

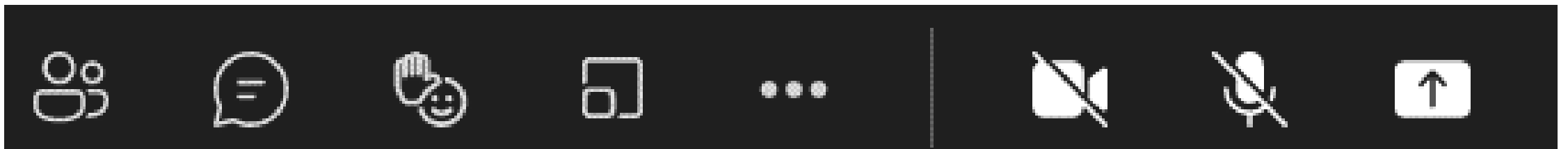


MPART Citizens Advisory Workgroup

May 14, 2024

Housekeeping

- Please keep your mic/phone muted unless speaking
- Only use the “raise hand” and/or “chat” function for questions or to request to speak
- Cameras are optional
- This meeting is being recorded



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MICHIGAN PFAS ACTION RESPONSE TEAM

Agenda

- Roll Call – Community Updates
- Subcommittee Reports
- PFAS and Health – Dr. Alan Ducatman
- MPART Updates
- Discussion of CAWG Charter and possible changes
- Next Meeting



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MICHIGAN PFAS ACTION RESPONSE TEAM

Roll Call and local updates/events/sharing from communities



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MICHIGAN PFAS ACTION RESPONSE TEAM

PFAS and Health University

Alan Ducatman, MD, MS

Professor emeritus, West Virginia

aducatman@hsc.wvu.edu

Washington Works, Parkersburg WV



Declarations including COI

- ▶ Contributed to Design; Led Participant Health communications for “C8 Health Project” in contaminated water districts, WV and Ohio beginning 2005
- ▶ Participate as paid and unpaid consultant to communities seeking medical monitoring benefits following PFAS water contamination
- ▶ Assisting attorneys for State of North Carolina (affected by PFAS contamination from a chemical industry source)

Goals: Information for PFAS-Affected Communities

Aims:

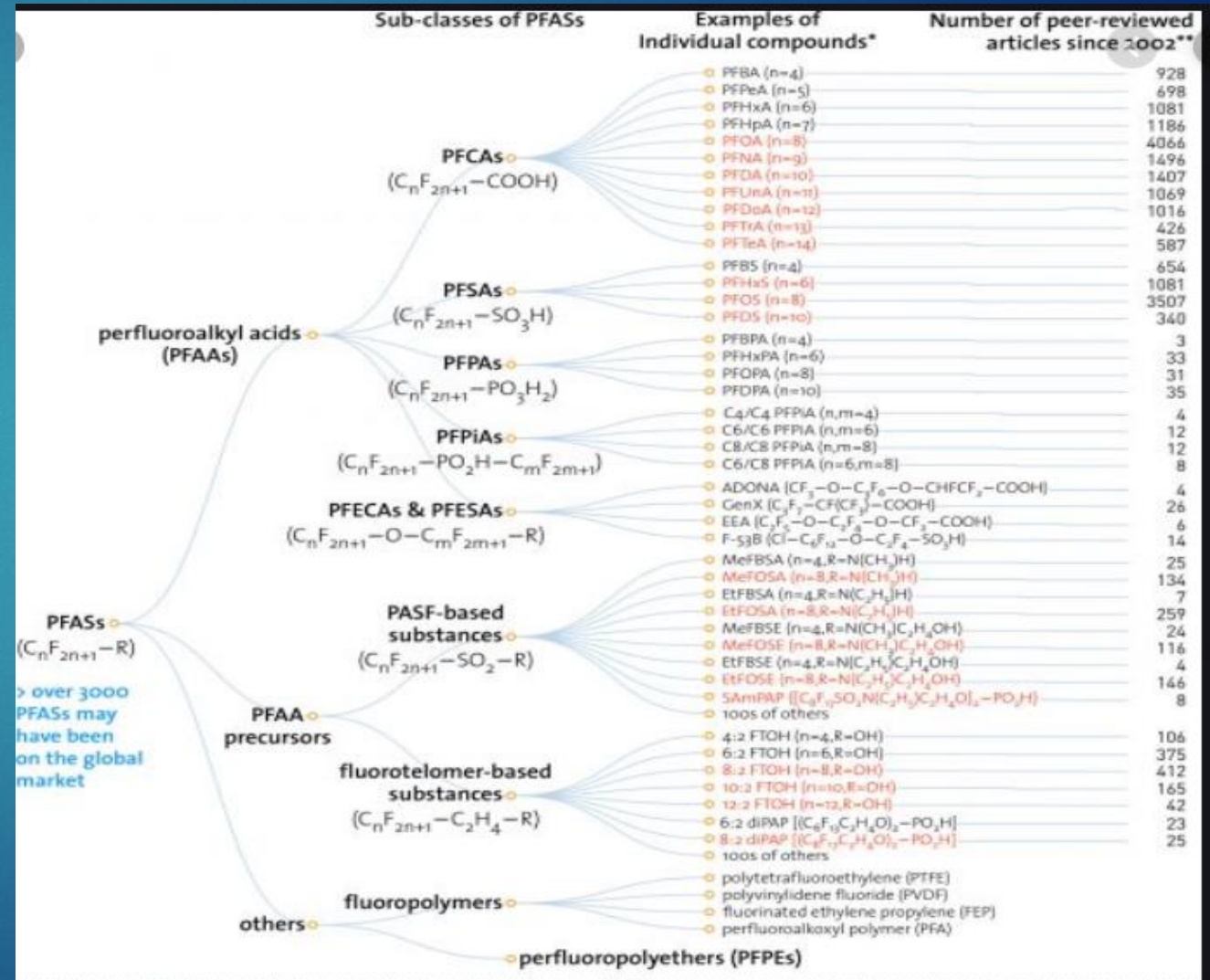
- ▶ Sources
- ▶ Health Communications
- ▶ Health Outcomes and Addressing Patient /Community Concerns



