

Alternative Splicing of the Allatotropin Gene: Developmental and Physiological Regulations

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The gene for the neuropeptide, *Manduca sexta* allatotropin (Mas-AT) is expressed as at least three (1, 2 and 3) mRNAs that differ from each other by alternative splicing. By using probes either common to all known isoforms or specific for mRNA-2 and -3, the expression profiles were determined in various tissues during development. Mas-AT mRNAs (~1.1-1.3 kb) were strongly detected only in nervous tissues, but larger mRNAs were present at low levels in the midgut. In the brain, RNA-2 was predominantly detected in larvae, and its levels declined at wandering. In the pharate adult and adult stages, RNA-1 was the major isoform present. In contrast, the nerve cord contains RNA-1 and -3 in larvae, and RNA-2 in pupae and adults. In the midgut, the probe common to all isoforms detects a larger (~1.5 kb) mRNA present throughout development and the RNA-2-specific probe detects only a 4 kb RNA in the pupal and adult stages.

When last instar larvae were starved, parasitized, or fed the ecdysteroid agonist RH-5992, the level of Mas-AT RNA-3 is specifically increased in the nerve cord. Each of these treatments results in reduction of feeding and increased levels of juvenile hormone (JH). The normal decline in JH biosynthesis by the corpora allata does not occur in starved or RH-5992-fed larvae. The increase of RNA-3 levels has the capacity to increase the production of Mas-AT and two related peptides that may be part of the complex response of larvae to nutrient deprivation.