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COGNITION

Neural modulation of feeding behaviors in C. elegans

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Feeding is a complex behavior controlled by environmental and internal physiological factors. The nervous system modulates motor activity depending on the availability of food and the nutritional state. When animals find food after a fasting period, they stay in a small area to exploit the new source of nutrients. Biogenic amines, serotonin (5-HT) and norepinephrine (NE) are involved in the modulation of food-related behaviors in mammals. However, the molecular mechanisms underlying this regulation are not entirely clear. Given its simplicity and highly conserved neurological pathways, C. elegans is a powerful organism that can be used to provide insights into the neural circuits modulating feeding behaviors.
When starved worms find food, 5-HT is released to decrease locomotion and promote food intake. We found that mutants lacking tyramine (TA), NE analog in invertebrates, are hypersensitive to the slowing-down response upon food encounter, resembling starved worms. This suggests that 5-HT and TA exert antagonistic effects. Moreover, the activity of tyraminergic neurons decreases in absence of food. In addition, serotonergic activity is enhanced in TA-deficient mutants. These results allow us to hypothesize that the inhibition of the tyraminergic activity during fasting favors the exacerbation of 5-HT-dependent effects on refeeding. Given the conservation in neuronal components, it is likely that our studies are significant to understand feeding behaviors in other animals.