**STEEP SCIENCE DAY**
**October 2, 2019, Barnstable, MA**

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**Harvard Chan School of Public Health**

# STEEP

**S**ources, **T**ransport, **E**xposure & **E**ffects of **PFASs**

UNIVERSITY OF RHODE ISLAND
SUPERFUND RESEARCH PROGRAM

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# OBJECTIVES

| | |
|---|---|
| 1 | Fate of perfluoroalkyl substances (PFAS) after absorption |
| 2 | Potential adverse human health effects of PFAS exposure |
| 3 | Options available when PFAS have accumulated in the body |
| 4 | Potential for medical monitoring |

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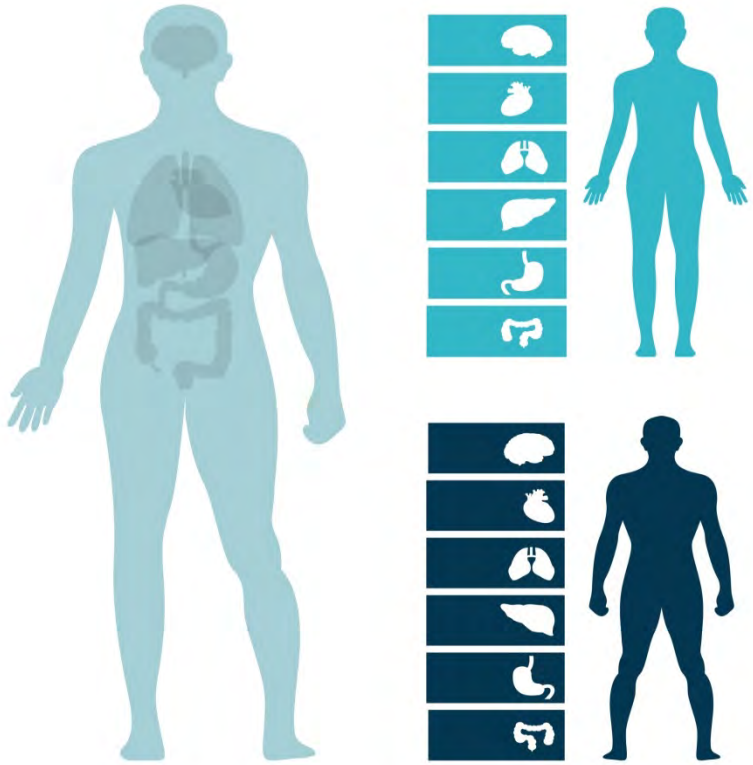
# PFAS Accumulation and Elimination in Humans

- ✓ Bind to protein molecules in serum upon absorption
- ✓ Bioaccumulate throughout the body, not in fatty tissue
- ✓ Renal clearance is very slow, depends on kidney function
- ✓ Short-chain PFAS faster clearance than long-chain PFAS
- ✓ Differences in accumulation in liver, kidney, lungs
- ✓ Detectable in serum, seminal fluid, amniotic fluid, cord blood, breast milk
- ✓ Transfer via placenta and human milk



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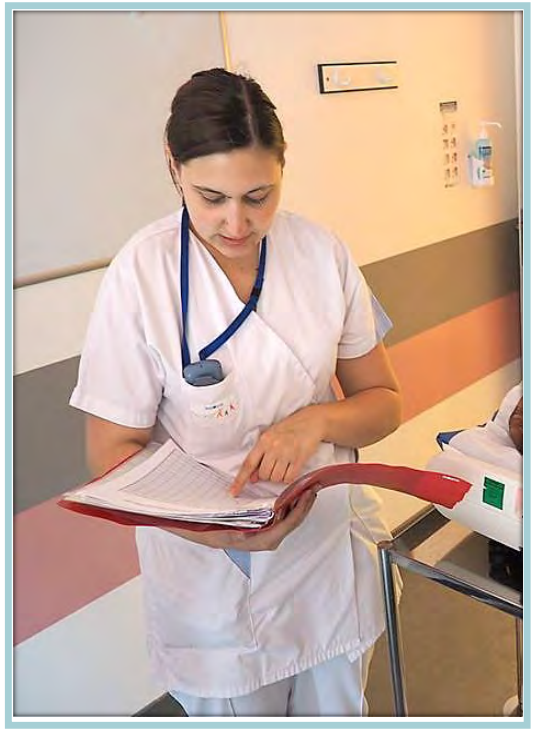
# PFAS Persistence in Humans

