

Investigating Water Contamination - Per- and Poly fluorinated Substances (PFAS) – Facilitator

Time requirement: 1 hour

Number of facilitators: 1 or more, per ratio found in Minimum Criteria

Materials

- Whiteboard or equivalent; markers
- Participant Guide
- Handouts (if locally developed)
- Internet access and devices for exercises

Objectives

When completed, participants will be better able to:

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

Teaching Methods

- Presentation/discussion
- Small group activities

Suggested Facilitator Preparation

Recent attention to water quality in the region includes PFAS contamination from industrial sources and municipal and military firefighting activities. This program covers initial approaches to investigate water contamination related to PFAS.

- See this document regarding water quality of the Great Lakes.
https://s3.amazonaws.com/american-rivers-website/wp-content/uploads/2019/06/11101113/GL_DrinkingWaterReport2019_FNL.pdf
- See full version of Dark Waters, if possible. Summary and review here:
<https://www.rogerebert.com/reviews/dark-waters-movie-review-2019>
- Review Participant Guide
- Review definitions/explanation of terms
 - Class of compounds – an overall term for a group of chemicals that has common properties
 - per- and poly-fluorinated (PFAS) compounds – a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water. Fluoropolymer coatings can be used in such varied products as clothing, furniture, adhesives, food packaging, heat-resistant non-stick cooking surfaces, and the insulation of electrical wire.
 - Chains of fluorinated carbon atoms – carbon atoms with bonds to fluorine
 - PFAS family – all of the chemicals in this group
 - biological or chemical degradation – Biological degradation is the breakdown of a chemical by a microbe or other organism; one example is earth worms breaking down the organic compounds in leaves to make compost. Chemical degradation is the breakdown of a chemical by another chemical; for example, oxygen in the air can act on a material to change the color of plastics or change the flexibility of the plastic. Other forms of degradation are mechanical (making into smaller parts) and photodegradation (degraded by light, including sunlight).
 - bioaccumulate – a substance gradually increases concentration (builds up) inside the bodies of living things as it moves up the food chain

- biosolids – organic matter recycled from sewage, especially for use in agriculture.
 - liver enzymes – proteins in the liver that speed up certain chemical reactions
 - serum lipids – fat-like substances found in the blood stream
 - difficulty in teasing out – sometimes there are a number of factors that can contribute to a health effect and it is difficult to associate one specific exposure with a health effect. This is especially true when the health effect is a common disease. For example, a newly recognized cause of lung cancer might be difficult to tease out of the effects of cigarette smoking. Large numbers of participants and very detailed exposure information and a unique type of cell change in the lung help overcome this difficulty.
 - civil action – not a criminal case. A legal suit brought to protect rights.
 - probable link – more likely than not that a connection exists
 - preeclampsia – a pregnancy complication characterized by high blood pressure and signs of damage to another organ system, most often the liver and kidneys.
 - epigenetic gene expression – A modification of the DNA instructions that silence or enhance production of proteins that direct cell function; The production of those proteins is referred to as gene expression. When inherited changes impact the activity of genes it is called epigenetic gene expression.
 - efficacy of vaccines - percentage reduction of disease in a vaccinated group of people compared to an unvaccinated group
- Copy any locally developed handouts
 - Review content of websites provided. Test web links prior to the session and if any are inoperative please notify your Program Director
 - Prepare an outline for notes to be included in the program file

Minimum Content Requirements

- Health effects
- Levels of exposure
- Evaluation of level of contamination
- Actions to reduce exposure
- Exercise(s)

Questions You May Be Asked

1. What is the difference between PFOA, PFOS and PFAS?

PFAS refers to a group (or class) of chemicals used in many consumer products. PFOS and PFOA are two of the most frequently mentioned PFAS chemicals.

2. How might be I be exposed to PFAS other than through drinking water?

Besides water, people can be exposed to PFAS through food which was grown in contaminated soil and water or equipment that used PFAS during food processing. People can also be exposed during use of products containing PFAS, such as stain repellent, or contact with treated surfaces.

