Apiculture Factsheet

Ministry of Agriculture
http://www.al.gov.bc.ca/apiculture

Factsheet #205

HONEYBEE DISEASE DETECTION

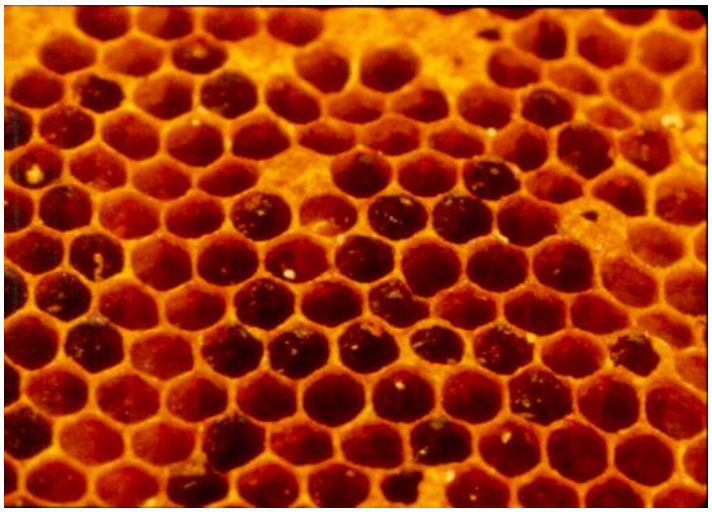
Recognizing disease symptoms in your honeybee colonies is an essential part of good beekeeping management. Early detection allows for prompt remedial action and helps in preventing serious disease outbreak and economic losses. Please consult additional references for information about control products and methods.

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 in Honeybee Colonies** and **#222 – Varroa Mite Detection Methods**.

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 caps of brood cells.
- Colonies with heavy infestation often display irritable behaviour.
- AFB has a distinct “foul” odour that can help in alerting the beekeeper to a disease problem.
- 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 from the cell, there is a strong indication of American Foulbrood Disease (AFB).
- Place toothpick in a small plastic bag or plastic wrap and mail to the Apiculture office for confirmation.
- Over time, the larval remains in the cell will dry and harden into a dark brown leathery scale on the bottom side of the brood cell. A single scale contains millions of spores that remain viable for decades. Bees can not remove scales from cells.
- AFB scales can be readily detected in the field by holding the brood frame at an angle of approximately 15 degrees. Scales should be easily visible.



View of brood comb held at approx, 15 – 20 degree angle. Note the darkened bottom sides of the cells containing scale. Capped brood is unevenly distributed (shotgun appearance). Cappings are often punctured by adult bees.

Laboratory Diagnosis

- AFB is caused by *Paenibacillus larvae*, a spore-forming bacterium.
- A microscope slide can be prepared by dissolving a small part of an AFB scale. Stir the scale with a toothpick in a droplet of water placed on a slide and apply a cover slip.
- Under 400X magnification, the AFB spores are readily visible. AFB spores are characterized by being very slightly oblong, uniform in size and shape. The spores "jiggle" in a characteristic Brownian movement.
- *P. larvae* is competitive and does not tolerate growth of other bacteria in the parasitized bee larva. As a result, most microscopic slides will show a predominance of *P. larvae* spores. This is not always the case with poor samples or those left in the collection bag for too long. In such case, secondary invaders such as moulds, will appear.

Control and Treatment

- Antibiotic-resistant AFB (r-AFB) has become established in BC. Antibiotics must be used for treatment purposes only. Do not use antibiotics as a prophylactic (=preventive) measure.
- Become thoroughly familiar with visual detection of brood diseases.
- Inspect regularly, especially when disease has been reported in the area or after the colony has been placed in crop pollination.
- For frames with suspect signs of brood disease, take a sample and mail to the Apiculture office for free analysis.
- When AFB has been confirmed, kill the bees and burn all the equipment.
  Or: Shake bees onto foundation and burn all the old equipment. Feed the bees with medicated sugar syrup at two week intervals until foundation has been drawn out.
- Use antibiotics only as recommended. Never use the product after its expiry date, and follow preparation instructions carefully (refer to **Factsheet #204**).
- Reduce the exchange of hive equipment between hives and apiaries.
- Replace 20% of all brood frames each year so that after a few years, no brood frame is older than five years.
- Don't barrel feed or leave used hive equipment exposed to foraging bees.
- Apply hygienic management practices, including clean clothing, hive tools, and gloves.
- Work all hives suspected of disease last.

