No. 2338

Molecular Mechanisms Underlying Differentiation of High Salt Taste Cells

Makoto Ohmoto

Takasaki University of Health and Welfare

Summary

The sense of taste occurs when chemical substances in food are detected by taste cells in the taste buds located in the epithelium of the oral cavity. The five basic tastes that humans can recognize are sweet, umami, bitter, salty, and sour. Sweet, umami, bitter, and sour tastes are each detected by different taste cells. It has been shown that salty tastes have two different detection pathways: low-concentration sodium taste and high-concentration salt taste. The former is detected by different taste cells from those that detect sweet, umami, bitter, and sour tastes, while the latter is detected by bitter and sour taste cells. As for the molecular mechanism that generates this diversity of taste cell types, the transcription factor Skn-1a (Pou2f3) is an essential factor in the differentiation of sweet, umami, bitter, and low sodium taste cells. This study focuses on Eya1, a transcription factor expressed in bitter taste cells (i.e., taste cells that detect bitter taste and high-concentration salt taste) and undifferentiated taste bud cells, to analyze the involvement of Eya1 in the differentiation of taste cells that detect bitter taste and high-concentration salt taste.

To analyze the function of Eya1 in taste buds, we used a knock-in mouse line expressing CreERT2, a drug-inducible Cre recombinase, in the stem cells of taste buds (Krt5-CreERT2) and an Eya1-flox mouse line, and generated taste bud-specific mice lacking Eya1 (Eya1 cKO mice). The expression study in the circumvallate papillae showed that the signal frequency of bitter taste receptors (Tas2rs) was greatly reduced compared to that of control mice. The number of signal-positive cells was counted and compared between control mice and Eya1 cKO mice. Although no significant difference was observed in the number of signal-positive cells for Trpm5, which is commonly expressed in sweet, umami, and bitter taste cells, the number of signal-positive cells for Tas2rs was significantly decreased in Eya1 cKO mice, and the number of signal-positive cells for Tas1r3 was significantly increased in Eya1 cKO mice. These results indicate that the number of taste cells involved in the detection of bitter and high salt tastes in the taste buds of Eya1 cKO mice is decreased, while the number of sweet and umami cells is increased, suggesting that Eya1 is a necessary factor for the differentiation of bitter and high salt taste receptor cells.