Investigating Water Contamination

Recent attention to water quality in the region includes the water crisis in Flint, Michigan and PFAS contamination from industrial sources and municipal and military firefighting activities.

Separate sections are provided here for those concerned with possible contamination of water by lead and the ‘forever chemicals’ most often represented by PFOA and PFAS. With your input, the facilitator will select the parts of this exercise that are most relevant to your training interests and needs.

When you complete this section, you will be better able to:

- Identify information resources
- Identify testing resources
- Describe actions to reduce exposures

Sections and exercises not covered during the training may be helpful to you in the future.

Lead in Water

Introduction

In Flint, the sudden rise in lead content of the water supplied to households and many businesses resulted from a change in the water source and inadequate treatment prior to distribution. However, concern about lead in water is not isolated to Flint. For example, other communities in Michigan (https://www.freep.com/story/news/local/michigan/oakland/2019/10/30/royal-oak-lead-drinking-water/4098342002/) and schools throughout Tennessee (https://www.chalkbeat.org/posts/tn/2019/08/29/nearly-100-tennessee-schools-found-high-lead-levels-in-their-water-is-your-school-on-the-list/) are the focus of concerns.

Throughout the country, old deteriorating lead pipes can result in lead entering the water.

Lead from paint is also a hazard throughout the country but is not the focus of this exercise.

Health effects

Lead is known to cause health effects, even at small concentrations especially when water is a major part of the diet. Lead particularly affects young children, infants, and fetuses.

Young children, infants and fetuses appear to be particularly vulnerable to the effects of lead. A dose of lead that would have little effect on an adult can have a big effect on a small body. Also, growing children more rapidly adsorb any lead they consume. A child's mental and physical development can be irreversibly diminished by exposure to lead. In infants, whose diet consists of liquids made with water, such as baby formula, lead in drinking water can make up an even greater proportion of total lead exposure (40 to 60 percent). http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=20001R4V.txt

A trusted resource for information on the effects of lead in children is the US Centers for Disease Control and Prevention (CDC), https://www.cdc.gov/nceh/lead/prevention/health-effects.htm) or your local health department. The CDC webpage begins: 'No safe level of lead exposure in children has been identified'. It is important to note that lead exposure is totally preventable if sources are identified and eliminated.

Health effects among adults generally result from exposure in the workplace air. Limits to exposure are described in the Occupational Safety and Health (OSHA) lead standard, 29 CFR 1910.1025.

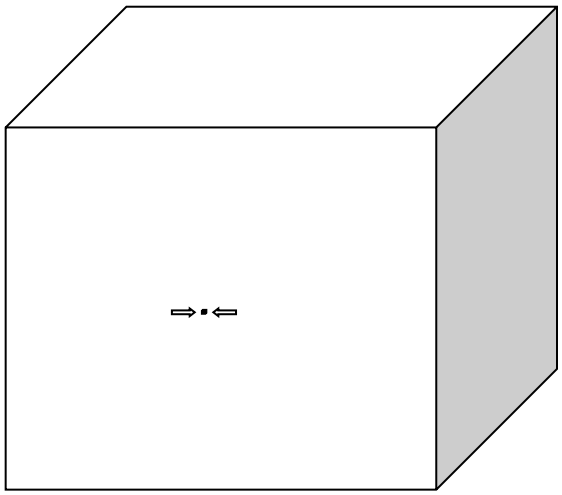
Levels of exposure (concentration) in drinking water

The US Environmental Protection Agency (EPA) in 2007 set a limit of no more than 15 ppb of lead in water.

What is a part per billion? 1 ppb is one part in a billion parts.

Below is an illustration of a part per million (ppm)—something that can be drawn.

Schematic of 1 part per million (ppm)



1 ppb is 1/1,000 of the size of the dot shown above. A ppb could not be seen, in a box of this size!

It would take 1,000,000,000 sheets of toilet paper to cover the distance from New York City to London, England; so one sheet of this distance would be 1 ppb. Other examples include:

- one second in nearly 32 years,
- one pinch of salt in 10 tons of potato chips.

Lead does not occur naturally in water but can contaminate the water before it comes into a building or be contaminated by the building plumbing (lead pipes and solder and lead in brass fittings and faucets).

How can the concentration of lead in the water at the source be found?

