Taste identification of L-arginine, L-serine and L-MSG by WT and T1R KO mice using CTA methodology

This experiment studied taste perception in mice to elucidate how the mammalian taste system detects L-amino acids. We provide further support that multiple umami receptors contribute to the overall detection of L-amino acids. Our hypothesis is that wild-type (WT) mice, possessing multiple receptor types, can identify L-MSG and L-Arg as eliciting different tastes. T1R1 and T1R3 knockout (KO) mice, on the other hand, are expected to be less efficient at distinguishing the two compounds, yet their ability to do so will not be entirely compromised. This experiment is a 2x3x3x11 mixed factorial design: Unconditioned stimulus (US: LiCl or NaCl), mouse strain (WT, T1R1 KO, or T1R3 KO), conditioned stimulus (CS: L-MSG, L-Arg, or L-Ser), and various concentrations of L-amino acids (11). The dependent variable (DV) is licking behavior. We conducted a conditioned taste aversion (CTA) on WT mice, which involves pairing a CS with LiCl or NaCl. LiCl induces an upset stomach, whereas NaCl does not. Mice learn to associate an upset stomach with their CS, which shifts the hedonics of their CS to a negative value. If the CS is presented in subsequent trials, mice will tend to avoid the CS and any substance that tastes similar to it. This phenomenon of taste generalization is central to this experiment, and is assessed based on the DV. Normalizing lick counts to water allows us to analyze licking behavior: 1.0 indicates no aversion to a given taste stimulus, whereas ≤ 0.40 indicates an aversion. Mice lacking key components of the primary umami receptor heterodimer, T1R1/T1R3 receptor monomers, presumably cannot detect umami substances; however conflicting results have been reported. The results of this portion of the experiment are confined to WT mice. Our results suggest that WT mice cross-generalize L-Ser with L-MSG, but only minimally generalize between L-MSG and L-Arg, or between L-Arg and L-Ser, consistent with our hypothesis.