maternal and child health. There is insufficient evidence to broadly recommend against breastfeeding based on maternal PFAS exposure, but individuals may seek advice on weighing possible harms from PFAS in breast milk versus benefits of breastfeeding.

## Guidance for pediatric patients

### Laboratory tests

- **Lipid panel (cholesterol, LDL, HDL, triglycerides).** PFAS exposure has been associated with higher total and LDL cholesterol and fatty liver.
- **Liver function tests (ALT, AST, GGT).** PFAS exposure has been associated with higher-than-normal liver function tests, as well as other evidence of hepatotoxicity, including hepatocyte and liver architecture damage.
- **Thyroid test (TSH with or without FT4).** PFAS exposure has been associated with thyroid disease.

### Clinical examinations

- **Screening for testicular cancer during annual examinations (starting around onset of adolescence).** PFAS exposure has been associated with increased risk of testicular cancer.

### Counseling topics

- **Vaccine response.** PFAS exposure has been associated with decreased antibody response to vaccines. There is currently no consensus on whether to measure antibody titers or revaccinate pediatric patients with low vaccine titers.
- **Endocrine disruption.** PFAS have been associated with lower levels of sex hormones in young children.

## References

**Agency for Toxic Substances and Disease Registry (ATSDR).** Toxicological Profile for Perfluoroalkyls. U.S. Department of Health and Human Services. 2021. <https://www.atsdr.cdc.gov/ToxProfiles/tp200.pdf>.

**American Medical Association.** Memorandum from the Speaker of the House of Delegates. Resolutions 901 and 922. 2019. <https://www.ama-assn.org/system/files/2019-11/i19-handbook.pdf>

**C8 Medical Panel.** Information on the C-8 (PFOA) Medical Monitoring Program Screening Tests Prepared by the Medical Panel for the C-8 Class Members. 2013. [http://www.c-8medicalmonitoringprogram.com/docs/med\\_panel\\_education\\_doc.pdf](http://www.c-8medicalmonitoringprogram.com/docs/med_panel_education_doc.pdf).

**Centers for Disease Control and Prevention (CDC).** CDC Public Health Grand Rounds: PFAS and Protecting Your Health. 2019. <https://www.cdc.gov/grand-rounds/pp/2019/20191119-pfas-health.html>.

**European Environment Agency.** Emerging chemical risks in Europe – ‘PFAS.’ 2019. <http://dx.doi.org/10.2800/486213>.

**International Agency for Research on Cancer (IARC).** IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. Some Chemicals Used as Solvents and in Polymer Manufacture. Lyon (FR): International Agency for Research on Cancer; 2017. PMID: [31829531](https://pubmed.ncbi.nlm.nih.gov/31829531/).

**National Academies of Sciences, Engineering, and Medicine (NASEM).** 2022. Guidance on PFAS Testing and Health Outcomes. <https://nap.nationalacademies.org/read/26156/chapter/1>

**National Toxicology Program (NTP).** 2016. Systematic Review of Immunotoxicity Associated with Exposure to Perfluorooctanoic Acid (PFOA) or Perfluorooctane sulfonate (PFOS); Office of Health Assessment and Translation, Division of the National Toxicology Program, National Institute of Environmental Health Sciences: Research Triangle Park, NC. [https://ntp.niehs.nih.gov/ntp/ohat/pfoa\\_pfos/pfoa\\_pfosmonograph\\_508.pdf](https://ntp.niehs.nih.gov/ntp/ohat/pfoa_pfos/pfoa_pfosmonograph_508.pdf).

## Acknowledging stress & addressing uncertainty

Uncertainty about long-term health effects can cause stress among patients who have been exposed to PFAS contamination.

Previous studies have shown that providing results of chemical exposure tests, along with contextual information and steps for action, can make people feel empowered.<sup>1</sup>

ATSDR has developed resources for medical professionals to address concerns of residents in communities impacted by contamination:

[www.atsdr.cdc.gov/stress/resources/clinicians-tip-sheet.html](https://www.atsdr.cdc.gov/stress/resources/clinicians-tip-sheet.html)

<sup>1</sup> JG Brody et al. (2006). <https://doi.org/10.2105/AJPH.2006.094813>

## Contributors

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Thank you to the researchers, medical professionals, and community members who reviewed this document.