



# *PFAS Chemicals in the Environment*

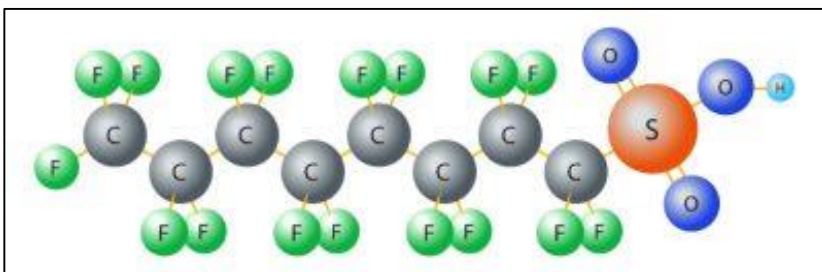
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Department of Fisheries and Wildlife  
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IPPSR Luncheon Forum  
PFAS Response in Michigan

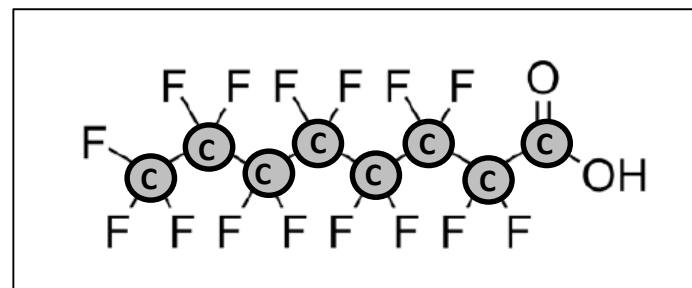


# PFAS Chemicals

- Synthetic organic compounds known as per- and polyfluoroalkyl substances (PFAS) - thousands of chemicals formed from carbon chains with attached fluorine (F)
- PFOS (perfluorooctane sulfonate) and PFOA (perfluorooctanoic acid) - two of the most well known and studied PFAS



PFOS



PFOA

- Gen-X & PFBS (short chain replacement chemicals)



# What do we know about PFOS and PFOA?

- Persistent
- Bioaccumulate
  - Bind to proteins
  - Reabsorbed by kidneys
  - Est. half-life: 2-9 years in humans (much less in animals)
- Easily dispersed
- Repel water, oil, grease



“Short-chain” PFAS may bioaccumulate less, but equally persistent as “long-chain” versions



## Used from 1940s until 2000s in US

Manufacturing of industrial and consumer products such as:

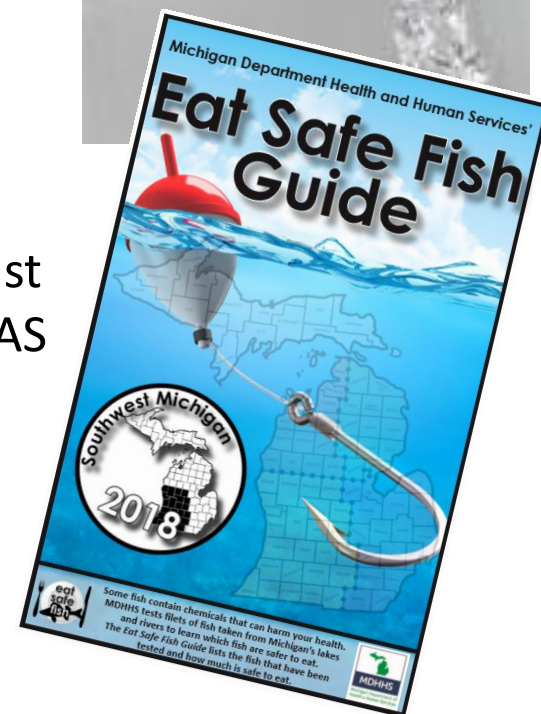
- stain resistant fabrics
- water-proof clothing
- tanneries
- non-stick cookware
- paper packaging for foods
- firefighting foams
- chrome metal plating





## How people become exposed

- Drinking contaminated water
- Eating fish caught from water contaminated by PFAS
  - “Do Not Eat” Health Advisories
- Other Pathways
  - Accidentally swallowing contaminated soil or dust
  - Eating food packaged in materials containing PFAS
  - Less known about plant uptake



PFAS absorption through the skin is negligible. Touching products made with PFAS or touching water with PFAS is not major ways people are exposed to these chemicals.

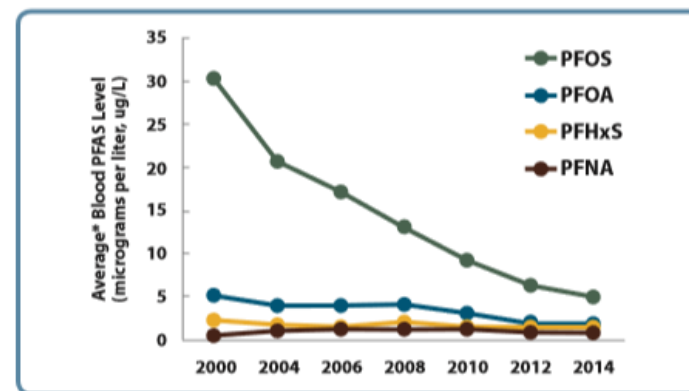


## Potential Health Effects in Humans

- developmental problems for infants and older children
- lowers a woman's chance of getting pregnant
- interfere with the body's natural hormones
- thyroid disease
- suppresses immune response
- increased cholesterol levels
- increased the risk of cancer

CDC scientists found four PFAS (PFOS, PFOA, PFHxS and PFNA) in the serum of nearly all of the people tested, indicating widespread exposure to these PFAS in the U.S. population.

