



Drinking Water Facts:

Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Updated July 2022

General information

PFAS are a large group of manmade chemicals which repel water and oil and are resistant to heat and chemical reactions. Because of these properties, they have important industrial and commercial uses. PFAS are used in the production of some non-stick cookware, in waterproof and stain proof coatings, in “leak-proof” coatings on food packaging materials, in fire-fighting foams, and other applications.

PFAS can enter drinking water through industrial release to water, air, or soil; discharges from sewage treatment plants; land application of contaminated sludge; leaching from landfills; and use of certain fire-fighting foams.

Four types of PFAS have been found in the blood (serum) of greater than 98% of the United States population. **These long-chain PFAS build up and stay in the human body for many years. The levels decrease very slowly over time after exposure is reduced or stopped.**

- **PFOS:** perfluorooctane sulfonate
- **PFOA:** perfluorooctanoic acid
- **PFNA:** perfluorononanoic acid
- **PFHxS:** perfluorohexane sulfonate

Exposure to PFAS

PFOA, PFOS, and PFNA dissolve in water. If drinking water is contaminated, it is a primary source of exposure to PFAS as compared with other background exposure sources. Other sources of PFAS exposure include food, food packaging, consumer products, house dust, indoor and outdoor air, and workplaces where PFAS are used or made. Exposure to PFAS in drinking water is primarily from ingestion of the water and food prepared with the water. **PFAS are not removed from water by boiling.** Exposure to PFAS through household uses of water such as showering, bathing, laundry, dishwashing, and rinsing produce is not significant.

Health effects of PFAS

Some studies of the general population, communities with PFAS contaminated drinking water, and exposed workers indicate that exposure to PFAS increases the risk of a number of health effects.

Health effects from PFAS are observed within the general population without exposure to PFAS from contaminated drinking water.

The most consistent human health effect findings for PFOA and PFOS – the most well studied of the PFAS types – are increases in serum cholesterol and uric acid levels in the blood and decreased antibody response following vaccination, as well as increased blood levels of some liver enzymes for PFOA. Although not as well studied, PFNA appears to increase blood levels of cholesterol and some liver enzymes. Human health effects are generally consistent with the toxicity of PFAS observed in laboratory animals.

PFOA and PFOS caused tumors in rodents, while PFNA has not been tested for this effect. In humans, PFOA exposure was associated with a higher incidence of kidney cancer in both the general population and in a community with substantial levels of PFOA in drinking water, and with testicular cancer in the community with contaminated drinking water.

The Centers for Disease Control and Prevention’s Agency for Toxic Substance Disease Registry (CDC/ATSDR) is conducting the “PFAS Multi-site Study,” to learn more about the relationship between PFAS exposure and health outcomes. This work is taking place across seven U.S. communities exposed to PFAS-contaminated drinking water. Work is ongoing, and results are pending. To learn more visit <https://bit.ly/ATSDR-PFAS>

Impact of PFAS on children

Infants and children consume more water per body weight than older individuals, so their exposure may be higher than adults when drinking water is contaminated with PFAS. They may also be more sensitive to the effects of PFAS.

In humans, exposure to PFAS before birth or in early childhood may result in health effects including decreased birth weight, decreased response to vaccinations, and increased risk of infectious disease. In laboratory animals, some PFAS, including PFOA, PFOS, PFNA, and many others, cause developmental delays.

Can I have my blood tested for PFAS?

Laboratory tests are available to measure PFAS in blood serum, but this is not a routine test. Health insurance may not cover the cost of this testing. While pursuing this type of specialized testing is a personal decision between you and your doctor, it is important to understand what testing can and cannot tell you.

What blood testing *can* tell you –

- Blood test results can be compared to national monitoring data collected from a representative sample of the U.S. population. The table below provides the most recently available (2017-2018) blood serum levels of the four PFAS most commonly detected in the U.S. population.

PFAS	Mean (geometric)	50 th percentile	95 th percentile
PFOS	4.25	4.30	14.6
PFOA	1.42	1.47	3.77
PFNA	0.41	0.40	1.40
PFHxS	1.08	1.10	3.70

- For example, if your concentration is higher than the 95th percentile, this means your blood serum is higher than the concentration found in 95% of the U.S. population.

What blood testing *cannot* tell you –

- While exposure to PFAS can increase the risk of certain health effects, a blood test indicating that you have been exposed to PFAS cannot be used to predict whether or not you will experience health effects or if PFAS exposure caused any health problems you may have.
- Test results alone cannot be used to identify specific sources of exposure.
- There is no accepted treatment to reduce levels of PFAS in the blood. Levels decrease slowly over many years when exposure has been reduced or eliminated.

What are the NJ Drinking Water Standards for PFAS?

In 2018, NJ became the first state to establish an **enforceable** drinking water standard for a PFAS chemical when it set a Maximum Contaminant Level (MCL) for PFNA. MCLs for PFOA and PFOS followed in 2020.