European Foulbrood (EFB)

Field Diagnosis

- European Foulbrood is much less serious than AFB. EFB shows up when the colonies have been under stress due to other diseases, colonies nearby, 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. the larvae die before they are capped.
- Affected cells show discoloured larvae, often in twisted positions, with visible tracheal tubes.
- The brood 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 samples for laboratory examination. Although field analysis is often correct, accurate distinction between AFB and EFB can only be made through microscopic examination.

Laboratory Diagnosis

- EFB is caused by *Melissococcus pluton,* but the secondary invader *Bacillus alvei* is mostly observed when samples are examined microscopically.
- Samples are prepared the same way as AFB samples.
- At 400X, *B. alvei* is readily identified by its long spindle shaped spores.
- The spores do not jiggle but float by in the 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 antibiotics (oxytetracycline) dissolved in 250 ml of 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. It may also provide new bees with better cleaning behaviour, i.e. less susceptible to disease.
- Minimize robbing by preventing sugar spillage. 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.
- There is no control product available. High incidence of Chalkbrood mostly indicates poor hygienic behaviour and stress due to weather, poor management or diseases.
- When there is a persistent Chalkbrood problem, replace the queen with one supplied by a reputable bee breeder. In addition, remove heavily mummied comb and scrape bottom board in order to reduce principal source of infection.

Laboratory Diagnosis

- Mummified larvae are generally white in colour. The mycelium of the fungus infiltrates the larval tissue that eventually hardens. The white colour is the result of asexual reproduction while sexual reproduction will produce black or grey coloured mummies.

Sacbrood

- Sacbrood is caused by a virus. The infected larva dies and the tissue disintegrates into a brown watery solution held by the larval outer skin. The skin sac can be removed intact from the cell. The cell is often uncapped but may also be closed and the cap punctured similarly to AFB cells.
- Sacbrood occurs when colonies have been under stress. Bees generally clear up the disease and remove affected brood themselves.
- There are no control products available.
- Microscopic examination will not reveal indicative signs.

Nosema

Field Diagnosis

- Nosema disease is caused by a spore-forming microsporidian fungus belonging to the genus *Nosema.* Two species, *N. apis* and *N. ceranae* have been identified in British Columbia.
- 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 with controlling their fecal discharge. In heavy infestations, hive bodies are smeared with fecal deposits.
- The disease is often not detected because affected bees are either inside the colony (in winter) or in the field, where they die.
- Nosema impairs the digestive process and causes bee starvation.
- Nosema is often confused with dysentery caused by a virus which produces similar symptoms.

Laboratory Diagnosis.

- For Nosema detection and confirmation, adult bees must be examined microscopically.
  Standard detection method: collect 25 dead bees and place in mortar with 25 ml of water (i.e. 1 ml water for every adult bee). Grind up and collect one droplet of solution and place on slide. Cover with coverslip.
- Examine under 100X power of compound microscope. Nosema spores are large, oblong and highly uniform in shape.
- For determining the level of infestation, an haemacytometer can be used to calculate the number of spores per adult bee.
- To submit a sample for analysis, collect at least 25 dry bees in tissue paper (no plastic) and mail to the Apiculture office. If collected bees are fresh and moist, place bees in paper bag and freeze for several days before mailing.
- The Ministry can also identify the species of Nosema through DNA analysis. These tests are available on a case-by-case basis.

Control and Treatment

- Nosema disease incidence increases when colonies are under stress and poorly managed. The condition is often exacerbated when there is moisture build up and poor air circulation in the hive.
- The antibiotic fumagillin, sold under various trade names, is highly 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.
- Higher Nosema incidence has often been reported with tracheal mite infestations.

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 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 purchased or raised from other healthy colonies.

- ***Chilled Brood***
  Bee brood may die when sudden cold spells occur in spring. This happens most readily in smaller colonies where the adult bee population is not strong 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 not 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.