Genetics Day Poster Submission

Presenter: Bainbridge, Chance

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Authors: CHANCE BAINBRIDGE, Gregory Reilly, Douglas S. Portman

Title: SEXUALLY DIMORPHIC NUTRIENT-DEPENDENT BEHAVIORAL PRIORITIZATION IN C. ELEGANS

Abstract: To cope with nutrient deprivation, animals often reprioritize behaviors to favor feeding over exploring. Because nutritional requirements and reproductive strategies differ by sex, this reprioritization can be sexually dimorphic. Work from our lab and others indicates that C. elegans exhibit sexually dimorphic behavioral and neuronal responses to nutrient availability. However, the mechanisms by which biological sex regulates neuronal function to produce sex-specific responses to nutrient status is poorly understood. In C. elegans, starvation and re-feeding provides a paradigm to understand how nutritional status and biological sex intersect to modulate behavioral state priority. Here, we investigate sex differences in behavioral priority by profiling distributions of locomotor states in well-fed and previously starved males and hermaphrodites. Because we are interested in roaming, dwelling, and quiescence, we recorded animals on high-quality HB101 food. From these recordings, we trained a Random Forest supervised machine learning model to identify these three states in both sexes. Our results indicate that male worms exhibit nutrient-dependent strategies distinct from hermaphrodites: males maintain high exploration (roaming) and quiesce less than hermaphrodites even following substantial nutrient deprivation. To ask how biological sex may regulate nutrient-dependent locomotor behaviors, we manipulated the genetic sex-determination pathway to sex-reverse specific tissues. These results suggest that the sexual states of both the nervous system and the intestine play a nutrient-dependent role in regulating locomotor state. To determine how nutritional status might be modulated by biological sex, we tested insulin and IGF signaling (IIS) pathway mutants for changes in nutrient-dependent locomotor behavior in both sexes. Preliminary results suggest that increased insulin signaling in males may promote sex-specific nutrient-dependent behavior. These studies will generate a framework to understand the genetic and neuronal basis of sex-specific nutrient-dependent behaviors. Moreover, this approach provides an opportunity to explore potentially conserved mechanisms by which genetic sex can regulate neuronal and behavioral responses to nutritional status.