The synergistic effects of minerals and lactic acid contributing to the taste of complex organic substances

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Japanese fish stock is an important component of Japanese cuisine and is a preferred flavor of humans and rodents. It is made of a complex mixture of amino acid, proteins, organic acids and minerals and has been shown to elicit all 5 of the basic tastes. The purpose of this study was to use condition taste aversion (CTA) methods to determine if an aversion to Japanese fish stock generalizes to one or more of 4 salts (NaCl, KCl, CaCl$_2$, MgCl$_2$), and if lactic acid alters the taste and resulting generalized aversion in C57Bl/6J mice with compromised olfactory systems. Conditioning and generalization testing were done with 25% solution of fish stock (conditioned stimulus) presented in a Davis Rig (MS160). Generalization was measured by counting licks when mice were presented with NaCl (100 & 300 mM), KCl (100 & 300 mM), CaCl$_2$ (15 & 30 mM), and MgCl$_2$ (20 & 40 mM), with or without 0.9% lactic acid added. We found that all 4 salts showed mild naturally aversive qualities at their highest concentration. Additionally, CTA generalized more to the divalent salts than the monovalent salts. Interestingly, lactic acid had little effect on CTA generalization to the monovalent salts whereas it decreased generalization to divalent salts. The CTA did not generalize to lactic acid alone. These results suggest that all 4 salts may contribute to the taste of the complex taste of Japanese fish stock and those interactions between lactic acid and divalent salts alter the tastes elicited by these salts. Further studies will examine how the interactions between lactic acid, citric acid, amino acids, inositol, and these salts may contribute to complex tastes.