A Large Family Tree Image From Wang et al., 2017

Per- and polyfluoroalkyl substances (PFAS)

- ▶ Aliphatics with ≥ 1 fully fluorinated carbon
- ▶ Many have little health information, a few have a lot of health information
- ▶ Many not detected by current methods (except as total fluorine)
- ▶ We know the most about perfluoroalkyl acids (PFAAs) such as PFOA, PFOS, and PFNA



Array of Historic Sources, Uses

Surfactants/Dispersants; Industrial manufacturing Aid in numerous commercial products :

Food packaging (including pet food, food preparation bags such as microwave popcorn, take-out, pizza box, frozen food container)

Medical device (including coatings for stents)

Home barrier insulation and specialty paints – future spray on roof applications proposed

Specialty Paper coatings

Treatments for Fabrics and Carpets, Outdoor wear and Leather

Adhesives (including carpet backing)

Ski wax, bike lube

Electronics, solar panels, elastomeric coating for electrical cables.

Cleaners, treatments: gun cleaners, chain cleaners, engine coaters, auto detailing, piano tuning (2 uses)

Hydraulic fracturing lubricant and tracer technology

Chrome plating and photolithography

AFFFs – most prevalent source in groundwater and drinking water, may contain a complex mixture, and each batch can vary to meet a standard (“MilSpec”)

Shaving, cosmetics, flosses

Array of Historic Sources, Uses



A 50 minute presentation on uses and sources would still leave out many that are in all of our homes.



A review of leading journals such as Science and Nature consistently reveals new and exciting technologies, for which some per- and polyfluoroalkyl substance plays a role.



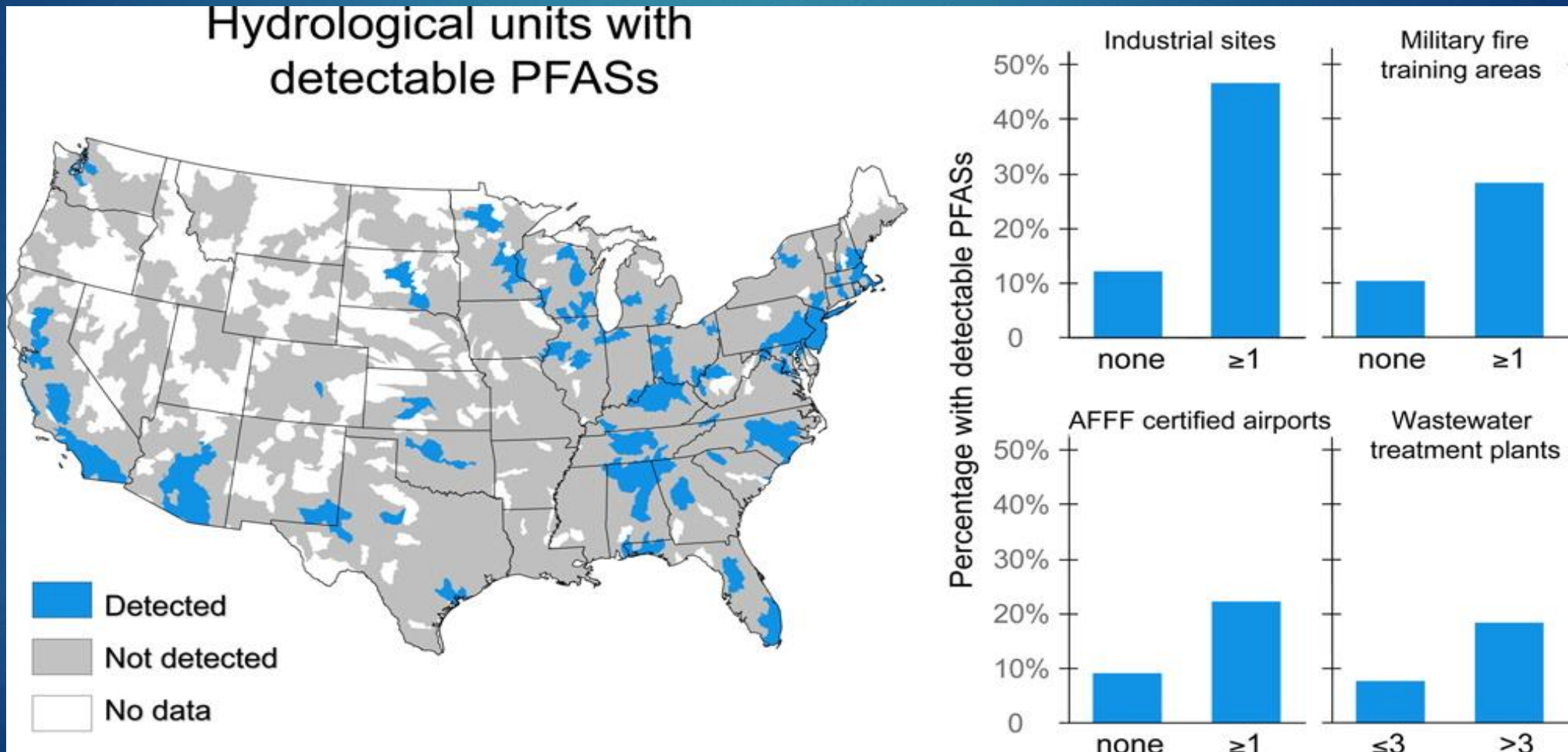
Useful to think of “essential uses” (important product, no substitute technology) vs “nonessential sources” which include both replaceable uses and thoughtless uses (EX: where does shaving cream go when we are done with it. Where is lipstick and lip balm applied)? Slippery slope of essential vs. products such as microchips depending on photolithography techniques.

