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Plasticity in discrimination circuitries for taste qualities of sodium and potassium glutamate

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Summary

Umami substances, monosodium L-glutamate (MSG) and monopotassium L-glutamate (MPG) represent considerably different taste qualities from each other in human. However, the taste quality of MPG with inosine 5'-monophosphate (IMP) seems to be close to that of MSG because we found using a conditioned taste aversion (CTA) paradigm that C57BL/6 mice, whose umami sensitivity is relatively similar to that of human, discriminated MSG from MPG, but dose-dependently failed to discriminate MSG from MPG with IMP (MPG+IMP). Taste preference tests using the two-bottle procedure also confirmed that C57BL/6 mice favored MSG and MPG+IMP more than MPG. The distribution pattern of MPG-stimulated Fos-like immunoreactivity (FLI) in the parabrachial nucleus (PBN) and the nucleus of solitary tract (NTS) was altered by addition of IMP to be similar pattern of MSG-stimulated FLI: MSG-stimulated FLI tended to distribute in anteromedial part of PBN and NTS, but MPG-induced FLI, which dispersedly located in the posterior part of PBN and NTS, shifted to anteromedial part of PBN and NTS with addition of IMP. Furthermore, MPG-stimulated FLI was modulated also toward horizontal and vertical axes in PBN but not in NTS by addition of IMP. These results suggest that IMP-induced taste quality change of MPG is accompanied by the alteration of pathways toward antero-posterior axis within NTS, followed by the alteration of pathways toward three-dimensional axes within the PBN. It is concluded that more detailed information of taste qualities are transmitted to the higher order portion of the central nervous system. In addition, we could not observe any sign of the cell proliferation in PBN using 5-bromo-2-deoxyuridine (BrDU) injection method at present, indicating that the adult neurogenesis does not contribute to the alteration of discrimination circuitries for umami taste by IMP.