Blood Levels of the Most Common PFAS in People in the United States from 2000-2014



\* Average – geometric mean

**Data Source:** Centers for Disease Control and Prevention. Fourth Report on Human Exposure to Environmental Chemicals, Updated Tables, (January 2017). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.  
Graph: ATSDR 2017



# EPA Lifetime Drinking Water Health Advisory Level (Current)

70 parts per trillion (ppt)

- PFOA and PFOS combined

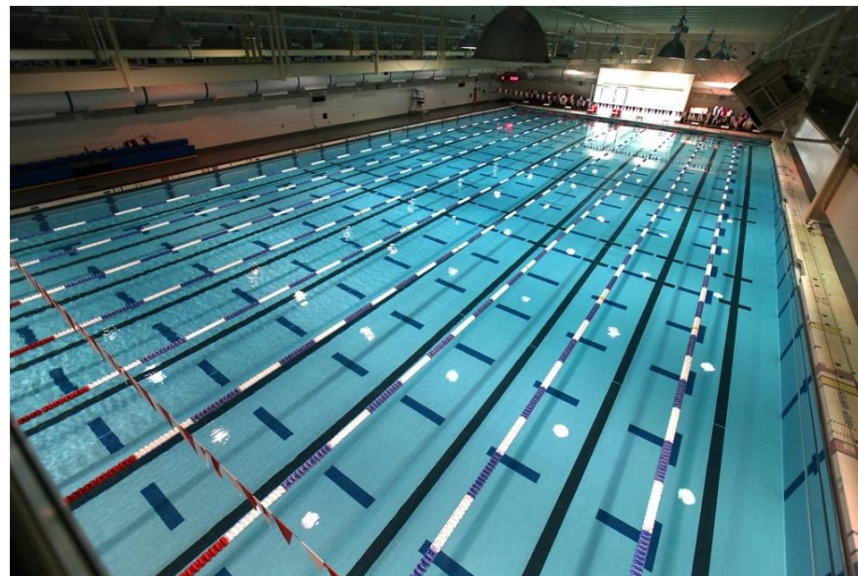
How much is 1 part per trillion?

Is a part per trillion significant?

- For persistent, bioaccumulative chemicals with long term exposure histories, **YES**

Lowest Standards in US States

- New Jersey 14 ppt for PFOA (2016)
- Vermont 20 ppt for 5 different PFAS chemicals (2018)





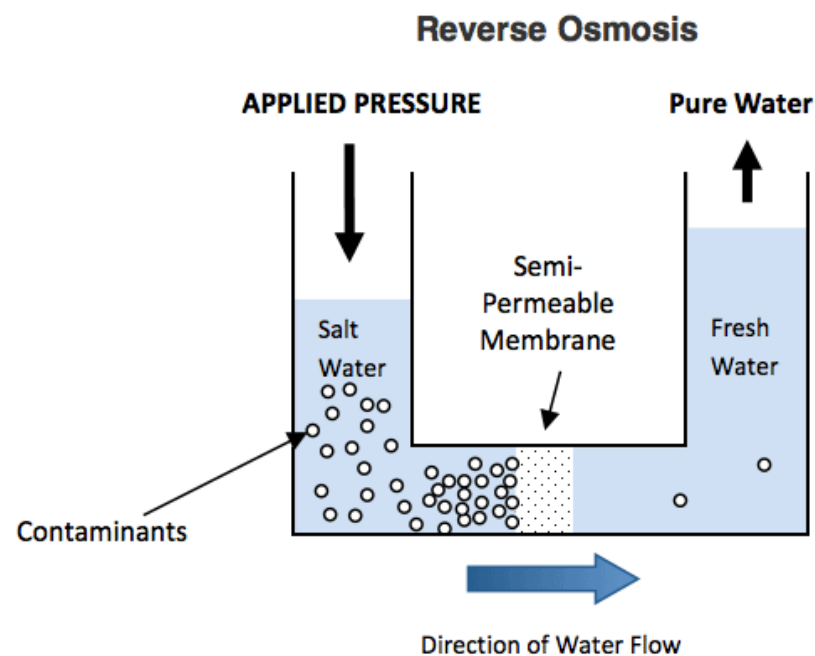
## Water Treatment (Point of Use)

- Granular activated carbon (GAC)
- Reverse Osmosis (RO)



Look for:

NSF International Certified to Standard P473  
(recently replaced by ANSI standard 53)



Never boil PFAS-contaminated water as way of removal





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