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Evolutionary and functional relationships of insect immune proteins

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Summary

Innate immunity has many features, involving a diverse range of pathways of immune activation and a multitude of effectors-functions. This thesis project examined different aspects of innate immunity. In the first part a novel gene family of putative C-type lectins is presented, which may have developmental and immune functions. In the second part, I explored the possible ancestral origin of immune-effector proteins by investigating salivary gland and silk proteins involved in coagulation. In the last part, novel immune genes with similarity to strictosidine synthase are presented and their role as antifeedent is discussed.

Glycodeterminants play an important role in mediating cellular and cell-substrate interactions during development and immune-related reactions enabling an organism to distinguish self determinants from non-self or modified-self determinants. The most studied sugar recognition molecules are lectins. They have a wide range of binding activities and they are organized in multigene families. Here I describe a group of *D. melanogaster* genes that are possible members of the C-type lectin family.

Characterization of a novel *D. melanogaster* hemocyte mucin revealed a gene-locus I71-7, which was identified as a salivary (labial) gland protein. These data suggest that I71-7 is expressed similarly to hemomucin and may take part in hemolymph coagulation and entrapment of microorganisms. To test whether labial gland proteins are expressed in the immune system of other insects, I studied two lepidopteran silk proteins and found them

to be expressed by immune tissues as well. The implications of labial gland secretory protein involvement in coagulation and its role in insect immunity are discussed.

I used conserved protein domains of the *Drosophila* immune receptor hemomucin to identify novel members of a gene family which have similarity to strictosidine synthase (SS), one of the key enzymes in the production of monoterpene indole alkaloids. In addition to the first animal member of the family described previously (hemomucin) a second *D. melanogaster* member could be identified, which appears to differ in subcellular distribution from hemomucin. In *Arabidopsis thaliana*, SS-like genes form a multigene family, compatible with a possible function as antifeedants and antibacterial compounds. In *Caenorhabditis elegans*, two members could be identified and one member each in *Mus musculus* and *Homo sapiens*. Interestingly, the human SS-like gene is strongly expressed in the brain, the very organ many of the indole alkaloids act upon.