DNA puffs are formed in sciarid salivary gland polytene chromosomes late in the fourth instar, before the pupal molt. DNA puff genes are amplified and transcribed in a developmentally regulated manner in the salivary gland of fourth instar larvae as a late response to the molting hormone ecdysone. We are currently investigating the mechanisms which control the expression of the BhC4-1 gene from DNA puff C4 of the sciarid Bradysia hygida. Since it is not possible to transform sciarids, functional studies of sciarid genes are being performed in transgenic Drosophila. By employing this heterologous system it has been demonstrated that the mechanisms which control the expression of the BhC4-1 gene are conserved in Drosophila. In transgenesis, the BhC4-1 gene is expressed in a developmentally regulated manner in the prepupal salivary gland and in the ring gland. Further characterization of the BhC4-1 promoter region revealed that a 67 bp (-253/-187) fragment and a 129 bp (-186/-58) fragment constitute ring gland and salivary gland enhancers, respectively. A BLAST search in the Drosophila melanogaster genome identified a high number of sequences presenting 90-100% similarity to short sequences within these tissue specific enhancers. The identified sequences are found in either in 5' regions, 3' regions, exons or introns of Drosophila melanogaster annotated genes. It is possible that some of these identified genes are under the same regulatory network which controls BhC4-1 expression. Results from genetic interaction experiments and in vitro incubation of salivary glands in the presence of ecdysone have demonstrated that the BhC4-1 expression in the salivary gland is a late response to the raise in ecdysone titers which trigger metamorphosis. Even though the trans-activating factors which regulate BhC4-1 expression in the ring gland are still unknown, it is possible to infer that the transcriptional complex which controls gene expression in the ring gland is distinct from the one which regulates salivary gland expression.

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