The EPA requires the local water district to annually report on quality; if your home is supplied by a municipal system, find the Consumer Confidence Report, updated each July 1, using this website: https://www.epa.gov/ccr. Search by State and County; if a weblink is shown, it may be to a general site for a municipality so a search for 'Consumer Confidence Report' will be needed as the second step. If no link is found, call the appropriate water district, and request a Consumer Confidence Report.

To help assess the potential for lead contamination in water, start with these two questions:

What can be learned from the history of the building?

What should be looked for in a building?

The first question requires knowledge of age of building. A few useful benchmarks:

1985 and earlier: 50/50 solder used. 50% lead, 50% tin
1986: no more lead pipes allowed in plumbing systems
use of lead-free solder in plumbing systems
2014: plumbing fixtures containing 8% or less lead no longer labeled 'lead free"
brass used in faucets may have contained lead
2014: lead in wetted surface of drinking water faucets/valves set at <=0.25%
does not apply to non-drinking water fittings - shower, toilets etc.

Become a sleuth, if you think there may be lead pipes coming into the building (Lead Service Line, LSL) or lead in plumbing for water distribution in the building. Guidance is shown in https://www.alleghenyfront.org/heres-how-to-tell-if-you-have-lead-pipes-in-your-home/. A summary:

> Service Line - If safe to access, collect a magnet and a screwdriver and go to the lowest level, usually the side by a street where the main water line is found, or the side of the building next to a private well. If you identify the service line, check to see if a magnet sticks; if so, it is steel, not lead or copper. Observe the color: dark not shiny gray may indicate lead. Using a screwdriver, gently scrape the surface and observe the color again: brownish/coppery= copper; soft and shiny=lead. Even if you find a copper line at the building, it may not extend all the way to a municipal supply source. Contact the water district to ask if records show that the entire service line has been replaced and obtain the date.
>
> Solder - Using the screwdriver, gently scrape. If soft and shiny compare with dates shown above. No guarantee that shiny is lead, but another clue.
>
> Faucets - Check for brass and consider the date of installation.

See also: https://www.sciline.org/evidence-blog/lead-drinking-water.

Exercise – Is there a risk of lead contamination?

Work in small groups to answer one of the following groups of questions.

1. Using https://www.epa.gov/ccr, what is the concentration of lead in the municipal water supply for a zip code of interest to the group?

If there is no report, what can you do to find the information?

2. Describe how you would learn or evaluate each of the following:

When was the building built?

Is the source line lead?

When was the soldering done on water pipes? If no date, what can you do?

3. The water at an industrial site is supplied from a well. List some questions to help identify any potential sources of lead contamination?

_____

_____

_____

_____

Evaluation of level of contamination

If you have a concern about lead in water, the following provides some 'next steps':

1. Use the contact information below to identify sampling assistance in your state. In addition, contact the local water district and the local health department.

Illinois http://www.dph.illinois.gov/topics-services/environmental-health-protection/lead-in-water
Indiana https://www.in.gov/idem/cleanwater/2581.htm
Kentucky https://eec.ky.gov/Environmental-Protection/Water/Drinking/DWProfessionals/ComplianceDocuments/Lead%20and%20Copper%20Quick%20Reference.pdf
Michigan https://www.michigan.gov/mileadsafe/0,9490,7-392-92796---,00.html
Minnesota https://www.health.state.mn.us/communities/environment/water/contaminants/lead.html
North Dakota https://deq.nd.gov/MF/DWP/default.aspx
Ohio https://epa.ohio.gov/divisions-and-offices/drinking-and-ground-waters/public-water-systems/lead-and-copper-in-public-water-systems
Tennessee https://www.tn.gov/health/cedep/environmental/healthy-schools/hs/drinking-water.html (focus on schools, but applicable more widely)
Wisconsin https://dnr.wi.gov/topic/drinkingwater/lead.html

2. Obtain a water sampling kit - bottle and instruction form that includes needed information. Identify costs for the testing if any. (Water districts and health departments may provide kits and testing at no or reduced cost.)

3. Follow directions, **exactly**; complete all entries in the paperwork

4. Return bottle and paperwork for analysis

This video may be helpful before sample collection:
https://www.youtube.com/watch?v=4EO2HbnXiEU

The level of lead in water will be shown in a written document mailed through the US Postal Service or e-mail notification. The following guidelines may be considered:

<15 ppb, the concentration is below the EPA standard. However, you may choose to use an approved water filter to reduce exposure
>=15 ppb but less than 150 ppb, use an approved water filter

>150 ppb, use bottled water for brushing teeth, cooking, drinking. Alert your family physicians immediately.

