Bioaccumulation of PFASs

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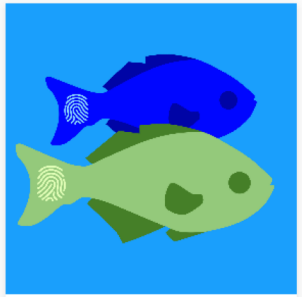
STEEP

Sources, Transport, Exposure & Effects of PFASs

UNIVERSITY OF RHODE ISLAND SUPERFUND RESEARCH PROGRAM

Connecting science and people



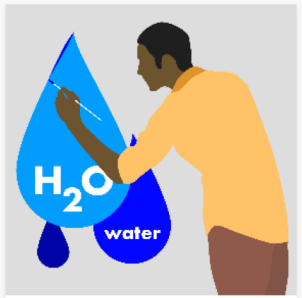
STEEP Research: Environmental Fate & Transport

STEEP Research: Childhood Risk

STEEP Research: Metabolic Effects

STEEP Research: Detection Tools

STEEP Core: Next Generation



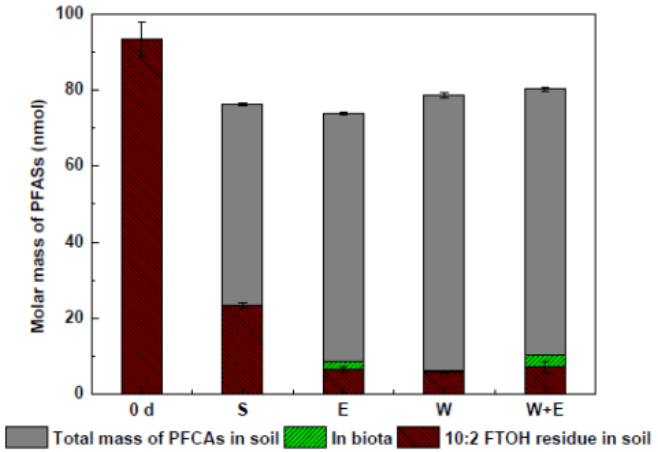
STEEP Core: Research Translation

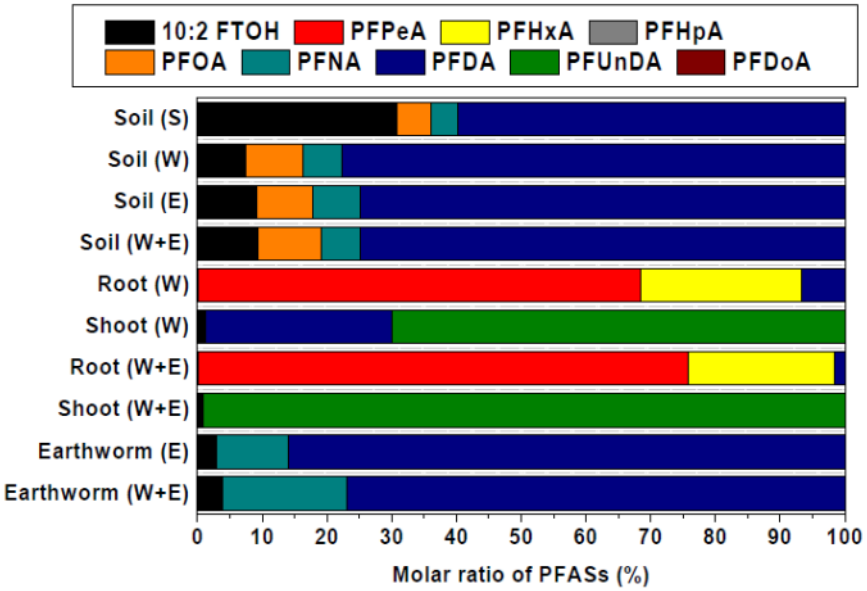