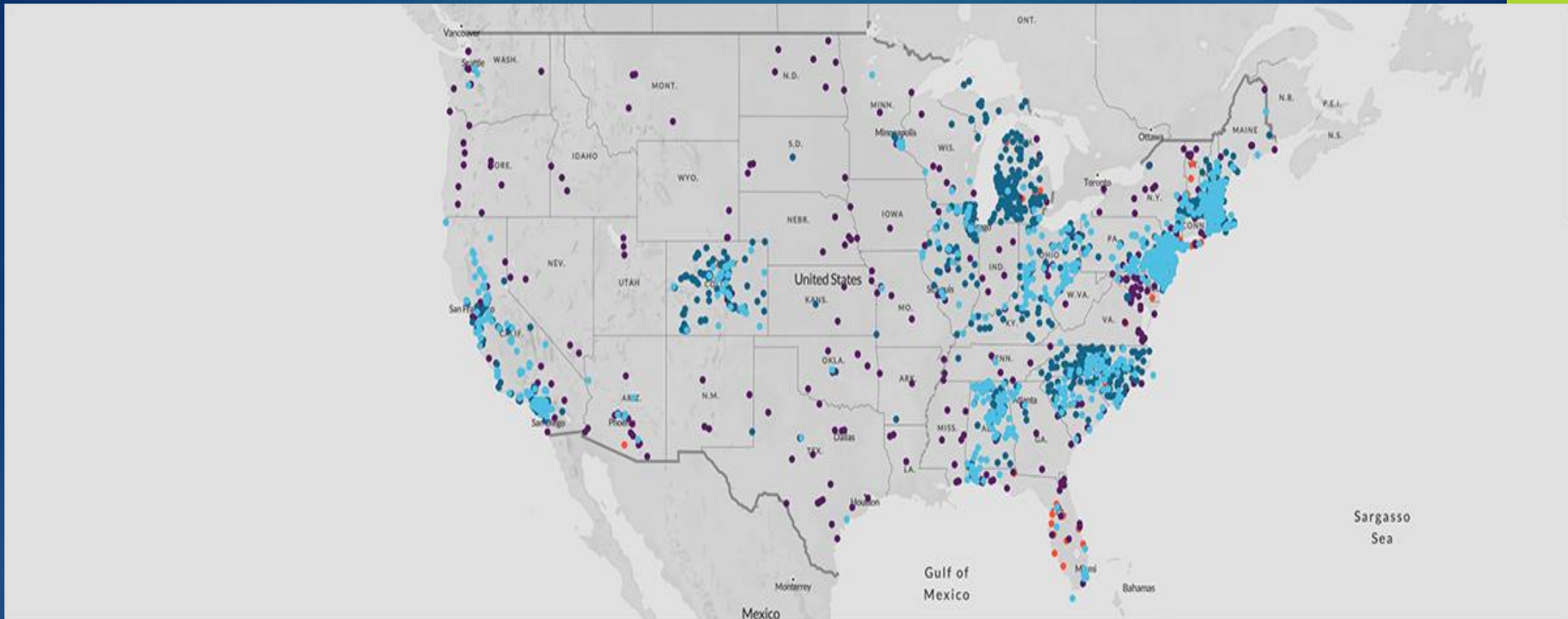


Migrate in air, through soil to water, in water, hard to filter, and “forever.”

> 6 Million Americans with Impacted Water

2016 from Hu et al. ES&T Letters 2016





Lower thresholds Increasing pollution found. EWG 2024 recent map

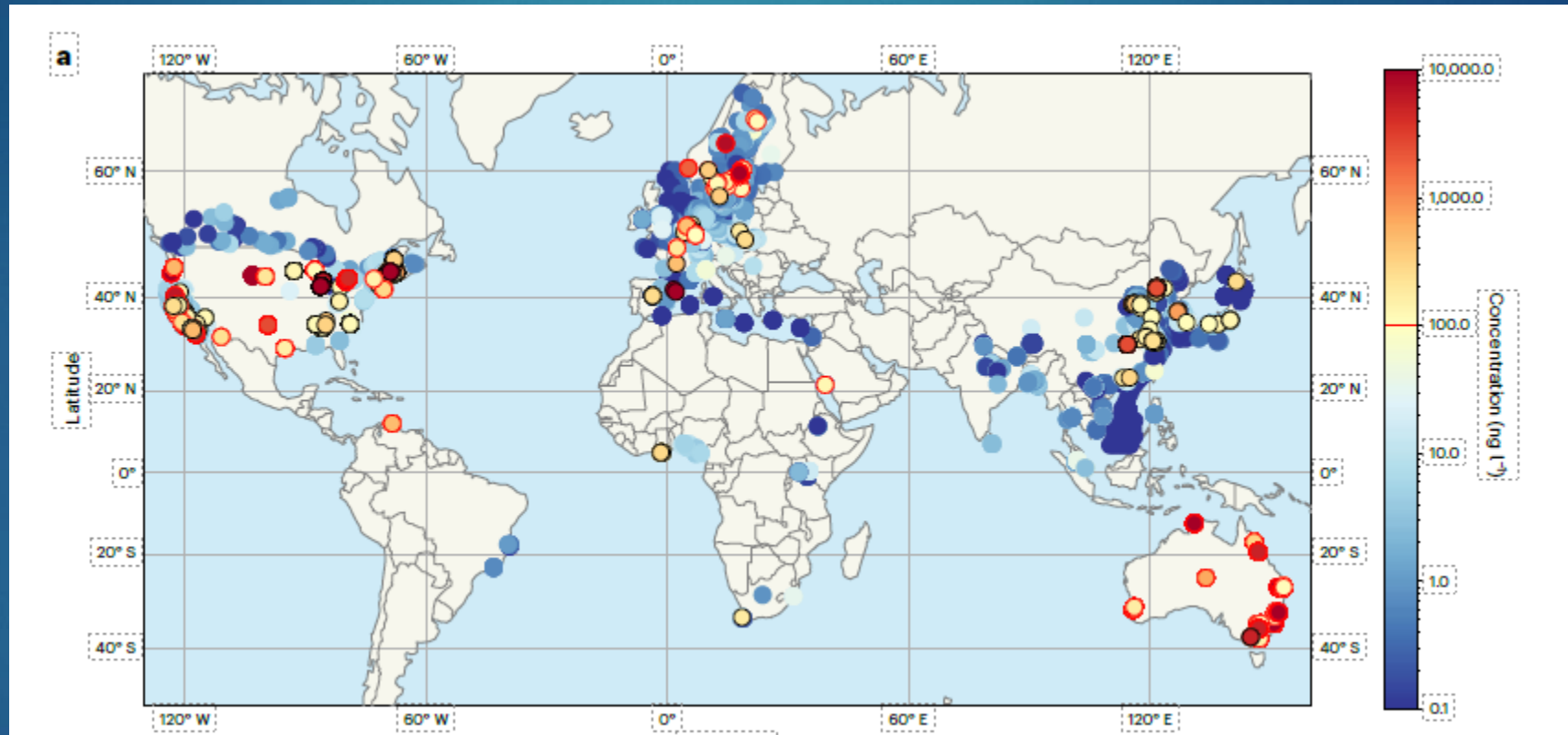
https://www.ewg.org/interactive-maps/pfas_contamination/ Maybe 100,000,000 Americans?

