Drinking Water Facts:

Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Updated February 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 suggest that exposure to PFAS increases the risk of a number of health effects. Health effects from PFAS are observed even 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

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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 cause developmental delays.

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

Should I drink bottled water when I learn PFAS are in my 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 is present in your drinking water, using bottled water or a home water filter designed to remove these PFAS will reduce exposure.

When PFAS are above the NJ drinking water standard in a drinking water supply:

- **For bottle-fed babies:** Bottled water should be used to prepare infant formula. Bottled water should also be used 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.

Continued…

- **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.
- **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

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.
- 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.

PFAS blood serum levels in the U.S., 2017-2018 (ng/ml)			
PFAS	Mean (geometric)	50th percentile	95th 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

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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.

How were the PFAS Maximum Contaminant Levels developed?

A maximum contaminant level (MCL) is an enforceable drinking water standard which requires all public water systems to routinely monitor. 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 thorough review of the available scientific information and are intended to be both health-protective and scientifically supportable.

The PFAS MCLs recommended by the DWQI 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.

Why is the NJ MCL for PFAS lower than EPA health guidance?

The federal Environmental Protection Agency (EPA) issued a non-enforceable drinking water Lifetime Health Advisory for PFOA and PFOS of 70 ppt individually or when combined in 2016. The DWQI concluded that the EPA Lifetime Health Advisory is not scientifically supportable or sufficiently health protective. EPA has announced that it will finalize national primary drinking water standards for PFOA and PFOS by Fall 2023 and that the scientific basis of the EPA Lifetime Health Advisory is now under review and subject to change.

How can I find out if PFAS are 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. Private well owners who are not selling or buying a home should contact a certified laboratory if they wish to have their well water tested. A link to a list of certified laboratories is below.

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 EPA 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.

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Additional Questions

How do I know my bottled water does not exceed the NJ drinking water standards for PFAS?
Bottled water sold in NJ is regulated by NJDOH and must meet Safe Drinking Water standards. Bottled water companies 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. Bottled water companies are required to submit these results with 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

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 given 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 EPA recommendations, bottled water or home filtered water should be used in your humidifier until levels of PFAS in your drinking water are reduced below the NJ drinking water standard.

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/
- List of certified labs to test your water for PFAS: https://www13.state.nj.us/DataMiner
- More info NSF 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://ww.atsdr.cdc.gov/toxprofiles/tp200.pdf
- Healthcare provider guidance https://www.atsdr.cdc.gov/pfas/docs/clinical-guidance-12-20-2019.pdf