Neurodevelopmental Effects of PFAS Exposure through Drinking Water

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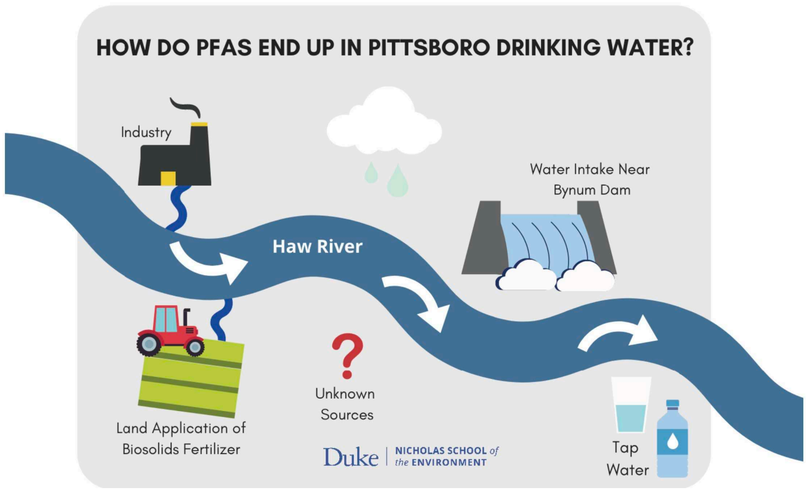
OBJECTIVES

Sum concentrations of per- and polyfluoroalkyl substances (PFAS) in Pittsboro, NC drinking water measured over 30 times higher than those in Durham.[1] Residents' PFAS serum levels measured 2-4 times higher than the general U.S. population.[2] Previous cohort studies suggest that exposure to these drinking water contaminants may lead to an array of of developmental, neurocognitive, and behavioral impacts.

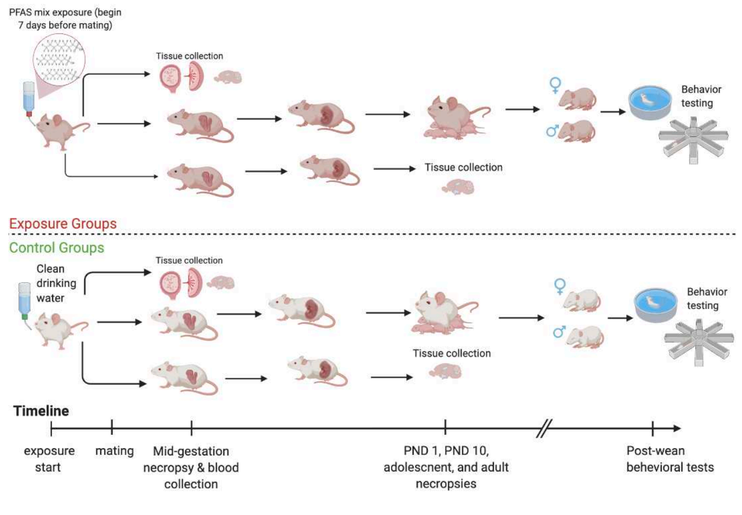
Study Aim: To determine the causative relationship between *in utero* PFAS mixture exposure and cognitive deficits, emotional dysfunction, and behavioral dysregulation and underlying mechanisms using an animal model.

Hypothesis: *In utero* exposure to this PFAS mixture will cause cognitive deficits, emotional dysfunction, and behavioral dysregulation in rat offspring by disrupting placental-fetal brain hormonal signaling.



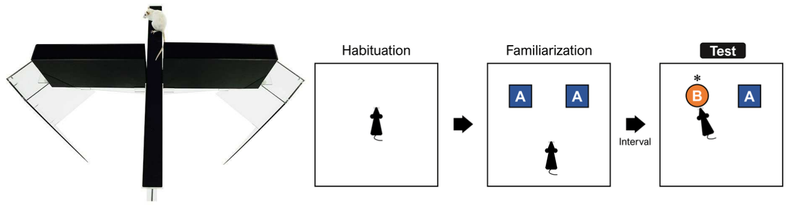
Hypothesized Sources of PFAS in the Haw River [3]

METHODOLOGY



Study Design and Timeline

- 3 cohorts of Sprague-Dawley strain rats are exposed to a PFAS mixture mimicking Pittsboro water and a high dose positive control during mating and through gestation
- Pregnancy and birth outcomes are tracked for dams and pups
- Offspring undergo a behavioral testing battery
- Tissues are collected for pathology, RNA sequencing, serum dose verification, and thyroid hormone measurement

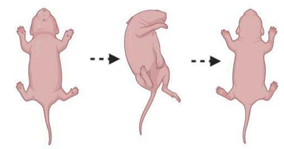


Examples of Behavioral Tests: Elevated Plus Maze [4] (left) and Novel Object Recognition [5] (right)

Analysis

- Reproductive outcomes: maternal weight gain, gestation length, litter size, pup survival, pup weight, pup anogenital distance, pup reflex development (pictured)

Righting Reflex Test



- Neurobehavioral outcomes: locomotor activity and habituation (figure 8 maze), anxiety and risk-taking behavior (elevated plus maze), depression and anxiety (novelty-suppressed feeding), non-spatial memory and attention (novel object recognition), depression (forced swim)

Acknowledgments

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References

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