Contact the laboratory and/or the Health Department for further guidance to resolve questions.

The level reported is for water on the day the sample was collected. If conditions change, retesting may be necessary.

Actions to reduce exposure

If actions are needed, consult the health department or other state agency regarding first steps. Some actions might include:

Should bottled water be used immediately?

Considerations include cost and ease of obtaining bottled waters.

Should water lines be flushed before use for drinking or cooking?

Running the water will flush water that has contacted pipes for long periods of time. Run the water until there is a noticeable change in temperature (indicating that the water is coming from outside the building. Then run the water for 1 to 2

additional minutes to assure that the source is the water main, not the service line.

Should the plumbing be replaced?

This is costly and cannot often be done rapidly. Some interim approach may be needed.

Should a water filter be installed at the tap(s) used for drinking and cooking?

If this is the decision as a long- or short-term remedy, it is important to use approved units (that really remove lead) and only for concentrations below 150 ppb.
Use only water filters that are NSF-certified; the unit should carry documentation or a label of 'NSF - Independently Certified'. In addition, you can identify if a unit is NSF certified here: http://info.nsf.org/Certified/DWTU/. See also https://www.epa.gov/sites/production/files/2018-12/documents/consumer_tool_for_identifying_drinking_water_filters_certified_to_reduce_lead.pdf. These NSF certified filters remove 99% of lead in the water if the concentration is less than 150 ppb.

Exercise – Is the filter unit NSF-certified?

The facilitator will provide filter packages or photos of packages. Work in small groups to determine if the unit is NSF-certified. Report back to the group.

Various types of filter units are available: countertop, faucet mount, whole house. Faucet mounts are often preferred; these units must be properly installed and cleaned routinely, and the filter must be replaced when the light/color indicates the need (green for OK, yellow for change soon, red for change now). Plumbing services are available for assistance. Cleaning and filter changing instructions are included with the unit. Go over these instructions with the installer and retain them for use - the pictures really help!

For this ongoing routine maintenance of any installed filter system, the following may be helpful regarding filter changing methods that will minimize contamination of surfaces and the person doing the work.

Replacement filters should be obtained prior to the appearance of 'red' on the filter unit. Be prepared!

Changing the filter should be done with care, to not release any of the trapped particles that may include lead.

If using gloves, the following guidance will reduce contamination:

- Wash your hands
- Check out gloves before donning, to assure no holes
- Don by pulling from the palm, not the cuff
- After the filter is changed (see steps below)….
    - Begin doffing the first glove by
        - pulling it back over the fingers
        - hold the glove in the palm of the other hand
    - Doff the second glove by pulling back over the fingers (and the first glove)
    - this assures all potentially contaminated surfaces are on the inside
- Dispose of out of reach of children
- Wash your hands

NOTE: This video shows proper glove donning/doffing: https://www.youtube.com/watch?v=xueBYfElFEg
It was developed for health care, but the technique is the same.

Change the filter.

- Have a small water-tight bag ready in a container in the sink
- Don gloves, if used
- Remove the used filter
- Put the used filter in the bag without touching/dripping the outside
- Put in the new filter
- Reassemble
- Doff gloves, if used
- Seal the trash bag
- Wash your hands
- Remove the container from the sink
- Put trash bag in container that cannot be accessed by children

If unfiltered water passes through an aerator, particulate may be caught in the screen. Routine cleaning will remove the particulate as a source of lead continuing to enter the water. It is very important to prevent contamination of nearby surfaces during this process. For example, 'dirty' aerators should not contact the countertop where food may be placed later. A factsheet (see below) is available to show how to collect particles and limit any surface contamination. Key actions include:

Do all the work in the sink, do not get any contamination on the counter.

Protect the drain so that parts do not go down the drain during the work. This can be done with wetted paper towel put over the drain entry. Water from the faucet used to flush parts can be collected in a bucket to minimize movement of the towel. When the aerator is reassembled, this water can be put down the drain. Dispose of the paper towel with trash not accessible to children.
Wear gloves. Particulate could get under your fingernails and then be ingested by you or transferred to a child. Follow glove don/doff steps shown above.

