Forever Chemicals

The Who, the What and What If

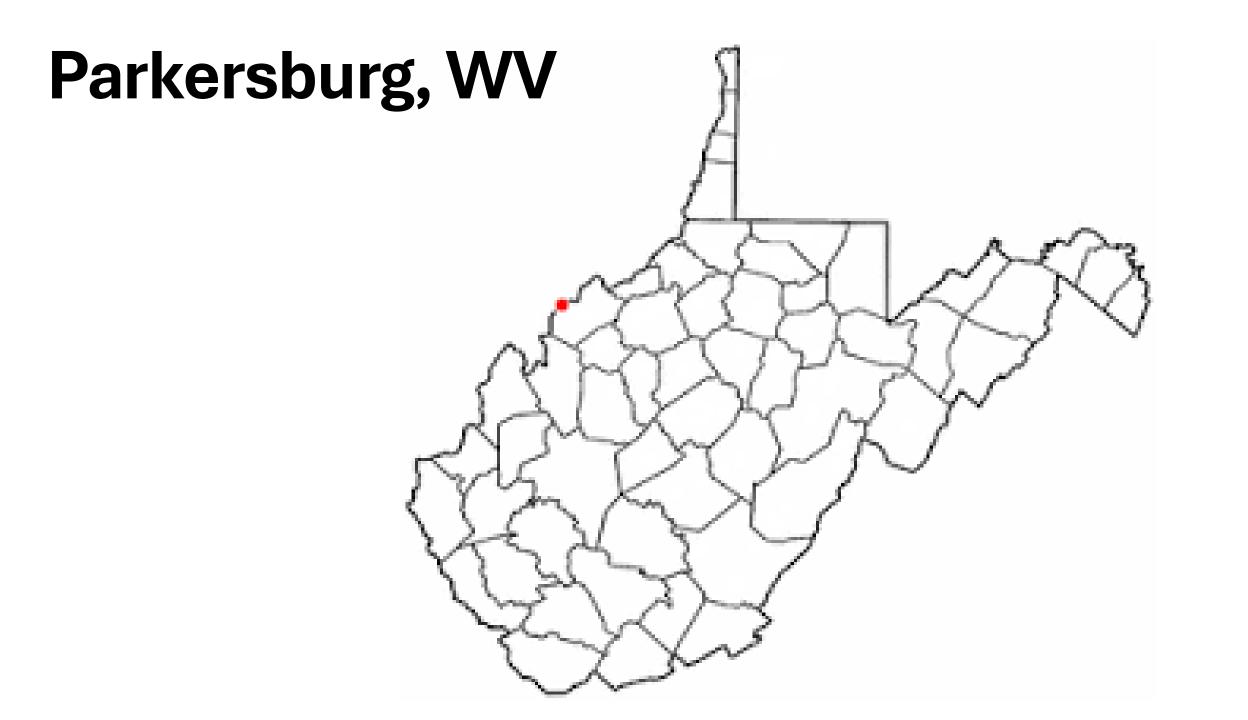
Nancy V. Rodway MD MS MPH

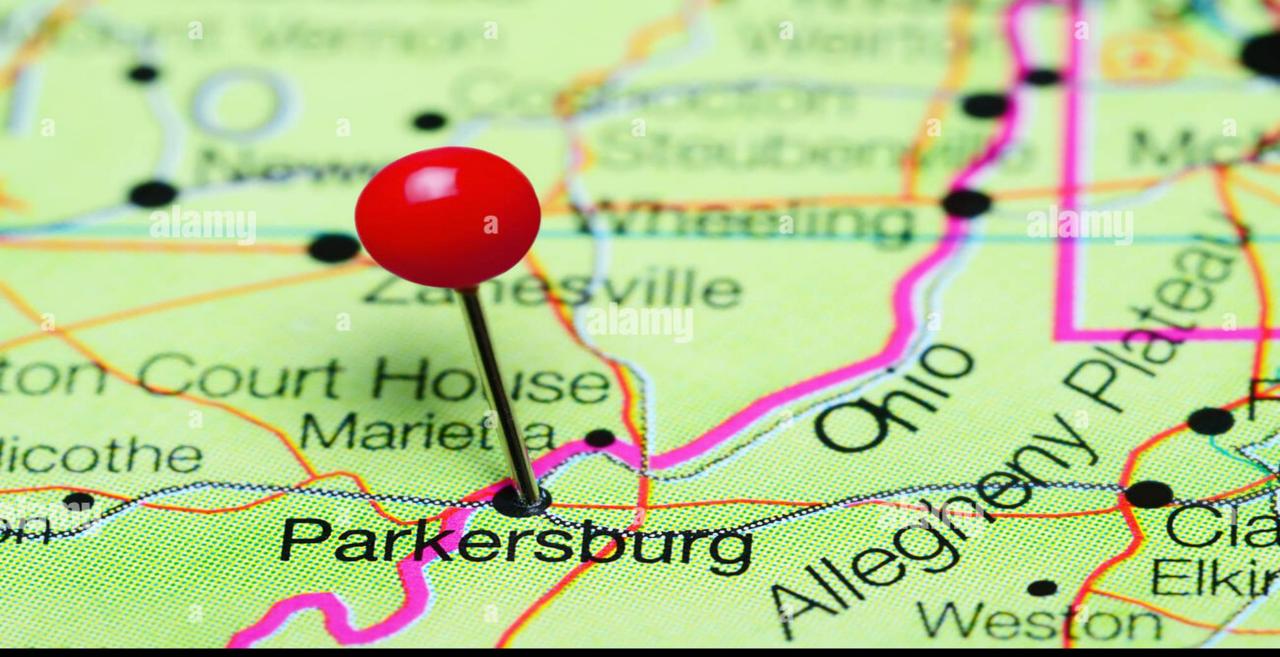


Objectives

- Describe the history of forever chemicals in Ohio.
- Clarify what constitutes a forever chemical
- Explain the environmental risks of forever chemicals
- Explain the medical risks of forever chemicals
- Describe what you can do to mitigate the risks of forever chemicals in you.
 - Testing your water for forever chemicals
 - Testing you for forever chemicals



