Molecular Identification of Rapidly Adapting Mechanoreceptors and Their Developmental Dependence on Ret Signaling

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Abstract

In mammals, the first step in the perception of form and texture is the activation of trigeminal or dorsal root ganglion (DRG) mechanosensory neurons, which are classified as either rapidly adapting (RA) or slowly adapting (SA) according to their rates of adaptation to sustained stimuli. The molecular identities and mechanisms of development of RA and SA mechanoreceptors are largely unknown. We found that the "early Ret+" DRG neurons are RA mechanoreceptors, which form Meissner corpuscles, Pacinian corpuscles, and longitudinal lanceolate endings. The central projections of these RA mechanoreceptors innervate layers III–V of the spinal cord and terminate within discrete subdomains of the dorsal column nuclei. Moreover, mice lacking Ret signaling components are devoid of Pacinian corpuscles and exhibit a dramatic disruption of RA mechanoreceptor projections to both the spinal cord and medulla. Thus, the early Ret+ neurons are RA mechanoreceptors, and Ret signaling is required for the assembly of neural circuits underlying touch perception.

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