TrkC Identifies a Putative Mechanoreceptor that Specifically Innervates Taste Papillae

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It is evident that the tongue perceives tactile sensation, but little is known about the neurons that mediate this. Since tropomyosin receptor kinase C (TrkC) neurons are mechanosensory in skin, it is hypothesized that these neurons are also mechanosensory in the tongue. I have previously found that TrkC neurons innervate the fungiform papillae of the tongue in a manner that primes them for surface-level somatosensation, and that TrkC neurons exhibit a similar anatomy to those of known mechanoreceptors in the trigeminal ganglion. Furthermore, I have found that TrkC neurons fire action potentials in response to tactile stimulation of the tongue. These combined anatomical and physiological findings indicate that TrkC neurons in the tongue likely play a role in mechanosensation; however, the receptive field of these neurons remained unknown, and without this information it is impossible to determine if these neurons are truly mechanosensory. Alkaline phosphatase staining was performed on the tongues of TrkC Cre-ER; Brn3a-AP mice to stain the entire length of TrkC neurons in order to analyze their morphology and receptive fields. It was found that the receptive field of TrkC neurons is limited to fungiform papillae and that the majority of TrkC neurons innervate a single papilla. These data support the hypothesis that TrkC neurons are mechanosensory and provide a link between the previous anatomical and physiological findings. Understanding TrkC neurons is a vital step to understanding somatosensation as a whole and will facilitate the development of clinical interventions and treatment for disorders involving the tongue.

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