Name: Eamonn Duffy
PI Name: Ryan Bachtell
Email: eamonn.duffy@colorado.edu
PI email: Ryan.Bachtell@colorado.edu

Characterization of thermal and mechanical sensitivity in select strains of the Hybrid Rat Diversity Panel

Eamonn Duffy[2, 4], Luanne Hale[1], Kyle Brown[1], Andrew Kwilasz[1], Laura Saba[2, 3], Marissa A. Ehringer[2, 4], Ryan Bachtell[1, 2]

[1]Department of Psychology and Neuroscience, University of Colorado Boulder; [2]Institute for Behavioral Genetics, University of Colorado Boulder; [3]Department of Pharmaceutical Sciences, Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado Anschutz Medical Campus; [4]Department of Integrative Physiology, University of Colorado Boulder

Opioid Use Disorder (OUD) is an ongoing public health concern in the United States, and relatively little work has addressed how genetic background contributes to OUD. Understanding the genetic contributions to oxycodone-induced analgesia could provide insight into the early stages of OUD development. Here, we present findings from a behavioral phenotyping protocol using several inbred strains from the Hybrid Rat Diversity Panel (HRDP). Our behavioral protocol includes the tail immersion assay that measures the latency to display tail withdrawal in response to a hot water bath. Initial withdrawal thresholds are taken in drug- naive animals to record baseline thermal sensitivity across the strains. Oxycodone-induced analgesia is measured after administration of oxycodone over the course of two hours. We also perform a modified “up-down” von Frey procedure to measure inherent strain differences in the sensitivity to a mechanical stimulus on the hindpaw. Strain differences were observed in thermal sensitivity in oxycodone-naive rats, with the WKY/NCrl strain displaying the lowest baseline tail withdrawal thresholds. All strains displayed oxycodone-induced analgesia that peaked at 15-30 minutes and returned to baseline by 2 hours. Analysis of the analgesic response across 2 hours suggested strain differences. We also observed strain differences in mechanical sensitivity, with the WKY/NCrl strain having the lowest paw withdrawal thresholds compared to several other strains, including SHR/OlaIpcv. We estimate the broad-sense heritability of these traits to be between $h2$ = 0.15-0.38. These data suggest that genetic background confers differences in mechanical sensitivity, thermal sensitivity, and oxycodone- induced analgesia.