Title: Interneuron Control of *C. elegans* Developmental Decision-making

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Abstract: Under adverse environmental conditions, *C. elegans* larvae can choose to enter an alternate stress-resistant diapause state during which metabolic activity and physiological growth are suppressed. *C. elegans* constitutively secretes a mixture of dideoxy sugar ascarylose derivatives that comprise dauer larvae-inducing pheromone and serves as a proxy for high conspecific density. This information about local competition is integrated with other inputs regarding temperature, food availability, and the worm's internal state to assess the environment's suitability for future reproductive growth. Although the roles of *C. elegans*'s amphid sensory neuron classes have been studied using laser cell ablation, little is known about the contributions of other neuron classes. We hypothesized that the AIA interneurons are likely to mediate the pheromone-induced dauer entry decision as they are major postsynaptic partners of the ASK pheromone-sensing neurons. Using genetic silencing and activation techniques, we determined that AIA inhibits dauer entry. We next investigated mechanisms of dauer entry decision execution downstream of AIA. Silencing of the AIB interneurons, which are AIA's major postsynaptic partners, decreased dauer entry suggesting that the AIA-AIB synapse is inhibitory. A loss-of-function mutation of the FMRFamide-like neuropeptide FLP-2 has been shown to exhibit a dauer constitutive phenotype, similar to the AIA-silencing phenotype. Using a transcriptional GFP reporter fusion, we confirmed that *flp-2* is expressed exclusively in AIA. Furthermore, AIA-specific *flp-2* expression in *flp-2* mutant background rescued the mutant phenotype. Our results demonstrate a novel role of the AIA interneurons in mediating *C. elegans* diapause entry and provide insight into the mechanisms by which AIA orchestrates the decision outcome. We are currently conducting a candidate gene screen for the corresponding GPCR target(s) of the FLP-2 ligand in the context of dauer entry. We will also explore the dynamics of the ASK-AIA-AIB sub-circuit throughout the dauer entry decision window using long-term functional imaging methods.