Generation mechanisms of mouse taste cell responses to salts

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We investigated the ionic mechanisms of mouse taste bud cells to understand the receptor mechanisms for salts under voltage or current clamp conditions using peeled mouse tongue epithelia. The epithelium was set on a recording chamber where receptor membranes and basolateral membranes of the mouse taste cells were perfused with deionized water and a saline solutions, respectively.

The mean and standard deviations of the resting potentials of the taste bud cells were -51.3 ± 14.7 mV, n = 13). The recorded taste bud cells elicited TTX-sensitive transient inward currents and various outward currents on depolarization. The taste bud cells were roughly classified into 3 groups based on the properties of the outward currents; type 1 cells (22%), saturating outward currents; type 2 cells (17 %) inactivating outward currents; and type 3 cells (61 %) no-saturating/no-inactivating outward currents. The type 2 and 3 cells elicited slow inward currents on hyperpolarization.

The taste bud cells investigated under current clamp conditions elicited a train of action potentials lasting for ~ 200 msec on depolarization. The spike frequencies were linearly increased on depolarization in the range between -50 mV and -25 mV.

Each taste bud cell in the peeled epithelia had long apical portion (2 x 30 μm). The taste receptor potentials generated at the receptor membranes or the apical portions close to the receptor membranes may elicit the action potentials that can release neurotransmitters from the taste cells. Although further experiments are needed, taste cells may use the action potentials as well as olfactory receptors or invertebrate photoreceptors.