

Abstract: While thousands of forever chemicals exist, perfluorooctanoic acid (PFOA) is of the most abundant, persisting in drinking water, air, soil, and wildfire. In various model organisms, PFOA exposure led to severe changes in circadian-regulated behaviors—metabolism, sleep-wake cycles, hormone imbalances. Though previous research has demonstrated the general effects of PFOA on circadian rhythms, the impact of PFOA on brain clock cells remain unknown. To test PFOA in a controlled lab setting, *Drosophila melanogaster* serves as an ideal model due to high conservation of human disease-related genes and neurological systems as well as powerful genetic tools. We hypothesize that PFOA exposure impairs the brain clock mechanisms at a molecular, cellular, and neural circuit level to cause abnormal circadian behaviors. First, we will examine how PFOA exposure impacts molecular clock protein oscillations within the brain using immunofluorescence. Next, we will determine how synaptic connections are altered in known circadian circuits via GFP Reconstitution Across Synaptic Partners (GRASP). Then, we will investigate the effect of PFOA exposure on neuropeptide and receptor pathways known to regulate circadian rhythms. Overall, this study will highlight the mechanism by which PFOA exposure leads to circadian disruption, laying the foundation for PFOA's effect on brain function and activity.