

## General Description

Nosema disease only affects adult honey bees, by parasitizing the cell wall of the midgut. As a result, infected bees have difficulty to absorb nutrients from ingested food, resulting in weakness and shortened life expectancy.

## Field Diagnosis

- Nosema disease is caused by a spore-forming microsporidian fungus of the genus *Nosema*. Most *Nosema* species are common insect parasites. Two species parasitize honey bees: *Nosema apis* and *Nosema ceranae*.
- *N. apis* has been considered an endemic parasite of the European honey bee in North America. *N. ceranae* is a natural parasite of the Asiatic honey bee *Apis ceranae*, and has been found to infect European honey bees in North America since early 2000s..
- Both *Nosema* species have been confirmed in British Columbia.
- *Nosema* incidence in honeybee colonies peaks in early spring.
- Infected adult bees suffer from diarrhea. The infection impairs the digestive process and may lead to bee starvation.
- Beekeepers often fail to detect the disease because affected bees are inside the colony (during winter) or in the field, where they die.
- In heavy infestations, the outside walls of the hives are smeared with fecal deposits.
- *Nosema* is often confused with (viral) dysentery which produces similar symptoms.
- The midgut removal test for visual examination is not sufficiently reliable because discoloration of the midgut occurs in infected and non-infected bees. .

## Laboratory Diagnosis

- For *Nosema* detection, adult bees are examined microscopically or through PCR testing<sup>1</sup>.
- Standard microscopic detection method:
  - Place 25 dead bees in mortar. Add 1 ml of water for every bee.
  - Grind up, collect one droplet of solution and place on slide. Cover with cover slip.
  - Examine slide under 100X power of compound microscope.
  - *Nosema* spores are large, oblong and highly uniform in shape.
- To determine the level of infestation, a haemocytometer can be used to calculate the number of spores per adult bee. (See Bulletin #203A – Counting Method of *Nosema* Spores).
- To submit a sample for *Nosema* identification, collect at least 50 adult bees in tissue paper or paper bag (no plastic), freeze for several days, and mail to the Apiculture office.

<sup>1</sup> PCR = Polymerase Chain Reaction. This test method identifies organisms by comparing a section of gene material of the test organism with a comparable piece of known composition. The technique was developed and introduced in the 1990s and has become standard procedure in forensics, medicine and a wide range of other disciplines.

## **Control and Treatment**

- Nosema disease mostly occurs when bees have been confined to the hive for a long time, and when there is moisture build up and poor air circulation.
- Successful treatment involves antibiotic application to the colony and cleaning of hive equipment.
  
- *Antibiotic treatment*
  - The antibiotic fumagillin (trade name Fumagillin-B) offers effective control. Do **not** feed antibiotic to the colony unless Nosema disease has been confirmed.
  - Application method is:
    - **Dosage:** 5 ml (=1 teaspoon) per treatment per colony
    - **Timing:** One treatment in fall and one treatment in spring
    - **Application Method:** Applied in syrup only, 5 ml dissolved in 4.5 litres of sugar syrup per colony. Fumagillin does not dissolve readily in water. To prepare, add small amounts of warm water (not HOT) to 5 ml fumagillin and stir into a paste. Add water gradually and mix into sugar syrup. Mixture can be prepared a day before use. Shake container occasionally.
  - The best natural defense against Nosema disease is a strong healthy colony with a prolific queen and sufficient food stores, especially pollen, in a well-ventilated hive body.
  
- *Beehive Equipment*
  - Boxes, inner covers and bottom boards must be scrubbed clean inside and out with hot water and soap. Scrape top and bottom bars.
  - Equipment can also be sterilized through irradiation at the Iotron facility in Port Coquitlam ([www.iotron.com](http://www.iotron.com)).