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# PFAS: A Bridge from Science to Action

*Strategies for counseling PFAS-exposed patients*

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GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH



The University  
of North Carolina  
at Chapel Hill

# Danielle

## In the Exam Room

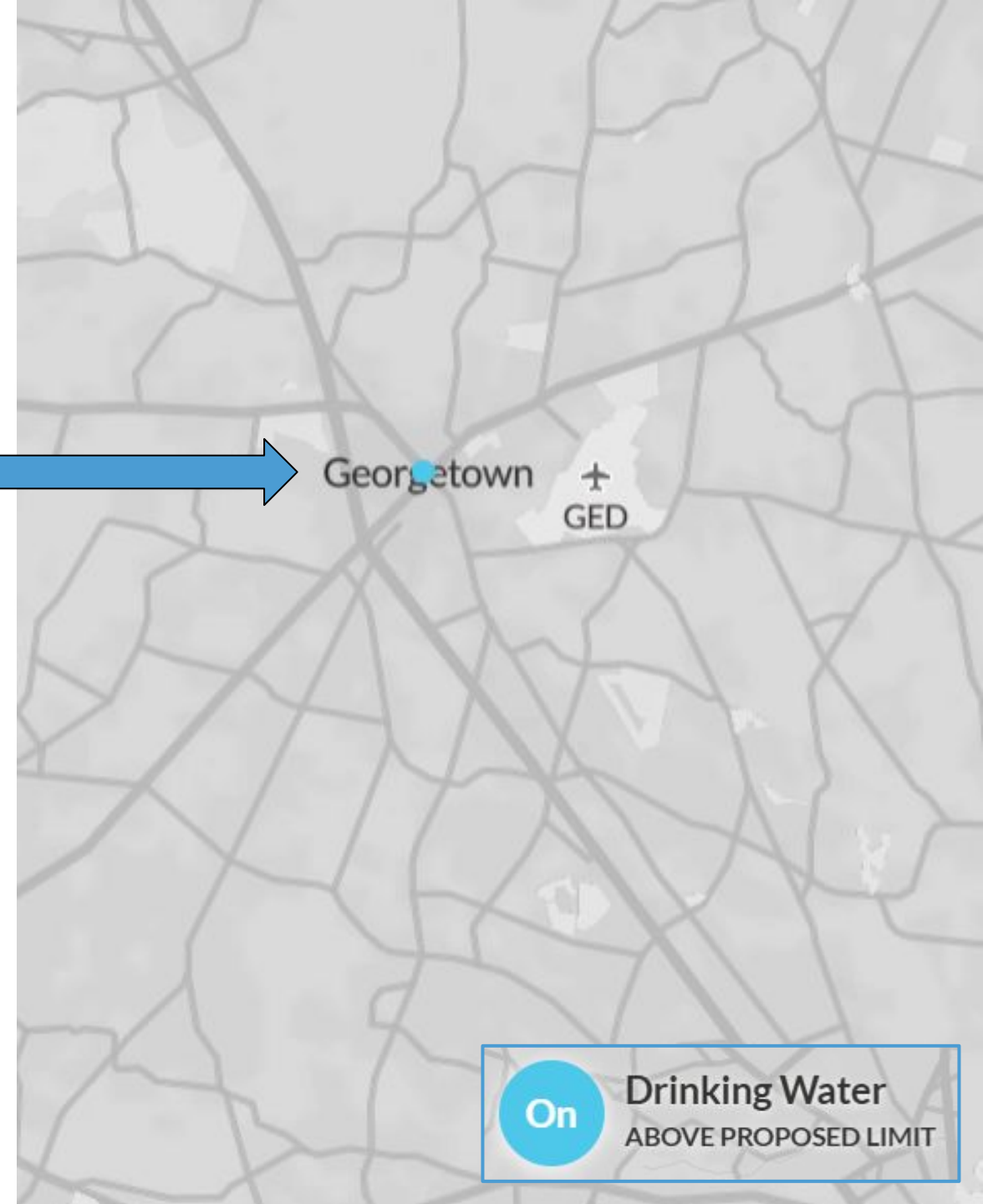
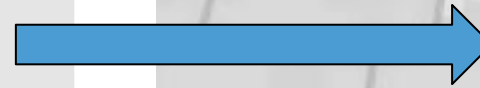
**Danielle, 34, brings her young son in for a routine physical outside Georgetown, DE. She's pulling up her phone before she even sits down.**

She shows you EWG's national PFAS contamination map, zoomed to her water utility.

## What She Asks You

**"Should I even let him drink from the water fountain at school?"**

You have fifteen minutes, a scared mom, and no training in ordering or reading a serum PFAS panel. Do you test her or her son? Reassure her? Refer her?



