



PRE- and POLYFLUOROALKYL (PFAS) SUBSTANCE AWARENESS

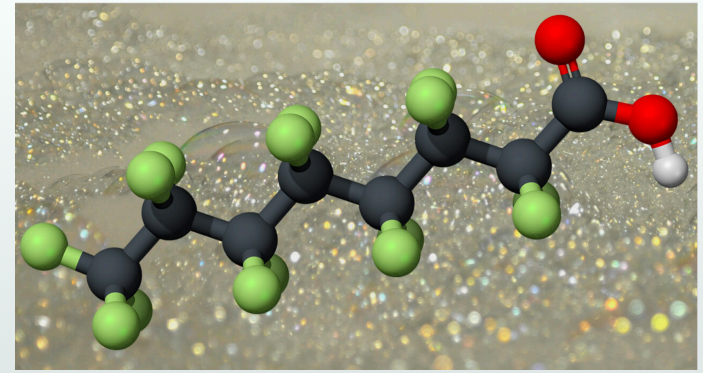
San Francisco Fire Department

presented by

San Francisco Firefighters Cancer Prevention Foundation



Per- and polyfluoroalkyl substances (PFAS)



What are they?

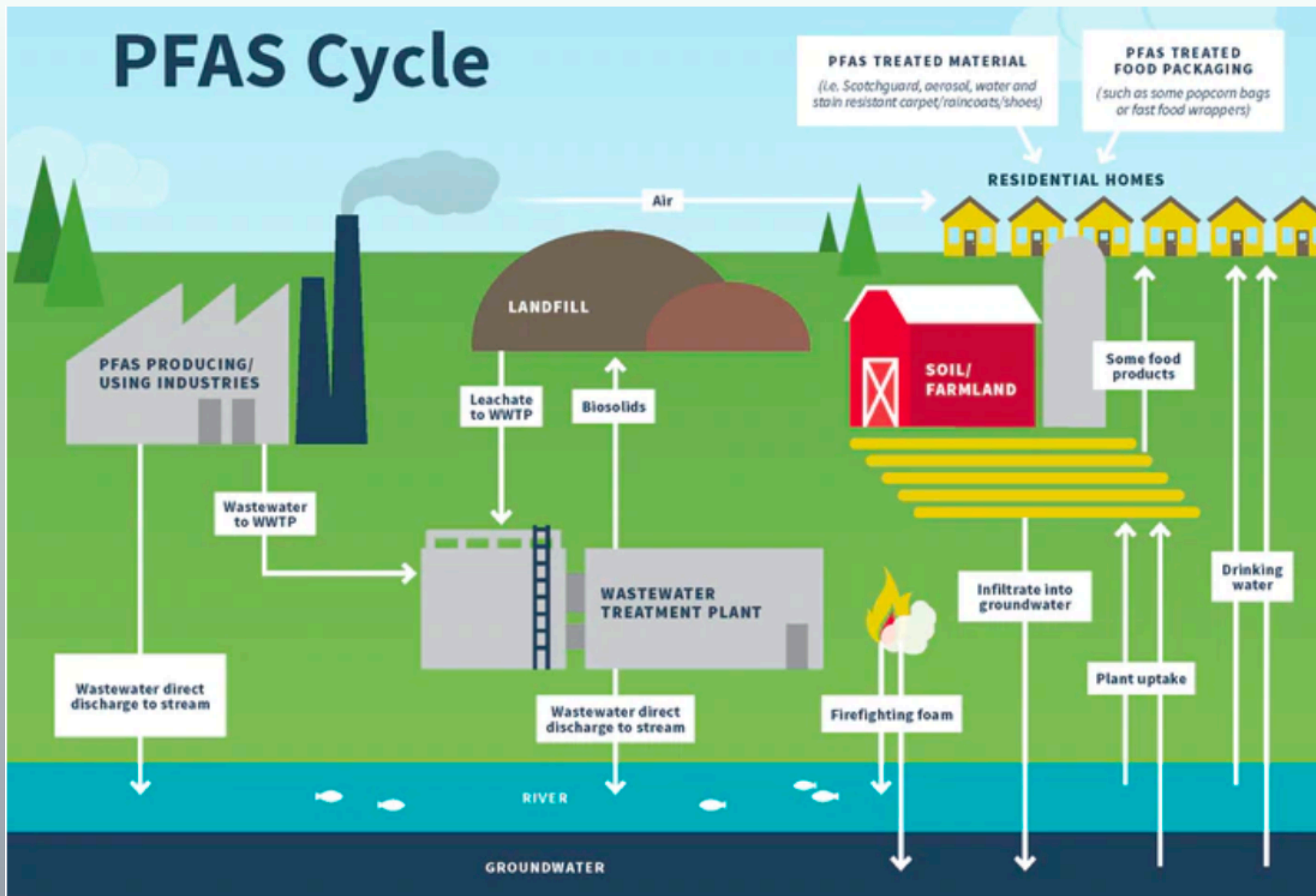
- A collection of manufactured chemicals that include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), Gen X technology, and many other chemicals
- The larger body of chemicals is referred to as fluorinated chemicals - characterized by strong *fluorine-carbon bonds*
- Fluorinated chemicals' indestructible quality is what makes them effective firefighting tools