Wear short sleeves or roll up long sleeves to prevent contamination of clothing

Minimize brush use. This may lead to splashing and spread of contamination to other surfaces and then the brush must be kept safely out of the reach of children or any tool that could be contaminated.

Limiting Contamination When Cleaning a Faucet Aerator

The Midwest Consortium developed this factsheet under grant D42 ES07200 and cooperative agreement number U45 ES 06184 from the National Institute of Environmental Health Sciences.

There may be lead particles in the aerator. The methods below were developed by the Midwest Consortium for Hazardous Waste Worker Training to keep kitchen or bathroom surfaces free of potential lead contamination during the cleaning. NOTE: if you will wear gloves, watch this video first: https://www.youtube.com/watch?v=xueBYfEIFEg.

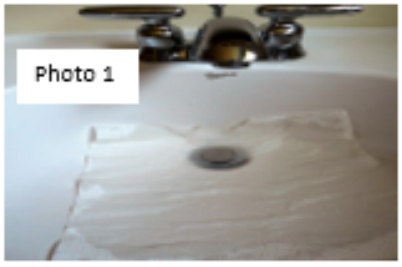


Photo 1


Photo 2


Photo 3


Photo 4

1. Lay paper towel in the sink, over the drain as shown in Photo 1.

2. Carefully remove the aerator. If it does not unscrew easily, cover the aerator surface with more paper towel and use pliers over the paper; grip tight and try to turn, but do not scar the surface. If this does not work, you may want to ask for help.

The aerator may have material on the surface, as shown in Photo 2 on the surface of the screen.

3. Use disposable cloth or paper towel to remove all the particles from the surfaces of the aerator. (Photo 3)

Avoid brushing the aerator or tapping the aerator on the counter or sink surface, as these actions may spread contamination. If you need to scrub to remove plugs in the aerator, get a disposable container, place it in the sink, and add enough water to allow scrubbing under water. This will contain any lead in the water that can be disposed of down the drain.

4. Once cleaned, replace the aerator; hand-tightening is usually sufficient to prevent leaks. Fold the paper towel from the sink in on itself, trapping any particles removed during cleaning. (Photo 4)

When removing gloves, keep the paper towel in your hand, draw the glove over it, then push the second glove over the first, trapping all contamination. (See Photo 5: glove 'packet' in the sink, ready for disposal.)


Photo 5

Exercise – Clean a Faucet Aerator

In small groups, discuss the following questions and be prepared to report back:

Do you have suggestions to add to the directions?

Can you identify additional actions that could limit spread of contamination?

If your facilitator provides access to a faucet with aerator, practice this cleaning process.

Summary

Lead in water

- contamination can result at several points along the distribution stream
- is a particular hazard to children
- is regulated by the Environmental Protection Agency
- potential can be assessed using several information resources
- testing is available when needed
- can be removed by an NSF-certified filter
- particles may be trapped in an aerator screen; cleaning guidance is available

Additional Resources

Overall guidance, CDC. https://www.cdc.gov/nceh/lead/prevention/default.htm

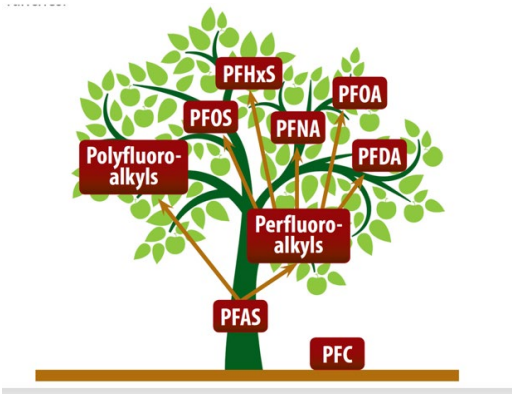
Overall guidance, EPA. https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water#reducehome.