NJ MCLS for PFAS	
PFNA	13 ppt
PFOA	14 ppt
PFOS	13 ppt

Abbreviations: ppt=parts per trillion; ppt = ng/L = nanograms per liter

A maximum contaminant level (MCL) is an **enforceable** drinking water standard which requires all public water systems to routinely monitor. If levels are found to be above the NJ MCL, the water utility **must** take actions to reduce levels below the MCL. Available water treatment technologies can effectively reduce levels of PFAS. In many systems, PFAS levels are reduced to non-detectable levels. Your public water utility will monitor and report these levels on a regular basis. Water results are available on NJDEP's [Drinking Water Watch](#) website.

What are the EPA Health Advisories?

The US Environmental Protection Agency (USEPA) issued a **non-enforceable** drinking water Lifetime Health Advisory in 2016 for PFOA and PFOS of 70 ppt individually or when combined. More recent scientific evidence finds negative health effects can occur at much lower levels for PFOA and PFOS. Therefore, as of June 2022, the USEPA has replaced the 2016 Health Advisories **with interim updated lifetime Health Advisories** for PFOA and PFOS. The USEPA has also released final Health Advisories for two additional PFAS – PFBS (perfluorobutane sulfonate) and GenX (a replacement for PFOA).

Chemical	Health Advisory	USEPA Reporting Level
PFOA	0.004 ppt	4 ppt
PFOS	0.02 ppt	4 ppt
GenX	10 ppt	5 ppt
PFBS	2,000 ppt	3 ppt

The Health Advisories for PFOA and PFOS are interim, meaning they are subject to change. These new Health Advisory levels are below the Reporting Levels, which is the level to which analytical methods can measure PFOA and PFOS. **Therefore, any detectable level of PFOA or PFOS is above the USEPA Health Advisory.**

The Health Advisories are non-enforceable, and they are intended to provide information to public water systems until a National Primary Drinking Water Regulation (e.g., MCL or Treatment Technique) is adopted.

How were the NJ MCLs and EPA Health Advisories developed?

- **NJ MCLs –**

The [NJ Drinking Water Quality Institute \(DWQI\)](#), an advisory body composed of scientists from academia, the water industry, and environmental health, is responsible for developing MCLs and recommending them to the NJ Department of Environmental Protection (NJDEP). The NJ PFAS MCLs were developed after a thorough review of the available scientific information, at the time, and are intended to be both health-protective and scientifically supportable.

The NJ PFAS MCLs are based on studies of effects on laboratory animals. These PFAS MCLs are protective both for cancer (for PFOA and PFOS) and non-cancer health effects. Cancer effects are determined based on a one in a million risk from lifetime water consumption. The non-cancer health effects may occur over a shorter period of time (less than a lifetime) when the PFAS level in water is above the MCL.

- **USEPA Health Advisories –**

The USEPA interim updated lifetime advisories for PFOA and PFOS are based on human epidemiology studies that find associations of health effects with PFOA and PFOS exposures in the general population.

Animal studies form the health basis of most federal and state drinking water standards. However, the use of human epidemiology as the basis of drinking water standard is preferred when sufficient and high quality of human data are available. Although the scientific basis of these Health Advisories is not final, the USEPA has decided that the use of human epidemiology is scientifically supportable and health protective. The USEPA has also concluded that the final Health Advisories will likely remain below the analytical Reporting Levels even if they differ from the interim advisories.

- **Understanding the differences between NJ MCLs and USEPA Health Advisories –**

Studies have shown health effects occur at exposure levels found in the general population. Furthermore, with ongoing exposure to drinking water levels of PFOA and PFOS even below the NJ MCLs, blood serum concentrations of PFOA and PFOS are expected to substantially increase above general population levels.

The efforts by the USEPA to incorporate the newest science into their drinking water advisories, including data on health effects in human populations exposed to low levels of PFAS, will result in public health protective drinking water standards for these chemicals.

The USEPA has announced that it will finalize national primary drinking water standards for PFOA and PFOS by late 2023. State standards may not be higher than federal standards. **If the USEPA adopts lower levels than NJ's MCLs, they will replace the NJ MCLs so that the lowest standard is in place.**

Recommendations if PFAS are detected in your drinking water

PFOA, PFOS, and PFNA build up in the body over time, and it takes many years for the levels of these PFAS in your body to decrease after exposure has ended. If PFAS are present in your drinking water, using bottled water or a home water filter designed to remove these PFAS may reduce exposure.

If you learn a PFAS is detected in your drinking water supply above a New Jersey MCL, until your water utility has reduced PFAS levels:

- **For bottle-fed babies:** Families should use bottled water to prepare infant formula and when giving infants plain water and to prepare juice made from concentrate for infants.
- **For nursing (breastfed) babies:** PFAS are present in breast milk and can be transferred to nursing babies. Despite this exposure, mothers who are breastfeeding should continue to nurse. The extensive information on the health benefits of breastfeeding suggests that benefits of breastfeeding outweigh potential risk of additional PFAS exposure.
- **For pregnant women, nursing women and women considering or planning on having a child:** Switching to bottled water or using a home water filter for drinking and cooking will reduce PFAS exposure. However, PFAS are slowly excreted from the body. Therefore, risk reduction will not be immediate, as exposure to the fetus and nursing infant is influenced by the mother's past exposure.

