



# PFAS Risk Assessment/Non-Drinking Water Exposure

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NH Hazardous Waste & Contaminated Sites Webinar Series  
November 10, 2021



# NHDES Environmental Health Program & Risk Assessment

*The Environmental Health Program specializes in evaluating how people are exposed to harmful chemicals found in their environment.*

## **Jonathan Petali, Ph.D. Toxicologist (Formerly “Ali”)**

- **Karen Craver, M.P.H., Administrator**  
Environmental Justice, Program Planning & Partnerships, Community Engagement
- **David Larson, M.P.H., Human Health Risk Assessor**  
Air Toxics, Site-Specific Assessment, Soil Guidance
- **Mary Butow, M.S., Human Health Risk Assessor**  
Ambient Groundwater Quality Standards (AGQS), Literature Review
- **Robert Thistle, Ph.D., Principal Investigator**  
ATSDR, Superfund Sites, Community Engagement

# Health Risks Associated with Per- and Polyfluoroalkyl Substances (PFAS)

- Increased cholesterol levels
- Changes in liver enzyme levels
- Small changes in infant birth weight
- Altered immune system function
- Increased risk of high blood pressure or pre-eclampsia in pregnant women
- Changes in thyroid and/or reproductive hormones
- Possibly increased risks for kidney or testicular cancer

PFAS-related health effects are being studied nationwide by the **Agency for Toxic Substances and Disease Registry (ATSDR)**, as well as private and academic institutions.

This is a **constantly evolving area of scientific research**. For more information from ATSDR, follow this link: <https://www.atsdr.cdc.gov/pfas/index.html>

# Risk Assessment 101: Primary Routes of Exposure & Relevant Environmental Media

## Ingestion

### Relevant Media

- Groundwater
- Surface Water
- Soil (Incidental ingestion)
- Biota & Food

*Primary Route of Exposure for PFAS*

## Dermal (Skin) Contact

### Relevant Media

- Groundwater
- Surface Water
- Soils

*Less Significant Route of Exposure for PFAS at Certain Concentrations*

## Inhalation

### Relevant Media

- Ambient Air
- Soil/Dusts
- Vapors

*Least Characterized Route of Exposure for PFAS, and Poorly Understood*

# Per- & Polyfluoroalkyl Substances & Ingestion

## Ingestion

### Relevant Media

- Groundwater
- Surface Water
- Soil
- Biota & Food

### *Primary Route of Exposure for PFAS*

For more technical information:  
Jonathan Petali, Ph.D.  
603-271-1359

### 2019-2020 – Drinking Water **Maximum Contaminant Level (MCL)** and **Ambient Groundwater Quality Standards (AGQS)**

- Based on risks to the infants of pregnant and lactating women with chronic exposure from drinking water.
- State-Derived Reference Doses (RfDs)
- Developed for 4 PFAS: **PFOA (12 ppt)**, **PFOS (15 ppt)**, **PFHxS (18 ppt)** & **PFNA (11 ppt)**

### 2021 - **EPA announced new RfDs for PFBS and GenX**, and is drafting RfDs for other PFAS.

- Will EPA generate Lifetime Health Advisories (LHAs)?
- Will EPA revisit the LHAs for PFOA & PFOS?
- What strategies are there for class-based approach to PFAS?

# Per- & Polyfluoroalkyl Substances & Ingestion

## Ingestion

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### *Primary Route of Exposure for PFAS*

For more technical information:  
David Larson, M.P.H.  
603-271-4773

### 2019 – Direct Contact Risk-Based Soil Concentrations:

- Developed for 4 PFAS:
  - Residential Scenario – PFOA (0.2 mg/kg), PFOS, PFHxS and PFNA (0.1 mg/kg)
  - Construction Scenario – PFOA (1.3 mg/kg), PFOS (0.6 mg/kg), PFHxS and PFNA (0.9 mg/kg)
- Combination of Incidental Ingestion & Skin Contact
- Full Information Available at: <https://www4.des.state.nh.us/nh-pfas-investigation/wp-content/uploads/PFAS-DCRB-value-121119.pdf>

### 2021 and Future Issues

- Other PFAS – e.g. GenX & PFBS
- Impacts to home produce and agricultural soils? Current topic of USDA and EPA research

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## Ingestion

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2019-2021 – Collaborations with Dartmouth College

- PFAS in Shellfish Sampling (Oysters, Mussels, Clams)
- PFAS in Gulf of Maine Fish & NH Fish Consumption Survey
- Primary Partners – Dr. Celia Chen & Dr. Megan Romano

2020-2021 – Freshwater Fish Tissue Sampling

- Contracted with Weston Solutions, Inc.
- Sampling of 14 NH Lakes for Water, Sediment & Fish Tissue
- Issued Fish Consumption Advisories for 5 Waterbodies
- More information at:
  - Weston Solution Report - <https://www4.des.state.nh.us/nh-pfas-investigation/?p=1405>
  - NHDES Fish Advisories - <https://www.des.nh.gov/news-and-media/nhdes-issues-new-fish-consumption-advisories-5-lakes-southern-new-hampshire>

# Per- & Polyfluoroalkyl Substances & Dermal Contact

## Dermal (Skin) Contact

### Relevant Media

- Groundwater
- Surface Water
- Soils

### *Less Significant Route of Exposure*

For more technical information:  
Jonathan Petali, Ph.D.  
603-271-1359

2019 – Direct Contact Risk-Based Soil Concentrations:

- Combination of Incidental Ingestion & Skin Contact
- Full Information Available at:

<https://www4.des.state.nh.us/nh-pfas-investigation/wp-content/uploads/PFAS-DCRB-value-121119.pdf>

2019 – Recreational Screening Levels (Swimming):

- Developed on a site-specific basis (e.g. Pease AFB)
- Currently no Surface Water Criteria for PFAS
- Tend to be significantly higher than drinking water guidance

2021 – Knowledge Gaps & Challenges:

- Research is needed to understand the dermal absorption factors (e.g. skin partitioning coefficients)
- Similar challenges with other PFAS & exposure to mixtures



# Per- & Polyfluoroalkyl Substances & Inhalation

## Inhalation

### Relevant Media

- Ambient Air
- Soil/Dusts
- Vapors

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2016-2021 – Major Concern for Residents in Certain Communities

- Benchmarks for Inhalation, or Reference Concentrations (RfCs), vary by state
- Limited information is available for estimating exposure via inhalation

2021 – Knowledge Gaps & Challenges:

- Extrapolating RfCs from RfDs
- Appropriate exposure scenarios & exposure assumptions
- Similar challenges with other PFAS & exposure to mixtures

# Summary

## Ingestion

### Relevant Media

- Groundwater
- Surface Water
- Soil
- Biota & Food

*Primary Route of Exposure for PFAS*

## Dermal (Skin) Contact

### Relevant Media

- Groundwater
- Surface Water
- Soils

*Less Significant Route of Exposure for PFAS at Lower Environmental Concentrations*

## Inhalation

### Relevant Media

- Ambient Air
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*Least Characterized Route of Exposure for PFAS, and Poorly Understood*

## Looking to the Future

- Risk assessment of PFAS will *change with new research*.
- New *EPA toxicity values, health advisories or state legislation* may result in new criteria for certain media.
- *More basic and applied research is needed* to assess risks from dermal contact and inhalation.
- *Local partnerships are helping* to address knowledge gaps.
- *Risk communication is critical*, especially with our affected communities, legislators and the regulated community.

# Questions?

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