

Apiculture Factsheet

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Factsheet #205

HONEYBEE DISEASE DETECTION

Recognizing disease symptoms is an essential part of beekeeping management. Early detection allows for the most effective controls and reduces the risk of disease outbreak.

This factsheet offers information about field symptoms and laboratory diagnoses of the most common honeybee diseases. For information about Varroa and tracheal mites, please refer to **Factsheets #219 – Tracheal Mites** and **#221** and **#222 – Varroa Mites**.

American Foulbrood (AFB)

Field Diagnosis

- Hive may show less than normal bee flight with dead bees on the bottom board. The colony may appear weak after opening the hive.
- Capped brood is uneven with puncture holes in the brood cell cappings.
- Colonies with heavy infestation often display irritable behaviour.
- AFB has a distinct “foul” odor. Please note, no odor does not prove AFB is not present!
- With a toothpick, lift punctured cap and remove content of brood cell. The larval remnant may be a light brown mass sunk onto the bottom side of the brood cell. If the mass is **ropy** when withdrawing the toothpick, it is likely AFB.
- Smear the cell contents on the inside of a small plastic bag or sleeve and withdraw the toothpick. Gently squeeze the air out of the plastic bag. Place bag in an envelope and mail to the Apiculture office for confirmation.
- In the brood cell, the larval remains will dry and harden over time into a dark leathery scale at the bottom side of the brood cell. A single scale contains millions of spores that remain viable for decades.
- AFB scales can be readily detected in the field by holding the brood frame at an angle of approximately 30 degrees with the sun or other a light source from behind.



View of brood comb held at approx. 30 degree angle. Note the scales of the open brood cells. Brood cappings are often punctured and unevenly distributed (shotgun appearance).

Laboratory Diagnosis

- AFB is caused by *Paenibacillus larvae*, a spore-forming bacterium.
- A microscopic examination involves detection at 400x magnification.
- AFB spores are slightly oblong, uniform in size and shape. Spores move and “jiggle” in characteristic fashion called Brownian movement.
- *P. larvae* out-competes other bacteria in the parasitized bee larva. AFB is readily diagnosed with most microscopic examinations. Poor quality or contamination of samples may hamper diagnosis.

Control and Treatment

- Become familiar with visual detection of brood diseases.
- Inspect regularly, especially when disease has been reported in the area.
- Discolored brood cells and pierced capped brood cells should be examined. Use a toothpick and slowly extract the cell contents and place in a plastic sleeve or piece of cling wrap. Mail to the Apiculture office for lab diagnosis. (**Please don't mail brood frame or comb*).
- When AFB has been confirmed, remedial action depends the level of infestation:
 - **Light; A few brood cells on a brood frame:**
 - Mark the frame with an X on the topbar and place in position 2 of the brood chamber. Healthy capped brood will emerge while no new brood will be initiated by the bees.
 - When most capped brood has emerged, remove the marked brood frame for destruction. Replace the frame with a new frame with foundation.
 - Apply an antibiotic treatment to the colony. Check the colony once a week.
 - **Medium; Few affected brood cells on most frames while colony appears healthy:**
 - Prepare a single brood chamber with new frames and foundation on a clean bottom board. Slide the diseased hive to the side and place new hive in its place.
 - Check for the queen and manually transfer her to the new hive. Shake the bees off each of the old frames. Force the entire bee population in single chamber.
 - Discard and destroy all old frames. If boxes are still in good condition, use blow torch and scorch the insides lightly.
 - Leave the colony in the new hive alone for 3-5 days to let them settle.
 - After the 3-5 days, use a bucket or top feeder with 2:1 sugar-water syrup including a correct dose of antibiotic. (Sugar syrup is needed to enable the bees to draw out the comb on the new frames).
 - **Heavy; Disease cells throughout the brood nest, colony is small and weak:**
 - The colony condition is beyond recovery. As it weakens, foraging bees from other colonies are attracted and will rob the colony spreading the disease.
 - The colony should be killed and equipment burned. To kill the colony quickly, confine the bees to one box and pour dishwasher liquid between the frames. Alternatively, shake the colony into plastic bag and add dry ice, or dig a small hole in front of the hive, shake the bees into the hole, pour some gasoline or methyl alcohol and ignite.
 - All frames should be destroyed. Only boxes, bottom boards and lids in good condition can be saved by scorching the inside.

Antibiotics & Management

- **Antibiotics (~veterinary antimicrobials) can no longer be purchased at bee / farm supply outlets but can only be obtained through veterinary prescription.**
- When AFB has been diagnosed, contact your local veterinarian or the Apiculture Office.
- Antibiotic-resistant AFB (r-AFB) has been diagnosed in BC. Antibiotics must only be used for treatment purposes. Don't use prophylactically as it stimulates drug resistance.
- Use antibiotics according to label instructions (refer to **Factsheet #204**).
- Reduce the exchange of hive equipment between hives and apiaries.
- Replace 20% of all brood frames each year. No brood frame should be older than five years.
- Don't open-barrel feed or leave used hive equipment exposed to foraging bees.
- Apply hygienic management practices, including clean clothing, hive tools, and gloves.

