

THE ARFF TRAINING ALLIANCE PRESENTS:



13TH ANNUAL

JOINT ARFF LEADERSHIP CONFERENCE

January 28-31, 2019

Jacksonville, FL

“Protecting Fire Fighters from Dangerous Chemicals in AFFF”



Jack Kreckie
ARFF Professional Services, LLC





Pre-presentation question?

Protein Foam



Uses natural proteins as foaming agents. “Bio-degradable” Produces a thick vapor resistant seal for hydrocarbon fuel fires. Provides a stable heat resistant blanket with superior burn back resistance.



In the 1960s, Fluoroprotein Foam was developed and included a **fluorinated** surfactant. It was considered "better" than protein because it had a greater blanket life and was compatible with dry chemical.



It's Only Foam !



ARFF Fire Fighters Have Multiple Routine Exposures to Foam Concentrate and Finished Foam During Training, Maintenance and Emergency Response.

Technical Fact Sheet – Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)

November 2017

TECHNICAL FACT SHEET – PFOS and PFOA

At a Glance

- ❖ Manmade chemicals not naturally found in the environment.
- ❖ Fluorinated compounds that repel oil and water.
- ❖ Used in a variety of industrial and consumer products, such as carpet and clothing treatments and firefighting foams.
- ❖ Extremely persistent in the environment.
- ❖ Known to bioaccumulate in humans and wildlife.
- ❖ Readily absorbed after oral exposure. Accumulate primarily in the blood serum, kidney and liver.
- ❖ Toxicological studies on animals indicate potential developmental, reproductive and systemic effects.
- ❖ Health-based advisories or screening levels have been developed by EPA and state agencies.
- ❖ EPA has not issued a Maximum Contaminant Level (MCL) for drinking water.
- ❖ Standard analytical methods use high-performance liquid chromatography coupled with tandem mass spectrometry.
- ❖ Resistant to most chemical and microbial conventional treatment technologies. Most common groundwater treatment method is extraction and filtration through granular activated carbon filters.

Introduction

This fact sheet, developed by the U.S. Environmental Protection Agency (EPA) Federal Facilities Restoration and Reuse Office (FFRRO), provides a summary of two contaminants of emerging concern, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), including physical and chemical properties; environmental and health impacts; existing federal and state guidelines; detection and treatment methods; and additional sources of information. This fact sheet is intended for use by site managers who may address these chemicals at cleanup sites or in drinking water supplies and for those in a position to consider whether these chemicals should be added to the analytical suite for site investigations.

PFOS and PFOA are part of a larger group of chemicals called per- and polyfluoroalkyl substances (PFASs). PFASs, which are highly fluorinated aliphatic molecules, have been released to the environment through industrial manufacturing and through use and disposal of PFAS-containing products (Liu and Mejia Avendano 2013). PFOS and PFOA are the most widely studied of the PFAS chemicals. PFOS and PFOA are persistent in the environment and resistant to typical environmental degradation processes. As a result, they are widely distributed across all trophic levels and are found in soil, air and groundwater at sites across the United States. The toxicity, mobility and bioaccumulation potential of PFOS and PFOA result in potential adverse effects on the environment and human health.

What are PFOS and PFOA?

- ❖ They are human-made compounds that do not occur naturally in the environment (ATSDR 2015; EPA 2009b).
- ❖ PFOS and PFOA are fully fluorinated, organic compounds. They are the two PFASs that have been produced in the largest amounts within the United States (ATSDR 2015; EFSA 2008).
- ❖ PFOS and PFOA are part of a subset of PFASs known as perfluorinated alkyl acids (PFAAs).

