Investigating the Effect of Neuronal Tau Expression on Aggression in a *Drosophila melanogaster* Model of Alzheimer’s Disease

Student name: Jessica Suzanne Figueroa  
Project advisor: Kenneth J. Colodner

Alzheimer’s disease is a neurodegenerative disorder characterized by the aggregation and hyperphosphorylation of the microtubule-associated protein, tau. Aggression is associated with this disorder, but the extent to which tau pathology underlies this behavioral symptom remains to be determined. This line of research explores how aggression is affected by the expression of tau in neurons. We hypothesize that the expression of human wild-type tau in adult *Drosophila melanogaster* will result in altered aggression levels in adult, male flies. In this study, we utilized the GAL4-UAS system to exclusively express tau protein in *Drosophila* neurons, and assayed aggression in fighting pairs of tau-expressing flies or control flies, without tau. A standard *Drosophila* aggression assay was used to record fights and quantify parameters of aggressive behavior in 5-day and 2-day-old flies. In 5-day old flies, we observed a significant decrease in aggressive behavior in tau-expressing flies compared to control flies as measured by the total number of lunges (a stereotypical high-intensity aggressive act) and latency to first lunge. In 2-day old flies, we observed no significant difference in aggressive behavior. These results suggest that age-dependent increases of tau protein expression in neurons alters aggression in *Drosophila*, but it is unclear how this effect is mediated. Tau has been shown to be toxic when expressed in *Drosophila* neurons, and the reduced aggression observed might simply be a result of tau-induced death of neurons that control aggression. Future experiments utilizing cell-type specific expression of tau and other behavioral assays should further help define the relationship between tau expression and aggression in this *Drosophila* model of Alzheimer’s disease.