US EPA Cross-Agency Coordination of PFAS Activities

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Outline

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Introduction to PFAS

- A class of man-made chemicals that are ubiquitous due to:
  - Wide variety of industrial and consumer uses
  - Persistence
  - High Mobility
- They are a concern due to:
  - Known or suspected toxicity, especially for PFOS and PFOA
  - Bioaccumulation
  - Some have very long half lives (several years), especially in humans
  - Shorter PFAS tend to be highly mobile, longer PFAS less mobile
- Information on PFAS is rapidly evolving

Agency PFAS Priorities

1. Addressing public concerns and informing risk mitigation activities by filling data gaps related to human health toxicity.

2. Establishing validated methods for measuring the amount of PFAS in different environmental media and for biomonitoring.

3. Reducing PFAS exposures by limiting production of potentially hazardous PFAS and by assisting states and federal partners in the remediation of environmental media.

4. Improving risk communication efforts to ensure the accurate and timely communication of information to the public and other partners (e.g. state and local governments, tribes, industry).

Cross-Agency Coordination of PFAS Activities

- **PFAS coordination is led through EPA's Office of the Science Advisor**
- **PFAS is a cross-Agency issue, but also multifaceted:**
  - Human health toxicity
  - Exposure
  - Analytical methods
  - Risk management
  - Risk communication
- **Currently there are three cross-Agency workgroups:**
  - Human health toxicity
  - Analytical methods
  - Data quality
- **This broad array of issues requires coordination of each individual aspect, but also overarching coordination of all issues to ensure that the Agency has an awareness of all ongoing and proposed activities.**

Current PFAS Activities: OCSPP

- **EPA's New Chemicals Program**
  - Reviewed hundreds of pre-market alternatives for PFOA and related chemicals since 2000 before they enter the marketplace.
- **Significant New Use Rule (SNUR)**
  - Proposed on January 21, 2015 to require manufacturers (including importers) and processors of PFOA and related chemicals, including as part of articles, to notify EPA at least 90 days before starting or resuming new uses of these chemicals in any products.
- **PFOA Stewardship Program**
  - Eight companies participated in the program and successfully eliminated production of PFOA.
  - Designed to phase out PFOA and related per- and polyfluoroalkylated substances (PFAS) including potential PFOA precursors by these companies by the end of 2015.

Current PFAS Activities: OLEM

- **EPA Federal Facility Superfund Program**
  - Program is actively engaged in a PFAS cleanup process at 30 Federal Facility National Priority List (NPL) sites.
  - PFAS detections in groundwater range from non-detect (based on analytical method limitations) or slightly exceeding the Drinking Water Health Advisory of 70 parts per trillion (ppt; PFOA and PFOS combined) to 2,000,000 ppt.
  - Drinking water has been impacted at 13 of these Federal Facility NPL sites.
- **Office of Superfund Remediation and Technology Innovation (OSRTI)**
  - 12 known impacted NPL sites, including one proposed for listing (St. Gobain Hoosick Falls, NY)
  - 100s potential NPL sites (e.g. 100 metal plating sites, 300 landfills)
- **Regional Assistance**
  - Holding site specific consultations with EPA regions on investigations of PFAS contamination

Current PFAS Activities: ORD

- **EPA has been studying exposure and health effects of PFAS for more than 15 years.**
- **Health Effects**
  - Compiling considerable knowledge on the toxicological effects of various PFAS, including studies on the fate of PFAS in the body
  - Conducting research to study the potential hazards of PFAS in the environment using computational toxicology modeling
- **Analytical Methods/Exposure Assessment**
  - Ongoing research on analytical methods, in collaboration with program and regional offices, for measurement of PFAS in environmental media
  - Evaluating sources, environmental fate and transport, and exposure to human and non-human receptors
- **Risk assessment**
  - EPA's Provisional Peer-Reviewed Toxicity Value (PPRTV) program completed a health assessment for perfluorobutane sulfonate (PFBS), a substance similar to PFOA and PFOS, in 2014
  - EPA identified PFAS as a chemical class of interest to the Agency in the 2015 multi-year agenda for the Integrated Risk Information System (IRIS) program
- **Risk Management**
  - Characterize PFAS contamination in the soil, surface water and groundwater at military installations where aqueous film forming foams (AFFF) have been used extensively
  - With the Air Force Institute of Technology (AFIT), test in situ remediation technologies to remove PFAS at contaminated sites

