

FIELD TRANSMISSION OF A MICROSPORIDIAN PATHOGEN OF GYPSY MOTH, *LYMANTRIA DISPAR*

Thomas Kolling and Andreas Linde

Univ. of Appl. Sciences, Dept. of Forestry,
Alfred-Moeller-St. 1, 16225 Eberswalde, Germany

ABSTRACT

The quantification of the transmission of entomopathogens is important for the evaluation of their establishment and potential as biological control agents, however, only few field or semi-field studies were performed. The microsporidium *Vairimorpha* sp. was isolated from a gypsy moth (*Lymantria dispar*) population in Bulgaria and is highly pathogenic for gypsy moth. Infective spores are produced in the larval fat body, and to a lesser extent probably in the malpighian tubules and the midgut epithelium. Unlike other microsporidia (e.g. *Nosema* spp. from gypsy moth), which produce spores in silk glands and therefore may be transmitted by contaminated silk and faeces, the exit of spores of *Vairimorpha* sp. from the fat body is still an obstacle. Spores can be released from cadavers of infected larvae or may be ingested through cannibalism. Laboratory studies show low rates of transmission among living larvae.

To study transmission in the field, a study plot was established in the Forest Botanical Garden in Eberswalde, Germany. Cages (1x1x2 m) were built around 10 oak trees (*Quercus petraea*, 3 years old, 2 m height) of similar foliage quantity. *Vairimorpha*-infected (5×10^3 spores per larva) and uninfected *Lymantria dispar* larvae (test larvae) were placed into the cages with a ratio of 10 initially-infected and 90 test larvae, or ratios of 20:80, 30:70, 40:60, 50:50; each treatment was replicated in two cages and repeated twice in the summer of 2005. After 18 days of exposure, all larvae were removed and individually reared in the laboratory for an additional 14 days, then

diagnosed for infection using phase contrast microscopy.

The rate of recovery was very high. In total, 87.8 percent of all larvae (72 percent of the initially infected larvae [all alive] and 94.5 percent of test larvae [these either as cadavers or alive]) were recovered after 18 days. Different from previous laboratory experiments, the field experiments revealed a high transmission rate. In particular, transmission ranged from 17 to 67 percent, depending on the ratio of initially infected and test larvae. In some cages we found transmission rates of up to 99 percent. The transmission rates increased with the ratio of initially-infected to test larvae (10:90; 20:80; 30:70; and 40:60), but showed no further increase when the ratio was 50:50.

These unexpected results indicate that the dynamics of the interactions between the insects and the microsporidium *Vairimorpha* sp. in the field seem to be very different from what we find in the laboratory. Remarkably, the correlation between the probability of encounter (of a dead, infected larvae with a test larvae) and the number of infected test larvae is highly significant ($\rho=0.740^{**}$; Spearman correlation coefficient 0.001-level). Based on these results in our field experiments, a significant influence of the presence of dead larvae in the cages on the transmission rates is conjecturable. For 2006 we are planning the next two trials with the same experiment design and hope to broaden the data basis for our results.