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Response of an Insect's Peripheral Taste System to
Mixtures of Sweet and Bitter Stimuli

Herbivores face a dilemma; the world is covered with plants, but many of them are toxic and contain limited nutrients. Numerous methods of detoxification can be induced in response to ingested toxic plant metabolites. However, an aversive response to harmless or mildly toxic plants is often elicited though proper detoxification mechanisms exist. Such “false alarms” could potentially limit the dietary options of herbivores. Furthermore, carbohydrates typically found in host plants of many insects induce an appetitive response. Contrastingly, larvae of the lepidopterous caterpillar *Manduca sexta* exhibit anomalous feeding behavior. Although carbohydrates elicit a robust peripheral gustatory response, *Manduca* show the same preference for carbohydrates as for water in 2-minute bite tests. In this study, we aimed to explain *Manduca*'s anomalous feeding behavior by examining the role of carbohydrate-sensitive taste cells in mediating the peripheral taste response of bitter-sensitive taste cells. Such a physiological adaptation could be employed by *Manduca sexta* to bypass the aversive response to deterrents. We hypothesized that activity of carbohydrate-sensitive cells “masks” the bitter taste of toxic plant metabolites. To test this hypothesis, electrophysiological recordings were taken from both the lateral and medial styloconic sensilla of *Manduca* larvae, taste structures sensitive to carbohydrates. Recordings were obtained after presenting either the lateral or medial sensillum to mixtures of carbohydrates and bitter compounds.