American Foulbrood–Prevention and Management

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Figure 1. Wax comb from the brood nest with dried AFB larvae.

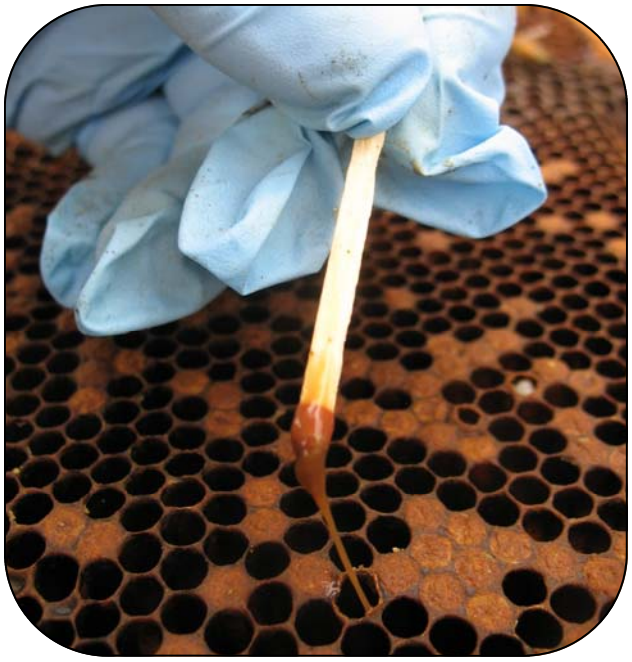

Figure 2. Larvae infected with AFB may have a mucus-like consistency. (Ropey test.)

INTRODUCTION

American foulbrood (AFB) is the most serious and damaging brood disease of honey bees. This disease is caused by a spore forming bacteria, *Paenibacillus larvae* specific to honey bees (figure 1). It is highly contagious and will weaken and in most cases kill a honey bee colony. AFB also contaminates beekeeping equipment whereby the destruction of the equipment is required to prevent the spread of AFB to additional colonies. There is **no cure for AFB**. Beekeepers can only take steps to prevent an infection from establishing itself in a beekeeping operation.

Note: In the past AFB was known by the species name *Bacillus larvae*.

MANAGEMENT OF AFB

Prevention of a widespread AFB outbreak in an operation is the best strategy. Finding an AFB infection as early as possible, and taking immediate action, is critical to prevent its spread within an operation.

Familiarize yourself with the symptoms of AFB (figure 2) and other pathogens of honey bees. Monitor the health of your colonies. Inspect the brood nest at least twice a year, in the spring and fall, and before treatment with drugs (oxytetracycline) which can mask some symptoms of the disease (figure 3).

Incorporate biosecurity practices into your beekeeping management. This includes regular sterilization of beekeeping equipment when moving between beeyards and taking precautions around equipment which has the greatest risk of contact with wax and honey that may harbour AFB spores.

- **Hive tools**. Hive tools should be scraped free of wax and propolis and points of tools that have come in contact with honey bee colonies should be

Figure 3. Inspecting brood comb for symptoms of AFB.

heated at high temperatures. Heating can be done with a propane torch or hive tools may be placed in a smoker where the beekeeper vigorously works the bellows. This should be done at a *minimum* between beeyard visits. If a colony shows symptoms of AFB the hive tools should be heat sterilized before being used on another colony. (figures 4 and 5)

- **Gloves.** Leather gloves may become covered with wax and propolis. This material can be very difficult to fully remove from gloves. Scrub the outside of the gloves with soapy water containing household bleach (250 millilitres per five litres of water). Soap will not destroy spores on the gloves, but it helps remove materials such as wax, which can harbour spores. If beekeepers choose to wear gloves they can also use disposable gloves or gloves that can be easily cleaned (dishwashing gloves).
- **Washing hands**. Although washing hands with soap and water will not kill the AFB spores, most of the spores will be removed from the beekeepers hands with vigorous handwashing.
- **Smoker**. The main area of concern is the top part of the bellows where the smoker is held and worked. If the face of the bellows is wooden, the beekeeper can sterilize it by briefly scorching with a torch. If the face of the bellows is made of plastic (or wood), the beekeeper can wrap this area in duct tape. As the bellows are used, the duct tape can be peeled off to reveal a clean surface. Both wooden and plastic bellows can be scrubbed with soapy water to remove spores.
- **Beekeeping brush**. A beekeeping brush may transfer limited numbers of spores from one frame to another. If possible, remove bees from a frame through shaking or if required use some long grass from the beeyard to gently brush bees aside. The grass is disposable and free.
- **Beekeeping suit and veil.** These items have limited to negligible potential to transmit spores between colonies. As a standard practice beekeeping suits should be washed on a regular basis.
- **Maintaining records** of the management and status of your colonies can be an effective tool to retrace infections.

