

## How is it identified?

*Nosema ceranae* cannot be diagnosed simply by observing the hive. The dysentery often associated with *N. apis* is not seen with *N. ceranae*. As well, *N. ceranae* infected foragers often die in the field, resulting in a lack of dead bees in front of the hive.

The most noticeable symptom of a *N. ceranae* infection is a lack of spring build-up, and a subsequent decrease in honey production. The presence of these symptoms does not provide a definitive diagnosis of *N. ceranae*, however, as the same symptoms could result from other causes.

Though distinguishing between *N. apis* and *N. ceranae* requires expensive genetic or molecular testing, it is possible to diagnose a nosema infection with a microscopic examination of the contents of a bee's abdomen. Detailed instructions for the performance of this test can be found in the Technology Transfer Program fact sheet entitled "Nosema Assessment Protocol". A digital version is available on the TTP web site on the "Fact Sheets & Publications" page.

Alternatively, samples can be sent for diagnosis to one of the Ontario Honey Bee Diagnostic Labs:

Jim Anderson, Tanglewood Honey Bee Lab  
RR 1, 35548 Highway 41, Eganville, ON K0J 1T0  
(613) 628-2890

Brenda Perrin, Perrin's Bee Lab  
RR 2, 284 Country Lane, Cameron, ON K0M 1G0  
(705) 359-1505

## How is it treated?

Fumagillin, the antimicrobial treatment commonly used against *Nosema apis*, has been found to be equally effective against *Nosema ceranae* in laboratory studies.

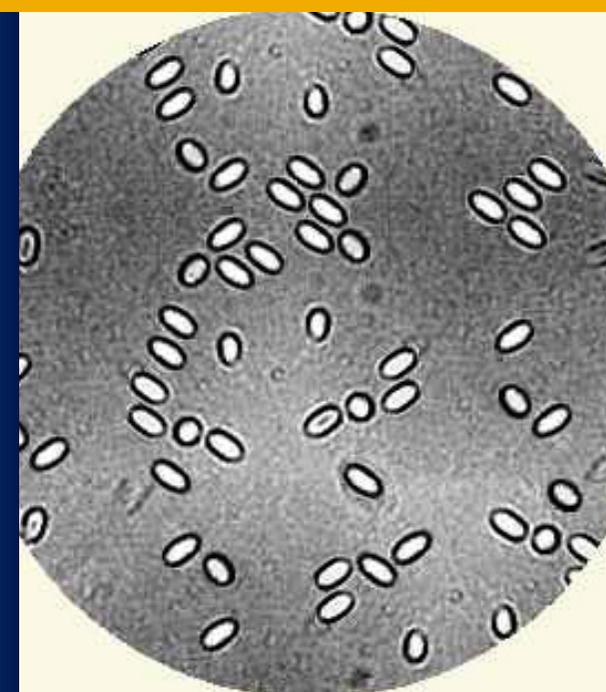
However, some field studies have found Fumagillin to be ineffective at controlling *N. ceranae* infections in the long-term. Though spore levels decrease immediately after treatment, within 2 - 3 months they return to levels as high, or higher than, those of untreated colonies and no improvement in colony strength or productivity is observed. This discrepancy likely results from the way Fumagillin is applied in the field, and highlights the need to explore more effective ways to administer the treatment.

Promising research is currently being conducted at the University of Guelph to discover novel treatments that meet the need for effective *Nosema ceranae* control. In the meantime, the best defense against *Nosema ceranae* infection is to reduce the spore load in the hive by replacing 2 - 3 old brood frames per year with foundation or newly-drawn comb.

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What you need to know about

## Nosema Ceranae



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## What is it?

*Nosema* is a fungal parasite, known as a microsporidian, that infects the midgut of adult honeybees and leads to their premature death. There are two known species of nosema that can infect the western honeybee: *Nosema apis* and *Nosema ceranae*.

The species *Nosema apis* has been known for over a century - its life cycle, symptoms and treatment are relatively well understood.

*Nosema ceranae*, on the other hand, was not found in western honeybees until 2006. Since that time *N. ceranae* has been found all over the world, and in many places, including Ontario, it has replaced *Nosema apis* as the most prevalent species. A study of Ontario colonies in 2012 and 2013 found 84% of colonies were infected with *N. ceranae*, while only 7% were infected with *N. apis*.

In light of the sudden prevalence of *Nosema ceranae* in Ontario colonies, it is important for beekeepers to understand how it differs from the more familiar *Nosema apis* in terms of life cycle, colony impacts, and treatment.

***Nosema ceranae* infects 84% of Ontario colonies**

## When is it active?

*Nosema ceranae* has displayed very different life cycles in different parts of the world. Here in Ontario *N. ceranae* infections have been observed to follow a regular pattern, both in terms of spore counts and spore viability (percentage of spores which are able to reproduce and spread the infection).

### Spring

- » spore counts rapidly increasing
- » high viability of spores
- » many new bees being infected

### Summer

- » spore counts reach their peak
- » low viability of spores
- » infection rates begin to decline

### Fall

- » most young bees not infected
- » proportion of infected bees in the hive is reduced

*Nosema ceranae* infections are most damaging in the spring and early summer when the spores are rapidly reproducing. For this reason, treatments applied in the early spring are most likely to be effective.

This infection pattern contrasts with that of *Nosema apis*, which peaks in late winter/early spring before the beekeeper even opens the colony.

**Early spring is the best time to treat for *Nosema ceranae***

## How does it impact colonies?

When compared with low levels of *Nosema ceranae* infection (fewer than 500,000 spores/bee), high levels (over 1,000,000 spores/bee) are associated with a significant decrease in colony strength and productivity. A recent study of Ontario colonies found that by mid-summer highly infected colonies had 20% fewer bees, 25% less brood, and 40% less honey than colonies with a low level of infection.

An economic analysis of *Nosema ceranae* infections in Ontario found that high levels of infection come at a cost the beekeeper of roughly \$70 per colony in lost productivity.

Fortunately, even highly infected colonies recover by fall, and there is no link between *Nosema ceranae* infection and winter mortality in Ontario.

Like varroa levels, nosema levels can differ significantly from one year to the next. In spring 2013 the average spore counts were 3X higher than in spring 2012, likely due to differences in weather.

***Nosema ceranae* infection significantly reduces colony strength and productivity**