Overall guidance, NIEHS.
https://www.niehs.nih.gov/health/topics/agents/lead/index.cfm

Schools and daycare centers. https://www.epa.gov/dwreginfo/lead-drinking-water-schools-and-childcare-facilities

Per- and Poly fluorinated Substances (PFAS) in Water

Introduction

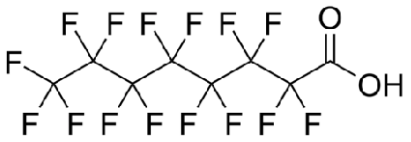


PFAS is a class of per- and poly-fluorinated compounds that includes approximately 4700 human-made and commercially available chemicals, polymers, and mixtures containing chains of fluorinated carbon atoms. PFAS are widely used in industrial processes and consumer goods like Teflon™-coated cookware, waterproof and stain resistant fabrics and food packaging. Not all are in current use or production, for example, 3M ceased production of PFOS in May 2000, and DuPont stopped manufacturing by 2015.

Even though the two most common members of the PFAS family are not manufactured at the level they were in 2000 (EPA Stewardship Program https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program), they persist in the environment because they are resistant to biological or chemical degradation; they bioaccumulate in the environment and wildlife. PFAS have been used in commercial and industrial applications since the 1940s where they were used in Teflon™ manufacturing (PFOA or C8), and in water- and stain- repellant coatings (ScotchGard™, perfluorooctane sulfonate or PFOS). Electroplating and aqueous film forming foams (AFFF) used in fighting fires also contain PFAS.

PFOA and PFOS (See Figure below for structures) are the most extensively studied PFAS and have become an emerging environmental concern with the discovery of these substances at high levels in drinking water aquifers, at concentrations above drinking water guidelines or standards.

Perfluorooctane Sulfonic Acid (PFOS)

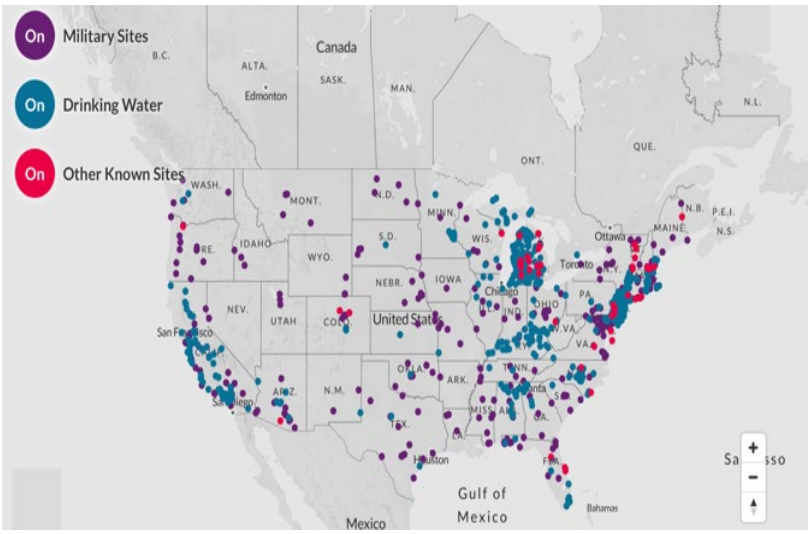


Perfluorooactanoi acid (PFOA)

Figure. Structure of two of the most common PFAS contaminants.

F, fluorine; O, oxygen; H, hydrogen; S, sulfur. Single and double bonds shown.

PFAS are widely spread throughout the water supply of the United State. An interactive map similar to the one below can be found on the web at:
https://www.ewg.org/interactive-maps/2019_pfas_contamination/map/



Exercise – Identify regional PFAS sources

Access this website shown above, https://www.ewg.org/interactive-maps/2019_pfas_contamination/map/.

Work in small groups to hover over sites of interest and note the information.

What information was found?

Was the site useful?

Select one person from your small group to report back to all participants what you found important and useful.

An extensive description of occurrence and sources of exposure provided by EPA is shown at https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos. In addition to water sources, PFOA has been detected in foods, air, indoor dust, soil, biosolids applied as fertilizers and a range of consumer products. While non-stick pans are often shown to illustrate a PFAS use, off gassing exposure is not a 'high risk' exposure unless the pan is heated to very high temperatures (500 degrees or more).

The identification of areas contaminated near military sites has been updated and is shown here: https://www.ewg.org/release/foia-data-tap-water-28-military-bases-tainted-forever-chemicals-above-states-safety.