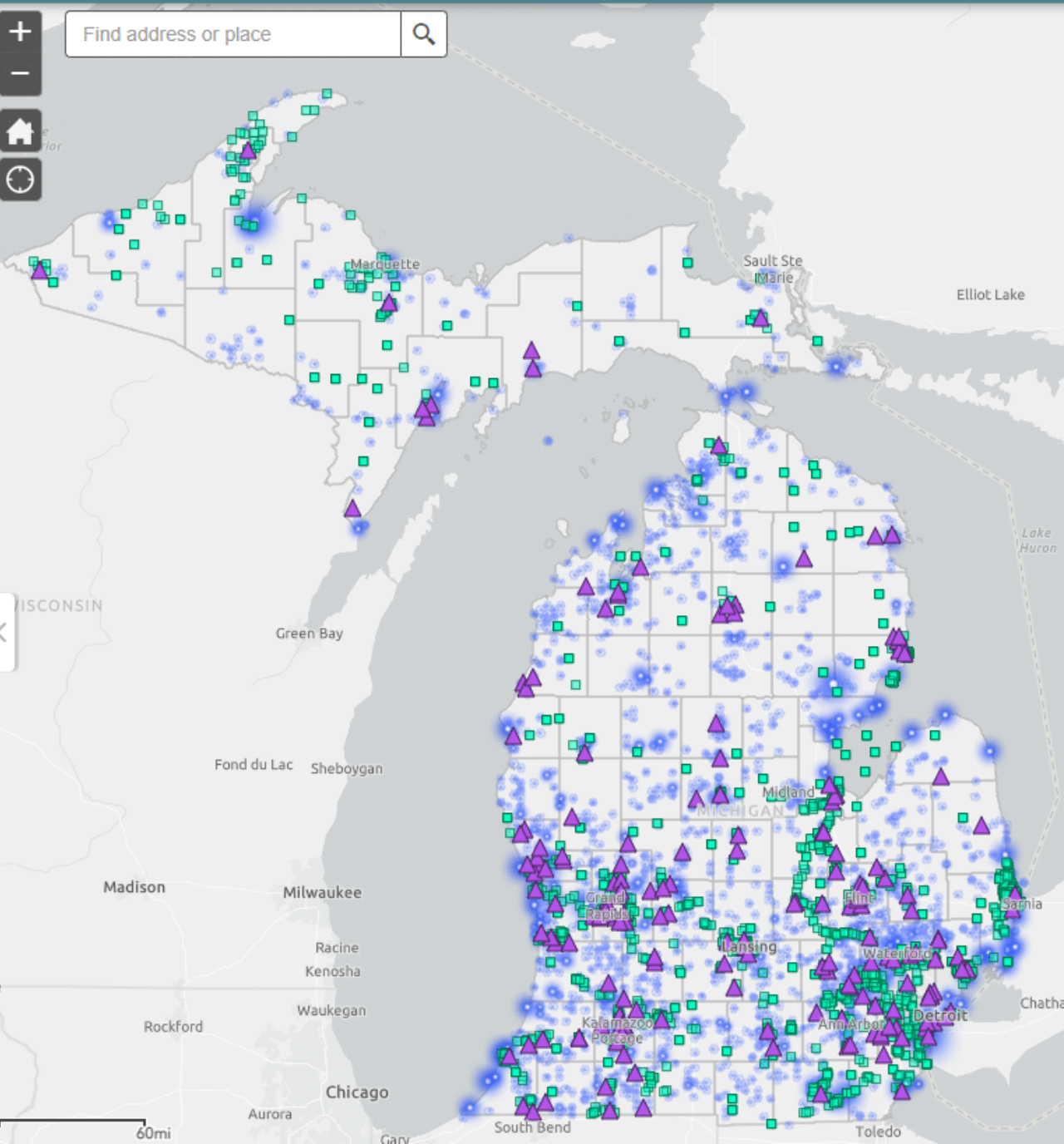
A personal observation is that it is more “equal opportunity” than some pollutant exposure patterns

Internationally:

From Ackerman-Grunfeld D et al. Nature Geoscience

2024 <https://doi.org/10.1038/s41561-024-01402-8>





Here In Michigan-
Kudos for Detection
(and interactive map)

- ▶ Task one - Measure. Michigan is a national leader.
- ▶ Task 2 - Intervene as needed !!
- ▶ Federal regulations published last month, let's see what happens
- ▶ Where do well-owners fit?

Common Patient Concerns

HEALTH OUTCOME(S)

Goals: 1° & 2° Prevention

- ▶ **Cancer !!!**
- ▶ *Human Development*
 - Birth Defects, Developmental Delays
 - Transgenerational Exposure and Pregnancy Timing or Choosing to Breastfeed or Failing to Breastfeed
- ▶ Infertility (reduced fecundity)
- ▶ Lipids, liver
- ▶ Stress (Property value, maintenance of filtration equipment, guilt concerning children or family)
- ▶ Our help for water sources and water filtration (Public health role. Influence entities perceived as uncaring)
- ▶ Breast Feeding and Pregnancy Timing: (Honest advice includes unknowns)
- ▶ **Decrease Health Risk, Screen for Outcomes (Community medical monitoring)**
- ▶ Remove Internal Contamination
 - Volunteer as Regular Blood donor ?
 - Take a bile acid sequestrant such as cholestyramine?