# Caleb

## The Visit

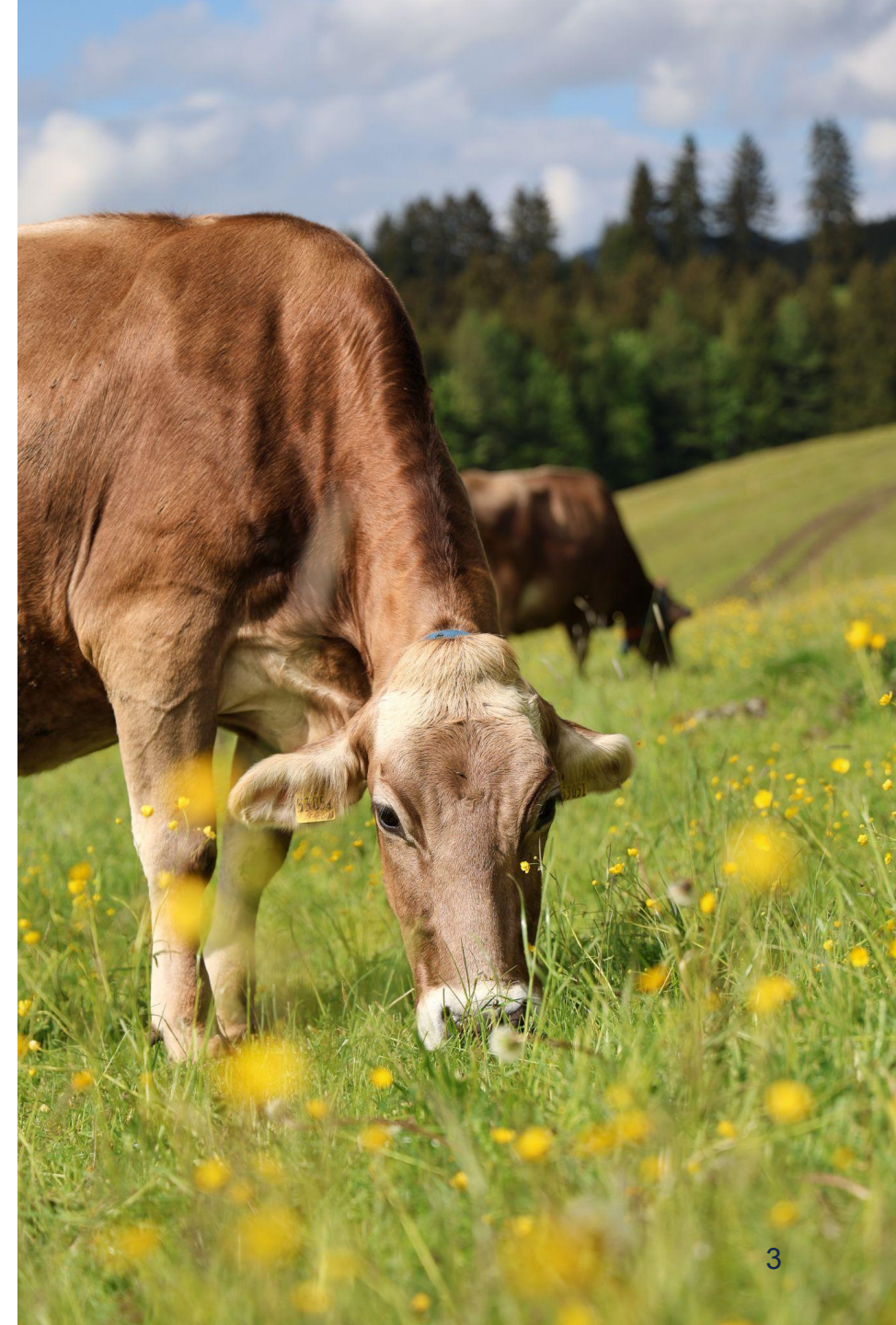
**Caleb, 27, took over his family's row-crop and dairy farm outside Blades, DE last spring. *He's here for a physical he's been putting off for two years.***

A required well test for his farm permit came back with PFAS levels far above the state health advisory. Soil samples from his fields followed; the county traced it to a shuttered metal-finishing plant a half-mile upstream.

## What He Asks You

**“I've drunk this water my whole life. My dad still lives in the farmhouse. What does that mean for us?”**

This isn't a conversation about background-exposure; it's a documented source that impacts water, soil, and homegrown food, for two generations. Where do you start?





# Agenda

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-  Describe the health implications of PFAS exposure and the current limits of clinical treatment.
-  Apply NASEM's tiered framework to decide when to test and monitor PFAS exposed patients.
-  Evaluate the evidence for dietary and pharmacologic interventions that modestly reduce serum PFAS.
-  Counsel patients on practical, source-specific exposure-reduction strategies for water, food, and household products.
-  Identify unproven or potentially harmful “PFAS detox” recommendations to avoid in practice.
-  Apply an equity-informed counseling framework to translate PFAS evidence into an individualized patient plan.



