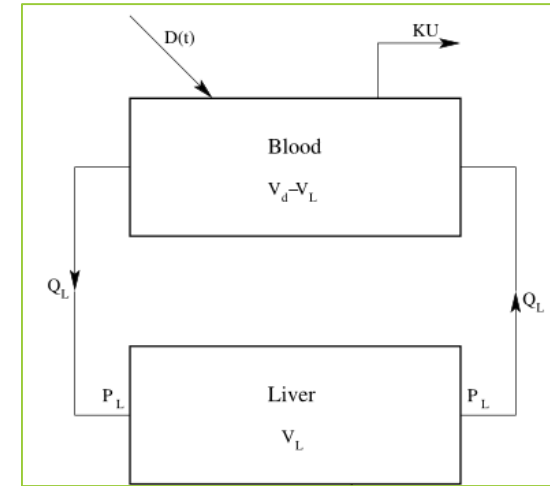


New PFAS Research Opportunities

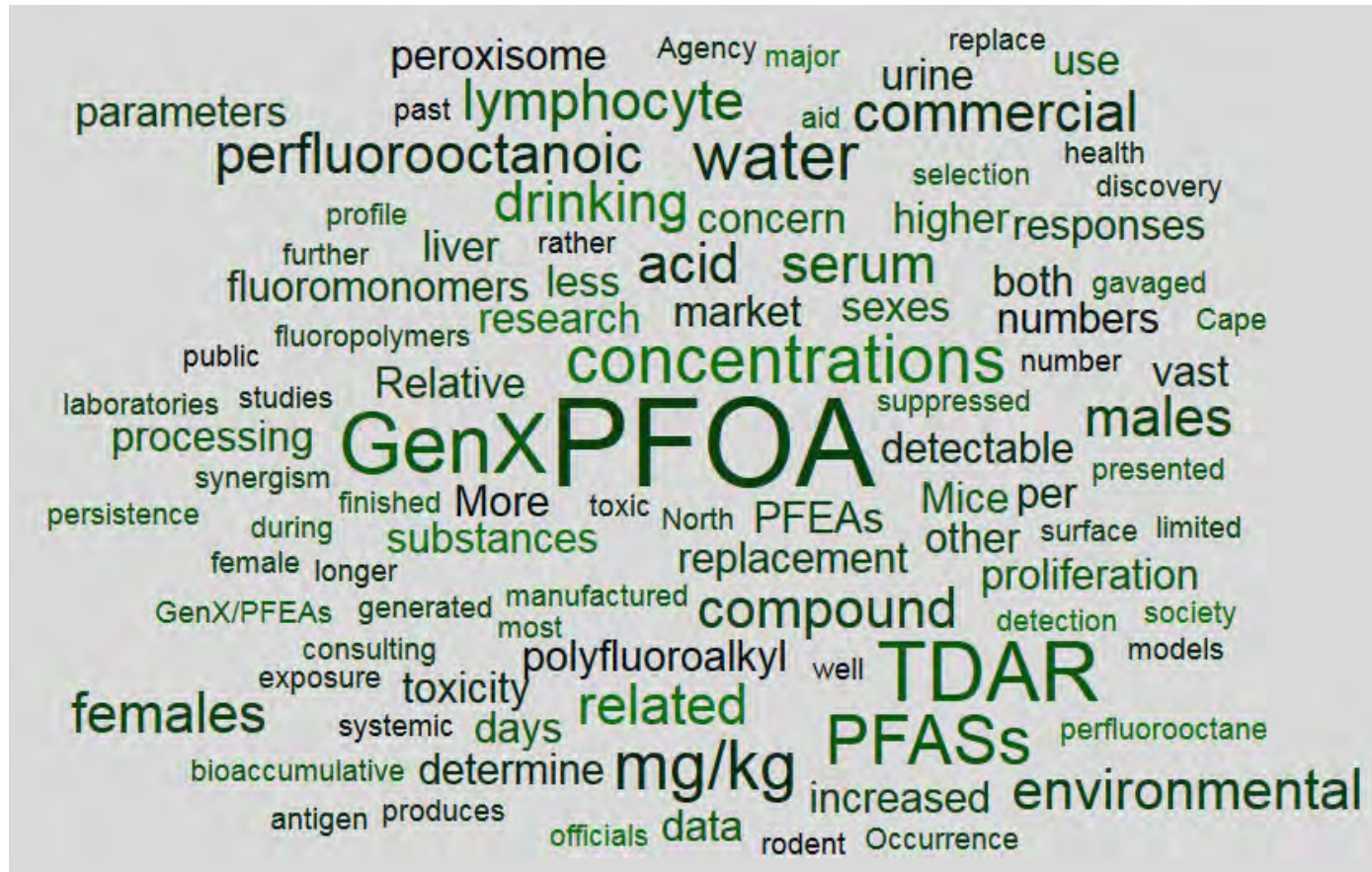


TEAM #5: OTHER APPLIED R&D

PRESENTED BY: JAMIE DEWITT

TEAM CO-LEADS: JAMIE DEWITT (ECU) AND REBECCA FRY (UNC-CH)

Why is this research needed?

