Drosophila melanogaster, sometimes called the “fruit fly”, provide a great genetic model for research on human disease since 75% of disease-causing genes in humans are also present in flies. Furthermore, also similar to humans, fly movements are controlled by a set of neurons that use the chemical dopamine in the circuit controlling movement. Because of this, we are using flies for our research on Parkinson’s disease, which has movement symptoms that is caused by death of neurons that use dopamine. The most noticeable symptoms of patients with this disease are abnormal movements; slowness, stiffness, instability, and tremor. While the disease is incurable, the main treatment these symptoms is therapy with levodopa (L-DOPA)—a molecule that is naturally converted to dopamine inside our brain. Some patients who receive L-DOPA cannot tolerate this therapy. The reason for this is not well understood. To investigate this issue, we are using flies to identify genes affect an organism behavioral response to levodopa. The long-term goal is to improve treatment of Parkinson’s disease.

We are investigating whether we evaluate with L-DOPA and measuring their movement behavior afterwards. We feed L-Dopa to larvae, a worm-like developmental stage that shows simple feeding behavior then we quantify the effect on the animals’ locomotion to determine the nature of the dose-dependent in abnormal movements. Statistical analysis of this data lets us define an experimental paradigm that can reliably measure the levodopa response.

This research demonstrated significant behavioral differences between the flies treated with L-DOPA and untreated flies. In our presentation at the Society for Neuroscience in Chicago, we will present data establishing the “proof-of-concept” that we have a reliable array for the affect of L-Dopa on movement behavior. It also describes our observations of two types of movements induced by L-Dopa that, to our knowledge, have not been identified in existing research.

The development of this assay was the aim of my FUSE grant, awarded in the Spring of 2015. In the future, I will work with other students to use computational analysis of video-recorded data, and then evaluate this response in genetically different strains. This will lead to the identification of genes that affect the response of an animal to L-Dopa.