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Peripheral Modulation of Gustatory Information

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Receptor potentials evoked in taste receptors of the tongue are converted into a series of afferent impulses which convey sensory information to the central nervous system through taste fibers. A part of the orthodromic impulses arising in one papilla, however, antidromically invade the adjacent papilla and inhibit the afferent signals evoked at the latter. The present study was performed to electrophysiologically clarify the mechanism of this inhibition using a preparation of the frog's taste organ and the medial and lateral branches of the glossopharyngeal (IXth) nerve which innervates the receptors. A single papilla innervated by the two branches was stimulated by various taste solutions and by a tap with a glass rod, and the response was simultaneously recorded from each branch. Then, NaCl responses were recorded from the branch producing a greater NaCl response, while the other branch was electrically stimulated (3 V, 100 Hz and 30 s). The degree of inhibition depended on the number of sensory responses and types of responses observed in the electrically stimulated branch. Statistical analysis suggested that gustatory units responsive to NaCl, quinine or acetic acid, and slowly adapting mechanosensitive units produced larger antidromic inhibition (amounting to 9–25%) than rapidly adapting mechanosensitive units (giving rise to only a slight inhibition). A possible mechanism of synaptic interaction in the peripheral gustatory system is proposed.