PFAS Have Found Industrial Use Everywhere

- 1956 - 3M Scotch-gard on carpets
- 1962 - Teflon non-stick coating cookware is FDA approved
- Gore-Tex - water-proof, breathable fabric membrane
- Microwave Popcorn - separating steam from the paper in popcorn bags
- AFFF Firefighting Foams



PFAS Cycle



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

800-662-9278 | www.michigan.gov/pfasresponse

08/2018

What's the Problem?

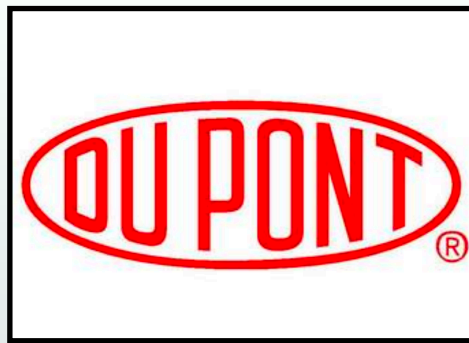
- The *Fluorine-Carbon bond* is very hard to break.
- This *F - C bond* has incredible environmental persistence —> known as a “forever chemical.”
- **CONCERN:** *Bioaccumulation* - Long-chained PFAS (C8) accumulate, increase in concentration, and stay in our bodies.
- *Short-Chained PFAS (C6)* – Research shows they seem to have the same toxicity as long chained PFAS when exposure to short-chained is at higher levels.
- *Biomagnification* - as you go up the food chain, we get higher levels in our bodies.

Health Effects of PFAS

- Cancer
- Cardiovascular Disease
- Increased Cholesterol Levels
- Liver Malfunction
- Thyroid Disease
- Hormonal Changes
- Obesity
- Contribute to Low Infant Birthweight
- Immune System Reduction
- Decreased Response to Immunizations

