

Pharmacological Study of Intracellular Second Messengers that Affect Active Ion Transport in the Midgut of Tobacco Hornworm, *Manduca sexta*

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Midgut active ion transport changes during the final larval stage of the tobacco hornworm. The short-circuit current (*I*_{sc}) of the posterior midguts dissected from feeding fifth instars (day 2) is higher than that of midguts from wandering larvae (day 5). The *I*_{sc} of midguts from day 2 larvae is inhibited by 1 mM cAMP and 0.1 mM cGMP, whereas the midguts from day 5 larvae are stimulated by cAMP but unaffected by cGMP. A similar pattern is observed if the midguts are exposed to the cyclic nucleotide derivative, 8-bromo-cGMP. Exposure to the calcium ionophore, A23187, or the endoplasmic calcium ATPase inhibitor, thapsigargin, slightly inhibited the *I*_{sc} of day 2 larval midguts, but this inhibition was not significant. Pharmacological agents known to modulate the activities of protein kinase A, protein kinase C, or protein phosphatases did not change the *I*_{sc}. These results indicate that midgut active ion transport is modulated by cyclic nucleotides, but the manner of the response depends on the developmental status of the insect.