

Sensing of "Umami" Taste and Synergistic Effects with Synthetic Lipid Membranes

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A lipid membrane is a novel material for a taste sensor. It responds to substances of four basic tastes: salty, sour, sweet and bitter. A fifth basic taste, "umami", was investigated in the present paper. Glutamate (MSG, L-type), inosinate (IMP) and guanylate (GMP) hyperpolarized the membrane potential and increased the membrane resistance; the effects were different from those for the other four basic tastes. A synergistic effect, which appears for the mixture of MSG and IMP (GMP), could be detected by the lipid membrane. The strength of the effect was comparable to that of a human sensation. MSG adsorption was measured with a fluorescamine, and it was confirmed that the adsorbed amount increased when IMP or GMP coexisted. Furthermore, D-MSG, which does not elicit umami, affected the membrane in a different manner from L-MSG. With these effects of umami substances it was confirmed that umami is a fifth basic taste in the lipid membrane and that the lipid is useful for taste sensing.

1. Introduction

Lipids are major components of the biological membrane which are the permeability barrier containing certain specific receptors for external stimuli. Though the specific actions as receptors are naturally attributed to proteins embedded in the lipid layer, the lipid membrane itself has also been arousing attention as a taste or smell receptor.

Many investigations on taste reception have been carried out with lipid mem-