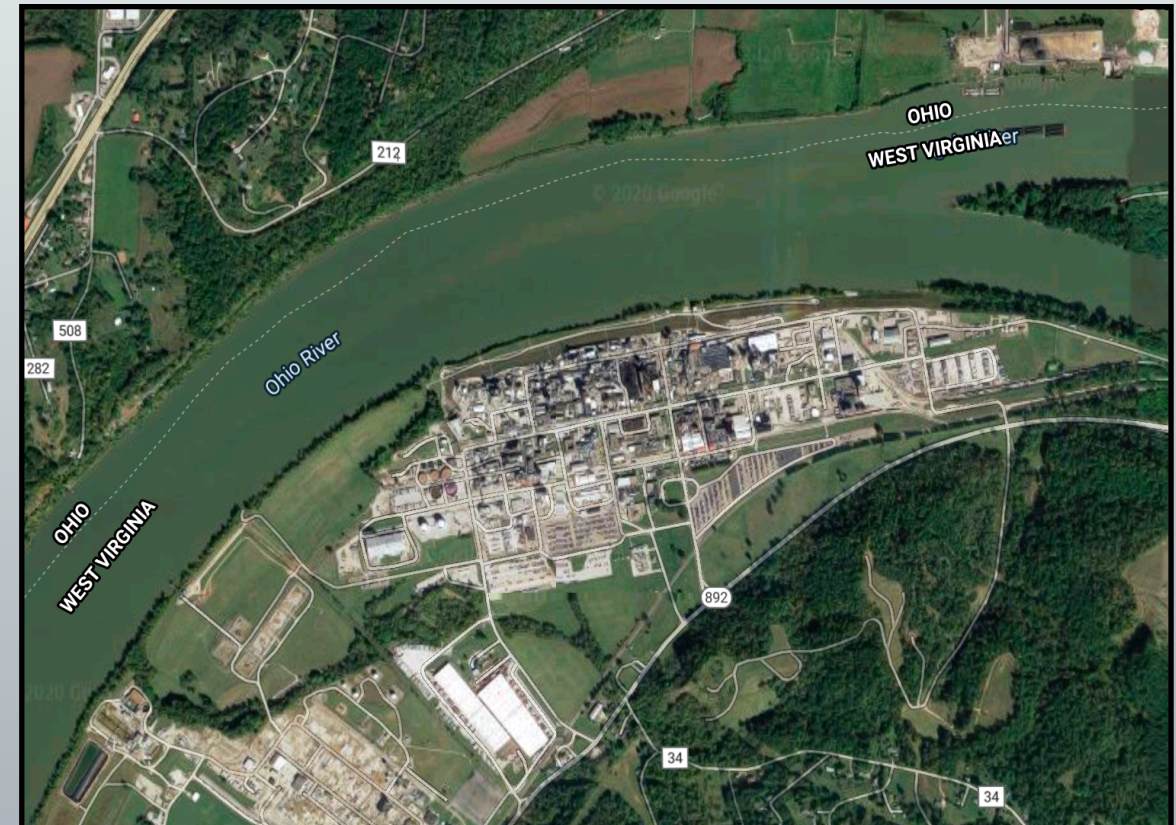
- In 2018, there were almost 800 studies being conducted on PFAS and human health

Source: Pub Chem. (2016) .
Perfluorooctanoic acid: Open
Chemistry Database. Retrieved from
[https://pubchem.ncbi.nlm.nih.gov/
compound/9554#section=Top](https://pubchem.ncbi.nlm.nih.gov/compound/9554#section=Top)



Washington Works Plant Parkersburg, W Va.

- **1951** - DuPont makes C8 – used in manufacturing Teflon
- **1954** - DuPont employees express concerns about C8 toxicity
- **1961** – DuPont confirms that C8 is toxic in animals and causes **observable changes** in organ functions
- **1981** - DuPont finds evidence of birth defects in babies born to female employees & decides to pull female employees from Teflon work
- **1999** - DuPont dumps 55,000 pounds of C8 into the Ohio River
- **Feb 13th, 2017** - Global Settlement \$670 Million - covers all the C8 cases that were filed in federal court, resulting from C8 being dumped in the Ohio River (<https://thedevilweknow.com>)



Source:
U.S. Environmental Protection Agency
Ohio Environmental Protection Agency
West Virginia Department of Environmental
Quality, Court Documents