Disclaimer: The U.S. EPA prepared this fact sheet using the most recent publicly-available scientific information; additional information can be obtained from the source documents. This fact sheet is not intended to be used as a primary source of information and is not intended, nor can it be relied on, to create any rights enforceable by any party in litigation with the United States. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Perfluorooctane Sulfonate – **PFOS**
Perfluorooctanoic Acid – **PFOA**

PFOS & PFOA's are Part of a Larger Group Called:
Per and Polyfluoroalkyl Substances – **PFAS**

PFAS Have Been and in Some Cases, Still Are Used
As Surfactants to Improve the Effectiveness of
Fire Fighting Foam

The EPA Warns that PFAS are **PERSISTENT**,
BIO-ACCUMMULATIVE and **TOXIC** – **PBT**

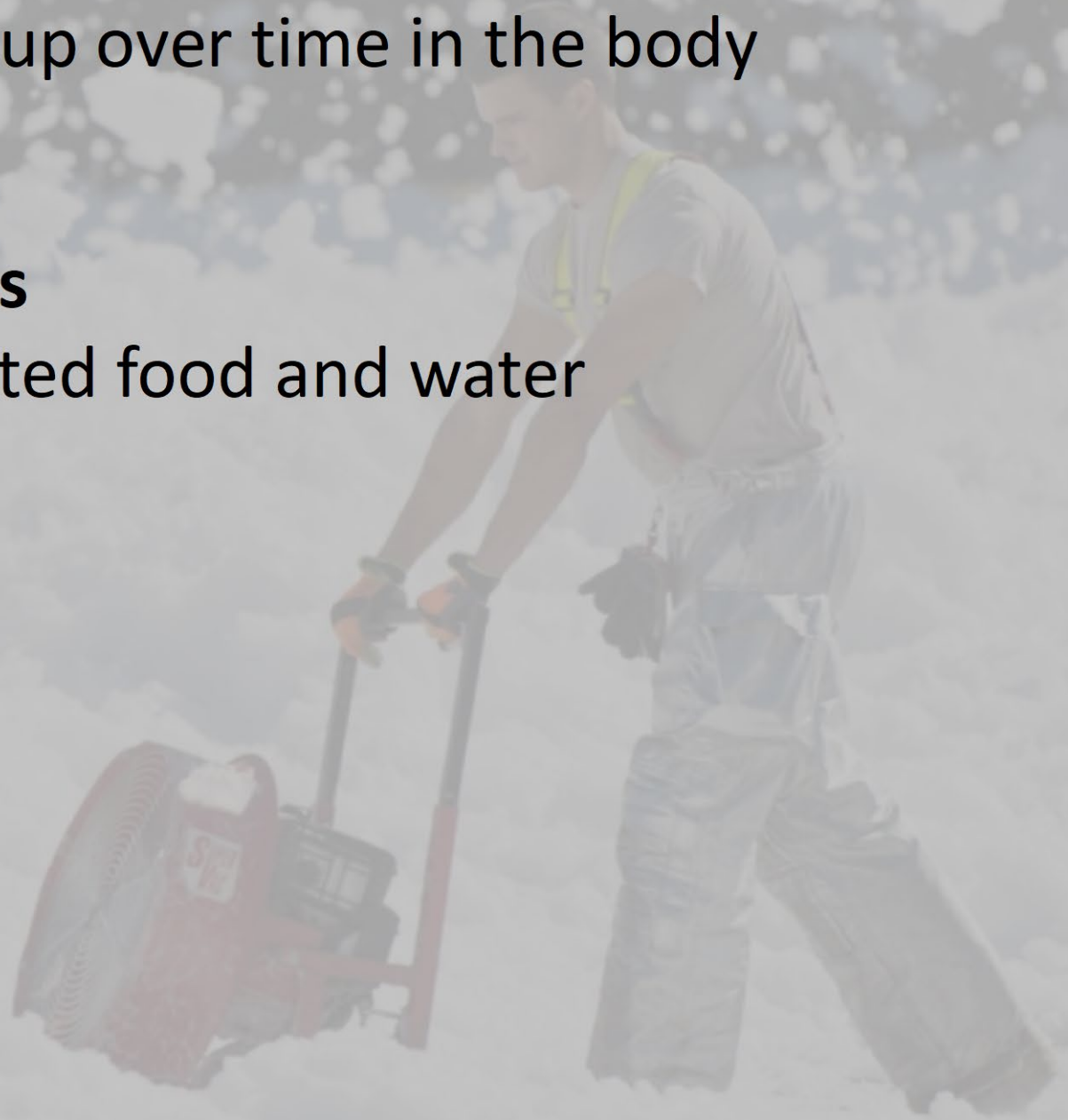
PERSISTENT – Stable, Does not break down in the environment