STEEP Core: Community Engagement

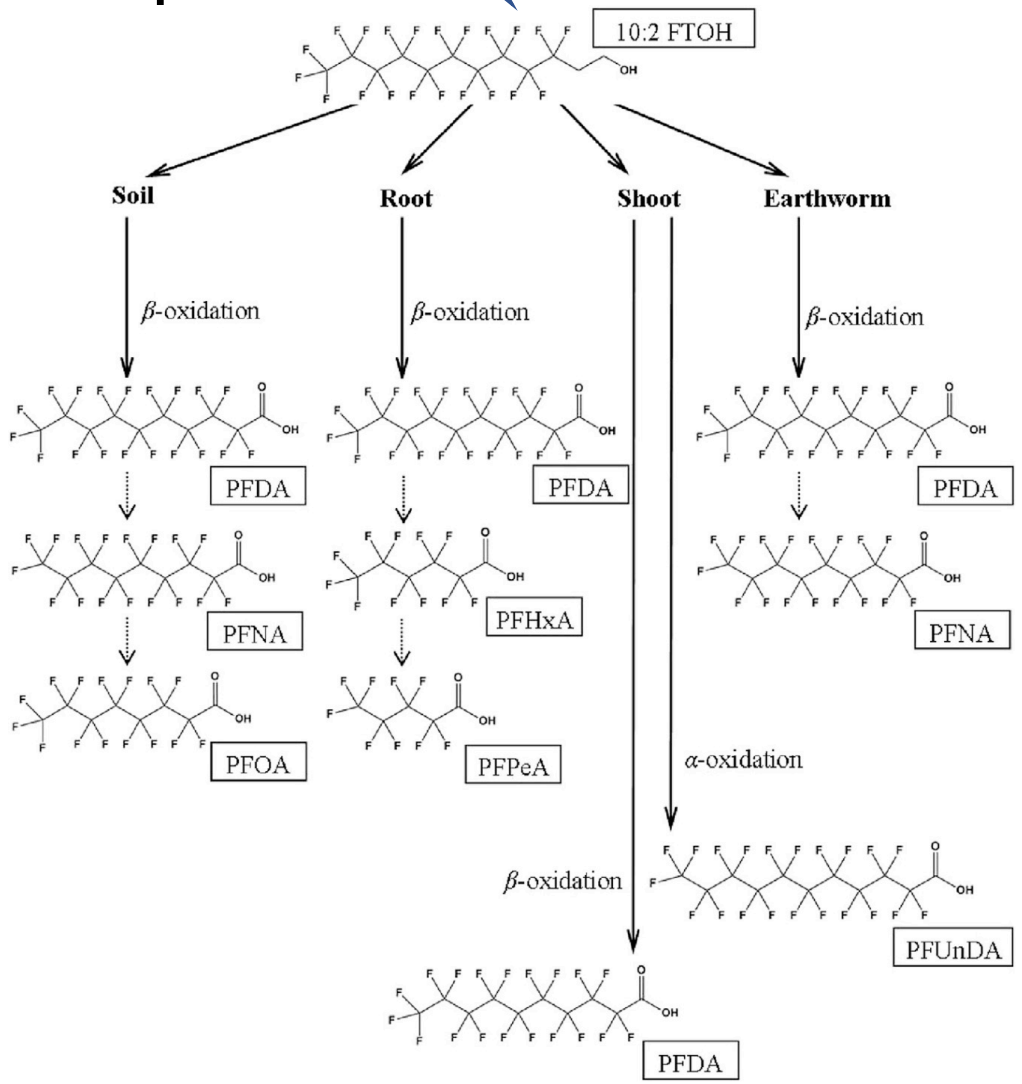
STEEP Core: Administrative

www.uri.edu/steep

Chemists 💙 precursors – plants ⚡ them down



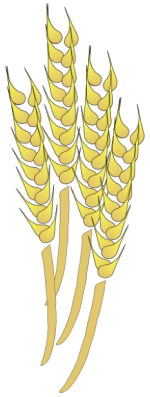


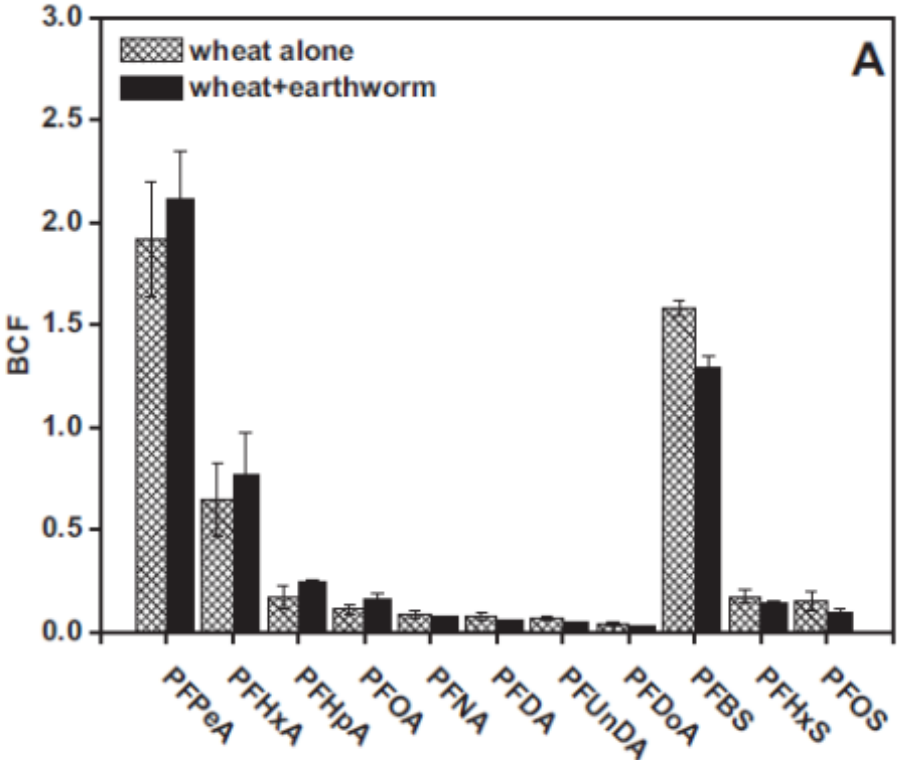


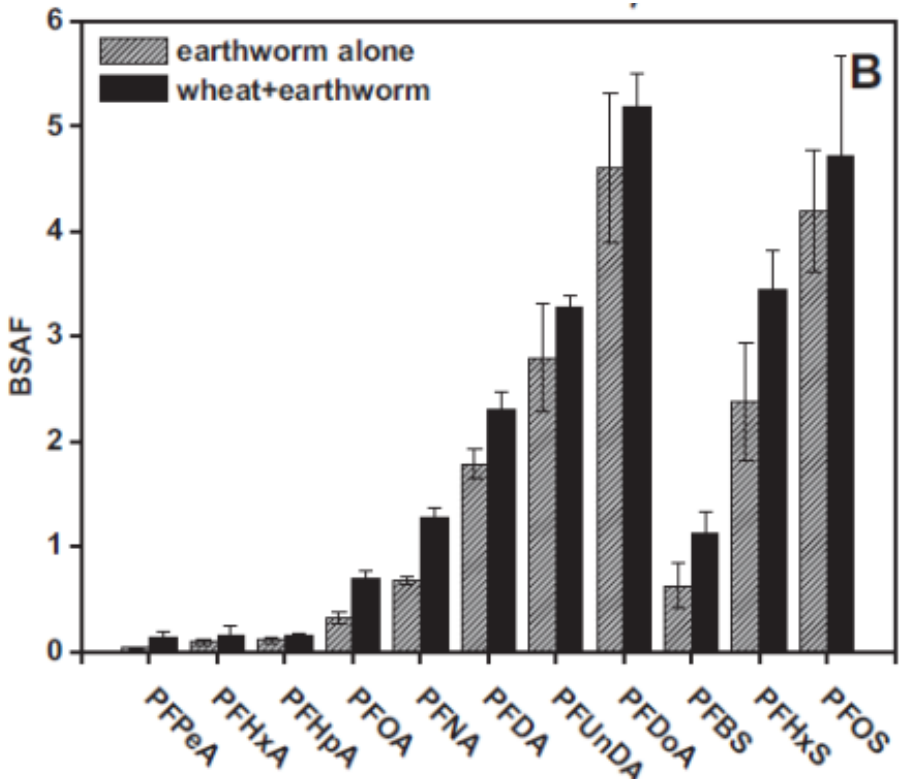
(Zhao and Zhu, 2017)