# Where Today Has Taken Us



## Exposure & pathways

How PFAS move through water, soil, food, and consumer products (Schaider & Brown)



## Testing & public health response

State blood-testing programs and what they teach us about screening at scale (Pennoyer)



## Bioaccumulation & persistence

Why these chemicals behave so differently in the body across communities (Ng, DeWitt)



## Lifelong impact

Childhood exposure and the outcomes that follow people for decades (Fenton)



**The bridge:** PFAS are pervasive and persistent; we're learning more and more about the outcomes of exposure.

*That doesn't answer the question, "What do I do now?"*



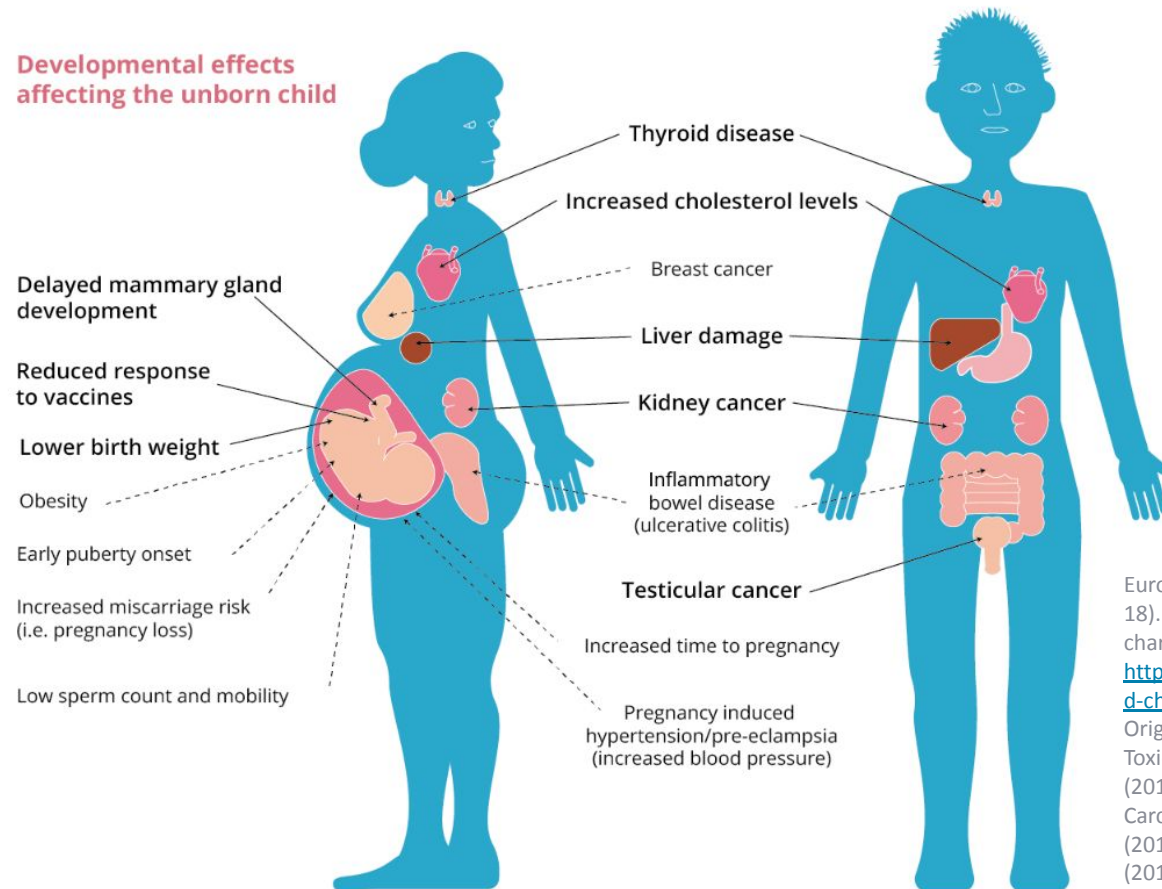
# Part 1 - Foundations



# If You're New Here....

— High certainty  
 ---- Lower certainty

## Developmental effects affecting the unborn child



European Environment Agency. (2025, December 18). Effects of PFAS on human health | Maps and charts. European Environment Agency Website. <https://www.eea.europa.eu/en/analysis/maps-and-charts/effects-of-pfas-on-human-health>  
 Original sources for this figure: National Toxicology Program (2016), C8 Science Panel (2012), IARC Working Group on the Evaluation of Carcinogenic Risks to Humans (2017), Barry et al. (2013), Fenton et al. (2009), and White et al. (2011b).



# The Baseline



***“No approved medical treatments are available to remove PFAS from the body.”***

— National Academies of Sciences, Engineering, and Medicine (NASEM), Guidance on PFAS Exposure, Testing, and Clinical Follow-Up, 2022

## So what can a clinician offer?

- 01 Counsel on exposure reduction**  
The best-supported action available today
- 02 Support the body's own elimination pathways**  
Nutrition plays a real (but modest) role here
- 03 Screen and monitor according to exposure level**  
Shared decision-making



# From Testing to Action: The Clinical Framework

The higher two tiers are where diet, water, and lifestyle counseling become clinically relevant →

**< 2 ng/mL**

**Usual standard of care**

No PFAS-specific action indicated beyond general preventive care.

**2 – < 20 ng/mL**

**Exposure-reduction counseling**

Screen for dyslipidemia, hypertension, particularly in pregnancy.

**≥ 20 ng/mL**

**Enhanced monitoring**

Add kidney, testicular, breast cancer; thyroid; and ulcerative colitis screening as clinically indicated; consider medical elimination options.