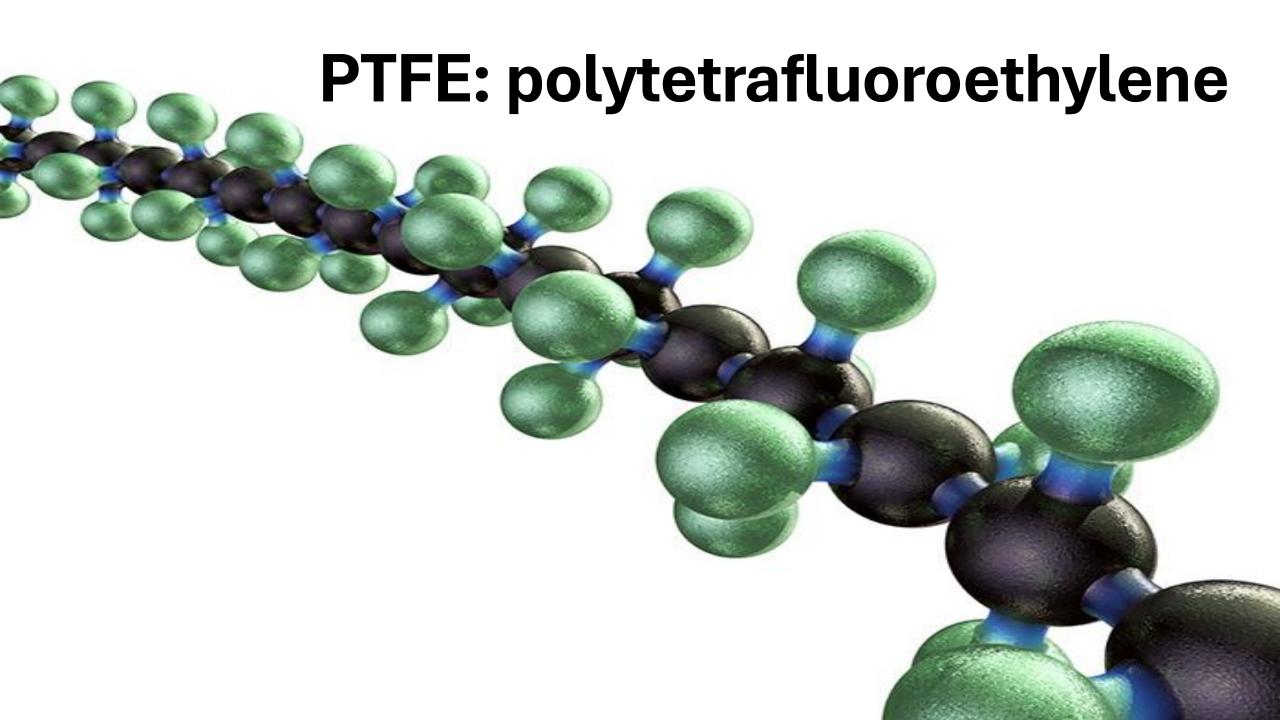


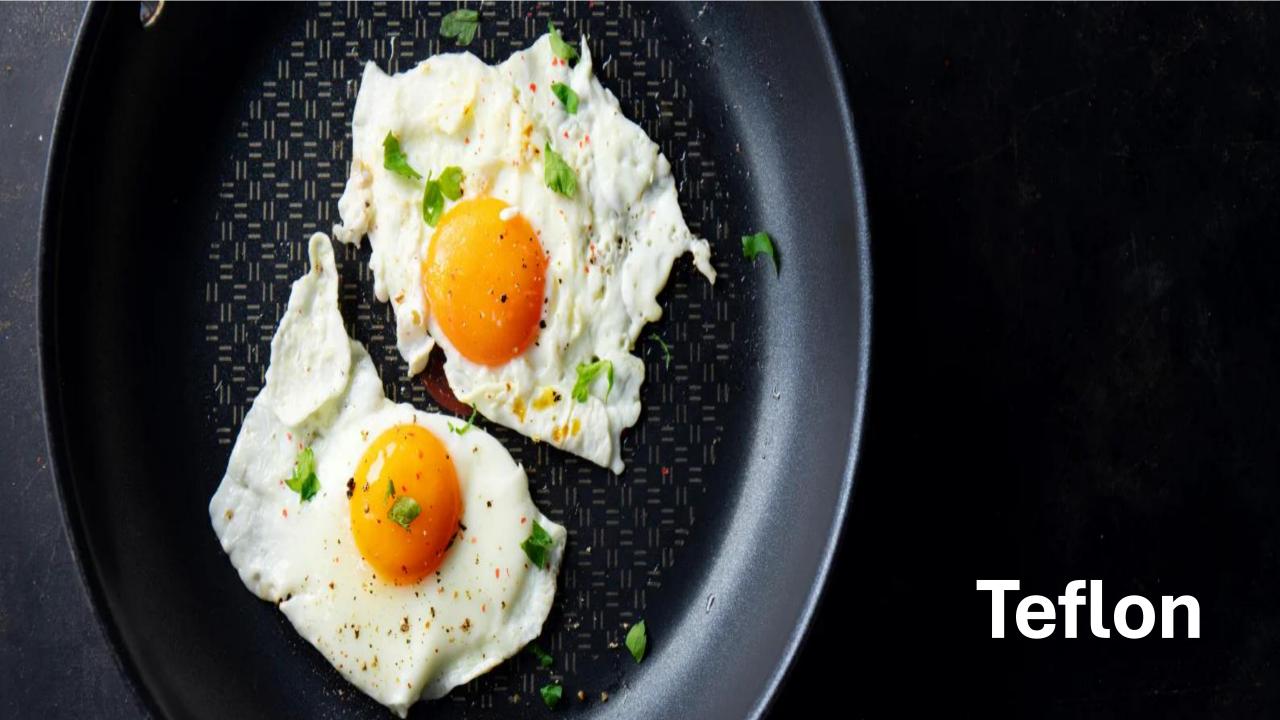


DuPont Washington Works











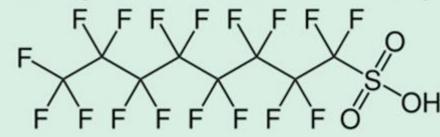
Teflon/PTFE

- Heat Resistant
- Resistant to most chemicals, solvents, and corrosives
- Non-stick, slippery
- Water and Oil Repellent
- Non-Flammable
- Durable

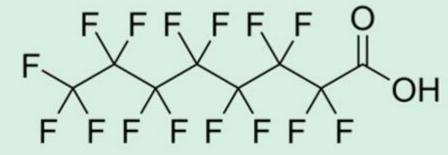
Legacy Forever Chemicals (AKA C8)

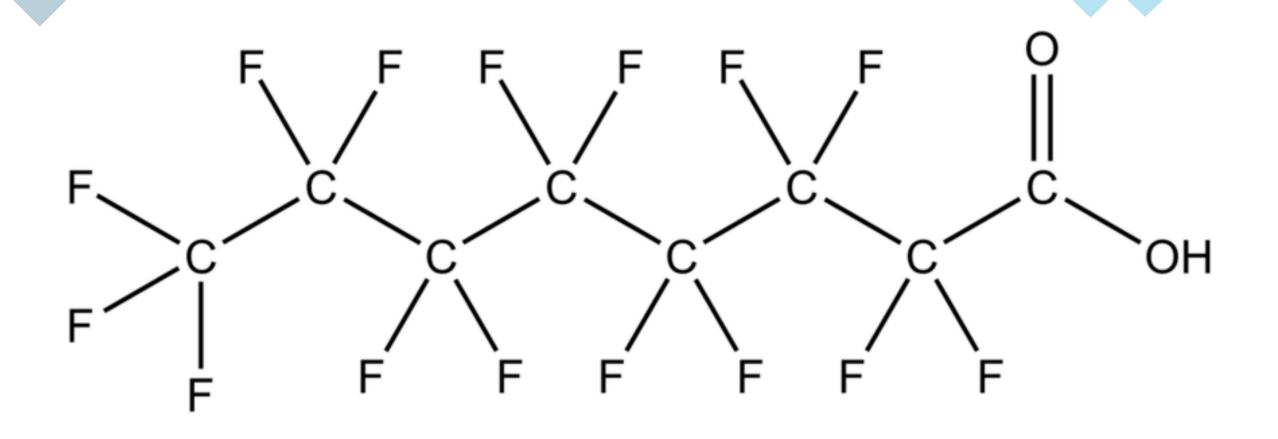
PFAS

PFOS (Perfluorooctanesulfonic acid)



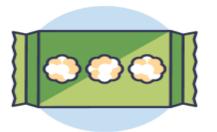
PFOA (Perfluorooctanoic acid)