Health Effects of PFAS

Major adverse effects have been documented in laboratory animals. These include

- carcinogenicity
- alteration of liver enzymes and serum lipids
- immunotoxicity – delayed immune responses
- endocrine disruption including delayed breast development, accelerated puberty in male pups, altered cholesterol metabolism
- adverse pregnancy outcomes including reduced ossification of the proximal phalanges, decreased pup birth weight, altered liver and kidney weight, fetal death

The actions of PFAS on humans are less clearly defined because of the difficulty of teasing out causal relationships for common exposures and common diseases. A large study of 69,000 individuals was carried out as an result of a civil action against DuPont (https://www.levinlaw.com/dupont-c8-litigation). After a careful, 7-year objective review and evaluation of the data by a panel of experts, there appeared to be a probable link between exposure to PFOA and diagnosed high cholesterol, ulcerative colitis, thyroid disease, precocious puberty (https://ehp.niehs.nih.gov/doi/10.1289/EHP3567), and testicular and kidney cancers. A probable link was also found for preeclampsia, particularly with more recent exposures (http://www.c8sciencepanel.org/prob_link.html). The effects on puberty, testicular cancers and thyroid disease indicate PFAS compounds can act as endocrine disruptors, probably through epigenetic gene expression (Olsen and Liew, J. Publ. Health. Emerg. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6108546/pdf/nihms983997.pdf 2018; and Leung et al., Epigenetics, 13: 290-300 2018).

Mechanisms for toxic action of PFAS have not been detailed fully, but there are many issues of concern; for example the observation that PFAS exposures affect efficacy of vaccines has important implications in the link between chemical exposures and infectious diseases and general public health globally.

Ongoing work at the National Institute of Environmental Health Sciences is shown at https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm.

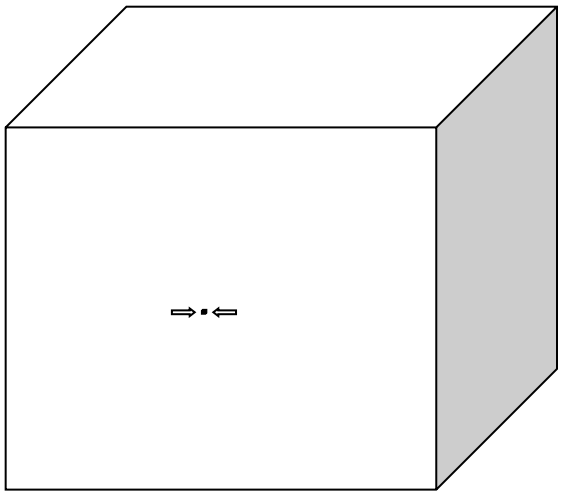
Levels of Exposure - Heath Advisory Level

The EPA has set an exposure guideline for drinking water to the combination of two of the PFAS compounds: PFOA and PFOS. This level is called a 'lifetime health advisory', determined as offering a margin of protection throughout lifetime consumption of drinking water with this concentration of contamination. The most vulnerable populations that this advisory is to protect are fetuses during pregnancy and breastfed infants based on water consumption of lactating women who use breastmilk to feed infants.

The level is set at 70 ppt (parts per trillion), combined PFAS and PFOA.

Referring to a ppm illustration of a concentration that can be illustrated,

Schematic of 1 part per million (ppm)



1 ppt is 1/1000 of a ppb or 1/1,000,000 of the size of the ppm dot shown above!
One ppt is the equivalent to:

one drop in 500,000 barrels of water
traveling 6 inches out of a 93 million-mile journey toward the sun

Source: https://www.secnav.navy.mil/eie/Pages/DrinkingWaterConcentrations.aspx,

This advisory is for drinking water only; it does not apply to other sources of exposure. States may have different guidelines. See https://www.nature.com/articles/s41370-018-0099-9/tables/1, https://www.nature.com/articles/s41370-018-0099-9/tables/2.

Evaluation of level of contamination PFOS and PFOA in water

These compounds are not regulated under the Clean Water Act; therefore EPA does not mandate evaluation of systems or enforcement of the advisory. However, some states or cities have implemented monitoring programs (example Michigan: https://www.michigan.gov/pfasresponse/; Cincinnati: https://www.cincinnati-oh.gov/water/water-quality-and-treatment/water-your-health/pfoa-pfos-and-genx/).

