

Accepted Manuscript

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PII: S0022-2011(17)30145-3
DOI: <http://dx.doi.org/10.1016/j.jip.2017.07.007>
Reference: YJIPA 6975

To appear in: *Journal of Invertebrate Pathology*

Received Date: 23 March 2017
Revised Date: 24 July 2017
Accepted Date: 26 July 2017

Please cite this article as: Neidel, V., Steyer, C., Schafellner, C., Hoch, G., Simulation of rain enhances horizontal transmission of the microsporidium *Nosema lymantriae* via infective feces, *Journal of Invertebrate Pathology* (2017), doi: <http://dx.doi.org/10.1016/j.jip.2017.07.007>

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Simulation of rain enhances horizontal transmission of the microsporidium *Nosema lymantriae* via infective feces

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Abstract

Larvae of the gypsy moth, *Lymantria dispar*, infected with the microsporidium, *Nosema lymantriae*, release infective spores with feces. We tested the effects of simulated light rain on transmission in cages, providing random contamination of host plant foliage with feces. Contamination by larvae in the intermediate stage of infection, 15-16 days post inoculation, entailed transmission to a mean 4.4 to 16.7 % of test larvae. Simulated rain significantly increased transmission to 30.0 to 57.3 %. Transmission success significantly increased with disease progress. Experiments demonstrated that feces are a suitable source of spores and a likely transmission pathway in the field.

Keywords: Microsporidia; *Nosema lymantriae*; disease transmission; precipitation; gypsy moth

1. Introduction

The microsporidium *Nosema lymantriae* is a pathogen of the gypsy moth, *Lymantria dispar* (Lepidoptera: Erebidae) that causes systemic infections (Weiser, 1957). Infection often leads to death during the larval stage as organs, including the silk glands, the fat body and the Malpighian tubules, get gradually filled with spores of the proliferating pathogen. It is transmitted both, horizontally and vertically (Goertz and Hoch, 2008a; 2008b). Feces of infected larvae contain a large quantity of environmental spores and are a presumptive source of new infections. Corresponding quantification studies have been conducted with larvae reared on meridic diet (Goertz and Hoch, 2008a; Pollan et al., 2009). We observed, that fecal pellets produced by larvae fed meridic diet are soft and sticky while those of leaf-feeding larvae are dry and firm, thus less likely to cause contaminations. Therefore, the role of feces in transmission under natural conditions has been questioned,

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