Worms vs plants.
They share the (PFAS-spoiled soil) spoils

- Plants prefer short-chains;
- worms not so much

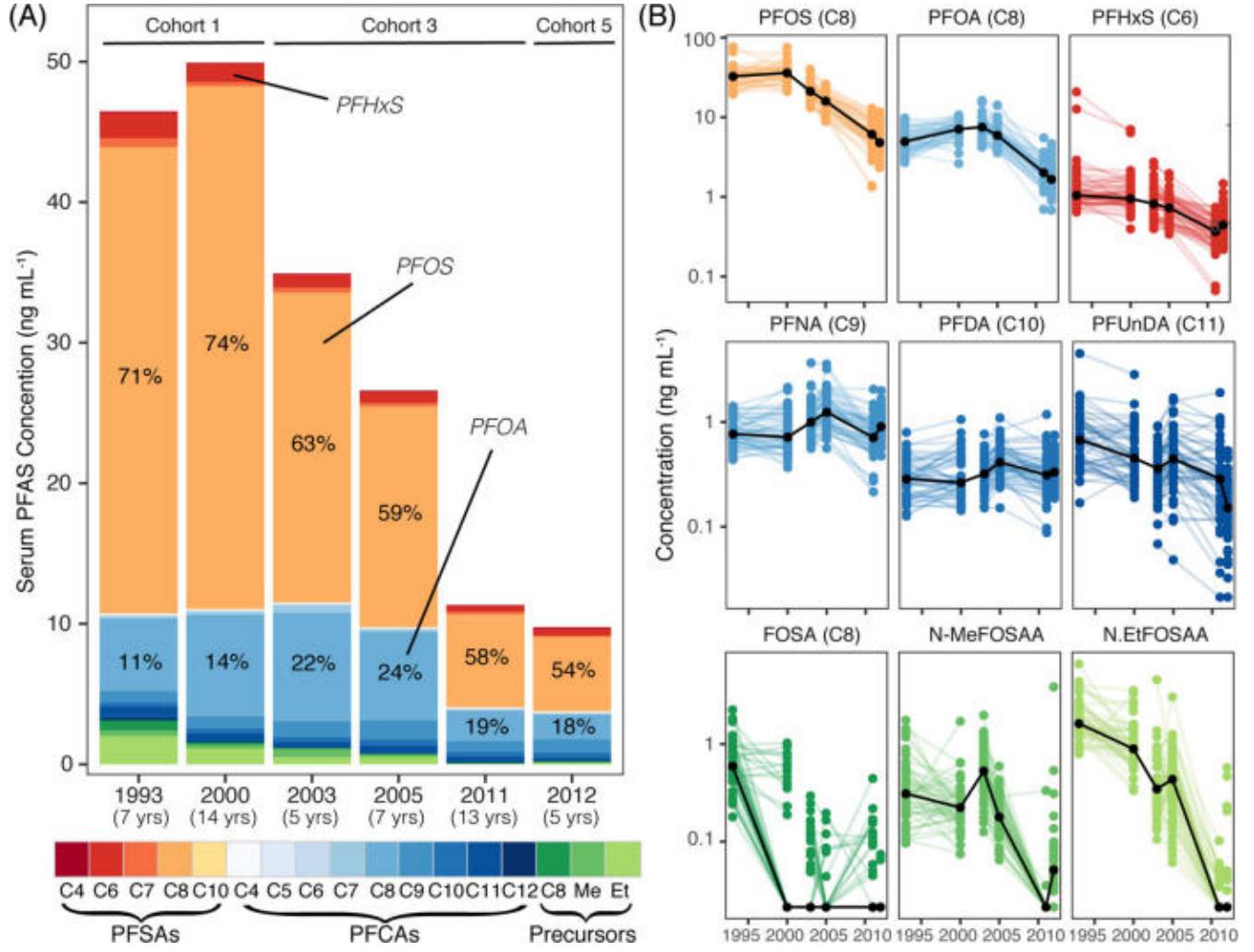