Current PFAS Activities: OW

- **Published Drinking Water Health Advisories (HA) in 2016 for PFOA and PFOS**
  - HAs are non-regulatory information for federal, state and local officials to consider when addressing drinking water contamination.
  - Identified 0.07 µg/L (70 parts per trillion) as the HA level for PFOA and PFOS combined and provided information about treatment and monitoring.
- **Evaluating PFOA and PFOS for regulatory determination under the Safe Drinking Water Act (SDWA)**
  - PFOA and PFOS are on the fourth Contaminant Candidate List (CCL 4) published in November 2016. EPA's Office of Water is assessing PFOA and PFOS against the three SDWA regulatory determination criteria:
    - *May have an adverse effect on the health of persons*
    - *Is known to occur or there is a substantial likelihood that it will occur in public water systems with a frequency and at levels of public health concern*
    - *In the sole judgment of the Administrator, regulating the contaminant presents a meaningful opportunity for health risk reductions for persons served by public water systems*
  - EPA must decide whether or not to regulate at least five CCL4 contaminants by January 2021.
  - Preliminary regulatory determinations for public comment expected in 2019 (to enable final regulatory determinations by January 2021).

Current PFAS Activities: Regions

- **PFAS have been identified as an important issue in the EPA regions. Below are the general, ongoing efforts in the regions:**
  - Working collaboratively with states, local and federal partners, particularly DOD, to address concerns with PFAS contamination of public and private drinking water wells and legacy contamination at Superfund sites.
  - Providing support to states on different issues, including direct analytical support for sites, method improvement, method validation studies and quality assurance protocols.
  - Assisting states, local agencies and federal facilities with public messaging regarding risks.
  - Regions have had to issue Safe Drinking Water Act Administrative Orders to federal facilities (Pease AFB, NH and Warminster Navy Base, PA) in order to protect public supply wells given the emergent nature of this class of chemicals and the slow reaction time of other federal agencies.
- **Regional laboratory representatives participate in national and regional programmatic meetings offering technical advice with expertise in analytical methodology and quality acceptability.**

Current PFAS Activities: Cross-Agency

- **EPA ORD and the Office of Land and Emergency Management (OLEM) lead a cross-EPA workgroup on characterizing human health hazards**
  - To characterize the available toxicity information for approximately 30 PFAS of interest to various program offices or regions
  - To develop quantitative toxicity values for multiple PFAS, other than PFOA and PFOS
  - To inform evidence-based decisions by EPA offices and regions regarding potential human health risks from ongoing or future exposures

Category	Draft Final PFAS List	Acronym
Perfluoro carboxylic acids	Perfluorododecanoic acid	PFDoA
	Perfluoroundecanoic acid	PFUnA
	Perfluorodecanoic acid	PFDA
	Perfluorononanoic acid	PFNA
	Perfluorooctanoic acid	PFOA
	Perfluoroheptanoic acid	PFHpA
	Perfluorohexanoic acid	PFHxA
	Perfluoropentanoic acid	PFPeA
	Perfluorobutyric acid	PFBA
Perfluoro sulfonates	Perfluorodecanesulfonate	PFDS
	Perfluorononanesulfonate	PFNS
	Perfluorooctanesulfonate	PFOS
	Perfluoroheptanesulfonate	PFHpS
	Perfluorohexanesulfonate	PFHxS
	Perfluoropentansulfonate	PFPeS
	Perfluorobutanesulfonate	PFBS
Perfluoro sulfonamide	Perfluorooctanesulfonamide	PFOSA
Fluorotelomer sulfonates	Fluorotelomer sulfonate 8:2	FtS 8:2
	Fluorotelomer sulfonate 6:2	FtS 6:2
Perfluoro sulfonamidoacetic acids	N-ethyl-N-((heptadecafluorooctyl)sulfonyl)glycine	NEtFOSAA
	N-(Heptadecafluorooctylsulfonyl)-N-methylglycine	NMeFOSAA
Fluorotelomer alcohols	Fluorotelomer alcohol 8:2	FtOH 8:2
	Fluorotelomer alcohol 6:2	FtOH 6:2
Perfluoro ether carboxylic acids	Perfluoro(2-methyl-3-oxahexanoic) acid	GenX
	4,8-dioxa-3H-perfluorononanoic acid	ADONA
Fluorotelomer phosphates	6:2 Fluorotelomer phosphate monoester	6:2 monoPAP
	6:2 Fluorotelomer phosphate diester	6:2 diPAP
	8:2 Fluorotelomer phosphate monoester	8:2 monoPAP
	8:2 Fluorotelomer phosphate diester	8:2 diPAP
	6:2/8:2 Fluorotelomer phosphate diester	6:2/8:2 diPAP
Fluorotelomer carboxylic acid	5:3 Polyfluorinated acid	5:3 acid

