TWO APPROACHES FOR QUANTIFYING TRANSMISSION OF MICROSPORIDIA IN SEMI-FIELD CONDITIONS

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ABSTRACT

Horizontal transmission of the microsporidium *Nosema lymantriae* in *Lymantria dispar* larvae in semi-field conditions was quantified using two approaches: we varied (1) the density of the pathogen and (2) the time that susceptible larvae were exposed. Wood-framed cages were installed around fifteen 2-m-tall *Quercus petraea* trees on an oak plantation. Different trees were used each year. To study transmission at different pathogen densities, *L. dispar* larvae that were inoculated and marked in the laboratory (= inoculated larvae) and uninfected, susceptible larvae (= test larvae) were placed in the cages in ratios of 10:90, 20:80, 30:70, 40:60, and 50:50 larvae, respectively. All larvae were removed from the cage after 21 days. Two trials in consecutive years were conducted. To test transmission at different times of exposure, 30 marked, inoculated larvae and 70 test larvae were placed into the cage at the same time. Larvae were removed from the cages at three points in time: 11, 16, and 21 days of exposure.

Transmission at Different Pathogen Densities

The number of inoculated larvae affected prevalence of infections in test larvae. The prevalence was variable, but there were no differences between the two trials. Moreover, there was no significant interaction between trials and number of inoculated larvae. Infection of test larvae increased with increasing numbers of inoculated larvae (from 14.2±3.5% at density of 10 inoculated larvae to 36.7±5.7% at 30 inoculated larvae). At higher densities, percent infection in test larvae appeared to level off (35.7±5.5% at 50 inoculated larvae). A logarithmic function best fit to our data (R^2=0.330, F=13.783, P<0.001).

Transmission at Different Times of Exposure

No transmission of *Nosema* infections occurred within the first 15 days post inoculation (11 days of exposure). Transmission increased over time; we found the first infected test larvae in samples taken 20 dpi (16 days of exposure). In the cages sampled 25 dpi (21 days of exposure), *Nosema* prevalence in test larvae ranged from 20.6 to 39.2%. The results of our experiments show that *N. lymantriae* is efficiently transmitted under field conditions. Data from concurrent laboratory studies suggest that this is mainly due to spores that are released via feces. Increasing transmission with increasing time of exposure reflects the increasing pathogen density due to this release of spores from living larvae.