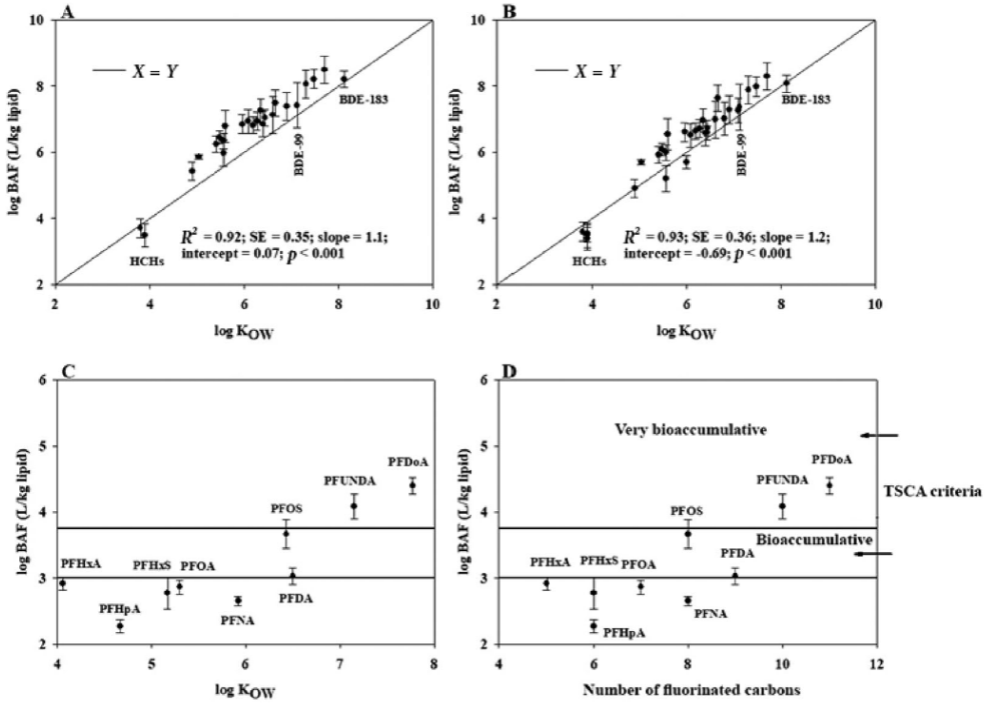
(Zhao et al., 2014)

The usual suspects: PFHxS, PFHpS, PFOS, PFHpA, PFOA, PFNA, PFDA, PFUnDA, Me/EtFOSAA