FIREFIGHTING FOAMS



MICROWAVE POPCORN BAGS



WATER RESISTANT CLOTHING



PAINT



STAIN RESISTANT PRODUCT



PERSONAL CARE PRODUCTS

PRODUCTS THAT CONTAIN

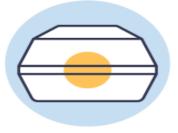
PFAS



COSMETICS



NON-STICK COOKWARE



FACT FOOD PACKAGING



STAIN RESISTANT FURNITURE



PHOTOGRAPHY



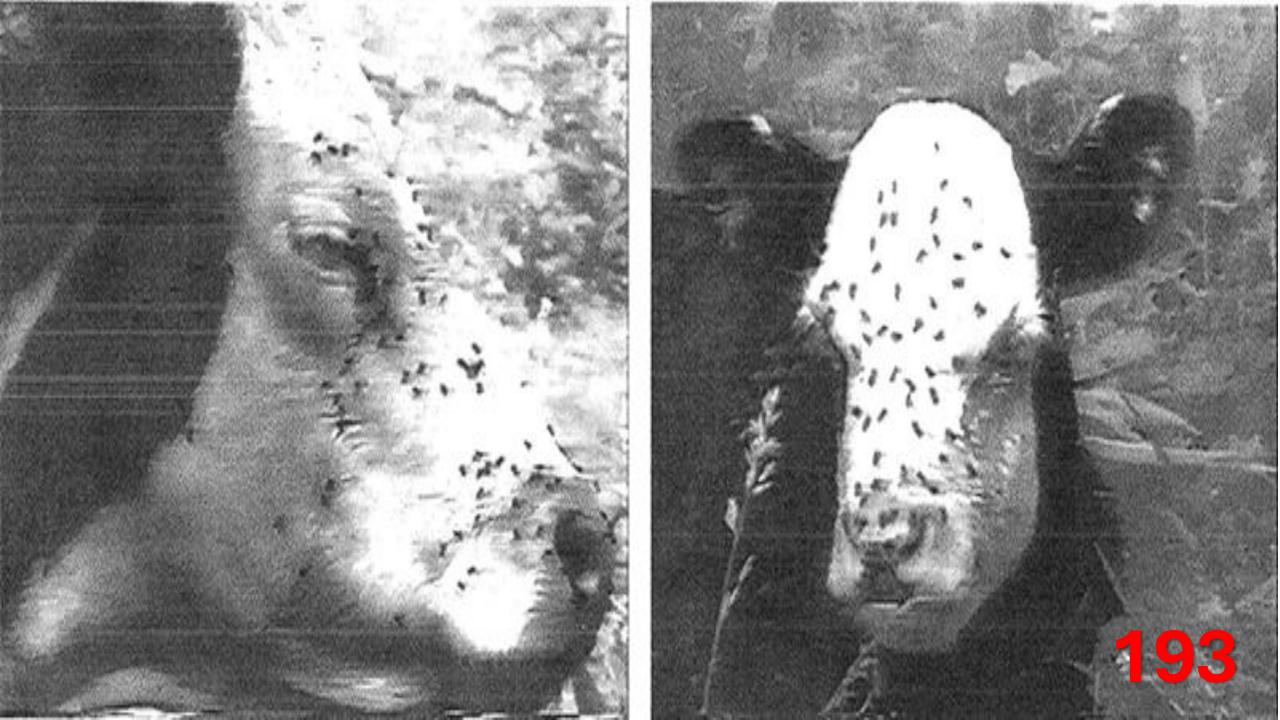
PESTICIDES











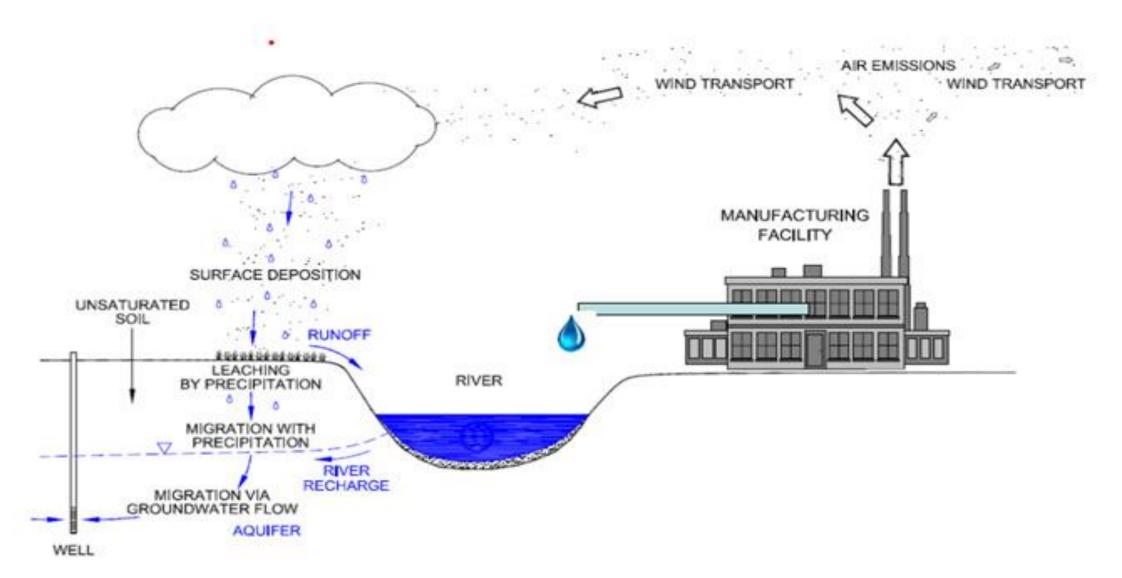


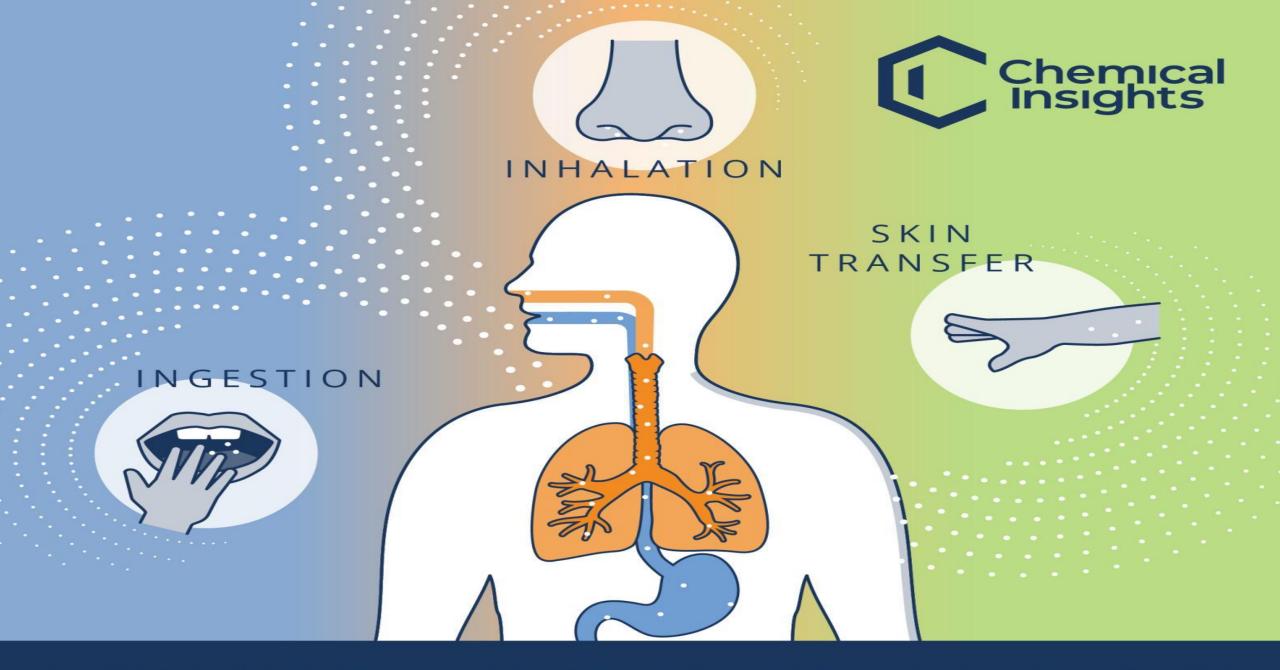


Community Exposure to Perfluorooctanoate: Relationships Between Serum Concentration and Exposure Sources

Objective: to determine PFOA levels in this exposed population and determine source(s) and relationship to gender and age

WELL FIELD SITE





HUMAN EXPOSURE TO PFAS OCCURS IN THREE WAYS





Community Exposure to PFOA RESULTS

- Community serum PFOA very high: 298-370 ng/mL, 70x higher than general population
- PFOA exposure due to work and drinking water, not air.
 - Little Hocking Water Association LHWA
 - LHWA users had blood PFOA 106x higher than water
- Carbon water filter can help
- Highest levels in children less than 5 yoa and elderly
- No gender differences





Pregnant women can pass PFAS through the placenta and through mother's milk.



West Virginia EPA

Increased "safe levels" of PFOA in water to be higher than detected levels









Decades of Deception: A Timeline of Companies Hiding Health Risks of PFAS

1956

Stanford
University
study finds
that PFAS
binds to
proteins in
human blood.

1965

DuPont rat study shows liver damage and increased spleen size. 1978

3M concludes
that PFOS and
PFOA, a PFAS
chemical used
to make
DuPont's
Teflon, "should
be regarded as
toxic."

1989

3M study finds elevated cancer rates among PFAS workers.





Bilott helped secure, from DuPont, over \$850 million in settlements and benefits for affected residents, including funds for medical monitoring and individual damages, exposing DuPont's knowledge of PFAS harms to the EPA.

The U.S. Environmental Protection Agency (EPA) fined DuPont \$16.5 million

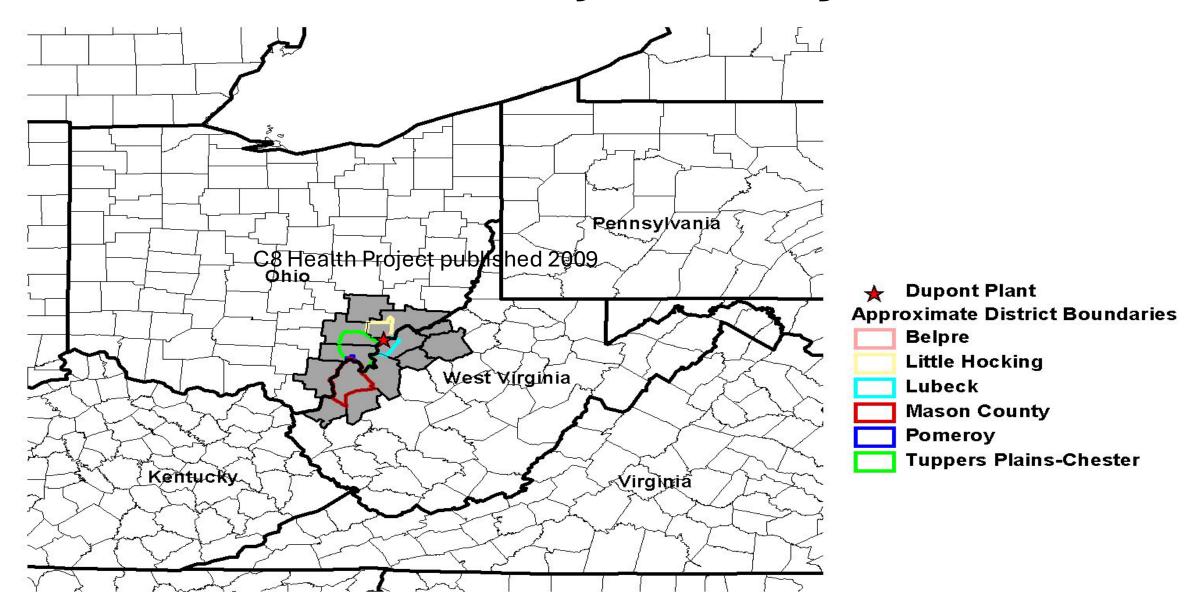


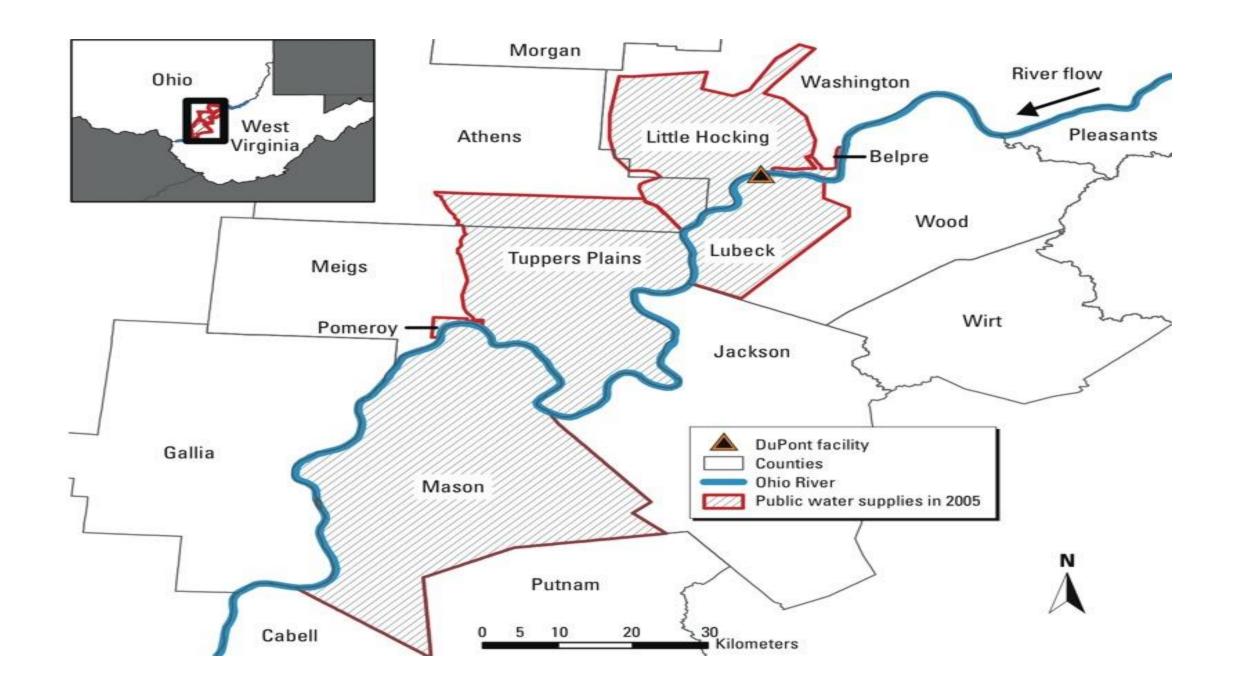


Required DuPont to provide equipment to remove C8 from the human drinking water

Fund a community health study, the C8 Health Project, to document the health effects of PFAS on residents in affected water districts.*