Sources: NASEM, *Guidance on PFAS Exposure, Testing, and Clinical Follow-Up* (2022) · ATSDR, *PFAS Information for Clinicians* (2024)



# The Nutrition Paradox



## Elevated

Higher in  
burden—  
maintaini

Degree of food processing and serum poly- and perfluoroalkyl substance concentrations in the US National Health and Nutrition Examination Survey, 2003–2018

Diana C. Pacyga <sup>a</sup> , Jessie P. Buckley <sup>a</sup>, Euridice Martinez-Steele <sup>b</sup>, Paige A. Bommarito <sup>c</sup>, Kelly K. Ferguson <sup>c</sup>, Danielle R. Stevens <sup>c</sup> [Show more](#)

## Significance

Unprocessed/minimally processed foods, more than ultra-processed, were associated with serum PFAS concentrations. Efforts should focus on eliminating PFAS from multiple parts of the food chain.

reflecting  
that diet

***“It's a little disappointing that if we were to make recommendations for people to focus on eating unprocessed foods, that it doesn't solve this issue.”***

— Dr. Jessie Buckley, UNC Gillings, study co-author

Pacyga et al. (Aug 2025) · NHANES 2003–2018, n>11,000



# The Nutrition Paradox



## Ultra-processed diets

### Elevated Blood PFHxS & MeFOSAA

Higher intake was linked to elevated body burden—**especially in adolescents** and individuals maintaining a normal to low body weight.



## Minimally processed diets

### Elevated PFDA & PFUnDA

Healthy diets still showed elevated body burden—likely reflecting **water, soil, and animal-product pathways** that diet quality alone cannot resolve.

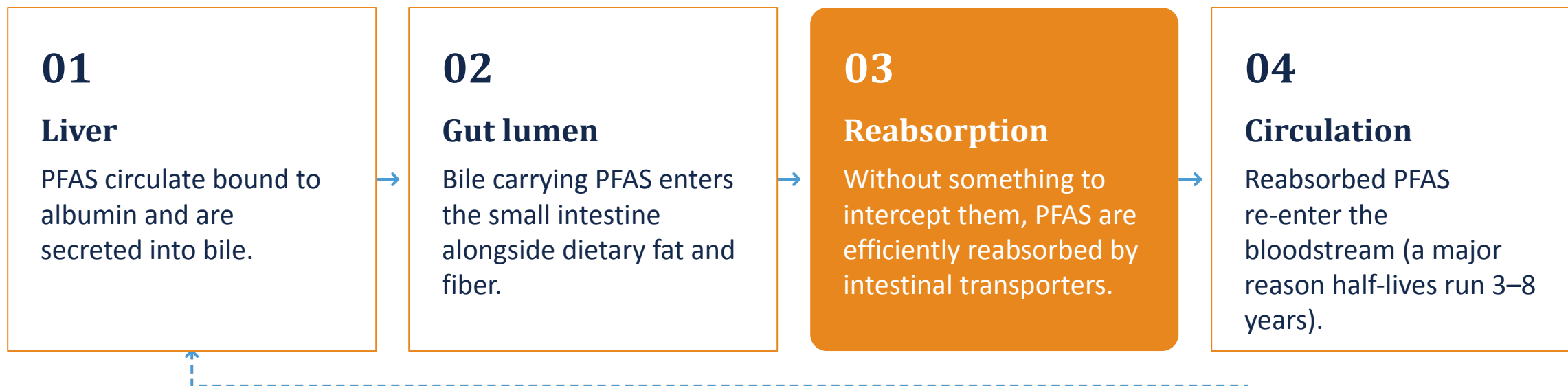
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# Mechanism Spotlight: Why the Gut Is the Target



***Bind something to the bile in the gut—whether it's viscous dietary fiber or a prescription resin—and you can trap PFAS for fecal excretion instead of letting it recirculate.***

ATSDR, Guidance on PFAS Exposure, Testing, and Clinical Follow-Up (2024) · Andersson et al., Environment International (2025) · Andersen et al. (2021)





# Part 2 - Evidence



# Evidence Tier 1: Dietary Fiber

EVIDENCE: EMERGING



## Observation

Fiber-rich, fruit-and-vegetable-forward dietary patterns associate with lower serum PFAS across multiple cohorts (Dzierlenga 2021; Lin 2020; Seshasayee 2021).



## Mechanism

Oat  $\beta$ -glucan—a viscous, fermentable fiber—was associated with lower serum PFAS in a re-analysis of a cholesterol trial, and with reduced PFAS body burden in a mouse model (Schlezingner 2025).



## Mirrors Bile Acid Mechanism!

### Cholesterol lowering pathway

Fiber binds bile acids in the gut lumen—the same pathway PFAS travel—increasing fecal loss of both PFAS and cholesterol.