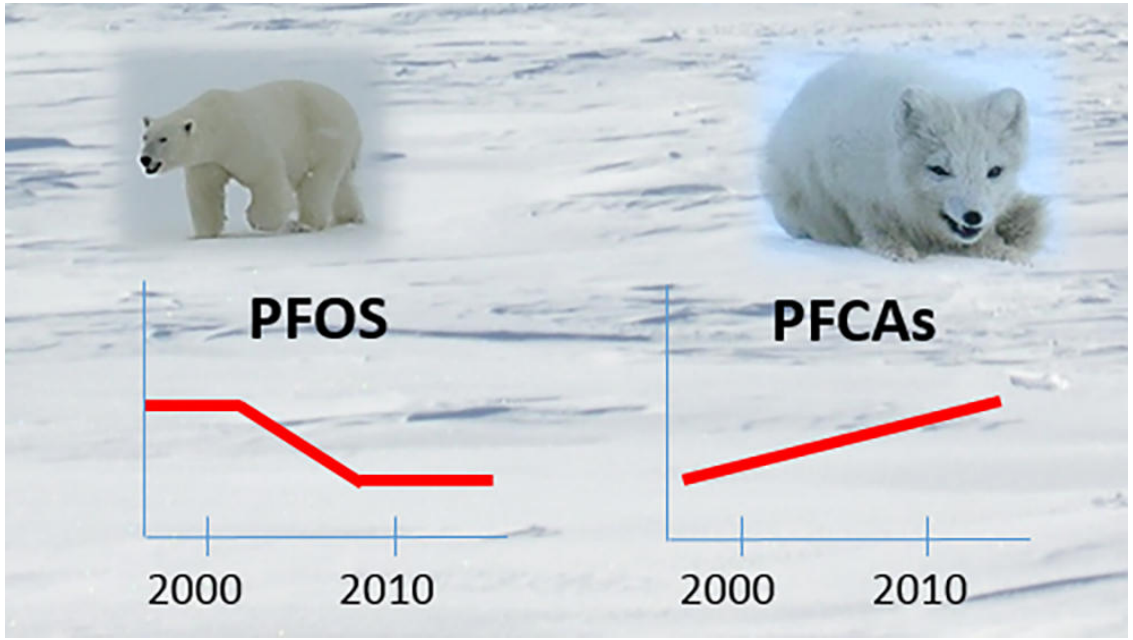
Foodweb effects in Arctic Ocean: PFOS

- Foodweb matters.



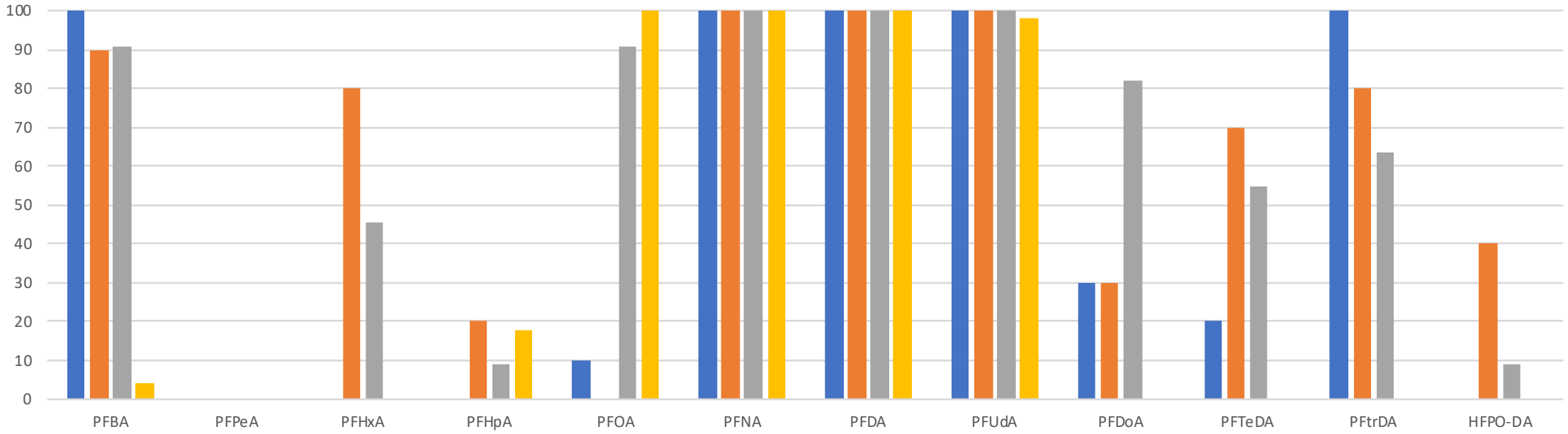
(Khairy et al., 2019)

Atmospheric precursors, too.



(Routti et al., 2017)

% PFAS > DL in seabird chicks and Faroese



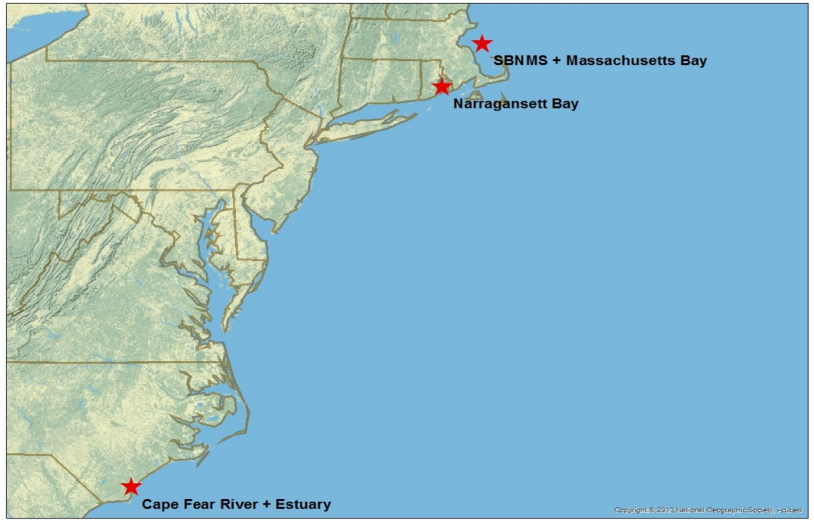
Mass. Bay Narra. Bay CFRE Faroer children 2012