Active approaches to enhanced excretion with clinical trial support

- ▶ Cholestyramine or similar bile acid sequestrants, especially for PFOS. Old fashioned modestly effective drug for lipids. Safe but unpleasant
- ▶ Regular phlebotomy. Results not as impressive, also works.
- ▶ Both work, and they are relatively safe, but there is no proof of net benefits.

▶ Image from Public Health England Abstract. Article by Ducatman et al in Environ Toxicol Pharmacol PMID 33819618

TABLE 3. Association between Cholestyramine use and PFAS levels

Cholestyramine	Sample size	Unadjusted geometric mean ratio (95% CI)	Multivariable adjusted* geometric mean ratio (95% CI)
PFHxS			
Non-users	56136	1 (referent)	1 (referent)
Users	36	0.38 (0.29-0.49)	0.43 (0.33-0.56)
p-value		0.00	0.00
PFOA			
Non-users	56136	1 (referent)	1 (referent)
Users	36	0.723 (0.48-1.09)	0.55 (0.41-0.74)
p-value		0.12	0.00
PFOS			
Non-users	56136	1 (referent)	1 (referent)
Users	36	0.07 (0.05-0.08)	0.07 (0.05-0.08)
p-value		0.00	0.00
PFNA			
Non-users	56136	1 (referent)	1 (referent)
Users	36	0.38 (0.32-0.44)	0.39 (0.33-0.46)
p-value		0.00	0.00

* Adjusted for age, gender, body mass index, water district, and estimated glomerular filtration rate

Reproductive Age Women Have Lower PFAS

- ▶ Menstruation
- ▶ Transplacental
- ▶ Breast Feeding

Image from Zheng et al.

<https://doi.org/10.1016/j.scitotenv.2021.152446>





C8 Science Panel 2005-13
(PFOA-contaminated water,
N=69,030, and literature review)

There are now > 2000 peer review papers concerning this chemical class, human exposures, and health effects

► “Probable Link” Findings

- **Hypercholesterolemia**¹
- Thyroid Disease²
- Ulcerative Colitis²
- **Testicular Cancer**¹
- **Kidney Cancer**¹
- Pregnancy-induced Hypertension

1. Substantially Increased Evidence since 2015 2. Nuances since 2015

Examples of Outcomes other than probable links that have become clearer since the Science Panel Deliberated

Liver Disease

Hyperuricemia

California Basis for PFAS Health Goals

	PFOA	PFOS
Health Effects in Humans	<ul style="list-style-type: none">• Kidney cancer• Liver toxicity• Immune system toxicity• Increases in cholesterol• Suggestive evidence of preeclampsia	<ul style="list-style-type: none">• Increases in cholesterol• Immune system toxicity• Suggestive evidence of preeclampsia
Health Effects in Animals	<ul style="list-style-type: none">• Liver, pancreatic, and testicular cancer• Liver toxicity• Immune system toxicity• Thyroid toxicity• Developmental and reproductive toxicity	<ul style="list-style-type: none">• Liver and pancreatic cancer• Liver toxicity• Immune system toxicity• Thyroid toxicity• Developmental and reproductive toxicity



PFAS health outcomes evidence taxonomy

Substantial (“Sufficient*”)

Multiple Populations and different study designs

Findings pertain to populations with a wide range of exposure (less focus on all high or all low)

Dose response

Unifying Experimental evidence such as histopathology and plausible pathways

Moderate (“Limited*”)

Population Evidence but in fewer populations

Experimental: Mechanistic or histologic data less rich

* Clinicians less commonly use the scientific designations of federal agencies such as “Limited.” Clinicians may misunderstand “Limited” to mean a negative statement about evidence.

At or above (“Limited*”)

Population evidence only.

Few studies

More Conflicting outcomes

Less Indication of Mechanisms or Parallel findings in experimental settings.

PFAS Outcome Examples – my View

Strong Evidence

Immunotoxicity, ↓ vaccine uptake

Lipids /Sterol interference, Associated Codeable conditions and longitudinal diagnoses and medications

