An integrative and quantitative analysis of dopamine-dependent odor avoidance behavior of the nematode *C. elegans*

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Enhancement of sensory behavior after prior exposure to a stimulus is one of these fundamental neural functions. Its molecular and neural bases, however, has not been studied in as much depth as the reduction of sensory responses, such as adaptation or habituation. We found that the avoidance behavior of the nematode *C. elegans* in response to a repellent odor 2-nonanone is enhanced rather than reduced after preexposure to the odors (Kimura et al., J. Neurosci. 2010); this behavioral plasticity may be beneficial for the animals by protecting them from further disturbance. The enhancement is acquired as non-associative learning and requires dopamine signaling via D2-like dopamine receptor DOP-3 in a pair of RIC interneurons. We are currently trying to understand the neural mechanism for the regulation of the 2-nonanone avoidance through integrating quantitative analyses of the animals locomotion and 2-nonanone diffusion and optophysilogical analyses of neurons for the avoidance with calcium imaging and optogenetic manipulations.