Steroid hormones control important developmental and physiological responses in animals, including humans. It is known that when a cell is exposed to a steroid hormone, there is an immediate change in the genes that are expressed into proteins [1, 2]. Of notable importance is steroid regulation in the salivary glands of larval Drosophila melanogaster and the corresponding physiological responses that are governed by treatment with the conserved insect steroid, 20-hydroxyecdysone (20E). Exposure to the steroid hormone 20E causes a change in gene expression that facilitates the secretion of glue glycoproteins from inside the cells into the lumen of the tissue. Altered gene expression induced from exposure to 20E is manifested in part because of an elevation in the cytoplasmic concentration of Calcium ions (Ca^{2+}) [1, 2]. The molecular details that make the connections between the observed secretions of glue granules, the sudden increase in intracellular Ca^{2+} concentration, and the proteins that mediate these physiological responses are unknown [1], but are now experimentally tractable because of recent advances in the fields of genomics and molecular genetics. We have conducted a search through a database containing over 13,000 expressed genes from the salivary glands that show altered expression before and after hormone exposure. The goal of this research is to compile a list of candidates that show a significantly altered level of expression in preparation for functional genetic tests. Any such genes identified will be compared to human databases for shared functionality in terms of their expression and subsequent control on basic physiological responses in mammalian systems.

Why Study Salivary Glands?

1. Long history of investigating global responses to steroids (puffs on chromosomes) before the genomic era.
2. Large steroid-responsive epithelial tissue that can be cultured towards the end of the last larval instar (L3) [1, 2].
3. Conserved insect steroid, 20-hydroxyecdysone (20E). Exposure to the steroid hormone 20E is emptied into the extracellular space by means of vesicle-mediated exocytosis [2].

In the salivary glands of larval D. melanogaster, pulses of 20E leads to a transcriptional cascade that facilitates the production of glue glycoprotein and their secretion that occurs towards the end of the last larval instar (L3) [1, 2].

The secretion of glue glycoprotein is a highly regulated process and has been shown to occur in concert with 20E secretion and Ca^{2+} changes as it has been demonstrated that at critical times in larval development, 20E is emptied into the extracellular space by means of vesicle-mediated exocytosis [2].

References