Also PFOS, PFHpS, PFHxS

some PFBS, PFDS, FOSA

Little PFPeS, PFNS, Me-FOSAA

No 4:2, 6:2, 8:2 FTS



The known unknowns are getting us

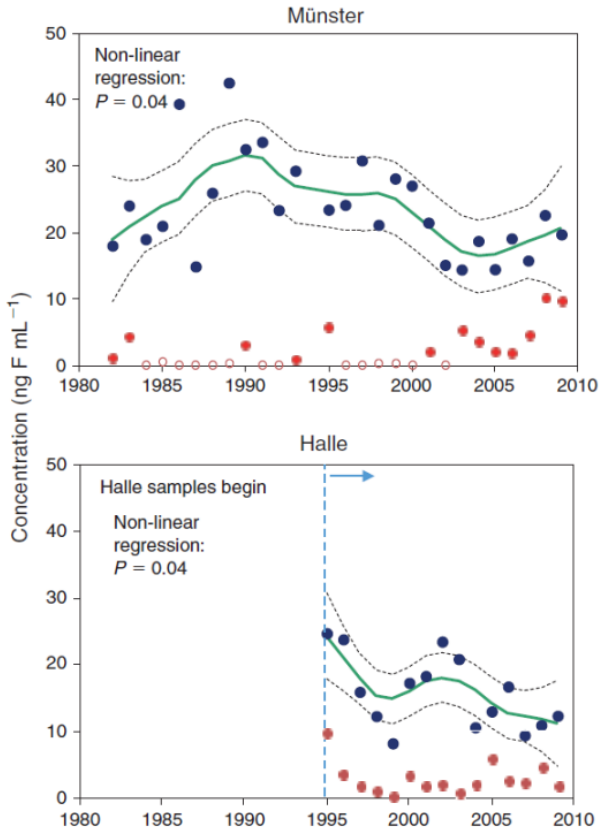


Fig. 3. Temporal trends of extractable organofluorine (EOF) and unidentified organofluorine concentrations (ng F mL^{-1}) in German plasma. (Blue dot indicates the mean value of EOF, dotted line indicates the 95% confidence interval of the trend and green line indicates the trend generated using locally weighted regression smoother (LOESS); red dot indicates the mean value of unidentified organofluorine; open red dots indicates no unidentified organofluorine.)

