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It can be done

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Navigating the Complexities of PFAS Analysis, a Laboratory Perspective


Analytical Services


Health Assessment


Novel Chemistries


Remediation & Treatment


Site Characterization


Toxicology

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Today's Presentation

- PFAS primer
- Published method
- Regulatory guidance
- Target analytes
- Accreditations
- State level regulations and requirements
- The laboratory perspective
- Upcoming method changes
- Conclusions

What is PFAS?

- Man-made fluorinated chemicals with widespread use due to unique properties which makes them persistent in the environment
- EPA Lifetime Health Advisories only for the two most studied compounds, PFOA and PFOS; there are more than 3,000 related chemicals in this class

Surface Treatments

Food-related

- Non-stick coated pans
- Food wrappers

Apparel, Household & Personal Care

- Stain-resistant fabrics
- Carpet
- Upholstery
- Leather protector
- Hair care products
- Floor polishes
- Air fresheners

Performance Chemicals

Industrial

- Mist suppressant in chrome plating
- Cabling materials
- Molds
- Photolithography
- Semiconductor
- Electronics
- Building
- Construction
- Roofing

Automobile, AFFF

- Car paint
- Wiper blades
- Oil filters, lubricants, etc.
- Aqueous film forming foams

Prevedorous et al 2006, Buck et al 2011

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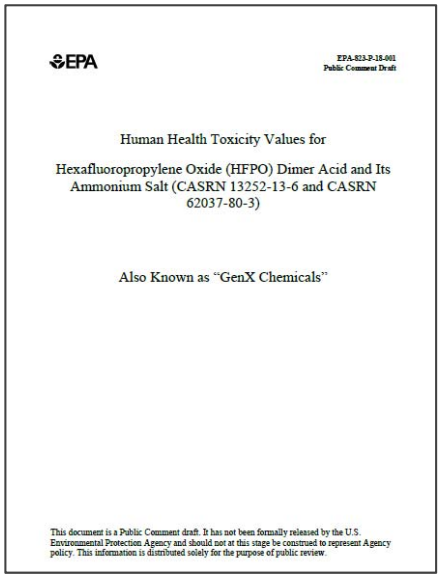
What is PFAS?

- Affect growth, learning, and behavior of infants and older children
- Lower a woman's chance of getting pregnant
- Interfere with the body's natural hormones
- Increase cholesterol levels
- Affect the immune system
- Increase the risk of cancer

- **…But Much Still Unknown**


EPA

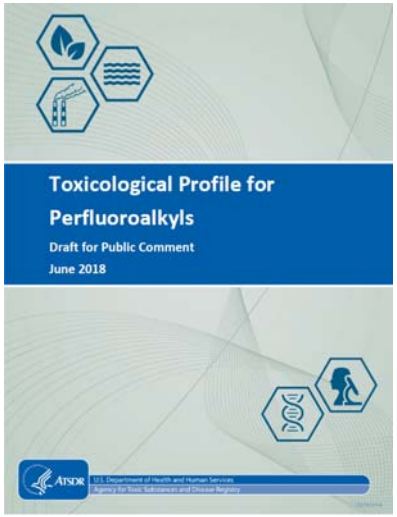
EPA-823-P-18-001
Public Comment Draft

Human Health Toxicity Values for

Hexafluoropropylene Oxide (HFPO) Dimer Acid and Its Ammonium Salt (CASRN 13252-13-6 and CASRN 62037-80-3)

Also Known as "GenX Chemicals"

This document is a Public Comment draft. It has not been formally released by the U.S. Environmental Protection Agency and should not at this stage be construed to represent Agency policy. This information is distributed solely for the purpose of public review.



CDC/ATSDR: "Most people in the United States have one or more specific PFAS in their blood, especially PFOS and PFOA".

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What is PFAS?

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Current Methods

- ASTM D7979 (water)
- ASTM D7968 (soil)
- EPA Drinking water method 537.1
- EPA SW-846 Method 8327

DoD Guidance Documents

- DoD Quality System Manual
  - 5.0 – July 2013
  - 5.1 – January 2017
  - 5.2 – January 2019
  - 5.3 – May 2019

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UCMR 3

PFCAs

- **PFHpA**
- **PFOA**
- **PFNA**

PFASs

- **PFBS**
- **PFHxS**
- **PFOS**

FOSAs

FOSEs

FOSAAs

FTOHs

FTSs

FTCAs

PFTA and FTUAs

Replacements

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EPA 537 and EPA 537.1

PFCAs

-
-
- **PFHxA**
- **PFHpA**
- **PFOA**
- **PFNA**
- **PFDA**
- **PFUnA**
- **PFDoA**
- **PFTrDA**
- **PFTeDA**

PFASs

- **PFBS**
-
- **PFHxS**
-
- **PFOS**
-
-

FOSAs

-
-
-

FOSEs

-
-

FOSAAs

- **MeFOSAA**
- **EtFOSAA**

FTOHs

-
-
-
-

FTSs

-
-
-
-

FTCAs

-
-
-

PFTA and FTUAs

-
-
-
-
-

Replacements

- **HFPO-DA**
- **Adona**
- **11Cl-PF3OUdS**
- **9Cl-PF3ONS**

DoD 24 and DoD 28

PFCAs
- **PFBA**
- **PFPeA**
- **PFHxA**
- **PFHpA**
- **PFOA**
- **PFNA**
- **PFDA**
- **PFUnA**
- **PFDoA**
- **PFTrDA**
- **PFTeDA**