Kidney cancer

Liver Functions and liver toxicity

Thyroid Alterations/Binding proteins

Uric Acid - Hyperuricemia/Gout

Substantial Evidence

Breast Feeding, diminished capability

Fecundity/Fertility male

Insulin Resistance/Diabetes

Kidney Disease

Osteoporosis

Preeclampsia/PIH

Testicular Cancer

Ulcerative colitis

Birthweight

Some or conflicting evidence

Asthma, Allergy

Cardiovascular/BP

Childhood adiposity

Fecundity/Fertility

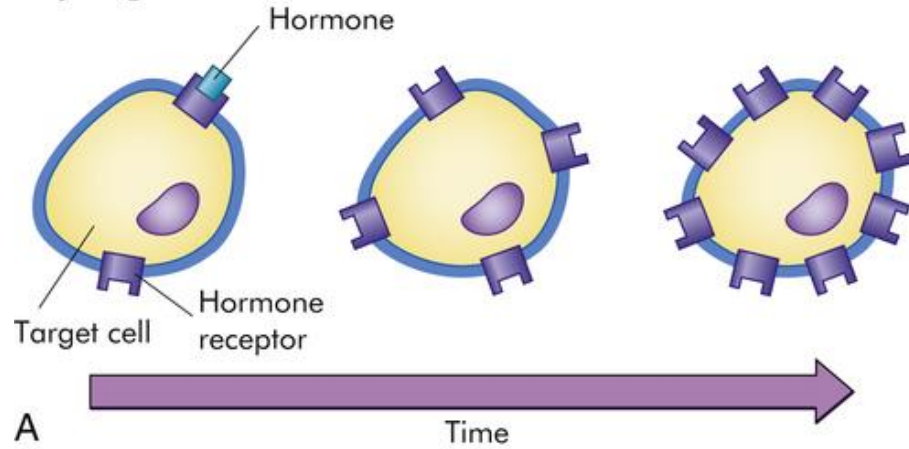
Liver cancer & Breast cancer

Infections, notably in early childhood

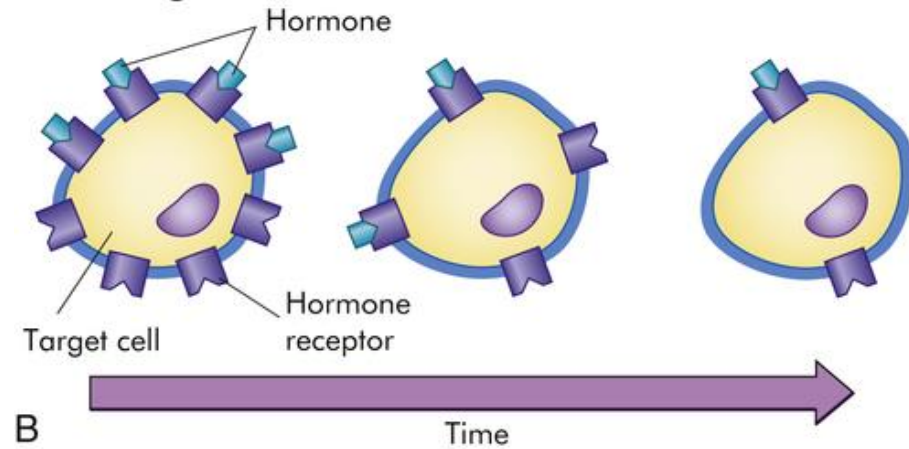
Thyroid disease- autoimmune

Developmental: Intrauterine Growth Retardation (IUGR/SGA), Preterm birth

Up-regulation



Down-regulation



Why??

One reason is signaling, our bodies “think” these are messages to “up- or down-regulate” cell function.

Another is membrane effects and reactive oxygen species

Health communications and (inadvertent) obfuscation

Science Terms Serve the Comfort level of Scientists

Sufficient evidence

Moderate evidence or limited evidence (a very wide range in practice)

Other such as some evidence, conflicting

Major misunderstandings around some of these terms, especially “limited evidence.”

Clinicians communicating with patients or communities should try to avoid terms which can be mistranslated to be dismissive

More useful terms are

Near certain

Substantial

More Likely than not

Unsure, uncertain

Epidemiology invariably has some conflicting evidence, there are guidelines for interpretation

I would like to think one of our papers influenced this topic at the agency level..

COMMENTARY

Official health communications are failing PFAS-contaminated communities

Alan Ducatman Jonas LaPier Rebecca Fuoco and Jamie C. DeWitt

<https://doi.org/10.1186/s12940-022-00857-9>

Example of historical, problematic PFAS Health Communications



“Scientists are still studying the health effects of exposure to PFAS. Although more research is needed, some studies in people have shown that certain PFAS may affect health.”

and

“PFAS have not been proven to cause any specific illnesses in humans. ...To date there is not enough information available to definitively say what, if any, health effects may be caused by exposure to PFAS.”

PFAS Health Communications Improving

- ▶ There is still a tendency to dismiss hard evidence, but it is much better than it was
- ▶ Regulatory and research agencies are understaffed for many roles, including PFAS. Formal external reviews can help. In addition, external vigilance and feedback concerning messages and actions is part of the process.
- ▶ Vigilance icon featured



Based on the outcomes, some communities in US have received Medical Monitoring benefits



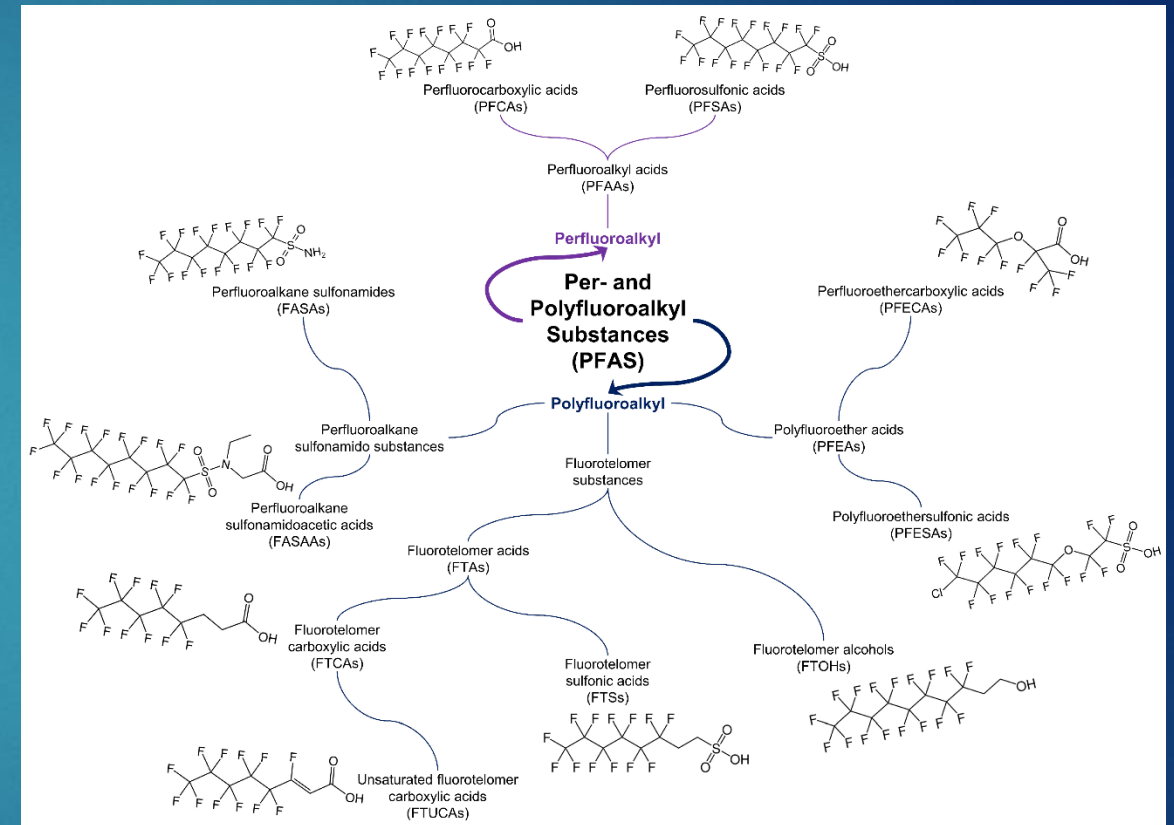
This process is dependent on many factors, and some of the barriers are outside of the realm of science or medicine. Clean water is primary prevention. Medical monitoring is secondary or tertiary prevention.