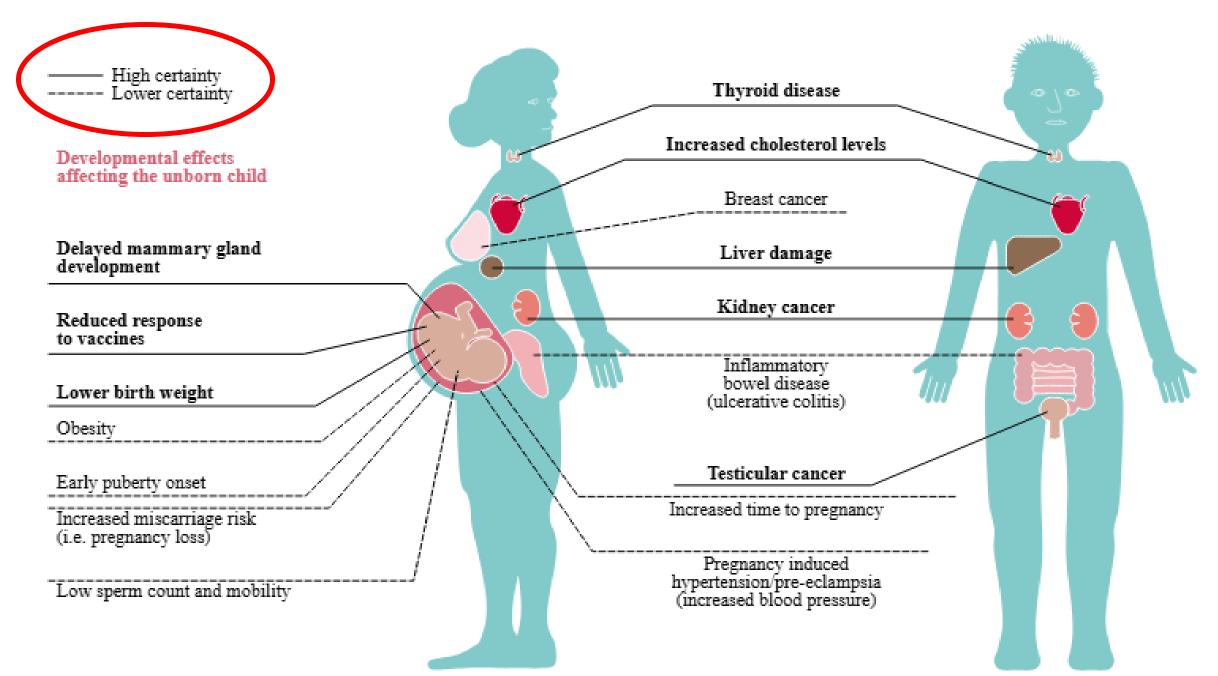
C8 Health Project Study Area





C8 Health Project published 2009

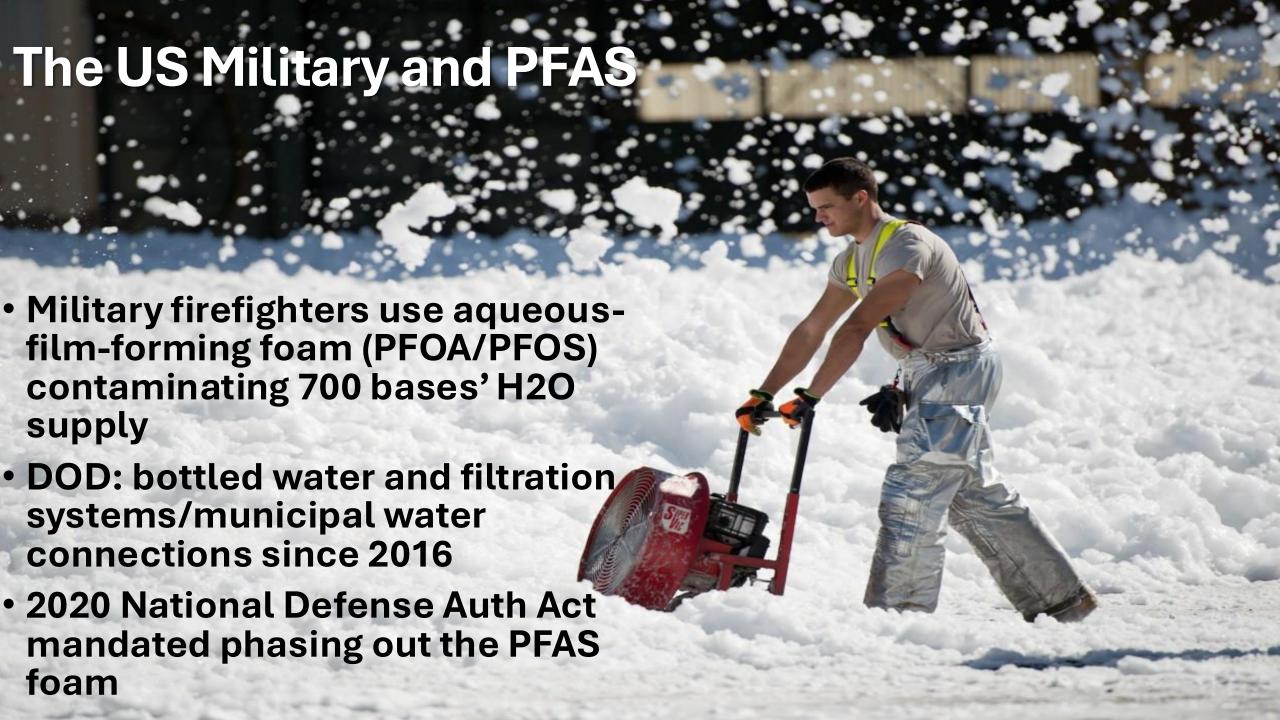
- Study of residents exposed to C8 through drinking water
- More than 69,000 participants
- Average serum PFOA was 82 ng/mL, with a median of 28 ng/mL
- PFOA levels 100 to 5,000 ng/mL in occupational cohorts
- Probable links between C8 exposure and:
 - Kidney cancer
 - Testicular cancer
 - Thyroid disease
 - High cholesterol
 - Ulcerative colitis
 - Pregnancy-induced hypertension



https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/47/facts/PFAS-FactSheet.pdf

Testicular cancer

- PFAS associated with increased risk of testicular cancer.
- Elevated levels of some PFAS, especially PFOS, in the blood was associated with serving as a firefighter or at a military base with high levels of PFAS in the water supply.
- Consider monitoring of PFAS/PFOS blood levels and testicular cancer in military and firefighters



Due to C8 Health Project:

- IARC has classified PFOA as "carcinogenic to humans"
- IARC has classified PFOS as "possibly carcinogenic to humans"
- National Cancer Institute classified PFOA and PFOS as human carcinogens in 2023.
- The US EPA has not officially classified PFOA as to its carcinogenicity. The EPA's Scientific Advisory Board "suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential."

https://www.cancer.org/cancer/risk-prevention/chemicals/teflon-and-perfluorooctanoic-acid-pfoa.html#:~:text=In%20a%20draft%20(not%20final,considered%20as%20it%20becomes%20available .https://dceg.cancer.gov/research/what-we-study/pfas



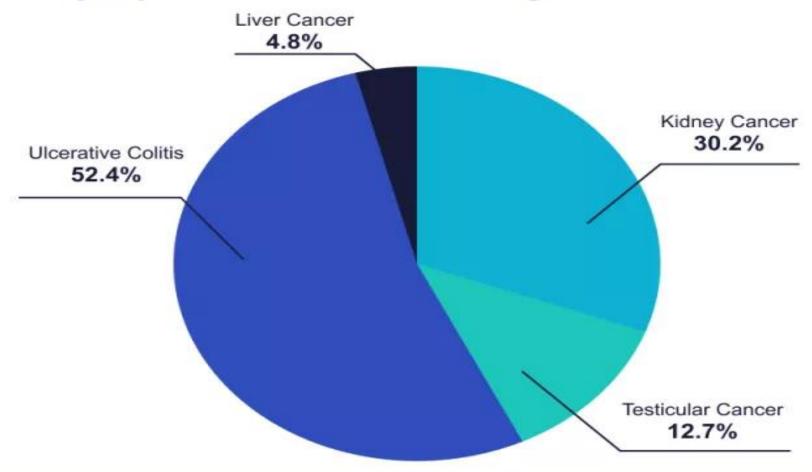
C8 Health Project

The C8 results triggered additional lawsuits against DuPont for health damages, with significant settlements

And so on...



Injury Distribution Among PFAS Claims

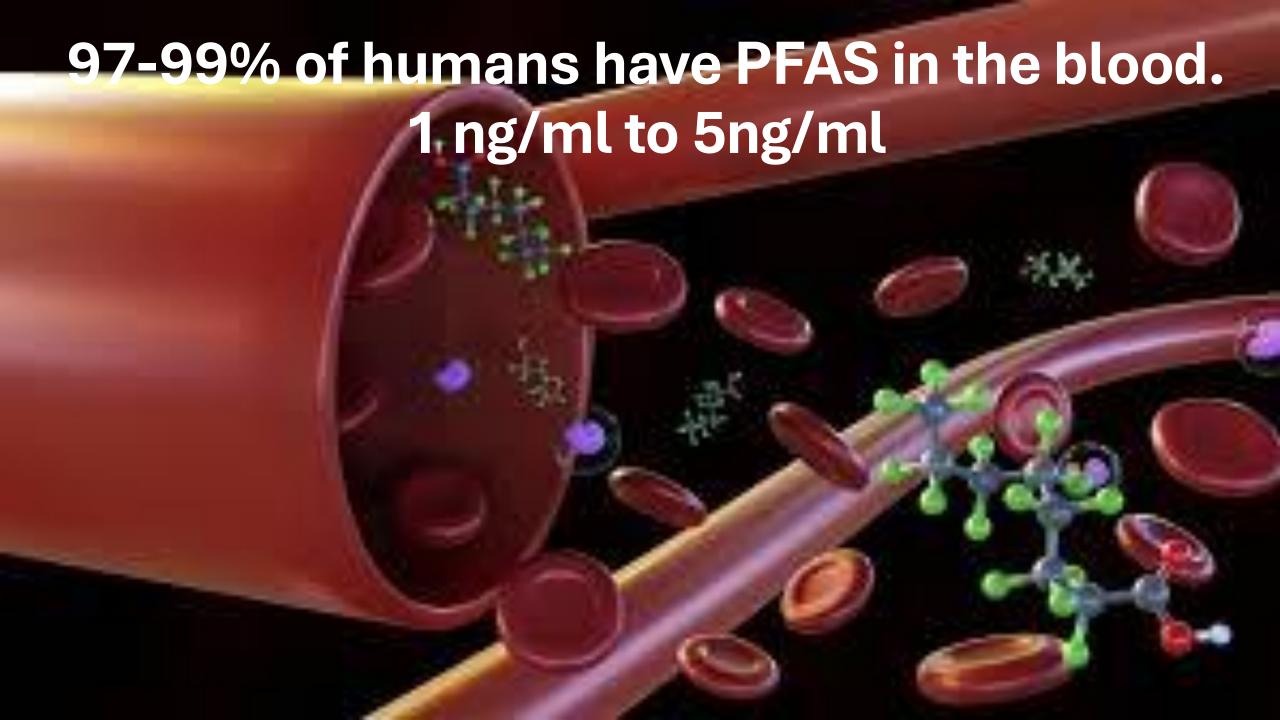


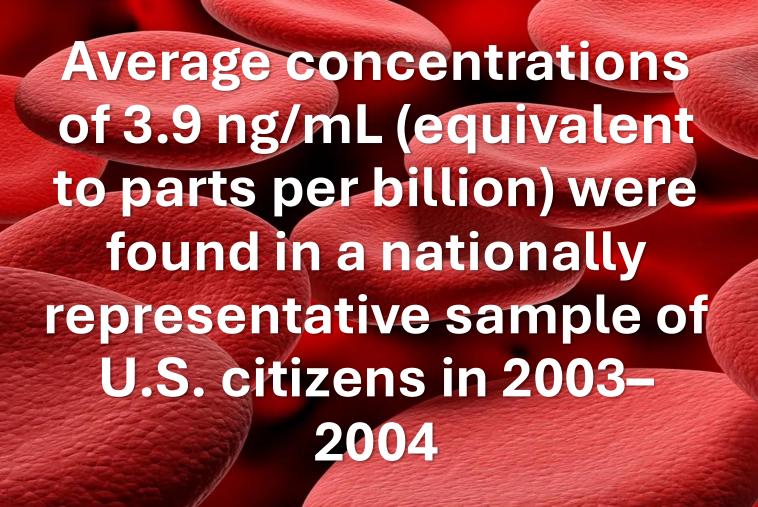




PFAS in the Brain:

- damage blood-brain barrier, making the brain vulnerable to PFAS and other neurotoxins.
- concentrates in lipid-rich areas like the hypothalamus and brainstem.
- interfere with neurotransmitters dopamine and serotonin, and is linked to attention deficit/hyperactivity disorder (ADHD) and Parkinson's disease.
- cause neural inflammation and is associated with cognitive decline
- damage brain mitochondria, the energy producers of cells.
- Fetal and early childhood exposure to PFAS is associated with delayed language/motor skills, and other neurodevelopmental issues.





