

A sense of taste

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Gustatory receptors, housed in specialized gustatory sensillae, mediate an insect's decision to accept or reject a host. The dynamics of receptor-ligand associations are largely unknown for gustatory receptors in pest insects. A class of these receptors, the sugar sensing receptors, were studied using the yellow fever mosquito, *Aedes aegypti*, as a model organism. In our two-choice feeding bioassays, 3-4 day old female mosquitoes preferred to feed on the sugar trehalose over water (at all tested concentrations) and trehalose plus an amino acid (at specific concentrations of amino acid - eg., leucine 0.001, 0.01 & 0.1mM) over trehalose alone (trehalose concentration kept constant- 10mM). Interestingly, the tested female mosquitoes didn't show any preference between an amino acid alone (all tested amino acids) and water. Single-sensillum electrophysiological studies revealed that some labellar taste sensillae (eg., RD4) increase their neuronal firing rate on contact with a combined amino acid (e.g., leucine) sugar trehalose diet compared to sugar trehalose alone. Two gustatory receptors expressed in labellar tissues were identified as candidate sugar receptors potentially facilitating a synergistic electrophysiological and behavioural response on contact with sugar plus amino acid diets. These two receptors were initially tested for their sensitivity and specificity for binding to trehalose, through *in vitro* heterologous expression in *Spodoptera frugiperda* cells (Sf9 cells) and live cell calcium imaging. One of the two tested receptors showed a dose-dependent response to trehalose and further testing with this receptor revealed that it is more likely implicated in a synergistic response to leucine enriched trehalose diets.