PFASs
- **PFBS**
- **PFPeS**
- **PFHxS**
- **PFHpS**
- **PFOS**
- **PFNS**
- **PFDS**

FOSAs
- **PFOSA**
-
-

FOSEs
-
-

FOSAAs
- **MeFOSAA**
- **EtFOSAA**

FTOHs
-
-
-
-

FTSs
- **4:2FTS**
- **6:2FTS**
- **8:2FTS**
-

FTCAs
-

PFTA and FTUAs
-
-
-
-
-

Replacements
- **HFPO-DA**
- **Adona**
- **11Cl-PF3OUdS**
- **9Cl-PF3ONS**

NY List

PFCAs

- **PFBA**
- **PFPeA**
- **PFHxA**
- **PFHpA**
- **PFOA**
- **PFNA**
- **PFDA**
- **PFUnA**
- **PFDoA**
- **PFTrDA**
- **PFTeDA**

PFASs

- **PFBS**
- **PFHxS**
- **PFHpS**
- **PFOS**
- **PFDS**

FOSAs

- **PFOSA**

FOSEs

FOSAAs

- **MeFOSAA**
- **EtFOSAA**

FTOHs

FTSs

- **6:2FTS**
- **8:2FTS**

FTCAs

PFTA and FTUAs

Replacements

- **HFPO-DA**
- **Adona**
- **11Cl-PF3OUdS**
- **9Cl-PF3ONS**

CA List

PFCAs

- PFBA
- PFPeA
- PFHxA
- PFHpA
- PFOA
- PFNA
- PFDA
- PFUnA
- PFDoA
- PFTrDA
- PFTeDA

PFASs

- PFBS
- PFPeS
- PFHxS
- PFHpS
- PFOS
- PFNS
- PFDS

FOSAs

- PFOSA
- MeFOSA
- EtFOSA

FOSEs

- MeFOSE
- EtFOSE

FOSAAs

- MeFOSAA
- EtFOSAA

FTOHs

-
-
-
-

FTSs

- 4:2FTS
- 6:2FTS
- 8:2FTS
- 10:2FTS

FTCAs

- 3:3FTCA
- 5:3FTCA
- 7:3FTCA

PFTA and FTUAs

-
-
-
-
-

Replacements

- HFPO-DA
- Adona
- 11Cl-PF3OUdS
- 9Cl-PF3ONS

ASTM List

PFCAs

- **PFBA**
- **PFPeA**
- **PFHxA**
- **PFHpA**
- **PFOA**
- **PFNA**
- **PFDA**
- **PFUnA**
- **PFDoA**
- **PFTrDA**
- **PFTeDA**

