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Title: Regulation of Glutamate Signaling in the Sensorimotor Circuit by CASY-1A/Calsyntenin in *Caenorhabditis elegans*

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Abstract: Locomotion is one of the most prominent behaviors in the nematode *Caenorhabditis elegans*. Neuronal circuits that ultimately produce coordinated dorso-ventral sinusoidal bends mediate this behavior. Synchronized locomotion requires an intricate balance between excitation and inhibition at the neuromuscular junctions (NMJ), the complex cellular and molecular mechanisms of which are not fully understood. Here, we describe the role of a cell adhesion molecule CASY-1, which functions to maintain this balance at the NMJ. In this study, we dissect out mechanisms by which the longer CASY-1A isoform could be affecting the excitatory cholinergic signaling at the NMJ by modulating the activity of sensory neurons. Mutants in *casy-1* appear to have hyperactive sensory neurons resulting in accelerated locomotion and motor circuit activity. These sensory neurons mediate increased motor activity via enhanced glutamate release. Using genetic, pharmacological and optogenetic manipulations, we establish that CASY-1A is required to monitor the activity of these neurons. Our study illustrates a novel neuromodulatory role of CASY-1-mediated signaling in regulating the excitation-inhibition balance of the motor circuit.

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