BIO-ACCUMULATIVE – builds up over time in the body

TOXIC - Poisonous

Potential Exposure Routes

- Ingestion of contaminated food and water
- Absorption
- Inhalation



HEALTH HAZARDS – PFOS and PFOA

Human epidemiological studies found associations between PFOA exposure and high cholesterol, increased liver enzymes, decreased vaccination response, thyroid disorders, pregnancy induced hypertension and preeclampsia, and cancer (testicular and kidney). (EPA 2016e)

There is suggestive evidence that PFOS and PFOA may cause cancer. (EPA 2016d)

The American Conference of Governmental Industrial Hygienists (ACGIH) has classified PFOA as a Group 3 carcinogen – confirmed animal carcinogen with unknown relevance to humans. (Group 2B) (IARC 2016)

PFAS are present in a number of household and workplace items such as:

- Food grown in contaminated soils, and or watered with contaminated water
- Food packaging that includes PFA in the manufacturing process
- Household products such as stain and water repelling products, non-stick products (teflon), polishes, waxes, paints and cleaning products
- Drinking water from contaminated sources
- Firefighting foam
- Chrome – plating
- Electronics manufacturing
- Living organisms, fish, animals and humans
- Was used in the thermal layer in the manufacturing of certain bunker gear

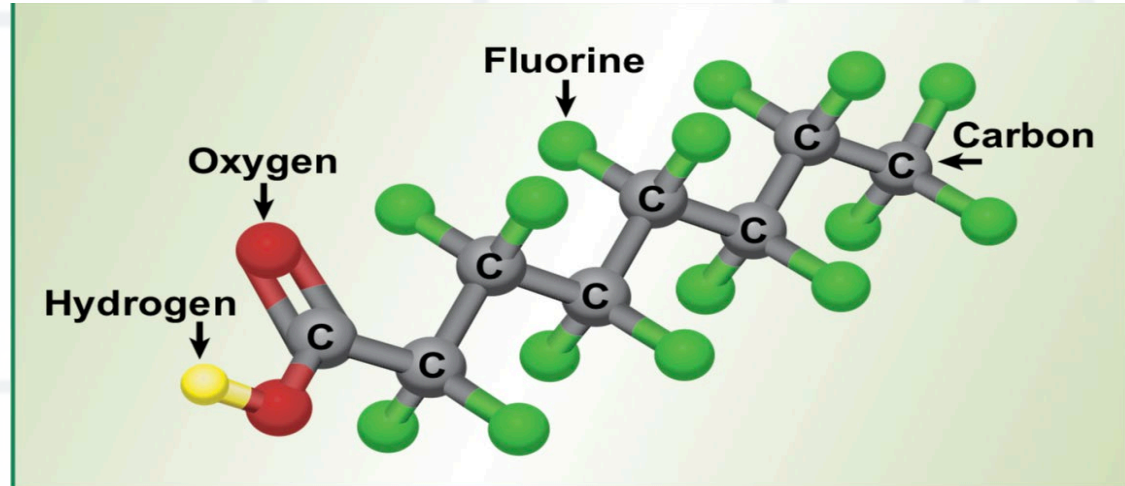
Carbon Chains

AFFF manufactured after 2002 is made with a process called Telomerization, which is a process for polymerizing perfluoroethylene to produce perfluorinated surfactants.

These surfactants have carbon chains that range from C4 to C24 in length

The EPA indicates that shorter (>C8) carbon chains have a reduced potential for toxicity and bioaccumulation.

PFOA - C8 has 8 Carbons



C6 Versus C8

C8 = PFOS / PFOA

C6 = PFOS / PFOA Free, but still accumulates PFOA through the manufacturing process.

C6 utilizes many other PFC chemicals to achieve the same performance as C8.

WE ARE TRADING TODAYS PROBLEM FOR TOMORROWS PROBLEM!

