GYPSY MOTH LARVAL DEFENSE MECHANISMS AGAINST PATHOGENIC MICROORGANISMS

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ABSTRACT

We investigated the response of gypsy moth, *Lymantria dispar*, larval hemocytes to *L. dispar* nuclear polyhedrosis virus (LdMNPV) administered *per os* and by injection, and to injected hyphal bodies and natural protoplasts of some entomopathogenic, entomophthoralean fungi.

Light and electron microscope observations of gypsy moth larval hemocytes show seven distinct types of circulating cells: prohemocytes, spherulocytes, adipohemocytes, oenocytoids, plasmatocytes, granulocytes, and coagulocytes. Ultrastructural studies show that the latter three cell types predominate. Plasmatocytes and granulocytes engage in phagocytosis, and granulocytes and coagulocytes are involved in hemolymph coagulation. These events are integral components of nodulation, encapsulation and wound healing and together act to protect the host from microbial infection.

Phagocytosis of non-occluded and occluded LdMNPV took place, but it was an ineffective defense against viral infection. Viral replication was observed in hemocytes within 36 hours, and from then on, dramatic changes occurred in the blood system. During the course of nucleopolyhedrosis, infected larvae experienced significant decreases in total hemocyte count, in percentage of circulating granulocytes, in ability of the hemolymph to coagulate, and in time required for hemolymph to melanize. The blood volume per unit mass of infected larvae was significantly greater than that of controls and wound repair in infected larvae was accomplished in an altered manner.

Gypsy moth larvae were challenged with protoplasts of *Entomophaga maimaiga*, *E. aulicae*, and *E. grylli* and with hyphal bodies of the mite pathogen, *Neozygites* sp. and the Lepidopteran pathogen, *Erynia pieris*. Hemocytes responded to these entomophthoralean fungi in several different ways: these included melanization, phagocytosis, nodulation, encapsulation and lysis of fungal cells. The exact mechanism(s) implemented by the host varied with the fungus but in general, the walled cells of *E. pieris* and *Neozygites* sp. evoked the strongest cellular responses, while protoplasts elicited comparatively weak responses.

This study is an initial step in an investigation of the gypsy moth immune system and of the mechanisms by which this pest protects itself against pathogenic microorganisms.