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Taste-Dependent Swallowing Behavior in Larvae of the Silkworm, *Bombyx mori*

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Swallowing is a major behavioral element for feeding as well as chewing, but this has been less focused in Lepidopteran insects. In the present study, we demonstrate the mechanics for swallowing behavior and the effects of taste stimuli on the behavior in larvae of the silkworm, *Bombyx mori* by a series of behavioral, anatomical and electrophysiological experiments.

During swallowing behavior the larvae drew fluids into the cibarium by a muscle compressor system in the foregut. During and after the suction of fluids in cibarium, the compressor pressed fluids to pharynx and ejected them down the esophagus. The compressor consisted of circular compressor muscles and dilator muscles serving to the roof of the cibarium from the cuticle of a forehead. Motor pattern of the anterior dilator muscles during swallowing was rhythmic with a positive correlation between duration and interval of burst of the muscle spikes, independently from the rhythmic motor pattern of chewing.

Larvae responded to sucrose solutions depending on its concentration. The larvae applied higher dose of sucrose solutions to their mouthparts showed the shorter duration of the suction. Higher dose of sucrose caused more suctions. This was true for the larvae applied sucrose solutions mixed with inositol or strychnine nitrate. The mixture with strychnine nitrate caused less suctions than that with inositol or sucrose alone. Water or inositol solution without sucrose caused lower frequent suctions. Thus, the swallowing behavior can be induced by sucrose alone, which contradicts the previous reports mentioning that cellulose is a major factor for swallowing. Ablation of a pair of maxillae with the taste sensilla did not affect any suction, suggesting that the other unknown taste cells might be involved in the taste-dependent swallowing behavior.