(Lau et al. 2007; Lundin et al. 2009; Olsen and Zobel 2007).

PFAS half-life in blood*

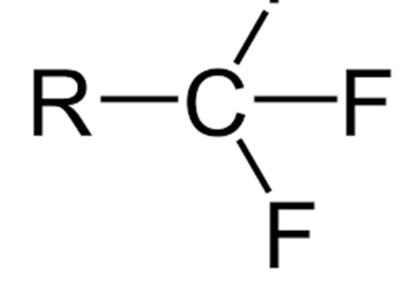
- The mean estimated PFOA half-life was 2.36 years
- Faster clearance in women
- Slower clearance rates in smokers
- Slower clearance in alcohol drinkers



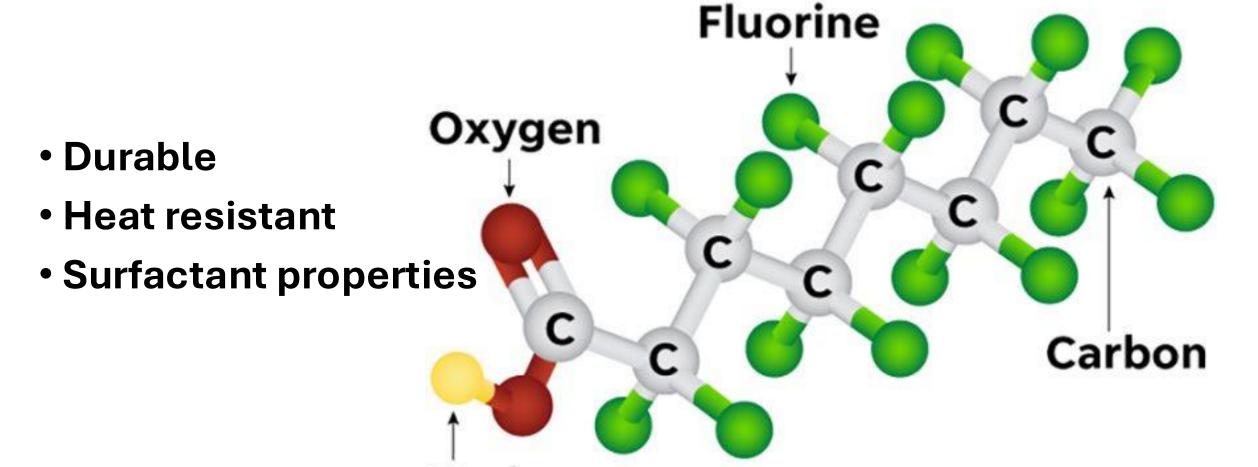
FOREVER.

PFASs

- Man-made chemicals with fully fluorinated methyl(ene) group
- Manufactured and used in industry since the 1940s.
- Thousands of different PFAS chemicals
- Not all studied for safety



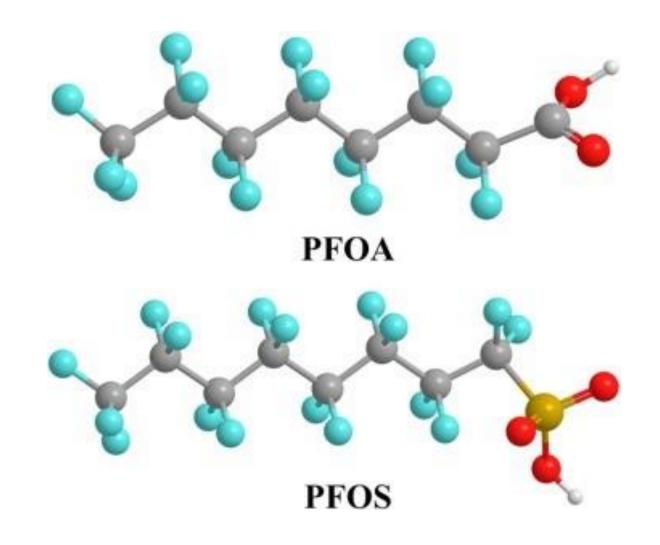
Poly (Per) FluoroAlkyl Substances

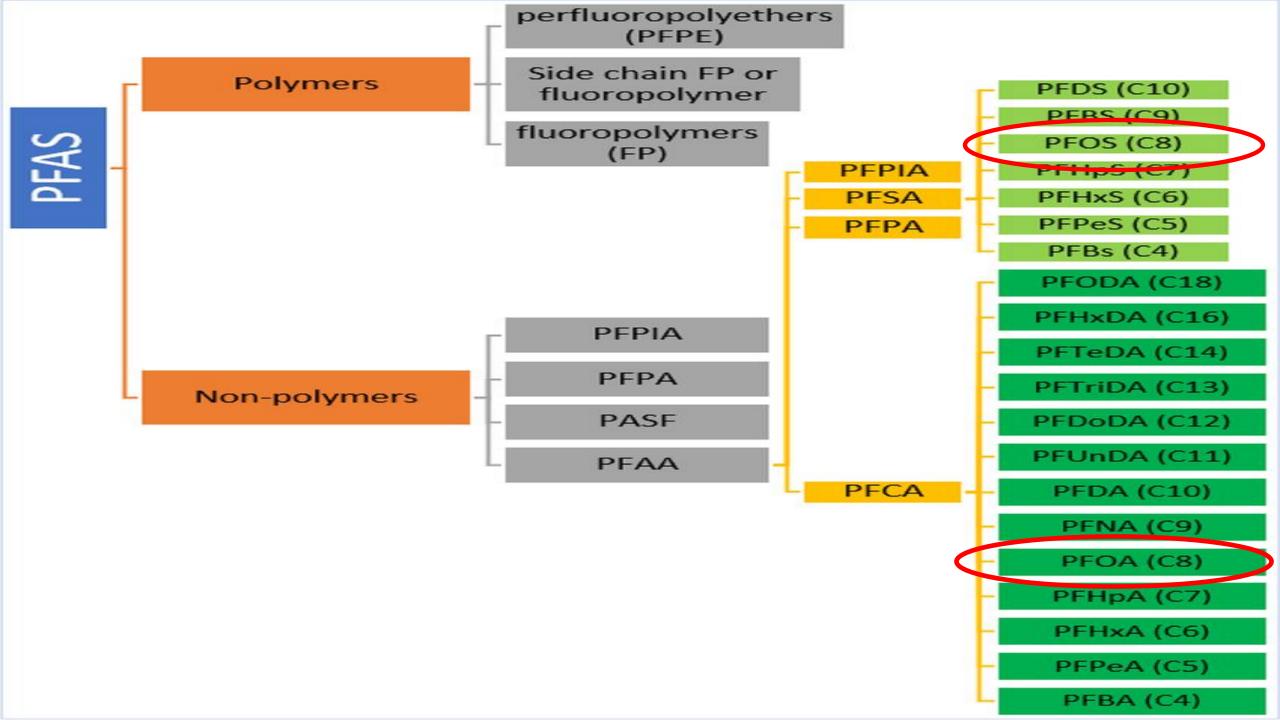


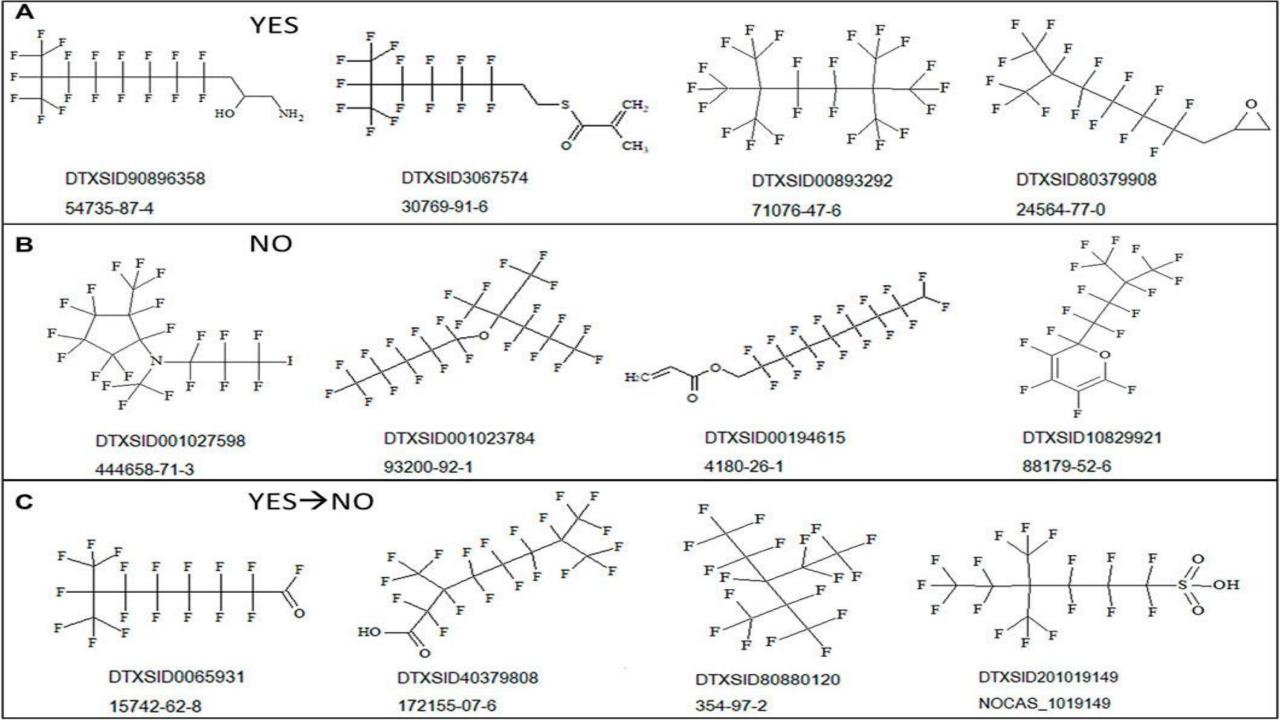


The carbon-fluorine bonds are among the strongest in organic chemistry and require highly specialized, energy-intensive destruction methods