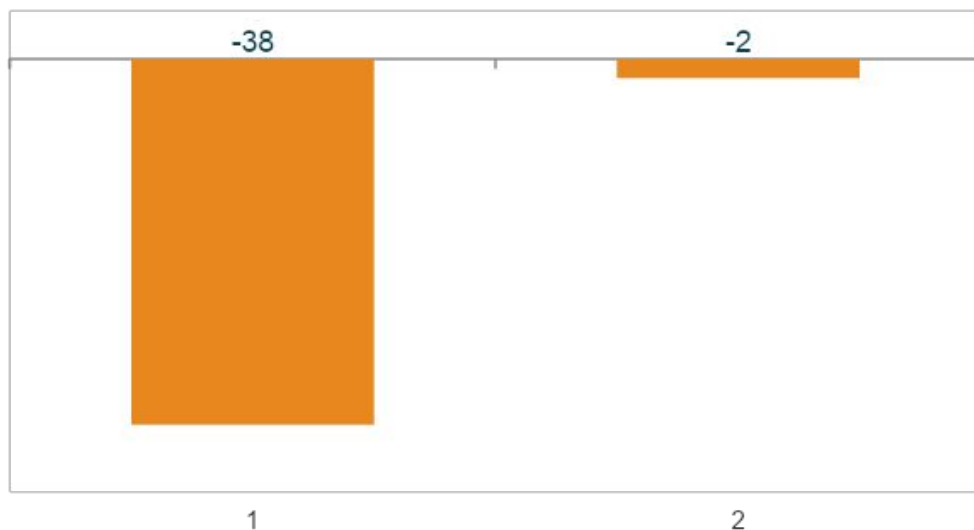
**Practical takeaway:** *A fiber-forward diet is well-supported for cardiometabolic health regardless of PFAS. Recommend it on that basis, with this as a bonus!*

*Dzierlenga et al. (2021) · Lin et al. (2020) · Schlezingner et al. (2025) · Seshasayee et al. (2021)*



## Evidence Tier 2: Bile-Acid Sequestrants

Serum PFOS decline, Ronneby crossover trial (2025)



### Colesevelam

~38% mean serum PFOS decline over 12 weeks in highly-exposed adults vs. ~2% in the control period (Ronneby, Sweden crossover trial, 2025)



### Cholestyramine

Consistently lowers serum PFOS across a case series (Genuis), a 56,175-person cohort (Ducatman, C8 Health Project, 2021), and NHANES analysis (~15% lower in users).



***These are prescription medications for highly exposed patients under medical supervision**—not an over-the-counter or self-directed nutrition strategy. The clinician's role in the future: identify appropriate candidates, coordinate with a prescriber if necessary, and manage GI tolerability and fat-soluble vitamin absorption during treatment.*

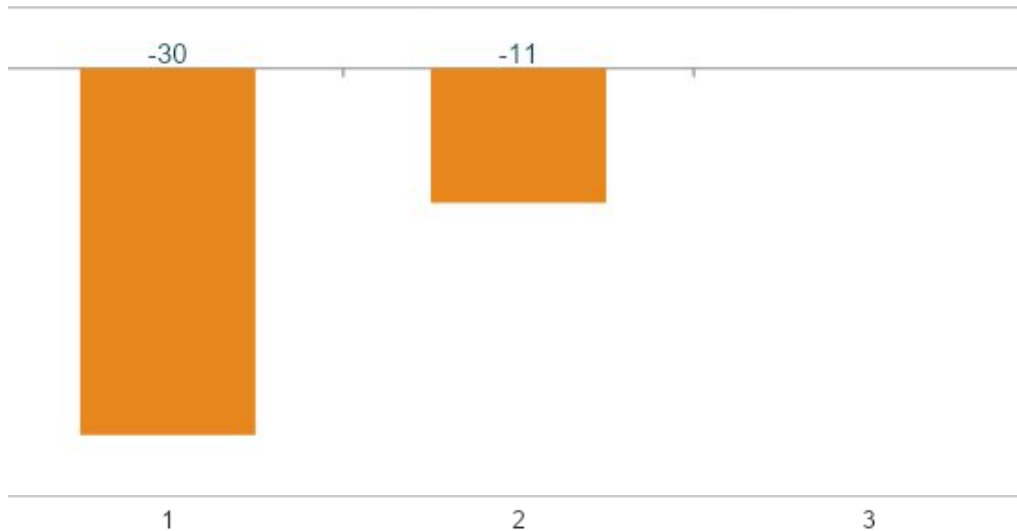
Andersson et al. (2025) · Ducatman et al. (2021) · Genuis et al. (2013)

EVIDENCE: MODERATE (RCT)



## Evidence Tier 3: Blood and Plasma Donation

Serum PFOS change at 12 months (n=285 firefighters)



### Gasiorowski et al. (JAMA Network Open, 2022)

Open-label RCT of 285 Fire Rescue Victoria firefighters with elevated PFOS, randomized to plasma donation, blood donation, or observation over 12 months.



### Clinical Benefit & Motivation

A dual-benefit option to raise with eligible, exposed donors: it actively reduces personal PFAS body burden while critically supporting the community blood supply.



**Clinical Practice Recommendation** This was studied specifically in occupationally-exposed adults (firefighters). Generalizability to lower-exposure patients and long-term health benefits are still being studied—it's a personal decision, not a default recommendation.



# The Ethics of Blood and Plasma Donation



## The case for offering it

### A real, evidence-backed option

The only randomized trial to date (Gasiorowski 2022) showed both blood and plasma donation **meaningfully lowered** serum PFOS in highly exposed firefighters—a concrete, low-risk action for a motivated patient.