Current PFAS Activities: Cross-Agency (cont'd)

- **OLEM/Region 3/ORD lead a cross-EPA workgroup on method development and validation**
  - To develop multi-laboratory validated methods for analyzing sample types other than drinking water (waters and solids) and quantifying 24 PFAS. Currently performing a multi-lab validation of a method for the 24 PFAS which was developed by the Region 5 Chicago Regional Lab
  - To develop sampling protocols to address PFAS analytical data quality issues Regions have identified
- **Region 10 and Region 3 lead a cross-EPA workgroup on evaluating data quality issues**
  - To develop guidelines for data deliverables and assessment criteria

ADDITIONAL SLIDES

Chemical and Physical Properties

- Properties of PFAS range depending on carbon chain lengths and functional groups.
- PFAS generally occur as mixtures and are not well characterized.

- PFAS provide desirable performance because they repel both oil and water:
  - The fluorinated carbon tail is both lipophobic/oleophobic (repelled by fats and oils) and hydrophobic (repelled by water).
  - The functional group head can vary but is often hydrophilic (attracted to water).
- As a result of these unique surfactant properties and their stability, they are common surfactants and stain preventers.

Production of PFAS

- PFAS production occurs by two primary production methods: Electrochemical Fluorination and Telomerization.

- During production of the intended products, many residuals and precursors are carried forward into the final formulations
(e.g., FTOHs and PFOA may be found in fluoropolymers).

- Many PFAS are used as processing aids in production of other PFAS products. This results in:
  - Primary production facilities that synthesize PFAS chemicals, e.g. chemical plants
  - Secondary production facilities that produce products using PFAS, e.g. textile and paper facilities, fluorocarbon plastics production

- Industry is changing formulations in response to regulatory drivers and mounting toxicity and persistence data. However, replacement chemicals are unknown as to persistence, toxicity and bioaccumulation.

Uses of PFAS

- **Food contact surfaces such as cookware[1], pizza boxes, fast food wrappers, popcorn bags, etc.**
- **Polishes, waxes and paints**
- **Stain repellants for carpets, clothing, upholstered furniture, etc.**
- **Cleaning products**
- **Dust suppression for chrome plating**
- **Electronics manufacturing**
- **Oil and mining for enhanced recovery**
- **Performance chemicals such as hydraulic fluid, fuel additives, etc.**

[1] PFOA has been phased out, however there is little evidence that the chemicals that have replaced PFOA are much safer.

Sources of PFAS

- **Landfills and leachates from disposal of consumer and industrial products containing PFAS**
- **Land where wastewater treatment plant biosolids was applied**
  - Note: Biosolids applied following regulations should be protective to human exposure via ingestion of crops (Blaine et al. 2013 and 2014)
- **Direct release of PFAS products into the environment – such as use of aqueous film forming foam (AFFF) in training and emergency response**

Analytical Methods

- Only PFOS, PFOA and PFBS have vetted toxicity values at this time. Therefore, for initial investigations these would be the primary PFAS contaminants of concern.
  - Drinking Water: EPA Method 537 Version 1.1
  - Media other than drinking water: Each contract lab has their own method (most loosely based on EPA 537) since a standard HW method does not exist
- ORD, Region 5 and others are developing methods for PFAS precursors and PFAS in non-DW matrices (surface waters, groundwater, wastewater, biosolids, soils, sediments, etc).
- OLEM, OW, ORD, and Regional Labs currently conducting a multi-lab validation effort to establish an EPA method(s) for non-DW media.
- ORD and others are developing methods to identify unknown PFAS in environmental samples due to transformations, degradation, new formulations, etc.

Drinking Water Health Advisories - OW

- In May 2016, EPA established lifetime drinking water health advisories (HAs) for PFOA and PFOS at 70 parts per trillion (ppt). https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos
  - Combined concentrations of PFOA and PFOS should be compared to 70 ppt.
- HAs are based on the best available peer-reviewed studies of the effects of PFOA and PFOS on laboratory animals and informed by human epidemiological studies.
  - Adverse effects: developmental effects, cancer, liver effects, immune effects, thyroid effects and cholesterol changes.
- HAs protect against adverse health effects to the most sensitive populations: fetuses during pregnancy and breastfed infants.
- HAs are non-regulatory and provide technical information to states agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.