Name: Jeffrey Hatfield **Email:** jshatfi@clemson.edu
PI names: Trudy Mackay, Robert Anholt
PI emails: tmackay@clemson.edu, ranholt@clemson.edu

Genetic Variation in Cocaine Preference in the *Drosophila melanogaster* Genetic Reference Panel.

Jeffrey S. Hatfield[1], Trudy F. C. Mackay[1], Robert R. H. Anholt[1]

[1]Department of Genetics and Biochemistry and Center for Human Genetics, Clemson University, Greenwood, S.C., U.S.A.

Studies on the genetic basis of susceptibility to cocaine use disorder in human populations are challenging due to limited sample sizes, heterogeneity of genetic backgrounds, and environmental variability. *Drosophila* present a powerful model for investigation into the genetic underpinnings of cocaine addiction, using preference for cocaine as a proxy for addiction behavior. Utilizing the Microplate Feeder Assay (MFA), we quantified cocaine preference for 16,442 flies across 103 distinct genetic backgrounds of the *Drosophila melanogaster* Genetic Reference Panel (DGRP). We provided flies with an equal choice between 10μL of a control food and 10μL of the same food supplemented with 0.02% cocaine. Consumption was quantified using a plate reader following a 22-hour exposure. Normalized cocaine preference was calculated for each fly as the difference in consumption between the two solutions divided by their total consumption. We found significant, naturally-occurring genetic variation for cocaine preference across this subset of the DGRP. We observed significant sexual dimorphism across tested DGRP lines, where male flies on average exhibit higher cocaine preference than female flies of the same line. Estimates of broad sense heritability of consumption were calculated using individual level data, as well as using DGRP line means, and were found to be $\widehat{H}^2 = 0.19$ and $\widehat{H}^2 = 0.97$, respectively. Here, we demonstrate the impact of genetics on susceptibility to cocaine preference in *D. melanogaster*. These data will facilitate future genome-wide association analyses, as well as identify *D. melanogaster* genetic backgrounds from the DGRP that can better model cocaine use disorder.