Passive Samplers for PFAS in Surface Water and Air

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Passive samplers

- Passive samplers measure activity of pollutants, e.g. the dissolved/gas phase
- uptake by diffusion
- advantage – no operational separation of particulate and dissolved phase
- need to know $K_{\text{passive-water}}(T, \text{sal})$ or $R_s$, sampling rate
- \[ C_{\text{diss}} = \frac{C_{\text{passive}}}{[R_s \times t]} \] (linear uptake)
- \[ C_{\text{diss}} = \frac{C_{\text{passive}}}{K_{\text{passive-water}}} \] (equilibrium sampler)
Where can we use passives?
Why passives might be useful

• Time-integrated concentrations
• Pre-concentrations already in field
• Less handling in laboratory
• Proxy for bioaccumulation

(Dreyer et al., 2010)

(Cerveny et al., 2016)
Something in the air...

... and in your blood

Airborne Precursors Predict Maternal Serum Perfluoroalkyl Acid Concentrations

(Figure 1. Exposure categories [low (n = 17), medium (n = 16), and high (n = 16)] of PrefAA in air predicting serum PFAA levels in 50 women.)

(Makey et al. 2017)
Testing of Polyethylene Sheets as Passive Samplers for Volatile PFAS in Indoor Air

Maya Morales-McDevitt et al.

(Dixon-Anderson and Lohmann, 2018)
PE-tube sampler for PFASs in GW

(Kaserzon et al., 2019)
Time series WWTP study, June 2018

Christine Gardiner et al.

Fields Point WWTP effluent

PS in Fields Pt WWTP Effluent

Sum 25 PFAS
Lab Validation of PFAS Passive Sampler

Uptake as function of

- water flow velocities
- temperatures
- Biofouling conditions
- Salinity
- DIC
Potential PFAS Contamination sites in Guam (Barry Kim)

- High occurrence of PFASs.
- Testing soil and water for PFASs
- Wet vs dry season
- Identify sources
Fiber Passive Sampler for PFAS Detection at AFFF Impacted Sites?

SPME fiber coated with **polyacrylate** *(24 hours for equilibrium)*

✓ FIBER to predict **physical-chemical properties** of PFAS?

(Becanova and Lohmann, in prep)
Birds reflect...

- open ocean
- urbanized estuary
- an estuary downstream of a fluoroproduct production center
Next steps

• Passive samplers as useful tools for PFAS activity and transfer
  • For air, passive air samplers are operational
  • Gas-phase sampling to be developed
  • Several options for dissolved PFASs
  • Porewater samplers to be developed
  • Proxies for bioaccumulation?
Thanks to
- NIEHS, of course
- RI C-AIM for HPLC-MS/MS;
- RI STAC and SERDP for passive sampling tube work
- Partners/collaborators, grad students
Questions?