PFOA and PFOS—the "legacy" PFASs aka C8





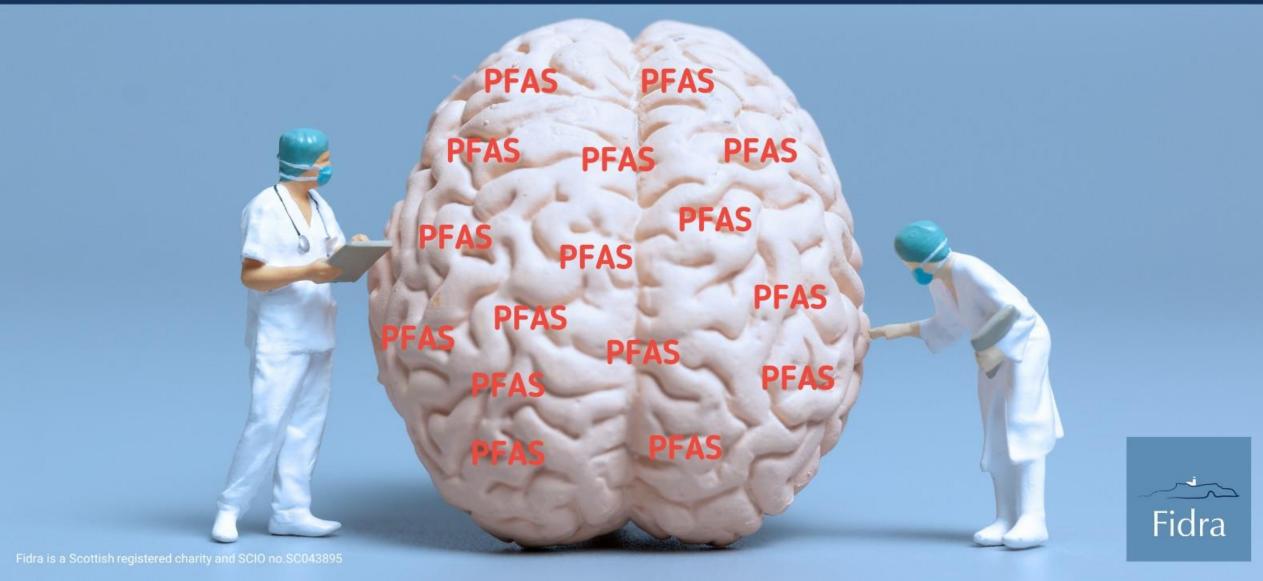


PFOS/PFOA and GenX

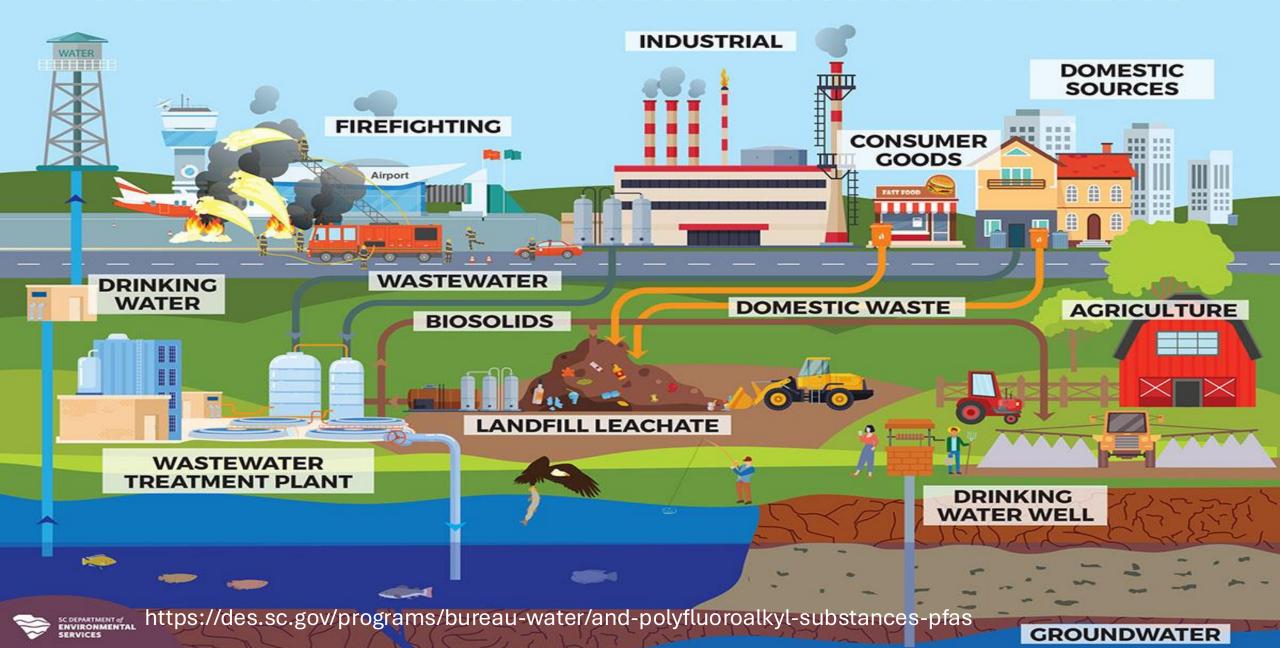


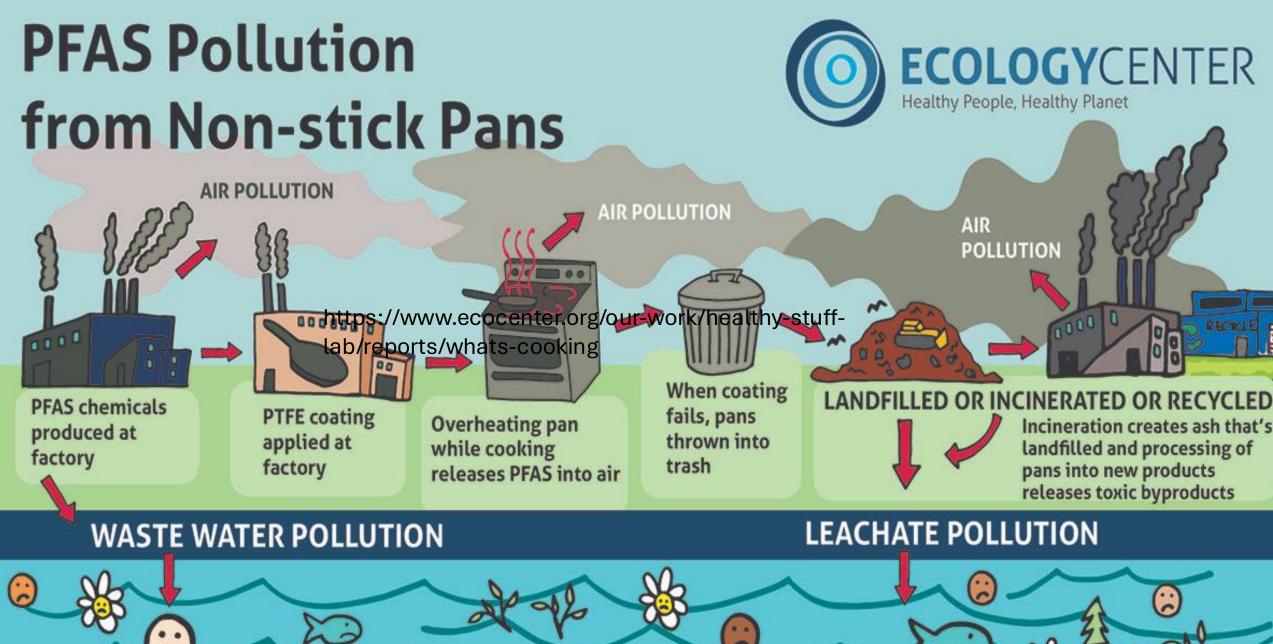
Substitute PFAS may have greater potential for accumulating in the brain

PFAS free



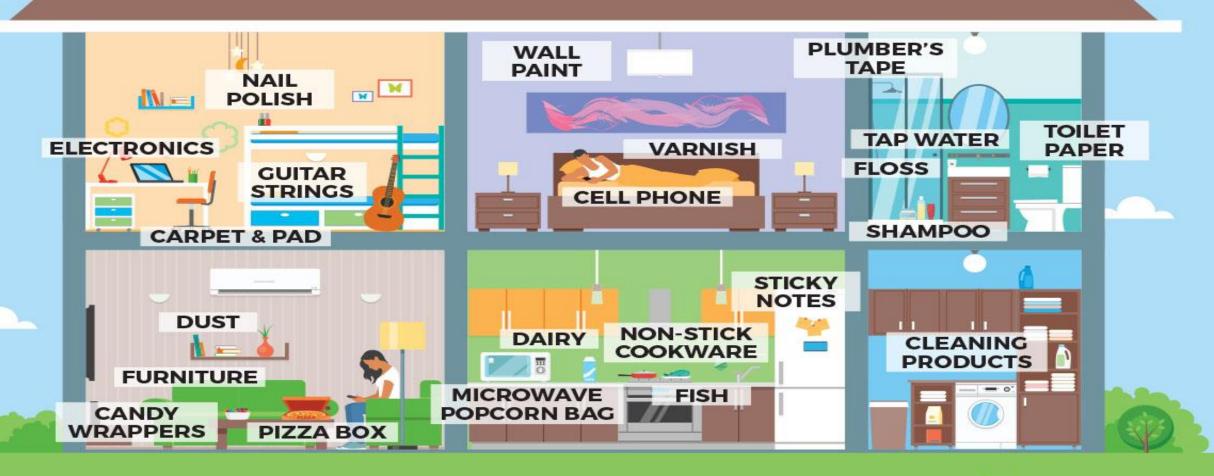
PFAS SOURCES IN THE ENVIRONMENT







PFAS SOURCES IN THE HOME







PFAS Contamination in the U.S.