PFASs

- **PFBS**
- **PFHxS**
- **PFOS**

FOSAs

FOSEs

FOSAAs

FTOHs

FTSs

FTCAs

PFTA and FTUAs

- **PHEA**
- **FOEA**
- **FDEA**
- **FOUEA**
- **FHUEA**

Replacements

Target Analytes

PFCAs
- PFBA
- PFPeA
- PFHxA
- PFHpA
- PFOA
- PFNA
- PFDA
- PFUnA
- PFDoA
- PFTrDA
- PFTeDA

PFASs
- PFBS
- PFPeS
- PFHxS
- PFHpS
- PFOS
- PFNS
- PFDS

FOSAs
- PFOSA
- *MeFOSA*
- *EtFOSA*

FOSEs
- *MeFOSE*
- *EtFOSE*

FOSAAs
- MeFOSAA
- EtFOSAA

FTOHs
- *FBET*
- *FHET*
- *FOET*
- *FDET*

FTSs
- 4:2FTS
- 6:2FTS
- 8:2FTS
- *10:2FTS*

FTCAs
- 3:3FTCA
- 5:3FTCA
- 7:3FTCA

PFTA and FTUAs
- *PHEA*
- *FOEA*
- *FDEA*
- *FOUEA*
- *FHUEA*

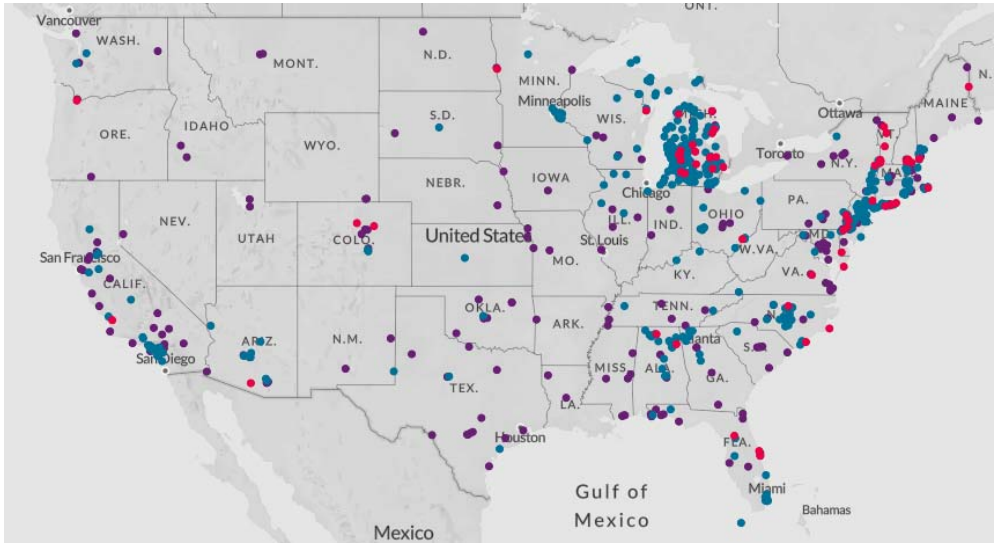
Replacements
- HFPO-DA
- Adona
- 11Cl-PF3OUdS
- 9Cl-PF3ONS

Accreditations

- Not all states offer accreditation or certification in PFAS
- Some states offer only drinking water
- Constantly changing
- Need to constantly follow up with states to verify offerings

State Level Criteria

- EPA health advisory limit of 70 PPT in drinking water for PFOS/PFOA
- States are setting action limits for PFAS independently of federal government
- States not all using the same analytes for health advisories or action limits



https://www.ewg.org/release/mapping-pfas-contamination-crisis-new-data-show-610-sites-43-states

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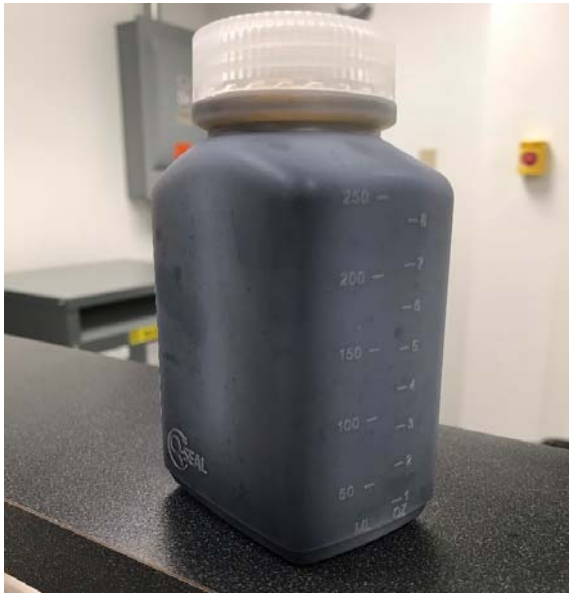
Laboratory Perspective

- Pre-certified HDPE and PP containers not available as certified "PFAS free"
- Sources of laboratory contamination
- Availability of PFAS free water
- Labeled standards
- Extraction process can be labor intensive
- Instrument redundancy

Laboratory Perspective

- Non-potable waters – not all waters are the same!



- Sediments, soils, and tissues – present other challenges

Laboratory Perspective

- High level of QC requirements on MQO, exceedances can lead to re-extraction
- LC/MS/MS vs GC/MS technology
  - External standard vs. internal standard vs. isotope dilution
  - compounds ionization influences by matrix

PFAS Analytical Landscape – What's on the Horizon?

PFAS Analytical Landscape – What's on the Horizon?

- New EPA Drinking Water Method (June 2019)
  - 25 PFAS by solid phase extraction, including analytes outside the scope of 537.1
  - Includes fluorotelemer sulfonates, perfluoroethers, and PFBA

PFAS Analytical Landscape – What's on the Horizon?

- EPA SW-846 Method 8328 (Spring 2019 for draft)
  - Surface, ground, and waste water, plus solids
  - 24 target PFAS plus GenX (HFPO-DA)
  - Closer to DoD requirements under QSM 5.1 (DoD "options" in method)
  - Target LOQ is 10 ng/L in waters (none listed yet for solids)

PFAS Analytical Landscape – What's on the Horizon?

- ASTM D-7968 (collaboration with EPA OLEM)
  - Solid extraction followed by direct injection
  - 24 analytes
  - Currently in external multi-lab review

Conclusions

- Cross-contamination – pre-screening of non-potable waters can save you may headaches!
- Methodology and guidance has changed dramatically in the last several years
- Regulatory landscape changes quickly and continues to change
- Costs driven to lowest cost/sample for methods with highly specific QA requirements put labs in difficult position
- Can be difficult to add new analytes to select accreditations between site assessments, some changes require a new site assessment
- With new published methods, the landscape for accreditation will likely change, current laboratory accreditations will need to shift and/or modify accordingly!

Questions?

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