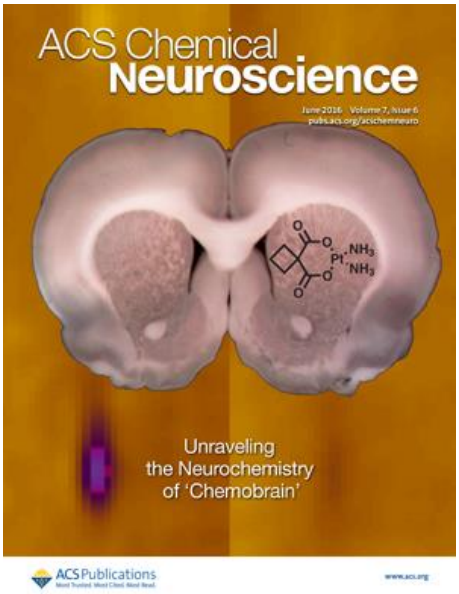
The Johnson Laboratory: Mechanisms of Neurological Disease



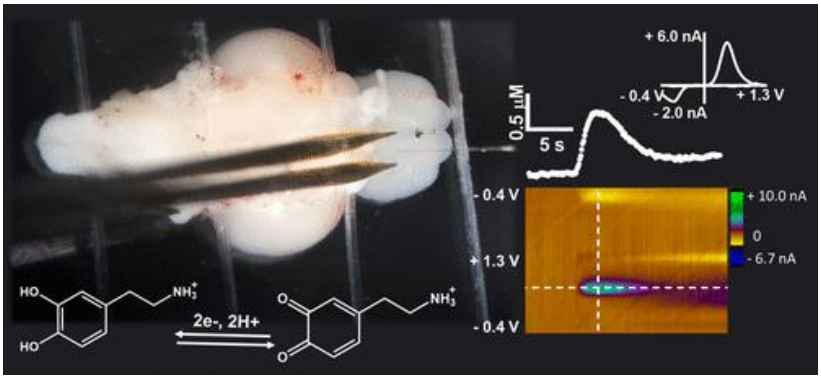
Kaplan et al. ACS Chem. Neurosci. 2016, 7(6):689-699

The effects of chemotherapy on neuronal function

Over the next decade, 19 million cancer patients will experience chemotherapy-induced cognitive impairment (CTRC, 'chemobrain'), a condition caused by the administration of chemotherapeutic agents. One of our research goals is to understand the underlying neurochemical mechanisms of chemobrain. To accomplish this task, we combine fast-scan cyclic voltammetry (FSCV) with operant behavioral methods in rodents. This approach allows us to correlated deficiencies in neurotransmitter release with impaired cognitive function. In this project, students will learn how to obtain electrochemical and behavioral measurements in rodents treated with chemotherapeutic agents.

Neurotransmitter release and uptake measurements in zebrafish

In addition to studying neurological disorders, our group is interested in developing and applying methods to enhance understanding of how the brain functions. Zebrafish are a valuable model organism for the study of the brain because they are easy to genetically manipulate and, in many ways, effectively model human disease. Additionally, the entire brain of a zebrafish is small enough to survive outside of the host, yet it is complex enough (10 million cells) to provide a way to study circuit function in ways that are not possible in more complex or simpler systems. Our group is currently applying FSCV to measure the release and uptake of electroactive neurotransmitters—dopamine, histamine, and serotonin—in zebrafish. These measurements will be combined with microscopy methods aimed at functionally imaging these neurons while obtaining electrochemical measurements. In this project, students will learn how to employ FSCV in zebrafish and may also apply these methods to models of neurological disease, such as chemobrain and Parkinson's disease.



Shin et al *ACS Chem Neurosci.* 2017, 8(9):1880-1888

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