European Foulbrood (EFB)

Field Diagnosis

- European Foulbrood is less serious than AFB. EFB shows up when the colonies have been under stress due to other diseases, proximity to competing colonies and overcrowding, poor management and weather.
- EFB is easily controlled with standard antibiotic treatments.
- EFB affects bee brood much the same as AFB except that the disease affects open brood, i.e. most larvae die before capping.
- Infected cells show discoloured larvae, often in twisted positions.
- Brood cell remnant taken out of the cell has a sour odour, distinctly different from AFB.
- EFB scales are easily removed from the cell (compared to AFB scales).
- When scales are detected, collect cell scrapings and submit for laboratory examination.

Laboratory Diagnosis

- EFB is caused by *Melissococcus pluton*, but the secondary invader *Pseudobacillus alvei* is mostly observed when examined microscopically.
- At 400X, *P. alvei* is readily identified by its long spindle shaped spores.
- The spores do not jiggle but float in the aqueous solution.
- Unlike AFB, EFB microscopic samples generally display a wide variety of microbes.

Control and Treatment

- Inspect brood frames regularly and be familiar with field symptoms.
- Remove all frames with significant numbers of affected cells.
- Spray or sprinkle 250 ml of medicated sugar syrup over the colony every 3-4 days for 10 days. Refer to **Factsheet #204** for handling of antibiotics.

Requeening provides a distinct break in the brood cycle of the colony, allowing the bees to clean up existing disease.

- Minimize sugar syrup spillage to prevent robbing. Do not barrel feed.
- Apply hygienic management practices. Clean hive tools, smoker and gloves after inspection of each apiary. Clean clothes regularly.
- Replace brood frames after 5 years.

Chalkbrood Disease

Field Diagnosis

- Chalkbrood disease affects bee larvae and is caused by the fungus *Ascosphaera apis*.
- Chalkbrood incidence increases in the fall and spring. Mummified larvae in front of the hive and on the bottom board are easily detected. Mummies on the bottom board may not necessarily indicate a serious problem but confirm hygienic bee behaviour.
- Remove heavily mummified comb and scrape bottom board to reduce source of infection.
- There is no control product available. High incidence of Chalkbrood mostly indicates poor hygienic behaviour and stress due to weather, poor management or diseases.
- In case of severe or persistent Chalkbrood problems, replace the queen with hygienic traits.

Diagnosis

- Mummified larvae are mostly white in colour. The mycelium infiltrates the larval tissue which eventually hardens. The white colour shows asexual spore production while grey or black mummies indicate sexual reproduction of the fungus.

Nosema

Field Diagnosis

- Nosema disease is caused by a spore-forming microsporidian fungus belonging to the genus *Nosema*. In BC, *Nosema apis* and *Nosema ceranae* have been identified.
- Nosema incidence in honeybee colonies peaks in early spring and early fall.
- The disease only affects adult bees by parasitizing their midgut. Adult bees have difficulty controlling their fecal discharge. In heavy infestations, hive equipment is smeared with fecal deposits.
- The disease is often not detected early because affected bees are either inside the hive (during winter) or in the field, where they die.
- Nosema impairs the digestive process and often causes nutritional deficiency.
- Nosema is often confused with dysentery caused by a virus producing similar symptoms.

Laboratory Diagnosis.

- For Nosema detection and confirmation, adult bees must be examined microscopically.
- Under 100X magnification, Nosema spores are oblong, uniformly shaped and thick walled.
- To determine infestation level, a haemocytometer is used to calculate spores per bee.
- To submit a sample for laboratory analysis, collect 50 - 100 bees in tissue paper (no plastic) or paper bag, freeze for several days, thaw, dry and mail to the Apiculture office.

Control and Treatment

- Nosema incidence increases when colonies are under stress and poorly managed. Moisture build up and poor air circulation inside the hive may exacerbate the condition.
- The antibiotic fumagillin, sold as Fumagillin B and Fumadil B is effective. The best natural defense is a strong healthy colony with a prolific queen and sufficient food stores. Rapid replacement of adult bees will minimize or eliminate the disease.

Various “Disease-like” Brood Comb Conditions

- ***Wax Moth***
Larvae of several local species (Lesser Wax Moth, Dried Fruit Moth) damage unoccupied combs as they tunnel through, leaving webbing and droppings. If comb is only lightly damaged, the bees will clean and repair the comb. The Greater Wax Moth causes more extensive damage, but it has only been incidentally reported in southern parts of BC.
- ***Bee Starvation***
A patch of dead adult bees with their heads fully inserted into cells, is a telltale sign of starvation. Wintered colonies may still have food reserves that were not accessible to the bees. Comb with a patch of dead bees can be placed in a new colony for cleanup, providing it is free of disease.
- ***Drone Brood in Worker Cells***
Multiple eggs per cell indicate laying workers. This occurs when the colony is queenless or when the queen is failing. When drone brood emerges from worker brood comb, the queen is a “drone layer” by laying unfertilized eggs. In either case, the colony needs a new queen. A new queen can be raised from other healthy colonies or purchased from an outside source.
- ***Chilled Brood***
Bee brood may die when sudden cold spells occur in spring. This happens more often in smaller colonies where the adult bee population is not large enough to maintain brood temperature. Placement of the frame in the center of the colony will force the bees to remove and clean all the cells.
- ***Moldy Pollen***
Stored pollen in comb is preserved when covered by honey. If the honey is removed and bees are no longer present, the pollen will become moldy. No disease is involved and the frame can be placed back into a strong colony for cleaning and use.