Entomopathogenic fungi infecting non-pest insects

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41th ANNUAL MEETING

of the

Society for INVERTEBRATE PATHOLOGY

and

9TH INTERNATIONAL CONFERENCE ON *BACILLUS THURINGIENSIS*

Incorporating COST862 Action: Bacterial Toxins for Insect Control

PROGRAM and ABSTRACTS

3-7 August 2008
University of Warwick,
Coventry, UK

Contributed paper. Thursday, 8:45. **192 STU**

Does fumagillin control the microsporidian *Nosema ceranae* in western honey bees (*Apis mellifera*)?

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Nosemosis in western honey bees (*Apis mellifera*) is caused by the microsporidians *Nosema apis* and *N. ceranae*. Pathology associated with *N. apis*, the historical parasite of western honey bees, is well understood, and includes increased winter mortality and poor spring build-up of surviving colonies. Conversely, pathology associated with recently-detected *N. ceranae*, historically of Asian honey bees (*Apis cerana*), is not well-described. *N. ceranae* was associated with increased winter mortality and reduced honey yields in Spain, and was highly pathogenic when inoculated experimentally. The antibiotic fumagillin dicyclohexylammonium (hereafter, fumagillin) is used to control *N. apis*; however, it is unclear whether fumagillin is effective against *N. ceranae*. To determine this, western honey bee colonies in Nova Scotia, Canada were sampled in spring and late summer 2007. *Nosema* intensity in the spring was significantly lower in colonies treated with fumagillin in September 2006 ($n = 94$) than those not treated ($n = 51$), but by late summer no difference existed between groups. Molecular sequencing of 15 infected colonies identified *N. ceranae* in 93.3% of cases, suggesting that fumagillin is successful at temporarily reducing this recent invasive parasite in western honey bees.

Contributed paper. Thursday, 9:00. **193 STU**

Environmental effects on fungal infections in honeybee larvae *Apis mellifera* (Hymenoptera: Apidae)

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Among the social insects, honeybees *Apis mellifera* have an exceptionally diverse set of parasites and pathogens. In this study two species of fungal diseases have been investigated: one is the common brood diseases, chalkbrood (*Ascosphaera apis*) and another opportunistic, but less common pathogen in honeybees, the stonebrood (*Aspergillus flavus*). Using the honeybee larvae as host and these two pathogens we investigated *in vitro* temperature impacts on the infected larvae. Temperature is known to have a crucial role in mediating the outcome of the host – parasite interactions; however there is limited information on the possible competition among fungal pathogens within the honeybee host. In addition, we investigated within-host competition among different fungal pathogens within a single larva and the role temperature plays in mediating these interactions.

Contributed paper. Thursday, 9:15. **194**

Asexual reproduction in the honey bee fungal pathogen *Ascosphaera apis*

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Ascosphaera apis is an important fungal pathogen of honey bees. *A. apis* produces sexual spores (ascospores) that are the primary infective agent of chalkbrood disease. Honey bee larvae can be infected with *A. apis* by ingesting larval food contaminated with ascospores. By contrast, asexual reproduction has never been described in *A. apis,* although it is a widespread form of propagation in Ascomycetes. Since asexual reproduction does not require mating, it allows rapid production of large numbers of conidia (mitospores), and their subsequent dispersal into new areas. This study thus fills an important gap in current understanding of the developmental cycle of an important fungal honey bee pathogen. Herein we describe asexual reproduction in *A. apis* and discuss its potential role in host pathogenesis and in the dissemination of this infectious bee disease in the environment. Considering the worldwide spread of chalkbrood disease and the lack of EPA approved drugs to cure it, an understanding of the *A. apis* life cycle is an important factor in the design of a disease management program.

SYMPOSIUM (Cross-Divisional) Thursday, 14:00-16:00

Role of Disease in Regulation of Non-Pest Populations

Symposium. Thursday, 14:00. **195**

Specialist and generalist entomopathogenic fungi infecting non-pest insects: Implications for ecosystem services and relevance of behavioural ecology

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Entomopathogenic fungi infect a wide array of insects from most orders and they are among the natural enemies that contribute to the regulation of insect populations. However, only a limited number of studies have focused on the impact of fungal pathogens on populations of non-pest insects. Effects of entomopathogenic fungi on non-pest host populations should receive more attention based on the increasing interest in conservation biological control. In this strategy, founded on competition theory, non-pest host populations adjacent to cropping systems will in principle affect pest populations through shared natural enemies. We present examples of selected non-pest host-fungus systems from temperate ecosystems that are relevant for the expected ecosystem service provided by entomopathogenic fungi. Predators are among the non-pest hosts that are infected by fungi. Recent advances in our understanding of the effect of pathogens on the behaviour of predators may shed light on the significance of entomopathogenic fungi for the regulation of predator populations. We discuss what we can learn about host-pathogen interactions from behavioural ecology and which life history parameters in the host that may be important for the impacts of fungal pathogens on their host populations.

Entomopathogenic fungi infecting non-pest insects: Implications for ecosystem services and relevance of behavioural ecology

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Abstract

Entomopathogenic fungi infect a wide array of insects from most orders and they are among the natural enemies that contribute to the regulation of insect populations. However, only a limited number of studies have focused on the impact of fungal pathogens on populations of non-pest insects. Effects of entomopathogenic fungi on non-pest host populations should receive more attention based on the increasing interest in conservation biological control. In this strategy, founded on competition theory, non-pest host populations adjacent to cropping systems will in principle affect pest populations through shared natural enemies. We present examples of selected non-pest host-fungus systems from temperate ecosystems that are relevant for the expected ecosystem service provided by entomopathogenic fungi. Predators are among the non-pest hosts that are infected by fungi. Recent advances in our understanding of the effect of pathogens on the behaviour of predators may shed light on the significance of entomopathogenic fungi for the regulation of predator populations. We discuss what we can learn about host-pathogen interactions from behavioural ecology and which life history parameters in the host that may be important for the impacts of fungal pathogens on their host populations.