

PFAS effects on fathead minnow development

Per- and polyfluoroalkyl substances (PFAS) have recently received significant media and research attention due to their increased presence in the environment, wildlife, and humans. Despite recent studies on the toxicity of PFAS, we still know very little about their effects in development, especially for new PFAS that are used as less toxic substitutes of traditional perfluorooctyl sulfonate (PFOS) and perfluorooctanoic acid (PFOA). The aim of this project will be to expose developing fathead minnow embryos to PFOS and PFOA, and to new substitutes, perfluorobutanesulfonate (PFBS) and perfluorobutanesulfonic acid (PFBA). The impact of PFAS exposure will be assessed using several toxicological endpoints, employing both traditional (e.g., survival, heart rate, morphology, behavior, histopathology) and modern techniques (lipidomics) and using a fathead minnow (*Pimephales promelas*) embryo model at an early developmental stage. **The overall hypothesis is that PFBS and PFBA alter development of fathead minnow embryos in the same manner as PFOS and PFOA.** The study will comprise of four replicates per exposure treatment (two exposures and one control for each PFAS). The student would be involved in the following aspects of the study.

1. **Developmental exposure of fathead minnow embryos to PFAS.** Dechorionated fathead minnow embryos will be obtained from a vendor and will be randomly distributed to beakers for the study with 20 fatheads per beaker per condition. The student will follow the fathead minnows through development. As soon as a heartbeat is determined, the student will video capture the heartbeat. We will also look for developmental deformities. The fathead minnows will be cultured till the yolk sac is totally absorbed – roughly for 10 day post hatch.
2. **Lipidomics analysis of fathead minnow embryos.** Ten embryos per treatment of the high concentration of chemical will be euthanized and extracted with organic solvents for lipidomics analysis. The student will do the extractions, but the LC MS/MS analysis will be performed by the analytical toxicology core lab. The student will analyze the final lipidomics results using Metaboanalyst.
3. **Lipase activity.** The student will learn how to perform a colorimetric assay to determine whether lipase activity is altered by PFAS in PFAS treated minnows. We hypothesize that a downstream effect of PFAS is to alter lipid metabolism.
4. **Manuscript.** The student will be involved in writing a manuscript on the results of the study.