## The tension it raises

### Whose blood supply is it?

Blood and plasma are shared, altruistic resources. Donating primarily to lower one's own PFAS level means that donation—PFAS and all—reaches a recipient who has no say in whether they receive blood with high PFAS levels. Blood banks do not currently screen or disclose PFAS content.



**Clinical Practice Concern** Access to this option isn't equal—it favors patients who are otherwise healthy enough to donate regularly. It also treats a shared public resource as a personal exposure-reduction tool, while potentially putting recipients at risk.



# Part 3 - Action

# Testing



| Lab                                                                     | # of PFAS tested | Reporting limit                                                                                | Testing procedure                                                                                                                                                                          | Cost                                                                      | Notes                                                     | Sample report                                                              |
|-------------------------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------|
| <b>Labs that work directly with individuals</b>                         |                  |                                                                                                |                                                                                                                                                                                            |                                                                           |                                                           |                                                                            |
| <a href="#">EmpowerDX At-Home PFAS Blood Test (Eurofins subsidiary)</a> | 16 PFAS          | Reporting limit: 0.1-0.5 ng/mL<br>Method detection levels (MDLs) range from 0.05 - 0.144 ng/mL | - Order online, delivered to your home in 5 business days<br>- Complete finger prick and mail it to the company's lab via FedEx with a prepaid shipping label<br>- Whole blood test        | -\$249 per test                                                           | - 90 business days turnaround time                        | <a href="#">View sample report</a> (Will only include CDC NHANES analytes) |
| <a href="#">PFAS Exposure Blood Test (Eurofins)</a>                     | 45 PFAS          | Reporting limit: 0.1-0.5 ng/mL<br>Method detection levels (MDLs) range from 0.05 - 0.144 ng/mL | - Complete finger prick and mail it to company's lab. Samples are directed to Eurofins Sacramento.<br>- Serum tests are available (see website).                                           | -\$425 per test, including kit and shipping both ways                     | - Does not have capacity to take large batches of samples | <a href="#">View sample report</a>                                         |
| <a href="#">Quest Diagnostics PFAS Test Panel (Quest)</a>               | 9 PFAS           | 0.1 ng/mL                                                                                      | - Must be 18 years or older<br>- Sample collection can be at-home (with a mobile phlebotomist) or in-person at a Quest facility<br>- Purchases not permitted in Alaska, Arizona, or Hawaii | - \$315 per test<br>- Additional fees may apply, including in-home visits | - 7-10 business days turnaround time                      | <a href="#">View sample report</a>                                         |

PFAS-REACH (Research, Education, and Action for Community Health): Silent Spring Institute, Northeastern University, Michigan State University, Testing for Pease, Massachusetts Breast Cancer Coalition, and Slingshot.  
[https://docs.google.com/spreadsheets/d/1kUdZlKpA-claKbEww\\_7vm8\\_l1q6kOu-r3zErXwYwr08/edit?gid=346039373#gid=346039373](https://docs.google.com/spreadsheets/d/1kUdZlKpA-claKbEww_7vm8_l1q6kOu-r3zErXwYwr08/edit?gid=346039373#gid=346039373)



# The PFAS Conscious Plate

EVIDENCE: SYNTHESIS



## Fiber-Forward Foods

Oats, legumes, fruits, and vegetables interrupt PFAS's gut reabsorption—the same pattern already supported for cardiometabolic health (Dzierlenga et al., 2021; Schlezinger et al., 2025).



## Fermented & Probiotic-Rich Foods

Probiotic foods support intestinal and metabolic health broadly. This is a general nutrition rationale, not a PFAS-specific finding—but we are beginning to see some connections between the microbiome, probiotics, and PFAS. (Liao et al., 2023)



## Lean, Thoughtfully Sourced Protein

Poultry, legumes, and fish support weight and metabolic health without added processed, high-fat animal products.



**Clinical Practice Recommendation** *Even a fiber-forward, whole-food diet still carries some PFAS (Pacyga et al., 2025). Recommend it anyway: fiber measurably reduces PFAS reabsorption (Dzierlenga et al., 2021) and guards against the outcomes PFAS is linked to—dyslipidemia (Andersen et al., 2021) and renal cell carcinoma, tied to both PFAS (Shearer et al., 2021) and excess body fatness (Lauby-Secretan et al., 2016).*

Andersen et al. (2021) · Dzierlenga et al. (2021) · Shearer et al. (2021) · Liao et al. (2023) · Lauby-Secretan et al. (2016) · Pacyga et al. (2025) · Schlezinger et al. (2025)



# Top Dietary Sources: Moderation/Variation are Key



## Fish/Shellfish

Marine and freshwater fish accumulate PFAS from contaminated water and sediment.



## Eggs/Egg Products

Poultry can ingest PFAS through soil, feed, or water, leading to detectable levels in eggs (with higher concentrations sometimes noted in free-range or organic eggs).



## Fruit/Fruit Products

Crops irrigated with contaminated water or grown in impacted soils can absorb trace amounts of PFAS.