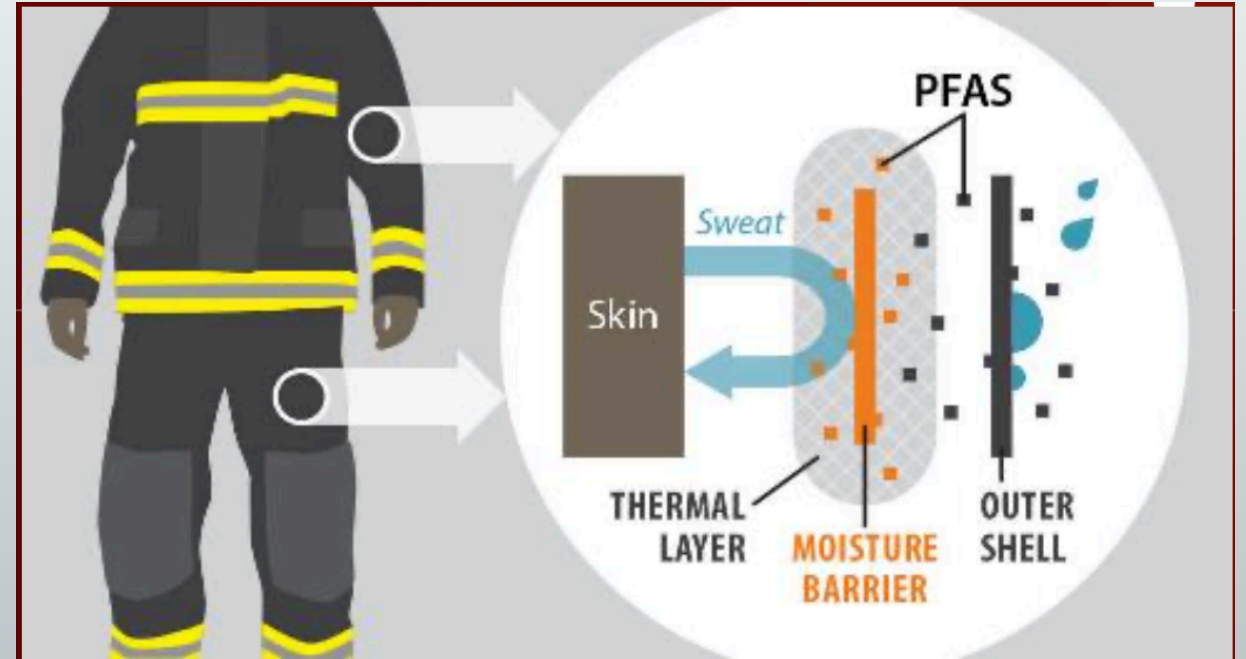
Firefighters & PFAS

- **AFFF Foam** (Class B)

- Are effective surfactants
- Lowers the ignition temperature
- Smothers the fire from oxygen

- **PPE**

- Dr. Peaslee, Notre Dame tested 40 sets of turnouts for Fluorine
 - Tested All 3 Layers:
 - Moisture Barrier —> Polytetrafluoroethylene (PTFE) (Teflon)
 - Thermal Liner —> Fluorine found in High End PPE
 - Outer Layer (shell) —> Side-chain fluoropolymer



Dr. Peaslee's Study Results

Total Fluorine Measurements

Sample part	State	N samples	Average F (ppm)	Std Dev. F (ppm)	% change
Moisture Barrier	New	9	178300	31100	
Moisture Barrier	Used	9	139800	18400	-22%
Outer Layer	New	10	21500	5300	
Outer Layer	Used	10	15100	3600	-30%
Thermal Layer	New	19	95	55	
Thermal Layer	Used	19	99	48	+5%
Identical garments – outer layers	New 2008	2	26500	4500	
Identical garments – outer layers	Used 2008	2	15600	3600	-41%

Source: <https://station-pride.com/2018/02/18/fire-gear-laboratory-test-results/>

Preventative Measures - **RIGHT NOW**

Limit Exposure - PFAS are BIOACCUMULATIVE

- Keep Wearing the Gear, there is no alternative...yet.
- Treat PPE with **respect**. Use them for fires, but not for non-fire emergencies (community events, shopping, as a “raincoat,” walk-through drills...).
- Keep gear separate from your kids, out of the back of your car. Put PPE in a bag.
- Wash the gear before you wear it.
- Keep it separate from where you live in the house.