Although there is **no cure for AFB**, beekeepers should consider using prophylactic antibiotics (oxytetracycline). Make sure the label specifies that the drug may be used with honey bees, follow all label instructions and do not use antibiotics during a honey flow. Oxytetracycline is the only registered antibiotic for use with honey bees in Ontario. Other antibiotics are illegal and may not be safe to use. It is very important to note that **antibiotics are not a cure or treatment** for AFB infections. Antibiotics may only inhibit the infection taking place since they affect the vegetative stage of AFB and inhibit the development of AFB in the gut of the larvae. This may prevent AFB from rapidly multiplying within a colony. Antibiotics have no impact on AFB spores. Therefore, once a colony is infected with high levels of spores it is too late. Beekeepers not using antibiotics should take extra precautions to monitor colony health.

Although antibiotics can be effective at preventing infections from establishing they can also **suppress the visible symptoms** of AFB, thereby masking an infection. It is important to inspect colonies before treatment. Beekeepers should also be aware that AFB infections can still take place even when antibiotics have been used.

Swarms may be contaminated with AFB spores. Beekeepers should place new swarms into a hive with a new foundation, treat prophylacticaly with antibiotics and maintain this colony in a separate beeyard until the colony's health is certain and a full round of drugs have been administered. Be aware that AFB is one of many pests and diseases that may be present in a swarm. It is important to inspect swarms for other pests and diseases, particularly before introducing the swarm colony to an established beeyard.

Figure 4. AFB can easily infect beekeeping equipment.

Figure 5. Sterilization of hive tools is important.

Beekeepers should be mindful not to encourage **robbing behaviour** in beeyards. This includes: not working a colony during a nectar dearth, ensuring a colony has sufficient feed during a dearth, removing discarded wax comb and honey from the bee yard, and ensuring that all colonies are healthy and populous and colony entrances are reduced during a major nectar dearth.

Dead bee colonies ("deadouts") and exposed wax comb should not be left in situations where bees can rob this material. **Deadouts are often a source of AFB.** Material from a dead colony should be taken to a storage location that is secure and "bee tight". When a honey bee colony dies, inspect the brood comb for scale and ensure the cause of death is not AFB.

Being aware of the beekeeping activity in the area where you manage your colonies is important. One of the best ways of doing this is by joining a local beekeeping association and keeping in contact with local beekeepers. If you use equipment from another beekeeper, such as a honey extractor, ensure that you are familiar with their beekeeping practices and disease status.

If you find any sign of AFB in your own beekeeping operation contact your local bee inspector immediately. It is a requirement in the Ontario *Bees Act* that beekeepers **report this disease** and follow any Orders issued by the Apiculture Program. Apiary inspectors can answer questions and make a field diagnosis. If you are confident that it is AFB, promptly destroy the infected colony.

Early detection and destruction are important. It is better to destroy one or a few colonies rather than have AFB spread so that large numbers of colonies must be destroyed. One beekeeper's disease status can impact someone else's livelihood. The *Bees Act* also requires a beekeeper selling honey bees or used beekeeping equipment to have a permit demonstrating the material has been inspected and determined healthy through the process of third party validation.

Whenever a beekeeper intends to make a sale the beekeeper must either hold a signed Queen and Nuc Permit issued from the provincial apiarist or a Selling Permit issued from an apiary inspector. The selling beekeeper simply contacts the local bee inspector or the Apiculture Program to schedule an inspection. There is no charge for an inspection or permit. To sell without a valid permit is a provincial offence.

Even the most diligent beekeeper can contract AFB. This is particularly true in areas of Ontario where there are beekeeping operations in close proximity to each other. Honey bee colonies are exposed to diseases at

other colonies within a **3 to 8 km** radius. Therefore it is important that newly affected beekeepers take immediate steps to eliminate AFB where it is found in the beekeeping outfit and restrict movement of potentially infected material.

IF AFB IS FOUND:

1. Inform the provincial apiarist or a local bee inspector immediately of any sign or suspicion of AFB. See: http://www.omafra.gov.on.ca/english/food/inspection/bees/info_beeinspectors.htm

2. Colonies found with AFB will be ordered to be destroyed – do not try to salvage an infected colony and infected comb. This behaviour will prolong the infection and will likely result in more colonies becoming infected. Early destruction and intervention is critical. **All** infected honey bees must be killed and **all** wax comb and accompanying frames in the colony, including **all** brood frames, foundation and honey frames and bottom boards, must be destroyed by fire. Only certain wooden ware may be salvaged if thoroughly sterilized by scorching. This includes wooden supers, inner covers, telescoping lids and queen excluders. See AFB Destruction protocol at http://www.omafra.gov.on.ca/english/food/inspection/bees/destructionprotocol.htm

3. Other honey bee colonies in the infected yard may be ordered to be treated with preventative antibiotics. This will depend on the season and conditions in the field.