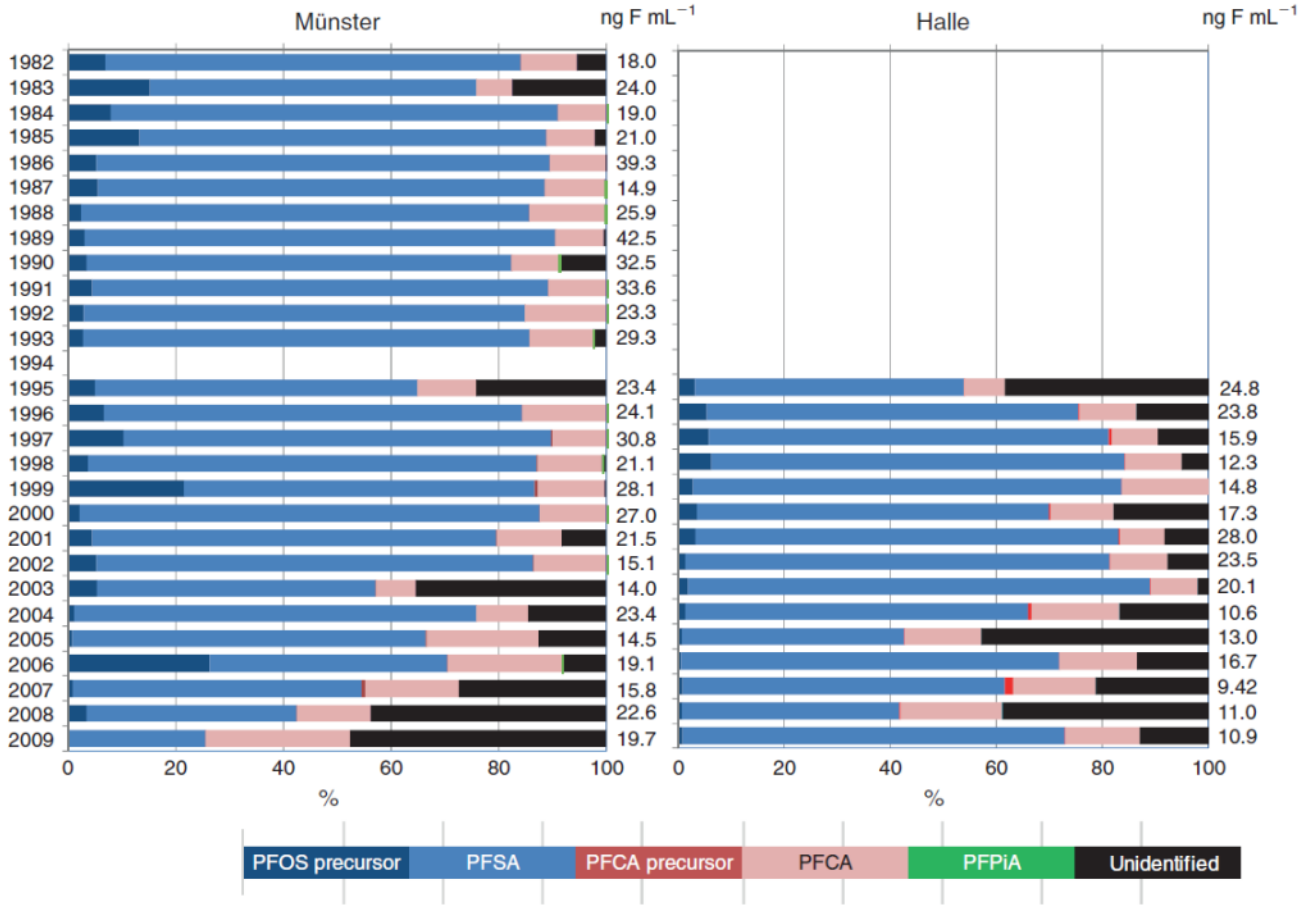


Fig. 4. Composition and concentrations (ng F mL^{-1}) of extractable organofluorine (EOF) in German blood plasma samples (perfluorooctane sulfonate, PFOS; perfluoroalkyl sulfonate, PFSA; perfluorinated carboxylates, PFCAs; perfluorinated phosphinates, PFPiAs).

(Yeung and Mabury, 2016)

Some thoughts on grouping

Ideally - Grouping based on persistence

- **The common feature of all PFASs are multiple CF2 units**
- **Typically this renders them, or their reaction products, very persistent**

In Europe focus on

- **PBT chemicals (or vP, vB), and**
- **recently PMT chemicals (difficult to remove).**
- **Combination of PBT or PMT suggests persistence is really key feature.**

What can be achieved in 1-2 or 5-10 years?

Take a lesson from Montreal Protocol

- **Phase out non-essential PFASs use which directly contributes to human and ecological exposure**
  - **FCMs, cosmetics, stain-repellency, AFFFs**

- **If needed replace perfluorinated with polyfluorinated compounds**
- **Tackle fluoropolymers last**

- Simple grouping needed, otherwise industry will substitute in-kind

Thanks to..

- $ from
  - NIEHS STEEP SRP
  - SERDP ER2508
  - NSF OPP (ARC 1203486)
- The Organizers
- Your attention!

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