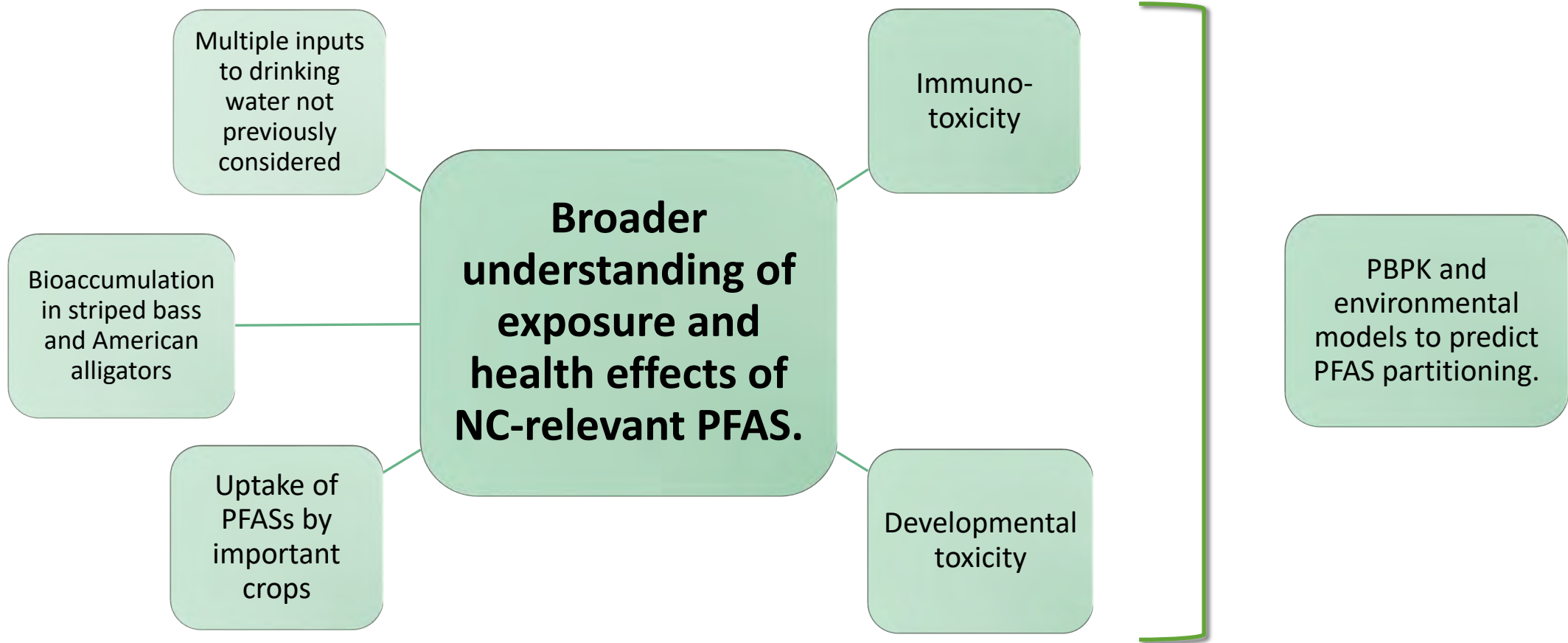


Context is everything!

Knowing what PFASs and in what quantities are in the environment is an important first step.

Our team will provide critical contextual information associated with identified PFASs in NC, ***a complex problem.***

Planned Approach





Research Questions

- What are novel sources of PFAS to surface and groundwater, i.e., from municipal solid waste landfills and unlined construction and demolition landfills?

Lead: Dr. Morton Barlaz, NCSU

- Specific objectives/tasks:
 1. Estimate the mass of PFASs that are discharged to POTWs by characterizing the PFAS fingerprint of MSW landfill leachates using non-targeted analysis.
 2. Estimate the mass of PFASs entering POTWs in NC via municipal wastewater and assess the relative importance of MSW landfills as a source of PFASs to POTWs.
 3. Estimate the release of PFASs to surface water downstream of POTWs using published information on their attenuation during wastewater treatment.
 4. Estimate the release of PFASs from landfills that receive C&D waste and document C&D landfill location.





Research Questions

- How do PFASs bioaccumulate from the environment into ecologically important species?

Lead: Dr. Scott Belcher, NCSU

- Specific objectives/tasks:
 1. Expand sampling of alligator serum from 20-30/sex to 50/sex for a greater sample size.
 2. In collaboration with NC wildlife, collect and analyze serum from 50 striped bass from the Cape Fear River (impacted by PFASs from wastewater discharges) and from surrounding lakes and tributaries (impacted by PFASs from air emissions).
 3. Collect and analyze 30 striped bass serum samples from the Pamlico Aquaculture Facility as reference (likely not impacted) population samples.
 4. Collect and analyze liver and muscle of adult sunfish/bluegill and largemouth bass from other smaller water sources with a known point source of PFASs.





