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Elucidation of the Physiological Significance of Zinc in Taste Cells Using a Zinc Biosensing System

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Summary

Zinc is an essential trace element and its deficiency results in dysgeusia. It is a neurotransmitter in the central nervous system and is accumulated in zinc transporter 3 (ZnT3)-expressing vesicles in the hippocampus. We previously examined the distribution of zinc and expression profiles of ZnT3 in taste cells. Zinc-positive signals were demonstrated using a zinc fluorescence dye (ZnAF-2DA) and autometallography staining in the cells of taste buds. ZnT3 immunoreactivity was detected in PLC-β2- and IP_3R3-positive type II and AADC-positive type III taste cells, but not in type I cells. However, the role of zinc in transmitting taste signals in rat taste buds remains unknown. In this study, we evaluated zinc release from isolated taste cells using a zinc biosensing system. mRNAs for ZnT3 were expressed by isolated taste buds. Taste stimuli activated the zinc-sensitive cells with isolated taste cells; however, the response ratio decreased significantly following pretreatment with MgEDTA as an extracellular zinc chelator, but not with ZnEDTA. These findings suggest that upon stimulation, zinc is released by the taste cells into the intercellular space, and it might play a role in signal transmission within taste buds.