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Nociception and escape behavior in planarians[1]

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Planarians are famous and widely studied for their regenerative capabilities. When a moving planarian is cut through the middle, the resulting head and tail pieces instantaneously retract and exhibit a characteristic escape response that differs from normal locomotion. In asexual animals, a similar reaction is observed when the planarian undergoes fission, suggesting that reproduction through self-tearing is a rather traumatic event for the animal. Using a multiscale approach, we unravel the dynamics, mechanics, and functional aspects of the planarian escape response. This musculature-driven gait was found to be a dominating response that supersedes the urge to feed or reproduce and quantitatively differs from other modes of planarian locomotion (gliding, peristalsis). We show that this escape gait constitutes the animal's pain response mediated by TRP like receptors and the neurotransmitter histamine, and that it can be induced through adverse thermal, mechanical, electrical or chemical stimuli. Ultimately, we will examine the neuronal subpopulations involved in mediating escape reflexes in planarians and how they are functionally restored during regeneration, thereby gaining mechanistic insight into the neuronal circuits required for specific behaviors.

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