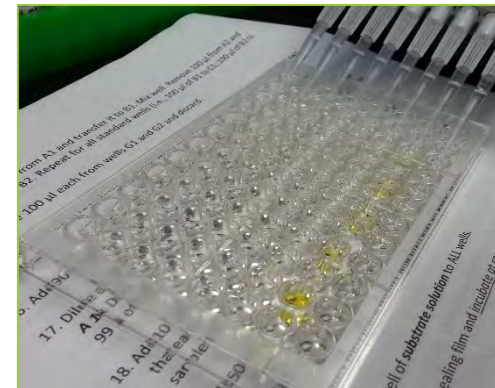
Research Questions

- Do emerging PFASs impact the immune system to the same degree as legacy PFASs?

Lead: Dr. Jamie DeWitt, ECU

- Specific objectives/tasks:

1. Determine effects of selected PFASs on major immune cell subpopulations in primary (thymus) and secondary (spleen) lymphoid organs.
2. Assess functional responsiveness of the adaptive immune system following exposure to selected PFASs.
3. Assess functional responsiveness of the innate immune system following exposure to selected PFASs.



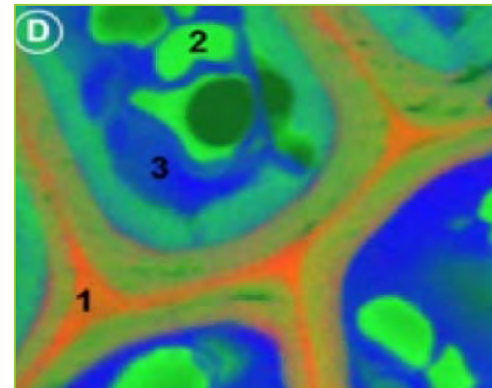


Research Questions

- Can PFASs be taken up by important food crops and do soil properties affect this uptake?

Lead: Dr. Owen Duckworth, NCSU

- Specific objectives/tasks:
 1. Can manipulation of soil properties, specifically through addition of organic matter, be utilized to reduce PFAS uptake by crop plants?
 2. How do PFAS partition in plant tissues at the sub-cellular scale, and are there associations with specific types of biomolecules in these tissues?





Research Questions

- Do PFASs in drinking water pose a risk to pregnant women and could they affect the cells of her placenta?

Lead: Dr. Rebecca Fry, UNC-CH

- Specific objectives/tasks:

1. What are the levels of PFAS in:

Drinking water

Placenta

Cord blood

Maternal urine

Maternal serum in pregnant women in NC

2. Are there PFAS-induced inflammatory effects on the placenta?





Research Questions

- Can we develop models to predict where PFASs go in organisms and in the environment?

Lead: Dr. Nick Luke, NC A&T

- Specific objectives/tasks:

1. Quantitative analysis of experimental immunotoxicity and systemic toxicity data generated by PFAST Network collaborators, including half-life estimates and generation of a physiologically based pharmacokinetic (PBPK) model.
2. Development of larger scale models to predict movement of emerging PFASs among environmental media.

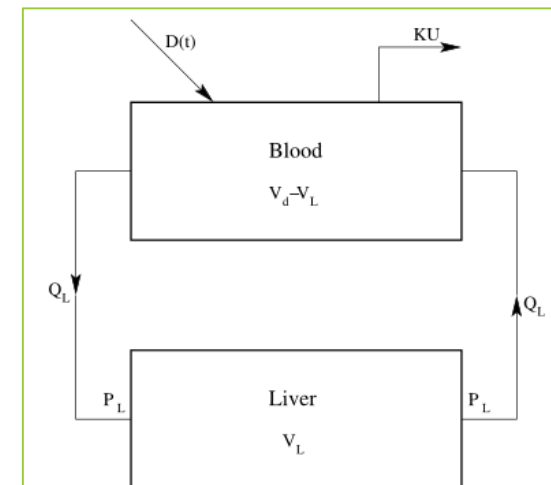


Photo references

From left to right on title slide:

- <http://efc.web.unc.edu/2013/11/05/solid-waste-finance/>.
- <http://www.starnewsonline.com/sports/20180816/scientists-look-for-genx-in-lake-waccamaw-alligators>.
- <https://www.slideshare.net/syednayyerarvi/immunotoxicity>.
- Karunakaran C. et al., 2015, Introduction of soft X-Ray spectromicroscopy as an advanced technique for plant biopolymers research, PLoS ONE 10, e0122959.
- <https://www.shutterstock.com/search/placenta>.
- Luke N. et al., 2010, Development of a quantitative model of pregnane X receptor (PXR) mediated xenobiotic metabolizing enzyme induction, Bulletin of Mathematical Biology, 72:1799-1819.