- ▶ An Example: Michigan Supreme Court 2005. The outcome boils down to something like this: One must be harmed before one can seek redress from risk. (The goal of medical monitoring is early detection and prevention mitigation.)
- ▶ In contrast, Adjacent communities in Vermont and New York, and an eligible group in Ohio/WV are eligible to receive ongoing medical monitoring ingoing programs.

Health Effects Knowledge mostly Limited to “Legacy” Compounds (hundreds in use)

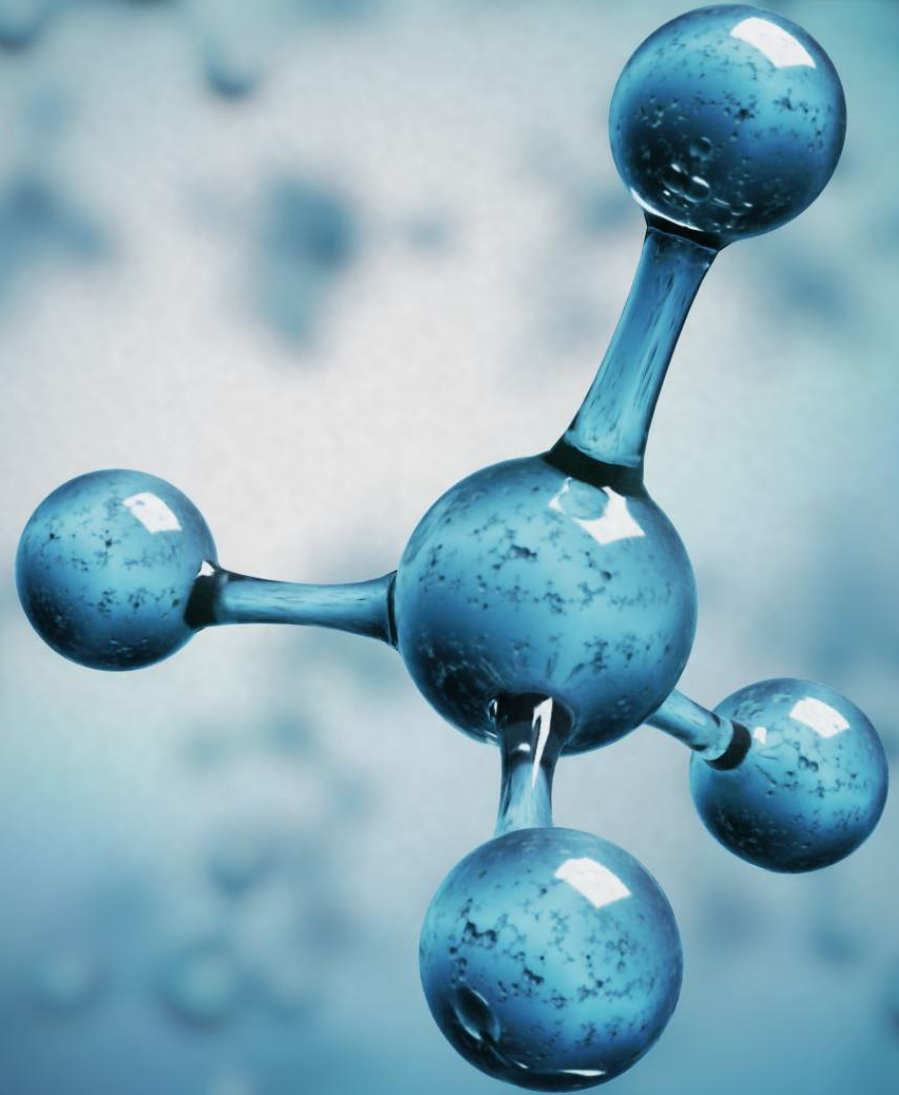
“Replacement compounds”

- ▶ Tend to have shorter half-lives
- ▶ Therefore, a “hope” is lower toxicity.
- ▶ Also, harder to study in humans
- ▶ Trade secrets, expensive “off-target” analysis
- ▶ Toxicology studies mostly not encouraging
- ▶ Even faster moving in water and harder to filter



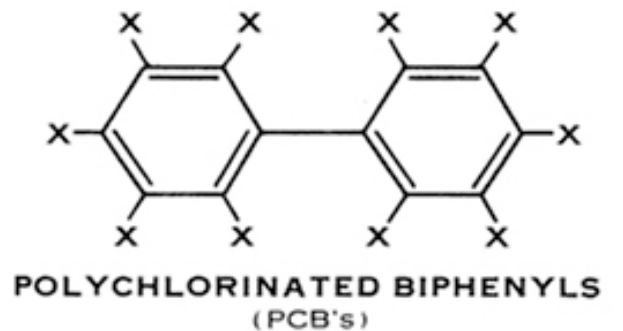
Graphic: Brase RA et al. *Int. J. Mol. Sci.* **2021**, *22*(3), 995; <https://doi.org/10.3390/ijms22030995>

We still do not know much about so many of the replacement compounds. In studies to date, the physiology is not necessarily different (but internal doses may be different)



Perspective – somehow given the choice between exposure to “legacy” PFAS and.....

- ▶ Industry responses to health knowledge concerning legacy compounds:
 - ▶ Substitutions. we have information about 4-6 PFAS. Many (not all) of the substitutes are still PFAS
 - ▶ It is hoped but uncertain that these are not “regrettable”
- ▶ Trade secrecy so its harder to find what is there
- ▶ Public research limited to End Products, and not including process contaminants.
- ▶ Redefinitions of PFAS
- ▶ .”