Water systems with PFAS above limits

U.S. EPA data shows 21 public water systems in Ohio that reported PFAS levels over the health advisory limits. Samples were collected starting in 2023 and will be collected through 2025. Some systems take action to reduce PFAS after collecting samples so the data may not show current drinking water exposures.

Toledo Cleveland Warren Akron OHIO Youngstown Canton Lima O Marion () (75) Martins Ferry Cambridge Columbus 0 Xenia MiddletownOS Cincinnati Marietta O 0 Portsmouth

Max Analytic Value (MAV) is the maximum value of any PFAS found in samples from this site.

Public water system	MAV
A. City of Cleveland Heights	400
B. Wright-Patterson AFB Area	160
C. Gallia Co. Rural Water Assn	20
D. Warren Comm W and S Assn 2	20
E. McDonald Village	18
F. Loveland City	16
G. Putnam Comm Water Assn	14
H. Western Water Company	14
I. Grandview Medical Center	11
J. Indian Hill City	11
K. Dayton PWS	10
L. Montgomery Co. Water Services	10
M. Delaware Co. WC	9
N. Yellow Springs Village PWS	9
O. Bexley City PWS	8
P. Barnesville, OH	7
Q. Cincinnati PWS	6
R. Portsmouth PWS	5
S. Franklin PWS	4
T. Hecla Water Assn Plant PWS	4
U. Lima City	3

Ohio PFAS Action Plan



pfas.ohio.gov

Settlement with DuPont and Chemours (2023)

The State of Ohio secured a \$110 million settlement with DuPont and its spin-off, Chemours. The lawsuit alleged seven decades of environmental damage from the Washington Works plant in Parkersburg, West Virginia, which polluted the Ohio River with a type of PFAS known as PFOA or C8.

Ohio 2025 PFAS Action Plan 2.0 Ohio EPA and ODH



- Test nearly 1,500 public water systems for PFAS
- Establish state action levels for six PFAS chemicals
- Provide public education about forever chemicals
- Improve mitigation strategies
- Provide funding
- Monitor evolving scientific understanding of PFAS



Ohio PFAS Action Plan

- Ohio's PFAS Action Plan 2.0 is a continuation of Ohio's first PFAS Action Plan, released in 2019.
- Mitigation strategies
 - AFFF takeback program
 - PFAS treatment guidance for public water systems
 - Ohio Waterways sampling
 - Fish sampling and testing





- Ohio public water systems must begin monitoring PFAS in 2027 have until 2029 to meet the new maximum contaminant levels (MCLs).
- If levels exceed standards, public must be warned.



EPA PFAs Maximum Contaminant Levels 2024/2025

Compound	Final MCLG	Final MCL (enforceable levels) ¹
PFOA	Zero	4.0 parts per trillion (ppt) (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless) Hazard Index	1 (unitless) Hazard Index

Compliance with MCLs is determined by running annual averages at the sampling point.







EPA final PFAS National Primary Drinking Water Regulation

- Public water systems must monitor for specific PFAS and have until 2027 to complete initial monitoring.
- Water systems must provide PFAS levels to the public beginning in 2027.
- Public water systems must reduce PFAS to MCLs by 2029.
- Beginning in 2029, public water systems that still have PFAS in drinking water more than the MCLs must act to reduce levels of these PFAS and must notify the public of the violation.

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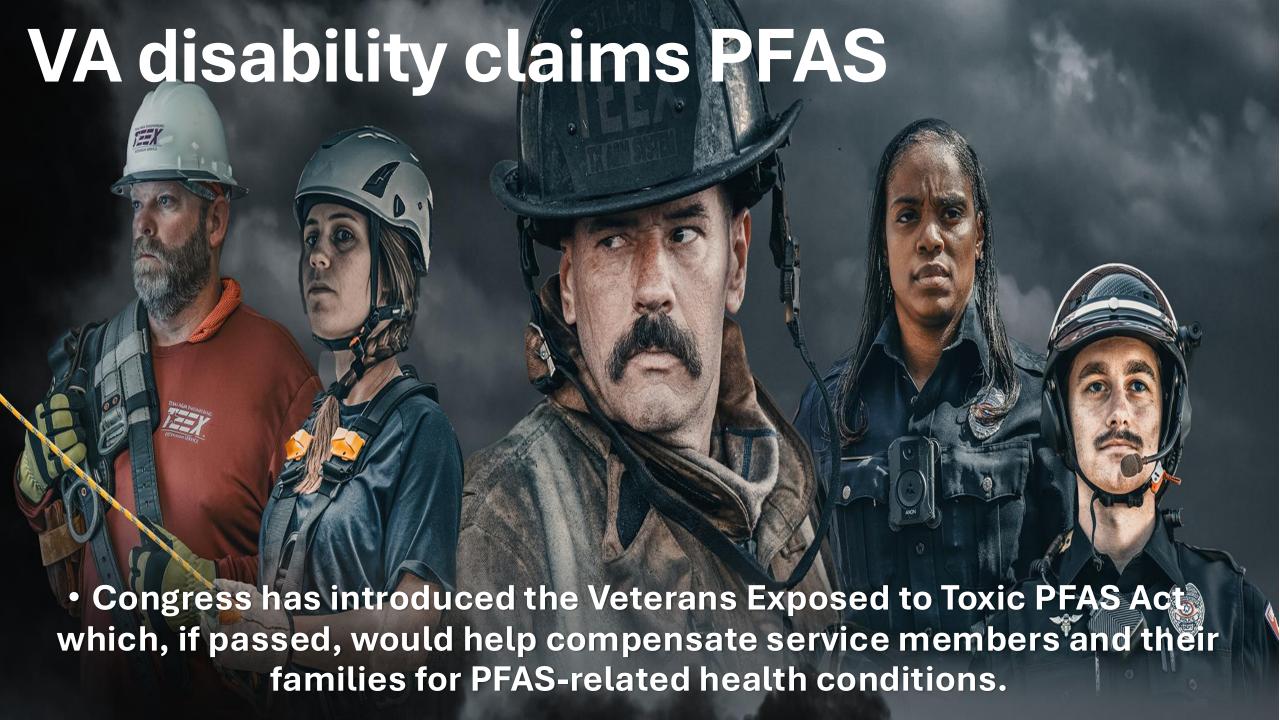
Federal EPA PFAS Standard



- EPA's first legally enforceable national standards for PFAS in drinking water
- In May 2025, the EPA announced an intention to delay the compliance deadlines for PFOA and PFOS until 2031.

EPA Funding

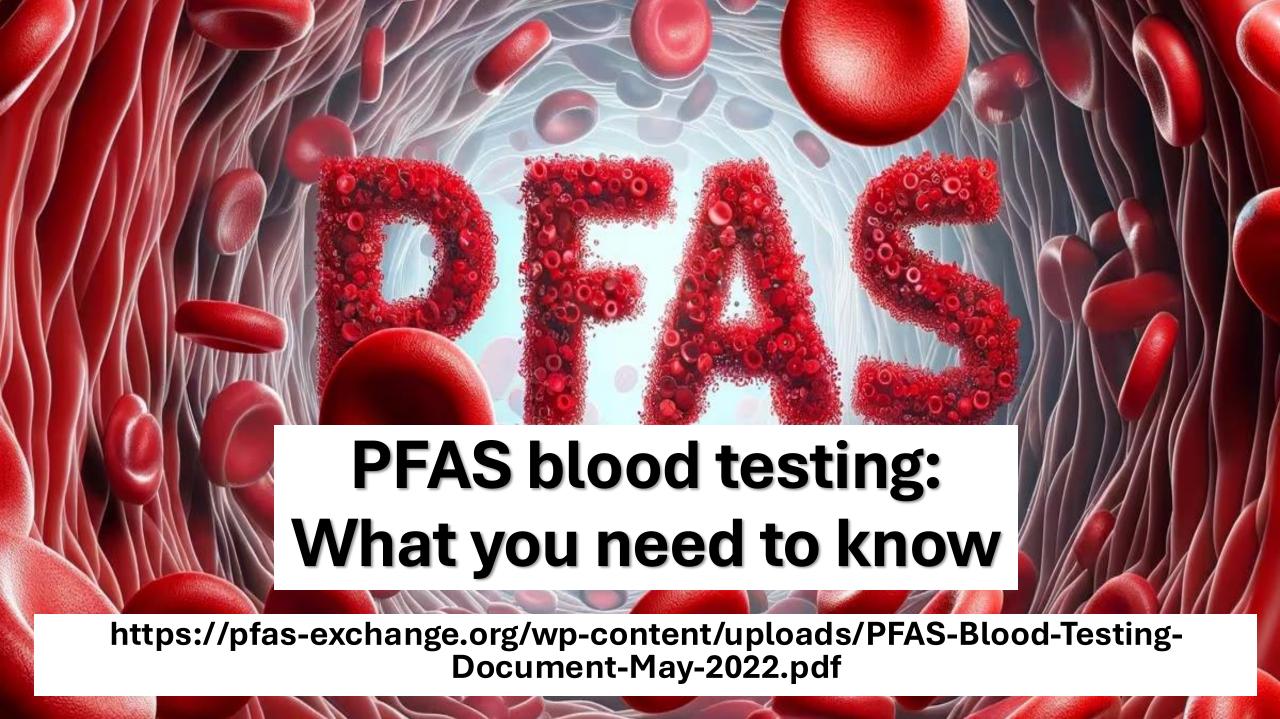
EPA provides \$1 billion in available funding through the Infrastructure Investment and Jobs Act to help states and territories implement PFAS mitigation at public water systems and to help owners of private wells address PFAS contamination



VET PFAS Act: Veterans Exposed to Toxic PFAS Act

- Introduced in the U.S. House of Representatives May 2025 to provide disability and healthcare benefits to veterans and their families who were exposed to PFAS chemicals at military installations. In October 2025, sent to House Committee on Veterans' Affairs.
- Presumptive service connection for certain conditions linked to PFAS
- Extends VA medical services to eligible veterans and their family members, including those who were in utero, who resided at a military installation with PFAS exposure.
- The law would provide benefits for specified conditions/diseases that the VA and Department of Health and Human Services determine are associated with PFAS exposure.





