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Is Your Sweet Tooth in Your Mouth or Your Stomach?

The mammalian sweet tooth seems to be universal. The consumption of sugar is controlled by taste (oral) and nutritional feedback from the gut (post-oral). These oral and post-oral mechanisms interact in order to drive daily sugar intake in C57BL/6 mice, however the exact interaction is unknown. It is known that 24-h intake tests provide oral and post-oral stimulation, and that saccharin only provides oral stimulation. Following this observation, adding saccharin to a glucose solution should increase oral stimulation, while holding post-oral nutritive feedback constant. In order to clarify the role of oral and post-oral mechanisms, two tests of oral assessment and 24-hr long-term intake tests are used. The present study used three concentrations of glucose: 167, 250, & 33 mM, saccharin (38 mM), and binary mixtures of G + S. Experiments 1 and 2 measured oral stimulation through the measure of electrical activity in the chorda tympani nerve and number of licks in short-term intake tests, respectively. Both experiments minimized post-oral stimulation. The oral assessment experiments showed that oral stimulation occurred in the following order: 167 G+S > S > 167 G > W; 250 G+S > S > 250 G > W; 333 G+S > S > 333 G > W. G+S was found to be more orally stimulating than saccharin, glucose, or water alone, respectively. Experiment 2 consisted of a long-term intake test, which involved post-oral feedback and was used to determine if oral stimulation could predict daily intake. The following relative intakes were observed: 167 G+S > 167 G = S > W; 250 G+S > 250 G > S > W; 333 G+S = 333 G > S > W. The measures of oral stimulation did not reliably predict patterns of long-term intake, and the difference between oral stimulation and long-term intake increased as the concentration of G increased in solution. This is demonstrated by the fact that mice consumed 1.4 times their body weight of 333 G and 333 G+S. The data seem to indicate that the contribution of post-oral stimulation to glucose intake increases considerably with glucose concentration.