

120. *adc-1* MUTANTS FORAGE WHILE MOVING BACKWARDS

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We have identified a *C. elegans* gene encoding a putative L-aromatic amino acid decarboxylase (*adc-1*) similar to human and *Drosophila melanogaster* histidine and dopa decarboxylases. Histidine decarboxylase synthesizes histamine. Dopa decarboxylase is required for serotonin and dopamine synthesis. To analyze the function of *adc-1* we obtained three independent deletion mutations in the *C. elegans adc-1* gene (gifts from M. Dong and M. Koelle). These deletions disrupt the conserved catalytic domain and likely represent functional nulls. These *adc-1* mutations perturb coordination between the head and body during backward movement. Specifically, while wild-type worms move backwards in a smooth sinusoidal wave, *adc-1* mutants appear to forage while moving backwards (Fwb).

To identify *adc-1*-expressing cells we generated antibodies against bacterially-expressed ADC-1. These antibodies label several cells in wild-type worms. No staining is observed in *adc-1(n3420)* mutants. This antibody staining colocalizes with P_{*adc-1*}::GFP. We have identified two stained cells in the lateral ganglion as the RIM neurons. The RIMs receive sensory input from the amphid sensilla and make gap junctions with AVAR/L, the backward command neurons. RIMs synapse onto AVBR/L, the forward command neurons, and the RMDs, motor neurons that synapse onto head muscles and contribute to the control of foraging. RIMs also synapse directly onto head muscles. Given the position of the RIMs within the neural circuitry, we postulate that these neurons act to inhibit foraging during backward locomotion. In addition we see staining in a single neuron within the ventral ganglion, and in four cells near the vulva that may be either the gonadal uv1s or the uv2s. These cells have lateral nuclei that extend thin processes ventrally. Interestingly, the uv1s contain dense core vesicles suggesting they may act as neurosecretory cells (J. White, personal communication).

Although ADC-1 is similar to dopa decarboxylase, both dopamine and serotonin levels appear to be normal in *adc-1* mutants. Furthermore, worms defective in serotonin and dopamine biosynthesis are not Fwb. However, we found that *cat-1(e1111)* and *cat-1(n733)* animals are Fwb. *cat-1* encodes a vesicular monoamine transporter required for the transport of biogenic amines into synaptic vesicles. We suggest that it is the transport of a biogenic amine other than dopamine or serotonin that accounts for the Fwb phenotype of *cat-1* mutants. Interestingly, the biogenic amine histamine has been shown to compete with serotonin for transport by CAT-1 (Duerr et al., J. Neurosci. 19: 72-84, 1999). ADC-1 may synthesize histamine, which is then transported by CAT-1.

To identify new genes that may function with *adc-1* to inhibit foraging during backwards locomotion we screened the F2 progeny of EMS-mutagenized worms for the Fwb phenotype. F2 worms were scored by touching each with an eyelash to initiate backing. Our pilot screen of 5,250 genomes yielded 17 mutants, including a new allele of *adc-1*. We are mapping the remaining mutants, dividing them into complementation groups and conducting a larger screen.