## Meat and Offal (Liver)

Organ meats, particularly game meat, and liver products, can also significantly contribute to dietary intake depending on local environmental contamination.



**Clinical Practice Consideration** *The European Food Safety Authority (EFSA, 2020) has established a group Tolerable Weekly Intake (TWI) of 4.4 nanograms per kilogram of body weight per week, primarily driven by evidence that PFAS weakens the immune system and “other potential adverse affects”—that’s **1-2 servings of highly contaminated fish/meat per week**. There is no equivalent assessment for TWI in the US.*

EFSA (2020) · Gyllenhammar et al. (2026)



# Fish: A Balancing Act



## The case for fish

- **Best dietary source of omega-3s** (EPA/DHA)
- **Protective** for cardiovascular & neurodevelopmental outcomes
- **Cooking reduces**—but doesn't eliminate—PFAS in fish (~29% avg. reduction) (Vendl et al., 2016)



## The exposure consideration

- **Top dietary route** for PFAS exposure via fish & seafood (EFSA)—driven by different compounds than tap water (Pennoyer et al., 2025)
- **State advisories updated** in 2025–26 (ME, MN, CO, MT, WI, NH & others)
- **Self-caught fish** are targeted most by local and state health guidelines



**Counseling Recommendation** *Know your source and check your state's advisory, don't avoid fish. Especially for pregnant patients and children, help them find their state's specific guidance for recreationally caught fish—store-bought fish carries comparatively less-studied but generally lower risk.*

EFSA (2020) · State advisories (Maine CDC, MN Dept. of Health, CO CDPHE, 2025–26) · Pennoyer et al. (2025) · Vendl et al. (2016)



# Kitchen-Level Actions

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## Cook at home more often

Frequent fast-food, takeout, and restaurant meals associate with higher serum PFAS—likely from heat/oils facilitating the uptake of PFAS from packaging (Susmann et al., 2019).



## Retire scratched nonstick cookware

Worn PTFE coatings can leach into food. Stainless steel and cast iron are reliable PFAS-free choices; “ceramic” and “PFAS-free” labels aren't always PTFE-free—check certifications.



## Limit grease-resistant packaging

To-go containers, pizza boxes, and microwave popcorn bags historically used PFAS coatings. FDA's 2024 phase-out helps going forward, but legacy stock remains in circulation.



## Skip plastic for hot food and liquids

Heating food or drinks in plastic containers can release PFAS and other chemicals—use glass or stainless steel when reheating.

*FDA Constituent Update (Feb 2024) · Pacyga et al. (2025) · Susmann et al. (2019)*

# Kitchen-Level Actions



## Cook at home more often

From heat/oils facilitating the uptake of PFAS

Cooking can reduce PFAS levels, but only because the PFAS leach into cooking oil/water. (Cooking doesn't break the C-F bond.) Drain oils/juices/broth, rather than eating them, to retain the benefit! (Vendl et al., 2022)



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# Water: Research, Test, and Filter

# 176M

## Americans Impacted

with detectable PFAS in tap water  
—nearly half the U.S. population

1

### Choose certified filtration

Granular activated carbon (GAC) or reverse osmosis (RO) reduce PFAS—a certified GAC filter removed 97–99% of PFAS over 8 months in an NC well-water study (Mulhern et al., 2021). Look for NSF/ANSI 53/58 certification.

2

### Test private wells

Well water isn't covered by municipal monitoring—patients on wells near industrial or agricultural sites should consider testing.

3

### Know your community's status

Public water customers can request PFAS results from their utility; EWG's national contamination map is a useful patient-facing tool.



**Relevant close to home:** Delaware DNREC and the Division of Public Health maintain PFAS water-testing data, as do most municipalities; look for local resources for patients. Note: skin contact from bathing or dishwashing is a minor PFAS exposure route. Prioritize ingestion: drinking, cooking, and formula water.

EWG 2024 tap water analysis; EPA, Overview of Drinking Water Treatment Technologies, [epa.gov/sdwa](https://epa.gov/sdwa) · EWG PFAS map, [ewg.org/interactive-maps/pfas\\_contamination](https://ewg.org/interactive-maps/pfas_contamination)



# Lifestage Considerations: Pregnancy and Lactation



## Maternal PFAS Transfer

Both pregnancy and lactation transfer maternal PFAS body burden to the fetus or infant —exactly why NASEM singled out pregnancy-related hypertension for closer screening.



## CDC and AAP continue to recommend breastfeeding for most patients

Despite documented PFAS transfer through breast milk, breastfeeding's well-established benefits mean this is a **shared decision-making conversation**, not a default recommendation toward formula.

*ATSDR notes research on PFAS levels in breast milk and formula is still catching up to real-world clinical need.*



## The Clinician's Role

This is one of the more anxiety-provoking conversations patients bring to us.

The clinician's and RDN's shared role is **informational support and reassurance** grounded in evidence—not alarm, and not false certainty in either direction.