Presentation of the Exercise

This exercise can be presented as follows:

Review the objectives

Introduction

Ask: What is PFAS?

Ask? What are they used for?

Be prepared for a discussion of these compounds and the everyday products they are found in.

Refer to the Participant Guide to illustrate the complexity of the term ‘PFAS’—a class of 4,700 chemicals.

While these two most common chemicals are no longer made, the legacy remains.

The chemical structure also demonstrates the size of these compounds.

Open and display the map of PFAS contamination

- https://www.ewg.org/interactive-maps/2019_pfas_contamination/map/ (click ‘info’)
- demonstrate the layering (military/water/other)
- hover over one site to show content
- alert participants to the pop-up: how to avoid exposure resource to download

Exercise – Identify regional PFAS sources

Number of Facilitators Required: 1

Time Requirement: 20 minutes (15 to become familiar with the site and find information and 5 minutes for report back)

Materials: https://www.ewg.org/interactive-maps/2019_pfas_contamination/map/

Participants who live near military bases may access this updated map:

<https://www.ewg.org/news-and-analysis/2020/04/updated-map-suspected-and-confirmed-pfas-pollution-us-military-bases>

Procedure: Ask participants to work in small groups and review the site, taking time to hover over one location and note what is learned. Have trainees select a representative from each group to report findings to the entire class.

Health effects of PFAS

Review the health effects found in laboratory animal studies listed in the Participant Guide.

Point out that the impact of PFAS compounds on humans are less clearly defined than among lab animals because of the difficulty of teasing out causal relationships for these exposures and common diseases.

Review the health effects probably found in humans, also found in the Participant Guide.

Access the NIEHS website

<https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm>. This is a trusted source of information and is updated as new health effect data becomes available. A particular point of interest to participants may be that the NHANES data shows that 97% of US residents have PFOS in blood samples, although there have been reductions since 2000. However, new replacements are appearing, and exposure to those is not characterized.

Highlight the NIEHS Factsheet at this site.

Levels of Exposure – Health Advisory Level

Introduce the health advisory level set for PFOA and PFOS. Refer to the ppm figure in the Participant Guide and the relation to ppt.

Underscore that this is an advisory notice from EPA, not a standard.

Evaluation of level of contamination of PFOS and PFOA in water

Ask: How can you determine the levels of PFOS and PFOA in your drinking water? See Participant Guide for steps.

Resources to obtain information about PFAS compounds in each state are listed here: <https://www.epa.gov/pfas/us-state-resources-about-pfas>. This listing may be particularly useful to obtain general information of resources in the State.

Government resources in each state are shown in the Participant Guide. Users of private wells should contact these agencies, but further work may be needed to identify information or resources when water is not supplied by a municipal source.

Actions to reduce exposure

Ask: How can you reduce exposure? Review options listed in the Participant Guide.

Return to the EWG website and remind participants that they can download a guide to avoiding PFAS exposure <https://www.ewg.org/research/national-pfas-testing/>.

Exercise – Is the filter unit NSF-certified?

Number of Facilitators Required: 1

Time Requirement: 10 minutes (5 to review pictures and 5 minutes for report back)

Materials: Provide each small group with pictures of packages of filters available locally or on the internet. Be prepared to show cost of each.

Procedure: Ask participants to work in small groups and review the pictures, taking time to read the labeling. Have trainees select a representative from each group to report to the entire class.

Summary

Review the learning objectives

Note that additional resources are shown.

Ask: Based on this exercise, what takeaways do you have as you go back to work?

List them on a writing surface viewable by all

Answer any remaining questions.

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>

Follow up

Make this exercise better:

Forward suggestions to your Program Director

Are there other 'Questions you may be asked' that should be included?

Organize the listing of 'takeaways' and forward to your program director. These are very important impacts to report to NIEHS.