Concern about contamination may result from living near an industrial facility that used or made these chemicals or an area of firefighting training or run off from agricultural areas where municipal sludge was used as a fertilizer. Contact the local environmental protection or health departments for results of any ongoing sampling. These links may be useful as a start:

Illinois https://www2.illinois.gov/epa/topics/drinking-water/Pages/default.aspx
Indiana https://www.in.gov/idem/7193.htm
Kentucky https://eec.ky.gov/Environmental-Protection/Water/Drinking/Pages/information-for-consumers.aspx
Michigan https://www.michigan.gov/pfasresponse/
Minnesota https://www.health.state.mn.us/communities/environment/risk/docs/guidance/gw/pfoainfo.pdf
North Dakota https://deq.nd.gov/Publications/MF/PFAS_factsheet.pdf
Ohio https://governor.ohio.gov/wps/portal/gov/governor/media/news-and-media/analysis-of-pfas-in-drinking-water
Tennessee https://www.tn.gov/health/cedep/environmental/environmental-health-topics/eht/pfas.html
Wisconsin https://dnr.wi.gov/topic/Contaminants/PFAS.html

The US EPA recommends that when concentrations greater than or equal to 70 ppt (PFOA and PFOS combined) are found that the local agency holding the results should

immediately resample and evaluate the scope of contamination. If confirmed, the responsible State agency should be consulted regarding additional sampling needed. The system operator and the public officials should promptly inform consumers; this notification should include options to reduce exposure including alternative water sources and use of pre-mixed formula for infants.

Users of private wells should contact the above agencies.

If it is determined that sampling is warranted, the following steps provide guidance.

1. Identify a laboratory. Use the contacts you developed above to identify a lab known to provide valid results. Link to certified labs is shown here: https://www.epa.gov/dwlabcert/contact-information-certification-programs-and-certified-laboratories-drinking-water. Not all labs test for all substances.
NOTE: representative sampling guidance from Michigan may be useful as an example: https://www.michigan.gov/documents/pfasresponse/For_Residents_-_Private_Residential_Well_PFAS_Sampling_Guidance_673170_7.pdf

2. Obtain a water sampling kit from the lab - bottle and instruction form that includes needed information. Identify costs for the testing. (As needed, contact the Health Department to determine if there is assistance to pay for testing.)

3. Follow directions, **exactly**; complete all entries in the paperwork

4. Return sample and paperwork for analysis

The combined level of PFOA and PFOS in water will be shown in a written (or e-mail) notification. Generally, the following guidelines apply:

> <70 ppt combined, the concentration is below the EPA advisory. However, you may choose to use an approved water filter to reduce exposure
>
> >=70 ppt combined, use an approved water filter and/or seek other supply
>
> If you have questions, contact the laboratory and/or the state agency.

The level reported is for water on the day the sample was collected. If conditions change, retesting may be necessary.

Actions to reduce exposure

If actions are needed, consult the health department or other state agency regarding first steps. Some actions might include:

Should bottle water be used immediately?

Considerations include cost and ease of obtaining the bottles.

Should the water be filtered?

If there is need to remove these compounds from the water, a filter can be installed at the tap. It is important to use approved units (that really remove PFOA and PFOS) to at or below 70 ppt.

Use only water filters that are NSF-certified; the unit should carry documentation or a label of 'NSF—Independently Certified'. In addition, you can identify if a unit is NSF certified here: http://www.nsf.org/consumer-resources/water-quality/drinking-water/perfluorooctanoic-acid-and-perfluorooctanesulfonic-acid-in-drinking-water.

Exercise – Is the filter unit NSF-certified?

The facilitator will provide pictures or boxes various filters. Work in small groups to read the documentation and determine if you can verify NSF certification.

Report your findings to the group.

Assure that the filtration system is installed properly and that you adhere to the maintenance schedule recommended by the supplier.

Summary

PFAS is a family of chemicals that do not break down in the environment and are often termed ‘forever chemicals’. PFOA and PFOS are the two most widely used.

Water contamination:

- Results from municipal and military firefighting use and industrial processes
- Particularly a hazard to the fetus and young children
- Not regulated, but Environmental Protection Agency has set a 70 ppt Advisory
- Methods are available for water testing
- Approaches to reducing exposure include filtering the water

Additional Resources

A summary of EPA guidance is shown here:
https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf

NIEHS guidance is updated frequently.
https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm

The Midwest Consortium developed this exercise for Hazardous Waste Worker Training under cooperative agreement number U45 ES 06184 from the National Institute of Environmental Health Sciences.