- ✓ Elimination half-life in humans: 2.3 to 8.5 years

| PFAS | HALF LIFE |
|---|---|
| Perfluorooctanoic acid (PFOA) | 3.8 years |
| Perfluorooctanesulfonate (PFOS) | 5.4 years |
| Perfluorohexane sulfonic acid (PFHxS) | 8.5 years |

# Potential Health Effects



## HUMAN CHRONIC DISEASE EFFECTS

- Possible associations with:
  - Diabetes
  - Thyroid dysfunction
  - Elevated cholesterol
  - Liver dysfunction
  - Increased body weight and change in fat metabolism
  - Cancer: kidney, testicular, prostate, bladder

*Lauritzen, 2017. Sagiv, 2017*

# Potential Health Effects

## HUMAN REPRODUCTIVE EFFECTS

- Possible associations with:
  - Longer time to pregnancy/reduced fertility
  - Increased risk of pregnancy loss
  - Increased risk of pregnancy induced hypertension, pre-eclampsia, low birth weight
  - Morphologically abnormal sperm and male infertility
  - Lower birth weight

*Fei 2009, Soubry 2014*

# Potential Health Effects

## CHILDHOOD HEALTH EFFECTS

- Possible associations with:
  - Decreased immune response to vaccines
  - Increased risk of overweight/obesity
  - Possible risk of allergies and asthma
  - Changes in puberty development

# Strategies to Deal with Elevated PFAS Body Burdens

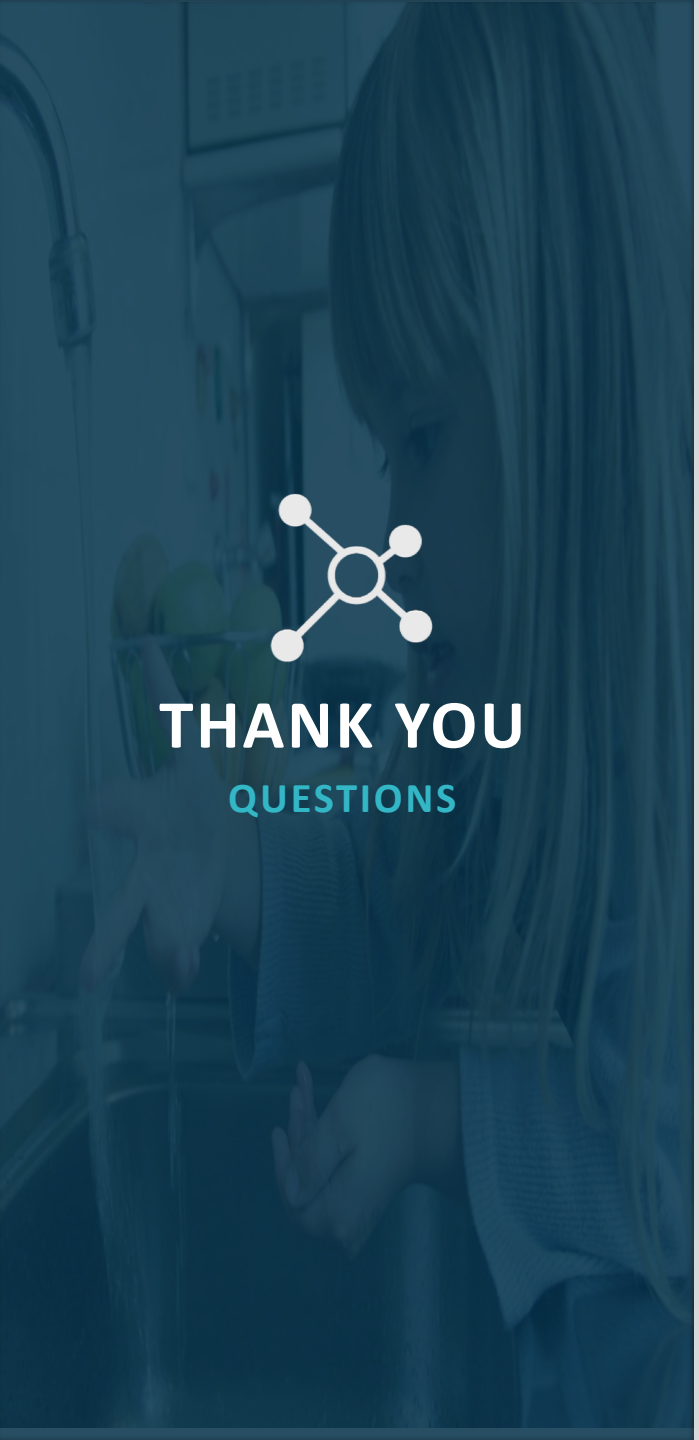
**Response to identification of source of PFAS exposure:**

