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Studies on the Characterization and the Mechanism of Taste Perception under the Long Zinc Deficiency

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Summary

Zn^{2+}, one of essential trace elements for both humans and animals, works as a component of various metalloenzymes including RNA polymerase and DNA polymerase. Therefore it is directly involved in DNA synthesize and plays an important role in cell division and proliferation. Zn deficiency causes many clinical symptoms such as taste disorder. The estimated life span of taste cells is quite short, about 10 days. Thus Zn deficiency makes it difficult to keep continuous cell renewal in taste buds. The morphological changes like a significant decrease in number of taste cells, loss of microvillus and delayed turnover rates of taste buds in Zn deficient rats have been observed using an electron microscope. However, the effects of Zn deficiency on taste perception remain controversial. To investigate the changes of taste perception of Zn deficient mice, we conducted 48 h two bottle preference test and nerve recordings. Mice were fed the low Zn food for 6 weeks and led to hair loss and finger deformity in C57BL/6Jms slc mice. The 48 h-preference test showed that avoidance for 1 and 3 mM citric acid was almost disappeared in zinc deficient mice, whereas the preference ratio for other tastants did not changed. Chorda tympani nerve recordings from Zn deficient mice showed relatively reduced responses to citric acid. We also conducted immunostaining to reveal the change of ratio of taste cells with type II cell marker, Galfa-gustducin and phospholipase C beta2, and type III cell marker, carbonic anhydrase 4, however there was no differences between Zn adequate mice group and Zn deficient mice group. These results suggest that citric acid avoidance was disappeared not because of specific loss of cells and might be postprandial effect. The 10 min-preference test were carried out to confirm the effect, and the result showed that there was no difference in the preference ratio for citric acid.

These results in this study suggested that the defense mechanism against Zn deficiency exist in the taste system.