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Title: NEUROGENETIC MECHANISMS UNDERLYING SEXUALLY DIMORPHIC BEHAVIORAL STATES IN C. ELEGANS

Abstract

Being able to flexibly adapt and move around an environment is imperative for an organism's survival. This plasticity in locomotion requires an animal to integrate both environmental stimuli as well as the internal state of the organism itself. In C. elegans, previous work has shown that under specific conditions, worms will switch between stereotypical forms of locomotion known as locomotor states depending on both the environment around them and their internal states. Generally, on a patch of bacteria, hermaphrodite will stochastically switch between two locomotor states: roaming and dwelling. Previous work has shown that the amount of time spent in each state can be altered by various perturbations to both the environment and internal condition of the organism. However, little is known about how the internal state of genetic sex affects these locomotor states. Studies from our lab have shown that genetic sex influences general locomotion in C. elegans and work from other labs has suggested that male locomotor states differ from that of their hermaphrodite counterparts. Using a custom Hidden Markov Model analysis, we have found evidence that suggests males have two locomotor states like hermaphrodites, but the kinetics of male locomotor states are sex-specific. Using tissue-specific sex reversals, we aim to determine where genetic sex may be acting to achieve these sex-specific locomotor states. Furthermore, the neurochemical modulators of locomotor states are well defined in hermaphrodites but poorly defined in males. Genetic sex could potentially use these neurochemicals to achieve the sex differences seen in locomotor states. Using a combination of mutants and tissue-specific knockouts, we aim to determine both what neurochemicals may have a sex-specific function and where they might be acting within males. My results will give further insight into how genetic sex can tune neural circuitry to achieve sex-specific behaviors and more broadly give insight into the complex interplay between genetics, neural circuitry, and behavior.