- Eliminate or minimize the source
- Provide safe alternatives
- If elevated accumulation has occurred, then minimize total exposure
- Long half-lives result in prolonged internal exposure to PFASs
- Due to the presence of PFAS in blood, women of reproductive age and blood donors have lower blood-PFAS concentrations
- Blood donation is not a recommended strategy to eliminate PFASs
- Kidney failure may result in increased elimination via the urine
- No current medical intervention can be recommended to remove PFAS from the body

# Medical Monitoring Options

**Response to identification of elevated PFAS absorption:**

- Eliminate or minimize any continued exposure
- Overall healthy lifestyle will minimize the impact on health
- Regular health checks can be useful in addressing signs of possible ill health
- At elevated PFAS exposure, specific medical tests can be considered:
  - Blood pressure, body weight, serum-lipids, urine stix for glucose
  - Antibody status for measles and other infectious diseases
  - Thyroid function, liver function
  - Tests for certain cancers
  - Possible reproduction intervention
- Decisions should be made by the primary care provider



# THANK YOU

## QUESTIONS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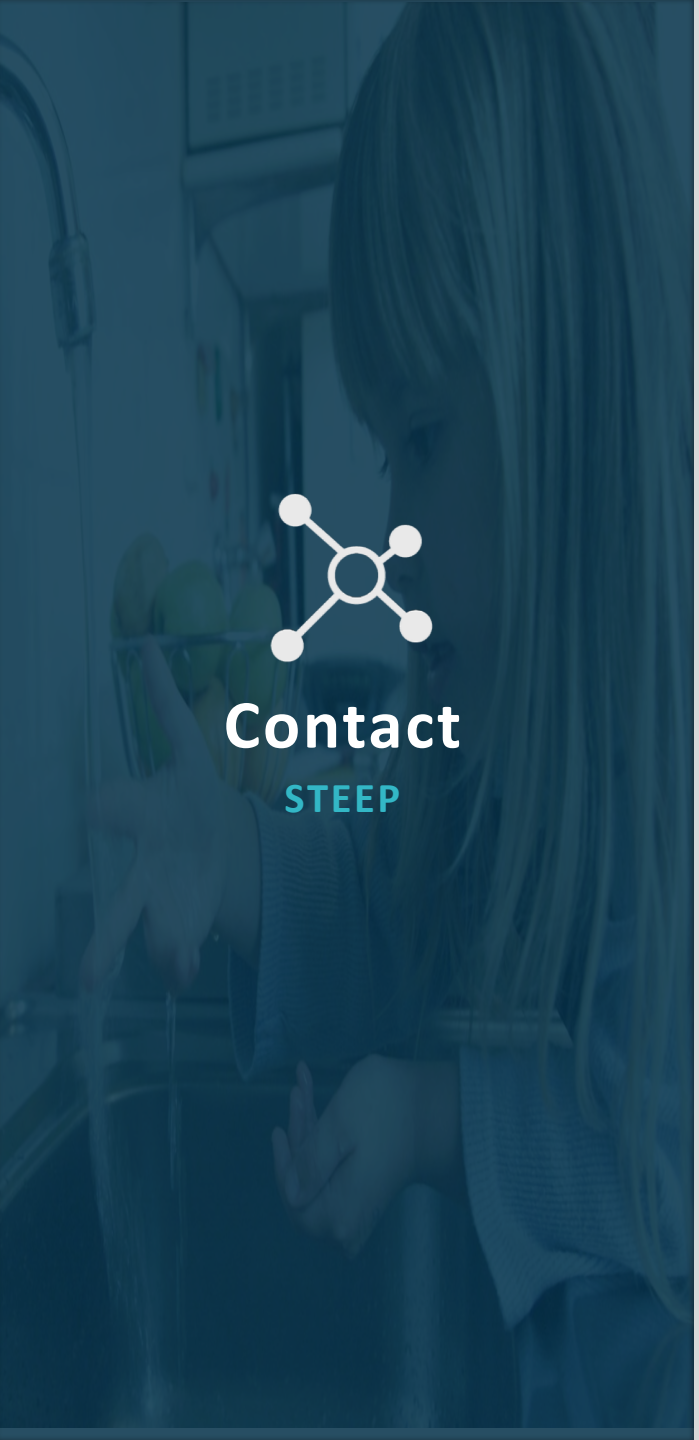

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