

Name: Alp Ummeet, BSc

Email: aummet@g.clemson.edu

Variation in Gene Expression and Brain Morphology among 48 Drosophila Lines that Vary in Cocaine Preference

A previous study of 598 inbred wild-derived and fully sequenced lines of the recently expanded Drosophila Genetic Reference Panel (DGRP3) revealed extensive genetic variation in cocaine consumption and preference with sexual dimorphism and variation in sexual dimorphism. About 10% of these lines showed an innate preference for cocaine consumption in at least one sex when given a choice between a sucrose solution and a sucrose solution supplemented with cocaine, despite adverse physiological effects, evident from an increased risk for seizures. A previous single-cell multiome study in Drosophila implicated mushroom bodies as neural substrates that had the most significant response to cocaine. In an initial study, we analyzed three DGRP3 lines with high cocaine preference and three lines with preference indices at the population mean for variation in mushroom body structure using anti-FasII immunostaining and 3D confocal microscopy imaging. Despite the small sample size, we found that alpha lobe structure and asymmetry correlate with cocaine preference and consumption. To increase statistical power, we are expanding this initial study to 48 DGRP3 lines across the range of cocaine consumption, from avoidance to preference. We are performing ATAC-seq and RNA-seq analyses of the same lines with and without exposure to cocaine, for sexes separately and with replicates, to identify changes in chromatin accessibility and differential expression of genes with human orthologs. We will assess to what extent cocaine-induced differential gene expression correlates with changes in morphometric variation in mushroom body structure and innate preference for cocaine. Supported by NIH grants U01-DA041613 and P20-GM139769.

Authors:

Submitter: Alp Ummeet, PhD Candidate, Clemson University Institute for Human Genetics, Greenwood

Robert Anholt, PhD, Clemson University Institute for Human Genetics

Mille Elsberg, BSc, Clemson University Institute for Human Genetics

Patrick Freymuth, MSc, Clemson University Institute for Human Genetics

Olivia Hamilton, BSc, Clemson University Institute for Human Genetics

Trudy Mackay, PhD, Clemson University Institute for Human Genetics

Vijay Shankar, PhD, Clemson University Institute for Human Genetics

Kaitlyn Williams, MS, Clemson University Institute for Human Genetics