# What Not to Recommend



## “Detox” protocols

Cleanses, activated-charcoal regimens, and infrared sauna programs marketed for PFAS have no supporting human clinical evidence—and some carry real risk of electrolyte disturbance, dehydration, or drug interaction. (Klein & Kiat, 2015)



## Blanket avoidance of fish, dairy, or produce

Even minimally processed diets showed elevated PFAS in the UNC data, but avoidance risks nutritional inadequacy without clear benefit. (Pacyga 2025, Petali 2024)



## Unsupervised high-dose fiber or off-label sequestrant use

Can cause GI distress and impair absorption of fat-soluble vitamins (A, D, E, K) and some medications when unmonitored. (Lent-Schachet 2023)



**Key Message:** *the evidence supports incremental exposure reduction, **not detoxification.***

Klein & Kiat (2015) · Lent-Schochet & Jialal (2023) · Pacyga et al. (2025) · Petali et al. (2024)



# The Equity Lens

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## Cost & Time Barriers

**Most of today's "individual" actions carry both cost and time:** *RO filtration systems, PFAS-free cookware, more home-cooked meals, private well testing*

Communities closest to contamination sources—near military bases, industrial sites, and farmland where biosolids are applied—are disproportionately lower-income and rural and have the least capacity to make these purchases.

## Equitable Solutions

**WIC, SNAP-Ed, and community health workers are underused partners for equitable PFAS counseling.**

*“We really advocate for cleanup and population-based measures that are going to take these chemicals out of foods to begin with, so that it's not up to an individual to have to try to protect themselves.”*

— Dr. Jessie Buckley, UNC Gillings School of Global Public Health



# Action vs. Evidence: A Recap



Axes are this talk's synthesis of evidence discussed in Part 2, not a formal GRADE or USPSTF rating.



# Building Your Bridge: A Counseling Checklist

## 1 Ask

Take a source-focused history: water (well vs. municipal), occupation, hunting/fishing—prioritize documented, high-certainty sources over background exposure.

## 2 Consider testing

Offer PFAS blood testing per NASEM tiers when exposure history warrants it—as a shared decision, not a default.

## 3 Screen by tier

Lipids and BP at 2–20 ng/mL; add kidney, testicular, and breast cancer screening; thyroid screening; as indicated at  $\geq 20$  ng/mL.

## 4 Counsel on reduction

Water filtration, cookware, packaging, fish sourcing, and occupational dust/hygiene when relevant—refer to an RDN for individualized dietary guidance.

## 5 Discuss medical options

Bile-acid sequestrants or blood/plasma donation for selected, highly exposed patients—not routine care; **a lower level isn't a proven health outcome.**

## 6 Follow up & uncertainty

Document, revisit at intervals, and be honest that the science is evolving—patients want partnership, not perfection.



# Back to Danielle

## 1 Ask

Danielle's water comes from a monitored public utility, not a well—no occupational exposure, no household fishing. This is background exposure, not a documented high-certainty source.

## 2 Consider testing

No red flags for elevated exposure—no need to test. The conversation is reassurance, not a lab order.

## 3 Screen by tier

With no elevated exposure history, usual preventive care applies. No PFAS-specific screening is indicated today.

## 4 Counsel on reduction

A certified GAC or RO filter for drinking and cooking water, more home-cooked meals, and retiring scratched nonstick pans—concrete steps!

## 5 Discuss medical options

Not applicable here—sequestrants and donation are for highly exposed patients, not background-level, utility-monitored exposure.

## 6 Follow up & uncertainty

Document the visit, invite her back with questions, and be honest about how the science is evolving.



# Back to Caleb

## 1 Ask

Caleb's well and soil are a documented, high-certainty source—not background exposure, like Danielle's. History includes decades of drinking water and homegrown food from the same land.

## 2 Consider testing

A real number can give Caleb and his family something concrete to act on, not just worry about.

## 3 Screen by tier

Given this exposure history, expect the higher tiers—kidney, testicular, thyroid, and ulcerative colitis screening likely join lipids and blood pressure.

## 4 Counsel on reduction

Filtered water for drinking and cooking; eating a high fiber diet. Eating food from the farm needs a longer conversation—refer for soil testing, remediation.

## 5 Discuss medical options

Caleb is young, healthy, and donor-eligible. Blood or plasma donation is an evidence-backed option.

## 6 Follow up & uncertainty

Document, refer to occupational/environmental health, and plan ongoing monitoring—this is a long exposure history that won't resolve in one visit. Also discuss family care.



# Resources and Referral Pathway

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**ATSDR — PFAS Information for Clinicians (2024)**

<https://www.atsdr.cdc.gov/pfas/hcp/clinical-overview/index.html>



**ATSDR — PFAS Blood Level Estimation Tool**

<https://www.atsdr.cdc.gov/pfas/blood-testing/estimation-tool.html>



**NASEM — Guidance on PFAS Exposure, Testing & Clinical Follow-Up (2022)**

<https://www.nationalacademies.org/read/26156>



**EWG — National PFAS Contamination Map**

[https://ewg.org/interactive-maps/pfas\\_contamination](https://ewg.org/interactive-maps/pfas_contamination)



**Find a Registered Dietitian Nutritionist**

<https://eatright.org/find-a-nutrition-expert>



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# Thank You

*Questions & Discussion*

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