Neuroplasticity is the process by which neuronal connections are altered throughout life as a result of environmental cues. In most species, including humans, plasticity in the central nervous system has traditionally been considered to be limited to development, but more recently there has been evidence of neuroplasticity in adult organisms. The auditory system of the cricket, *Gryllus bimaculatus* is a great model organism to study the mechanism of neuroplasticity in the adult central nervous system. When the auditory interneurons of the adult cricket are unilaterally deafferented, rather than retracting or dying, the dendrites extend across the midline of the prothoracic ganglion and form functional synapses with the contralateral auditory afferent neuron (Horch et al., 2011). Previous research in the Horch lab has shown that there is a sexual dimorphism in dendrite growth following deafferentation. While male crickets show a steady linear pattern of dendrite growth lasting at least ten days, female crickets show an early quick burst of dendrite growth ending around five days following unilateral deafferentation (Pfister et al., 2013).

Previous studies in the Horch lab have identified semaphorin 2a, a secreted guidance molecule, as a protein that may mediate the compensatory dendritic growth observed in the auditory system of cricket. SEMA2A is a good candidate molecule because it is present in the adult cricket central nervous system, has been shown to differentially affect axon and dendrite guidance, and is well conserved among species. Preliminary sema2a knockdown experiments using dsRNA suggest that SEMA2a is involved in dendrite growth over the midline following auditory deafferentation in the adult cricket. In addition, preliminary time course experiments have shown that sema2a RNA is upregulated at 30 hours following deafferentation; however, it is unclear whether there is a difference in Sema2a levels between males and females crickets related to the anatomical sexual dimorphism following deafferentation (Zhang, 2014).

The goal of this study was to quantify sema2a RNA levels in male and female adult cricket prothoracic ganglia at different time-points following deafferentation. Real-time quantitative PCR was used to measure levels sema2a levels in the prothoracic ganglion at 18 hours, 30 hours, and 5 days following unilateral deafferentation, compared to levels of the housekeeping gene, β-actin. Male and female crickets were compared to determine whether semaphorin levels contribute to the observed anatomical sexual dimorphism. It was expected that sema2a would be upregulated in the prothoracic ganglion following deafferentation, and that it would be upregulated at an earlier time point in females and a later time point in males. We found that for both males and females, there was no significant difference in sema2a RNA levels between 18-hour deafferents, 30-hour deafferents, and control crickets. In addition, there was no significant difference between sema2a levels in males and females. These results contradict previous findings in the Horch lab showing a sema2a upregulation at 30 hours following deafferentation. Further studies will be directed at repeating this time-course with the same cDNA after resolving qPCR machine issues and using immunohistochemistry to localize SEMA2A protein in the adult cricket prothoracic ganglion following deafferentation.