Recommendations continued

- **For older children and adults:** If a public water utility notifies you that a PFAS exceeds the NJ MCL, they are required to promptly take actions to reduce these levels. Individuals who wish to reduce exposure to PFAS while the water utility is taking actions to reduce levels can consider switching to bottled or home filtered water for drinking and cooking.

Anyone concerned about their health should consult with their personal healthcare provider. **Healthcare providers can find more information on PFAS health effects and exposure here -** <https://www.atsdr.cdc.gov/pfas/docs/clinical-guidance-12-20-2019.pdf>

How can I find out if PFAS are detected in my drinking water?

• Public Water Users

NJ public water systems were required to begin monitoring for PFNA in 2020 and for PFOA and PFOS in 2021. These results are available on NJDEP's [Drinking Water Watch](#) website. Some water systems have earlier results through the EPA Unregulated Contaminant Monitoring Rule (UCMR3). These UCMR3 results were reported in your annual Consumer Confidence Reports (CCRs) which may be available online or mailed to your home directly by your water provider. CCRs are also found on NJDEP Drinking Water Watch.

• Private Well Users

PFNA, PFOA, and PFOS have been added to the NJ Private Well Testing Act (NJ PWTA). The NJ PWTA is a consumer information law established in 2002 that requires private wells to be tested by a certified laboratory during real estate transfer and requires landlords to test well water supplied to tenants every five years and provide results. The addition of PFAS to the NJ PWTA means that private wells at homes being sold in NJ must be tested for these three PFAS (and other contaminants) starting December 1, 2021. Well owners who are not selling or buying a home should contact a certified laboratory if they wish to have their well water tested.

To find a list of certified laboratories visit NJDEP DataMiner: <https://njems.nj.gov/DataMiner/> [Search by Category > Certified Laboratories > Scroll to "PFAS Drinking Water Certified Laboratories"]

Did You Know?

Bottled water sold in NJ is regulated by the NJ Department of Health and is required to meet Safe Drinking Water standards. N.J.A.C. 8:21-5.1 et. seq

How do I know my bottled water does not exceed the NJ drinking water standards for PFAS?

Companies that sell bottled water in NJ were required to analyze for PFNA for the July 2020 - June 2021 period. For PFOS and PFOA monitoring must be completed during the July 2021 - June 2022 period. These bottled water companies are required to submit these results to NJDOH with the application for their annual license. More information on NJ's Bottled Water Program can be found here: <https://www.nj.gov/health/ceohs/documents/phfpp/BWStandards.pdf>

Where can I get more information about home water filters?

Water treatment devices utilizing granular or powdered activated carbon filters, reverse osmosis, ion exchange resins and other specialized treatment media are technologies that can reduce the level of PFAS in drinking water. If a water treatment device is used, it is important to follow the manufacturer's guidelines for maintenance and operation. NSF International, an independent and accredited organization, certifies products proven effective for reducing PFOA and PFOS below the USEPA Lifetime Health Advisory level (70 ppt), but these products are not certified for removal to the lower NJ MCLs of 14 and 13 ppt. Some studies have demonstrated up to 50% removal of PFAS when using either pitcher or refrigerator filters and some were able to reduce levels below detection.

NSF International is currently working to develop more stringent certification standards for testing home treatment systems for the removal of PFAS from drinking water.

Additional Questions

If high levels of PFAS were detected in my water, how will it affect fruits and vegetables in my garden?

For gardening or farming, certain plants may take up some PFAS from irrigation and soil. Unfortunately, there is not enough scientific data to predict how much will end up in any specific crop. For most people the risk of from the occasional consumption of produce grown in soil or irrigated with water contaminated with PFAS is likely to be low. For families who grow a large fraction of their produce the risk of exposure to PFAS may be higher and they can consider the following steps:

- Maximize use of water from an uncontaminated source for your garden.
- Wash your produce in clean water after you harvest it.
- Modify your soil with clean compost. Increasing the organic content of your garden soil can prevent the uptake of PFAS into plants.

If PFAS are present above the NJ drinking water standard, what water should I use in my humidifier?

In line with USEPA recommendations, bottled water or home filtered water should be used in your humidifier until levels of PFAS in your drinking water are reduced.

What water should I use in my continuous positive airway pressure (CPAP) machine?

Individuals should continue to follow existing medical guidance regarding the use of distilled water in CPAP machines as instructed by the manufacturer and their doctor.

Additional Resources

NJ Department of Environmental Protection –

- Water Supply
<https://www.nj.gov/dep/watersupply/pfas/>
- Site Remediation Program
<https://www.nj.gov/dep/srp/emerging-contaminants/>

NSF International –

- More info NSF certified home water filters, visit:
<http://www.nsf.org/consumer-resources/water-quality/drinking-water/>

CDC ATSDR –

- Detailed summaries of the toxicology and epidemiology studies on PFAS can be found at this link: <https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf>
- Healthcare provider guidance
<https://www.atsdr.cdc.gov/pfas/docs/clinical-guidance-12-20-2019.pdf>

USEPA –

- Health Advisories
<https://www.epa.gov/sdwa/drinking-water-health-advisories-pfoa-and-pfos>