

Nosema Disease

information for identification & control in New York

What is *Nosema*?

Nosema is one of the most prevalent infections in honey bees in New York. It is caused by two species of fungal gut parasites, *Nosema apis* and *Nosema ceranae*. Both parasites can kill colonies that are unable to clear the infection.

Bees become infected when they ingest *Nosema* spores. The disease is spread fecal-orally, through food sharing, grooming, sexual transmission, and by cleaning contaminated cells. Once spores are consumed, they travel to the intestine where they become infectious. *Nosema ceranae* is by far the most prevalent species of *Nosema* found in New York State.

Many institutions in the US and Canada recognize the treatment threshold as 1 million spores/bee, yet this threshold is not well established for *Nosema ceranae*. Beekeepers who wish to treat their colonies should use this current threshold until further research can determine a more reliable one.

What are the symptoms?

Symptoms include reduced honey production, slow spring build up, dwindling adult population, and reduced brood production. Other than these general effects, colonies infected with *Nosema* are often asymptomatic. Dysentery is not a reliable symptom, as it does not occur with *Nosema ceranae*. In colonies that die from the disease, most adults die far from the hive. Inside the hive, there may be a few dead bees on the bottom board and only some young bees and the queen remaining.



Dwindling and reduced brood production (left) are symptoms.

Dysentery (right) is not a reliable symptom.

Preventing *Nosema*

- Manage strong colonies that are not stressed from other causes, and ensure good nutrition
- Replace the 2 oldest frames in each hive body with foundation every year to reduce spore accumulation
- Decontaminate equipment from infected colonies before reusing. Choose one of these options:
 - Irradiating. The closest facility to New York is Sterigenics in Salem, NJ
 - Fumigating with 80% acetic acid
 - Heating hive bodies to 120°F for 24 hours, or 140°F for 20 minutes (this temp melts wax)
 - Freezing equipment for four days (only effective for *Nosema ceranae*)

Diagnosing *Nosema* disease

There are no reliable field diagnoses for *Nosema*. Instead, spores from the gut are identified through microscopic examination. The easiest way for beekeepers to diagnose their colonies is by sending a sample to the Bee Research Laboratory in Beltsville, MD for a free analysis.

Alternatively, if beekeepers have access to a light microscope, they can detect and quantify *Nosema* spores themselves by following the steps on the next page.

Detecting & Quantifying *Nosema* spores using a microscope



Step 1

Collect 25-50 bees from the inner cover or top of the frames in a hive. These bees will be representative of the entire colony.



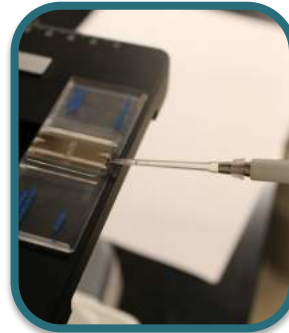
Step 2

Using tweezers cleaned with rubbing alcohol, remove the head, wings, and legs from each bee. Keep the abdomens.



Step 3

Add all the abdomens to a mortar and grind up with a pestle until a paste is formed. Add 1mL of water for each bee in the sample and mix together (e.g., for a sample of 25 bees, add 25 mL of water).



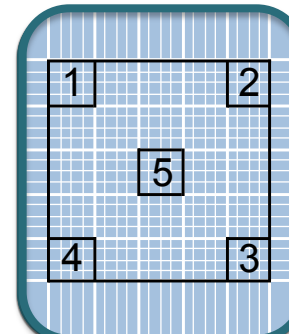
Step 4

Using an eye dropper, add one drop to each chamber of a hemocytometer. There are two chambers in total. If using a pipette, add 10 μ L to each chamber.



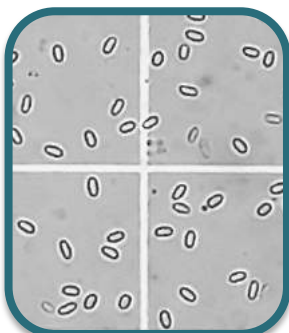
Step 5

Place the hemocytometer under the microscope and focus on one chamber at 400x magnification. Be careful the microscope lens does not come in contact with the cover slip or hemocytometer.



Step 6

Each chamber consists of 25 larger squares comprised of 16 smaller squares. Count spores within the 5 squares shown here. Include spores that touch the top & left lines, but not the spores that touch the bottom and right lines. Record your data.



Step 7

Add the number of spores in the five squares together for each chamber. Calculate the average per chamber and multiply this number by 50,000 to find spore load per bee. Wash and dry equipment before using the next sample.

Spores appear as white ovals with dark outlines. Different species of *Nosema* are not distinguishable through visual observation.

Calculation example:
chamber 1 has 48 spores
chamber 2 has 56 spores
Average = $52 \times 50,000$
2.6 million spores/bee