ACTION ITEMS

- Identify the type foam in your inventory. Contact the foam manufacturer with the foam type, Lot number or date of purchase. People handling the foam should know the difference between C6 and C8 and what foam they are handling.
- Ensure that Safety Data Sheets (SDS) are available for employees to review for all dangerous chemical on hand, including C6 and C8 AFFF.
- Develop and implement SOP's for the safe handling of AFFF.
- The next generation of foam is likely to be fluorine free, but regardless of the safety claims made by manufacturers, continue to treat foam as a dangerous chemical.

ACTION ITEMS

- Consult with your environmental department for guidance relative to:
 - Approved methods / locations for foam testing, training and maintenance.
 - Approved disposal methods for foam concentrate
 - Approved disposal methods for disposal of foam containers



Introduction

The purpose of this fact sheet is to provide interim guidance to aid physicians and other clinicians with patient consultations on perfluoroalkyl and polyfluoroalkyl substances (PFAS). PFAS fall into this category of substances that are not currently regulated, but answers to specific patient questions.

What are PFAS?

PFAS, sometimes known as "forever chemicals," are many different types of chemicals (including perfluorinated alkyl acids (PFA) and perfluorinated alkyl sulfonates (PFSA)) and perfluorinated compounds. They are used in a wide variety of products, including cookware, to make some food packaging, and in automotive, building, and industrial applications. Because PFAS help make these products more durable, they can persist in the environment and in the body.

Why are PFAS a possible health concern?

According to the U.S. Environmental Protection Agency (EPA), PFAS are an "emerging contaminant" and a potential threat to human health.

PFAS are extremely persistent in the environment. They can travel long distances through the air, water, and soil. Some long-chain PFAS are also persistent in the body.

PFOS and PFOA are two types of PFAS that have been found in blood, and at much higher levels than other PFAS.

PFOS and PFOA may be harmful to human health, and bioaccumulation and concentration of these chemicals in the body can be a concern.

What are the main sources of exposure?

For the general population, the main sources of exposure are:

- Drinking contaminated water
- Ingesting food contaminated with PFAS, such as certain types of fish and shellfish.
- Until recently, eating food packaged in materials containing PFAS (e.g., popcorn bags, fast food containers, and pizza boxes). Using PFAS compounds has been largely phased out of food packaging materials.
- Hand-to-mouth transfer from surfaces treated with PFAS-containing stain protectants, such as carpets, which is thought to be most significant for infants and toddlers.

- There currently is no established PFAS blood level at which a health effect is known nor is there a level that predicts health problems.
- Most people in the US will have measurable amounts of PFAS in their blood.
- The blood test for PFAS can only tell us of specific PFAS in your body at the time of the blood test.
- The blood test results cannot predict or rule-out the development of future problems related to exposure.

FOAM HANDLING

During Firefighting

- Use common sense. Wear your PPE. If your PPE is contaminated with foam, rinse it off at the scene, bag it and launder as per PPE manufacturers' guidelines.
- Use all the foam you need to extinguish the fire and secure a safe scene, then stop discharging foam. Remember: Life – Property – Environment
- Flush the truck as per Department SOP and environmental department guidance.
- Wash thoroughly or shower after exposure.

FOAM HANDLING

During Reservice, Maintenance or Testing:

- **Limit unnecessary exposure**
- **Wear Tyvek suits with booties**
- **Wear rubber, latex or nitrile gloves**
- **Wear goggles**
- **Wear respiratory inspection, SCBA or approved respirator. (Minimum P-100 or R-100 Mask).
Check with your Haz-Mat Team**



Respiratory protection is particularly important to the person monitoring the foam level and anyone who is pouring foam into the top fill cover.

OPEN DISCUSSION

POST PRESENTATION Question?





PROTECT YOURSELF!

DO NOT WAIT FOR THE DEPARTMENT, THE UNION
OR THE GOVERNMENT TO PROTECT YOU!

SHARE THIS INFORMATION!

CONTINUE TO LEARN!
GOOGLE PFOS!
READ SDS's

EXPECT THE UNEXPECTED!