PFAS “legacy,” “replacement,” and thoughts for the future

- ▶ The replacements tend to have shorter half-lives, and the toxicology varies with the specific compound (and can be discouraging to read).
- ▶ Replacement compounds tend to migrate even more than the legacy compounds and are most often even harder (and more expensive) to filter . They are sprinters, and can spread in rain
- ▶ We hope they are safer. Hope is a weak approach to public policy for something this expensive.



Health Communication Challenges - the 'Stockholm Syndrome' decision makers caught in the middle.



Water utility managers and others (can include state agencies!) can be “caught in the middle” :

- Worried about another large task
- Have (In)sufficient Funds to do the tasks
- Water managers typically not trained in Chronic Disease Epidemiology and in Toxicology
- Recognize that acknowledging the problem implies costs that will be passed to their budgets/consumers/taxpayers

CAWG Subcommittee's



WEBSITE REVIEW
SUBCOMMITTEE



PREVENTATIVE MEASURES
SUBCOMMITTEE



ENGAGING THE PUBLIC
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Anyone between the ages of 18-49 who lives in Michigan is eligible.



Complete our online survey. It takes about 1 hour, and you don't have to do it all at once!



Together we can gain a lifetime of knowledge about environmental exposures & cancer risk.

www.micares.health

Study ID: HUM00207056 IRB: Health Sciences and Behavioral Sciences Date Approved: 1/23/2024

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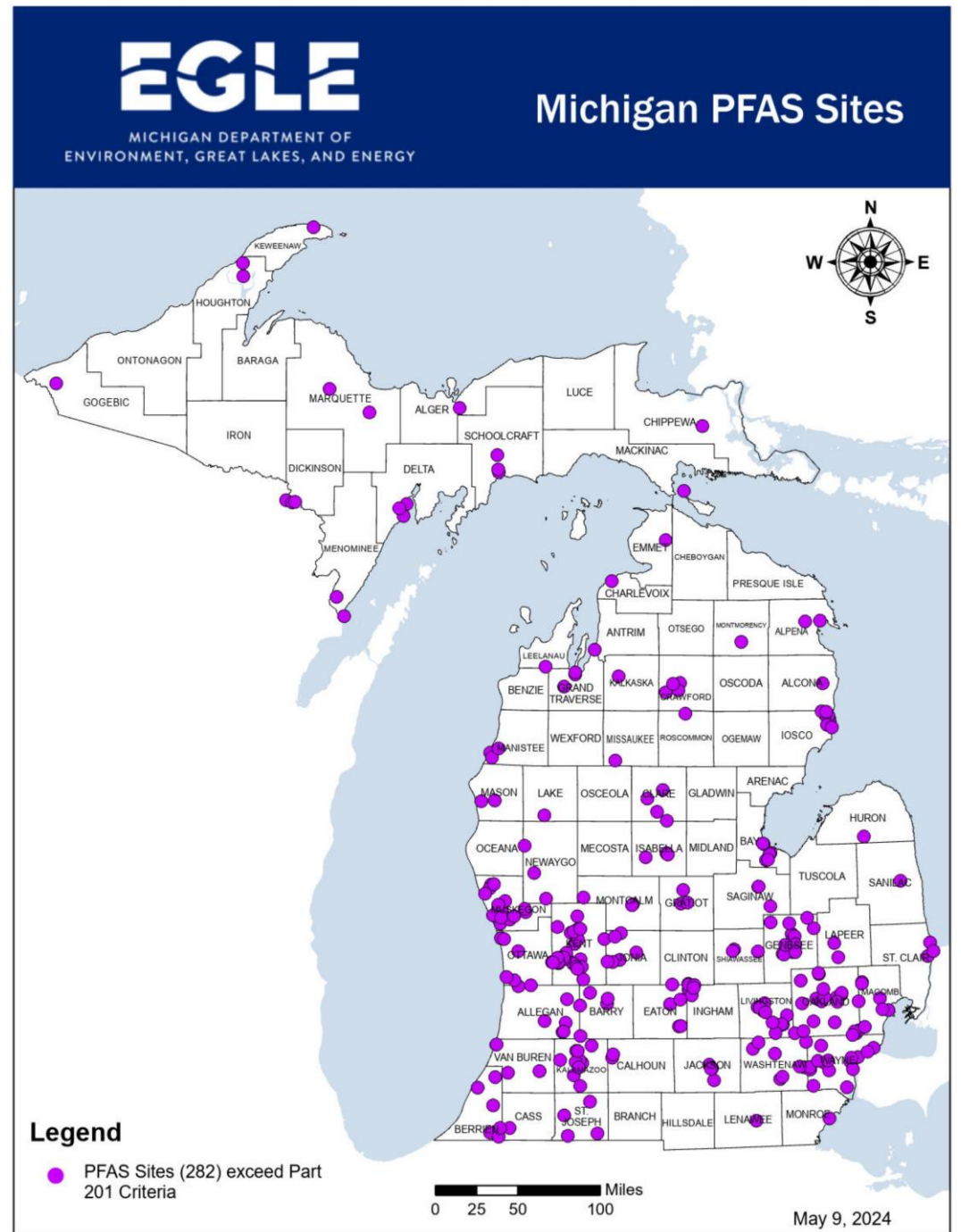
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New MPART Sites / Areas of Interest

- New Era Properties
Walker, Kent County
- Tallmadge Area of Interest
Tallmadge Township, Ottawa County
- Hartley & Hartley Landfill
Bay City, Bay County
- Athens Area of Interest
Athens, Calhoun County

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Join the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for the annual *virtual* Great Lakes PFAS Summit
December 3 – 5, 2024.



Great Lakes

VIRTUAL

PFAS SUMMIT

NOW ACCEPTING PROPOSALS TO PRESENT

<https://egle.idloom.events/2024-PFAS-Summit>

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MICHIGAN PFAS ACTION RESPONSE TEAM

Discussion of CAWG Charter and possible changes

Next Meeting
July 9, 2024



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MICHIGAN PFAS ACTION RESPONSE TEAM

MICHIGAN PFAS ACTION RESPONSE TEAM (MPART)

www.Michigan.gov/PfasResponse

The logo for the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The letters 'EGLE' are rendered in a bold, sans-serif font. The 'E' and 'L' are green, while the 'G' and 'E' are blue.

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY



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