Preventative Measures - Long Term

Proactive Actions

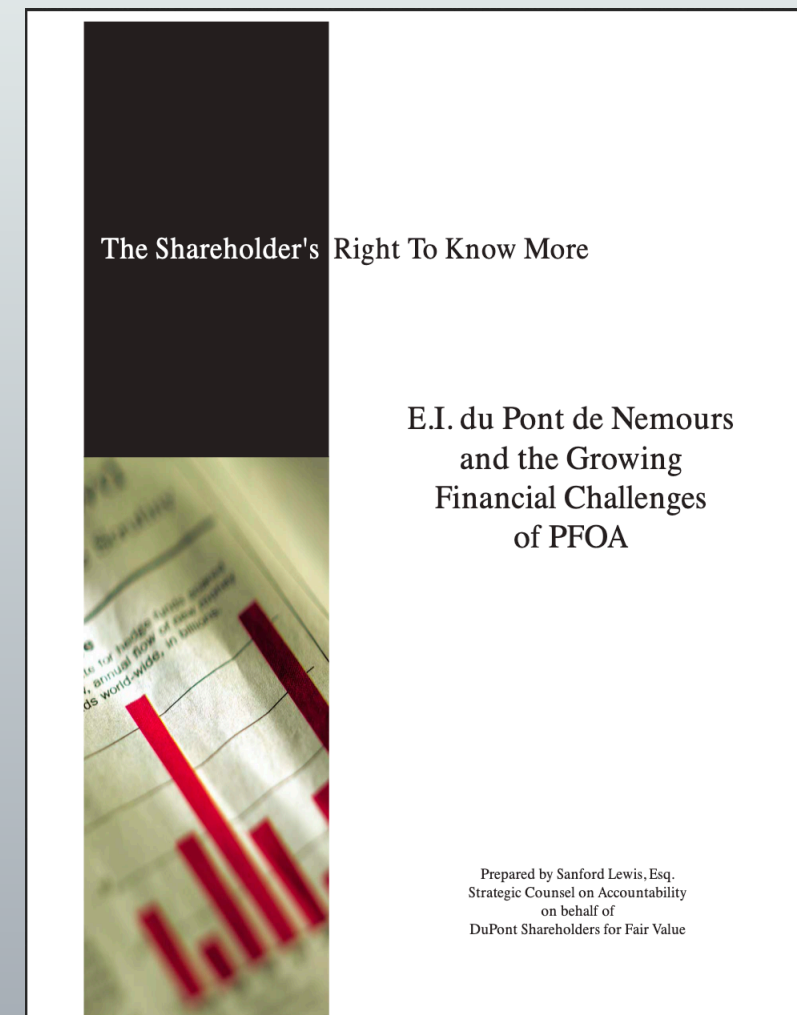
- Exploring alternative PPE treatments that will produce similar benefits
- Studies to determine how much dermal absorption is occurring
- Dust Analysis - PFAS degrade & become brittle —> Inhalation Hazard (Dust Analysis)

Legislative Actions

- Push Congress to establish a First Responder PFAS Task Force
- Mandate PPE companies to include % of PFAS used in PPE
- Create a Maximum number to limit the PFAS allowed in PPE

One Final Note

- 1992 - DuPont scientists found that PFOA cause **TESTICULAR CANCER**
- “In addition to causing testicular tumors, PFOA causes many other effects on the male reproductive system, including increased size of the testes, epididymides and seminal vesicles, and decreased prostate in rats.”
- “In the female, PFOA causes **MAMMARY TUMORS** and cellular effects on the ovary.”
- “Beginning in 1992, DuPont scientists began to publish papers addressing how PFOA causes testicular tumors and other harmful effects on the male reproductive tract (they have not studied mammary gland and ovarian effects). First, they found that PFOA increases blood levels of estradiol (the major form of estrogen in humans and rodents) in male rats. They also found that PFOA affects testosterone regulation, tending to decrease blood levels of testosterone and alter the production of testosterone in testicular cells, effects that are likely due to a “lesion at the level of the testes.”



Source: https://www.healthandenvironment.org/uploads-old/DuPont_Shareholders_Know_More.pdf



San Francisco Firefighters

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