

# Nosema ceranae, a Causative Agent of Nosemosis in the UK

Many beekeepers will be aware of the microsporidia that can infect our native honey bee, *Apis mellifera*. There are currently two species reported, *Nosema apis* and *Nosema ceranae* (Figure 1), that can cause the full blown disease 'Nosemosis'. *Nosema ceranae* is a recent arrival to the UK, first reported in 2007 by the NBU (see January 2008 article on BeeBase <https://secure.fera.defra.gov.uk/beebase/index.cfm?pageid=166>). Inside a vigorous hive, either or both species can exist without causing any apparent symptoms. However, when a colony is stressed by factors such as long confinement, starvation or poor nutrition, then bees' immune systems can be compromised, the host-parasite balance may then be disrupted and signs of disease may emerge. This article concentrates on the most recent arrival, *N. ceranae*.

## A brief symptomology

Unlike *N. apis*, *N. ceranae* is reported to cause 'dry' Nosemosis, dysentery only rarely being associated with it. As a result you may not know your colony is infected until you observe its decline and collapse. *Nosema ceranae* suppresses expression of the vitellogenin gene (*Vg*) in nurse bees which, in healthy bees, paces the onset of foraging, prepares bees for specialised foraging tasks and influences worker longevity. In nurse bees these behaviours are associated with high expression of *Vg*, while foragers have low *Vg* expression. As a result, in infected colonies where *Vg* expression is suppressed, transition time from nurse bee to forager is decreased resulting in a shorter lifespan of the infected bee.

The presence of *Nosema* also influences forager bees' flight behaviour such that they may not return to the colony. In such cases the colony self-regulates, expelling infected individuals from the hive; a process termed 'suicidal pathogen removal'. However, the process of self-regulation and expulsion of infected bees will not cure the disease as many millions of spores will be left on contaminated material. As the population decreases, the colony must then

regenerate itself, but, due to the low *Vg* levels from continuing infection, available nurse bees will start flying earlier. If the queen cannot compensate for the lost bees, the colony will continue to decline and may, ultimately, through steady attrition, die out.

With the removal of Fumidil B from the market, there are no legal products available to treat *Nosema*. However, there are management options to help beekeepers regulate disease. Important points to bear in mind are:

- Apiary hygiene is key. Wash hive tools between hives with a solution of one part washing soda and five parts water (e.g. 1kg of soda dissolved in 5 litres of water).
- Keep bee suits clean.
- Regularly change dark combs with foundation and sterilise frames. (Sterilisation advisory sheets: <https://secure.fera.defra.gov.uk/beebase/index.cfm?pageid=167>).
- In spring, sterilise solid floor boards and brood boxes; use a blow lamp to torch-sterilise wooden material or use washing soda solution to scrub down polystyrene/plastic equipment.
- Drifting of bees between hives spreads contamination through trophallaxis and can be an important carrier from colony to colony; correct hive positioning is important.
- Strong colonies can cope with minor levels of infection so keep healthy, well-fed, strong colonies with young queens and plenty of new-born bees coming through.

Detailed information about Nosemosis and other diseases is available from the BeeBase website, [www.nationalbeeunit.com](http://www.nationalbeeunit.com). If you suspect your colonies are diseased then please contact your local Bee Inspector. The NBU also offers a chargeable Adult Bee Disease Diagnosis Service (see: <https://secure.fera.defra.gov.uk/beebase/index.cfm?pageid=158>) and many associations now have their own microscopists.

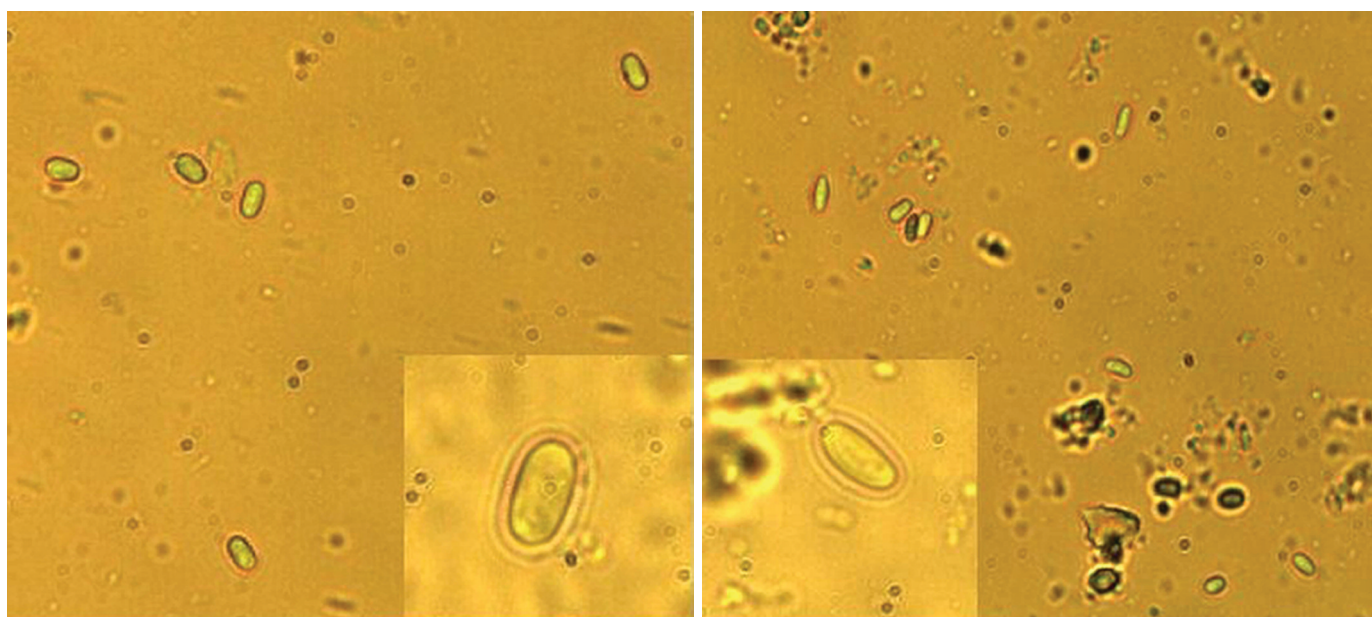



Figure 1. *Nosema apis* (left) and *Nosema ceranae* (right). *Nosema ceranae* is hard to distinguish from *Nosema apis* but can be differentiated by its shape, which resembles a grain of rice. Photos by Jason Learner.

### Further Reading

- Botias C et al. Further evidence of an oriental origin for *Nosema ceranae*. *Journal of Invertebrate Pathology* 2012; 110: 108–13.
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- Higes M et al. *Nosema ceranae* in Europe: an emergent type C nosemosis. *Apidologie* 2010; 41: 375–92.
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**Jason Learner, Technical Advisor,**  
Fera National Bee Unit (NBU)  
01904 462203, E-mail: [Jason.learner@fera.gsi.gov.uk](mailto:Jason.learner@fera.gsi.gov.uk)



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