Testing for PFAS

- CDC does not currently recommend routine PFAS blood testing for the general population. However, individuals who may have been exposed to high levels of PFAS, may consider getting tested.
- There is no known safe level of PFAS exposure.



What you need to know about PFAS testing

- Ask for a "comprehensive panel" that includes both linear and branched isomers
 - Most insurance companies will not pay for it.
 - Provider diagnostic ICD-10 code is Z13.88
 - Encounter for screen for disorder due to exposure due to contaminants
 - CPT code is 82542
- Rapid home tests cost about \$300
- Lab result starts the clock on the Statue of Limitations.
- The result WILL NOT tell you the source of the contamination nor how long you have been contaminated.

Testing your well for PFAS

- Collecting a water sample for PFAS testing is a complicated procedure and is best performed by a trained professional.
- A list of certified labs that collect and analyze water samples for PFAS can be found at the Ohio PFAS website or: epa.ohio.gov/static/Portals/28/documents/pfas/PFASSampleCollectionServices.pdf.

How to avoid PFASs

- Skip optional stain repellant on carpeting
- Choose personal care items without "fluoro" ingredients
- Be wary of water-repellant items





Highest PFAS levels on average



Bowls

Single-Use **Plates**

Fast food wrappers*



PFASs found in jackets made by:

- North Face
- Patagonia
- Adidas
- Columbia
- Jack Wolfskin



PFAS can be found in shoes from:



PFAS can be found in swimwear from:

- Disney
- Burberry









WHAT'S COOKING?

Healthy Stuff Lab Recommendations for Non-Toxic Cookware

Preferred

Uncoated made with Stainless steel Cast iron Glass, etc.



Non-PFAS coatings: Silicone Enamel

Avoid

PTFE-Coated Brands: Teflon™ Autograph Greblon, etc. Visit ecocenter.org for full list







Better Buying Tip

In general, coated pans are less durable and some coatings present chemical hazards during manufacture, use, and/or disposal. Uncoated cookware is generally safer and more durable.

*Not enough information is available to fully assess potential hazards of some non-PFAS coatings. Ceramic is likely a safer nonstick choice although is not known for durability.

Consumer Alert: Undisclosed PFAS



Many companies do not provide adequate information to determine if a product s PFAS/PTFE-free. This and other products frequently advertise PFOA-Free, free of JenX fluorinated chemicals, PFBS, PFOS, PFOA. The absence of any or all of these themicals DOES NOT mean a product is PFAS or PTFE-free.

Read the report: ecocenter.org/healthy-stuff



Flouroplastics: Perfluoroalkoxy (PFA) polymer



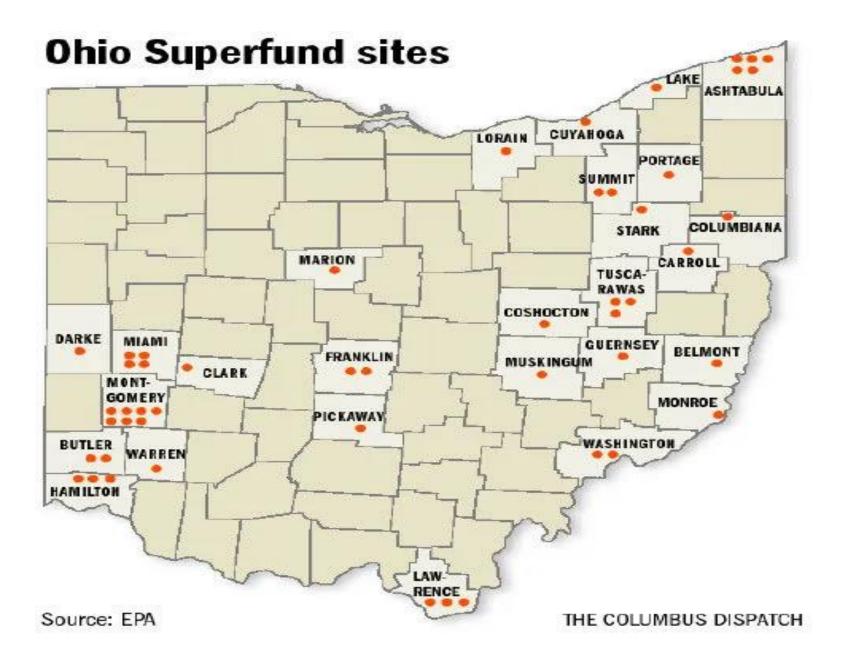
https://www.chemistryworld.com/news/chemours-ordered-to-immediately-limit-pfas-emissions-into-ohio-river/4021998.article https://westvirginiawatch.com/2025/08/08/a-victory-for-public-health-u-s-judge-orders-chemours-to-stop-dangerous-discharges-from-wv-plant/

Superfund law: CERCLA

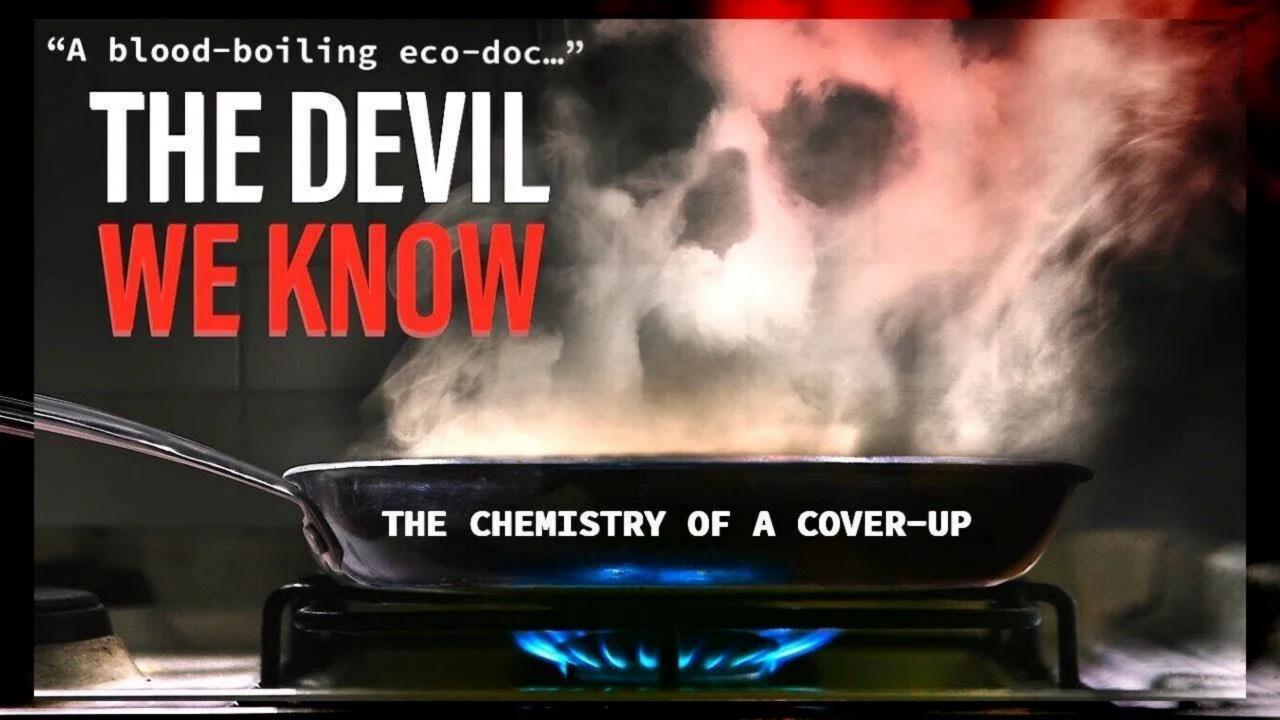
In April 2024, the EPA designated PFOA and PFOS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the Superfund law.

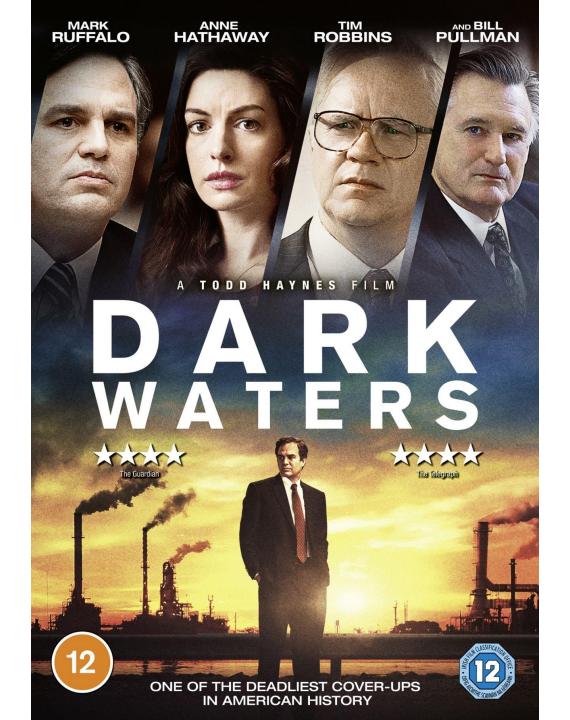
CERCLA holds manufacturers and polluters of PFOA and PFOS responsible for cleanup costs





https://www.epa.gov/superfund/search-superfund-sites-where-you-live





THE TRUE STORY
BEHIND THE MAJOR
MOTION PICTURE
DARK WATERS

EXPOSER

POISONED WATER, CORPORATE GREED,

AND ONE LAWYER'S TWENTY-YEAR

BATTLE AGAINST DUPONT

"For Erin Brockovich fans, a David vs. Goliath tale with a twist."

—The New York Times Book Review

ROBERT BILOTT

Downloadables

- Testing your private water
 https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/4
 7/facts/PFAS-FactSheet.pdf
- PFAS blood testing: What you need to know https://pfas-exchange.org/wp-content/uploads/PFAS-Blood-Testing-Document-May-2022.pdf
- Ohio PFAS website https://epa.ohio.gov/monitor-pollution-issues/per-and-polyfluoroalkyl-substances-pfas