4. A beeyard with AFB will have an AFB Quarantine Order issued for a period of two years. During the quarantine, no colonies or beekeeping equipment may leave the site. This reduces the risk of spreading AFB to other beekeepers and/or other beeyards within the same operation. Honey supers from colonies that are not ordered to be destroyed may leave the site but should be returned to the same beeyard where they originated and should be harvested separately from other non-infected and quarantined yards.

5. After two years the quarantine is lifted and the beeyard may undergo another inspection by apiary inspectors to validate the disease status.

STERILIZATION OF CONTAMINATED EQUIPMENT

Beekeepers also have the option of sterilizing contaminated equipment that is free of honey bees by irradiation. This option allows beekeepers to salvage wax comb that is infected with AFB spores. Consult with the Apiculture Program for available resources and contacts.

Sterilization Method

1. All honey should be extracted prior to equipment irradiation. Use a specially designed small extractor for this purpose. This is different than a regular honey operation extractor.
2. Containers used for extracting honey should be labelled "honey contains AFB".
3. Frames with AFB, frames with no honey, boxes, inner covers and hive lids are acceptable for irradiation. Also send smokers, coveralls and gloves to irradiation.
4. The beekeeper shall retain a copy of the irradiation certificate and the irradiation certificate shall be made available to the bee inspector upon request.
5. All irradiated equipment must be clearly marked as irradiated before being put back into use.

Note: This is the only method of sterilizing wax comb.

Other Equipment

Honey extractors, equipment used with processing honey and vehicles used to transport honey supers may have limited to low potential for spreading AFB. All surfaces should be thoroughly cleaned and rinsed with clean, potable water.

Proper Use of Antibiotics

In other jurisdictions, strains of AFB resistant to registered antibiotics (oxytetracycline) have developed. This means that these preventative measures are no longer effective. It is important that beekeepers prevent or delay the development of resistance in AFB.

- Beekeepers should **never** use "extender patties" to administer antibiotics to honey bee colonies. "Extender patties" are mixtures of vegetable oil, sugar and antibiotics. Due to the antibiotics being present in colonies for long periods of time, this method risks contaminating honey, and developing antibiotic resistance in AFB. **This is off label use of a drug and not permitted.** Oxytetracycline should **not** be mixed in sugar feed. Oxytetracycline is to be mixed with powdered sugar. Follow the label instructions and consult with treatment recommendations for the correct dosage and timing of applications.
- Beekeepers must also ensure they follow all protocol if importing bee stock, honey bees or used equipment into Ontario. An import permit is

required. This is based on an inspection of the material from the other jurisdiction to ensure the material is disease free. See:
www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900057_e.htm
www.omafra.gov.on.ca/english/food/inspection/bees/info_beeinspectors.htm

RESISTANT BEE STOCK

Although researchers have identified strains of honey bees that exhibit some tolerance to AFB through genetically inherited traits, these traits are not sufficient to manage an AFB outbreak and do not offer any protection to honey bee colonies (and equipment) without the "resistant stock". As well, all the infected equipment may remain highly contaminated with a large number of AFB spores. "Resistant stock" is not a recognized or accepted practice in Ontario for control of AFB.

If you have any further questions on how to effectively manage an AFB outbreak consult with your regional Apiary Inspector or the Apiculture Program.

RESOURCES

For more information on AFB see: AFB – Biology and Diagnosis Infosheet http://www.omafra.gov.on.ca/english/food/inspection/bees/afb-biology.htm

For more information on the treatment of AFB see: Treatment Recommendations
http://www.omafra.gov.on.ca/english/food/inspection/bees/apicultu.htm

Provincial Bee Inspectors (Ontario Ministry of Agriculture, Food and Rural Affairs):
http://www.omafra.gov.on.ca/english/food/inspection/bees/info_beeinspectors.htm

Apiculture Program (Ontario Ministry of Agriculture, Food and Rural Affairs):
http://www.omafra.gov.on.ca/english/food/inspection/bees/apicultu.html

Technology Transfer Program (Ontario Beekeepers Association):
http://techtransfer.ontariobee.com/
Orchard Park Office Centre, West Door C
5420 Highway 6 North, Suite B47
Guelph, ON N1H 6J2

Honey Bee Disease Control
Phone: (519) 836-3609
obatechtransfer@rogers.com
http://techtransfer.ontariobee.com/

Integrated Pest Management Workshops
http://techtransfer.ontariobee.com/

RECOMMENDED READING

OMAFRA - Treatment Recommendations for Honey Bee Disease and Mite Control

Ontario Beekeepers Association, Technology-Transfer Program – Ontario Beekeeping Manual with an Emphasis on Integrated Pest Management

Canadian Association of Professional Apiculturists – Honey Bee Diseases and Pests

Notes

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