

American Foulbrood

American foulbrood (AFB) is the most harmful brood disease of honey bees. It is highly contagious and if not managed, will kill an infected colony. Due to the bacteria's infectious nature, this disease can easily spread to other colonies in your apiary, your operation and your neighbour's colonies. AFB spores can survive on equipment for decades and withstand boiling water and many chemical disinfectants.

Prescription Only

As of December 1, 2018, all Medically Important Antimicrobials for veterinary use are sold by prescription only as they have been added to the Prescription Drug List. This includes antibiotics used in apiculture (e. g., oxytetracycline, tylosin, lincomycin).

It is imperative that the use of all medically important antibiotics are controlled to limit the development of resistance in human and animal pathogens, so that effective treatments remain available when required. Antibiotics for the treatment of all animals including honey bees are no longer available "off-the-shelf" in Canada, and a prescription from a veterinarian is required to access these drugs.

Beekeepers are encouraged to contact a veterinarian to discuss establishing a Veterinarian–Client–Patient–Relationship (VCPR) — don't wait until you have a problem to establish a relationship with a veterinarian.

Life Cycle

Only larvae less than 2.5 days old can be infected by bacterial AFB spores. Older larvae and adults are not susceptible. Infection occurs when larvae ingest spores in their food. Although adults will not develop an infection, they can carry the spores in their digestive tracts and on their mouthparts, and spores may be transmitted through the larval food. Spores can also be found on comb, equipment, and in honey. Once spores are ingested, they germinate (vegetative stage) in the gut of the young larva and continually multiply, eventually breaking out of the gut and into the body cavity of larvae where they continue to multiply. **Please note: The vegetative stage is the only point at which antibiotics have an effect on AFB. Antibiotics have no effect on the bacterial spores.** Larval death usually occurs after the cell has been capped on day nine to 13 of development. Once all larval tissue has been consumed by the vegetative stage, AFB spores develop in place of the dead larvae. There can be up to 2.5 billion spores in one dead larva or pupa

Symptoms of Active AFB Infections

The symptoms of AFB are variable and depend on the genotype of the bacteria and time since infection, as well as the genetics of your bees and the age and condition of your comb. In heavily

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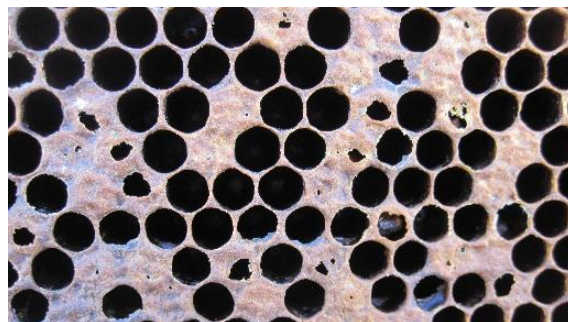
infected frames and colonies, there will be a foul odour, hence the name “foulbrood.” Some beekeepers are more sensitive to this odour than others; your colony can be infected with AFB even if you cannot detect the odour.

Signs of American foulbrood may include:

- Foul odour
- Spotty brood pattern
- Perforated or sunken and greasy brood cell cappings
- Larval scale
- Brown/caramel “gooey” larvae, which may exhibit “ropiness”
- Pupal tongue (uncommon)



Healthy brood



AFB infected with perforated cell cappings

To look for signs of AFB, examine at least three brood frames every time you inspect your colonies, and more, if possible. Thorough inspection is most critical in the spring and fall. To be thorough, shake the bees off the frame before inspecting so you can see all the brood cells on the frame. In brood infected with AFB, you may notice a spotty brood pattern with a number of “empty” cells where capped brood would normally be found. Cappings may have a greasy, sunken appearance, or may have perforations. If you suspect AFB, insert a tooth pick into a cell with a perforated capping or brown gooey larvae or prepupae, and gently stir its contents around. If when you slowly pull out the tooth pick there is a sticky brown substance that stretches approximately two cm, you may have AFB. This ropiness is characteristic of AFB. If the brown larvae does not stretch or “rope” out, it may be an infection of European foulbrood.

Please report suspected AFB infections to the provincial apiculturist at 780-415-2314

You may also notice a brown scale that looks like a dried chunk of debris on the lower side of empty cells. If AFB, this scale will be very hard to remove. Look for these scales when you inspect used brood comb. If you see scale, destroy the comb (burning/incineration).

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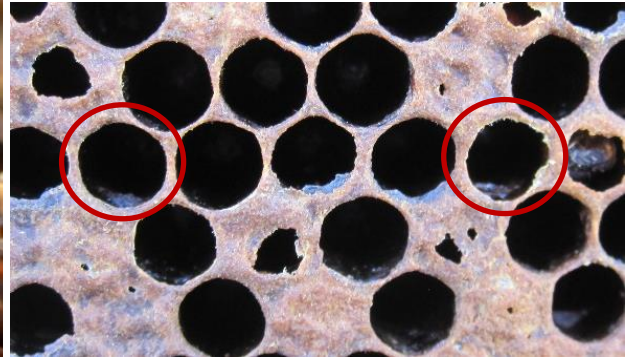
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Note that, except for scale and ropey brood, many AFB symptoms are shared with other diseases. It is critical that you are familiar with common diseases and colony problems to properly diagnose AFB.



AFB infection — ropey brood



AFB infection — scales (in red circles)

Spread of AFB

The spread of AFB within an operation or to a neighbour's colonies is usually due to poor management practices. It takes a large load of spores to infect a strong colony of bees. The high spore numbers required to exhibit clinical symptoms could be introduced to a colony through the following poor management practices:

- Exchanging infected brood frames between colonies
- Combining weak colonies that contain infected brood or contaminated combs
- Using contaminated empty combs from dead-outs
- Feeding bees old contaminated honey or pollen frames
- Using extracted honey supers from infected colonies
- Allowing bees to rob weak or dead colonies
- Not quarantining captured swarms/purchased bee colonies from another beekeeper
- Purchasing used equipment or colonies from a beekeeper without a proper inspection and disease history (Ask questions like: have you had AFB in your operation, do you treat for AFB and why, what do you use to treat for AFB?). For more questions to ask, check out our [Purchasing Honey Bees or Equipment in Alberta on apiculture publications and resources](#).

Prevention of AFB

The following management practices can help prevent AFB:

- Irradiate dead-outs and empty used equipment (for more information, contact [Iotron Industries Canada Inc.](#) Port Coquitlam, BC)
- Inspect all used equipment before use; destroy all combs with scale and irradiate or destroy combs without scale if they are from the same hive box
- Do not buy used beekeeping equipment, especially brood combs. If you must purchase used combs, inspect them carefully and consider irradiation prior to use.

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- If purchasing colonies from a beekeeper, thoroughly inspect them, get a detailed disease and treatment history, and house them in an apiary separate from your operation until you are certain of their disease status
- Replace a minimum of 10 per cent of brood combs annually with new drawn comb or foundation to prevent the buildup of pathogens and chemical residues
- Inspect a minimum of three frames of brood per colony when you visit your apiary, and shake the bees from the comb to facilitate the inspection
- Don't combine weak colonies unless you know they are not infected with AFB
- Don't extract honey from brood chambers
- If you capture a swarm, hive it in a brood box with foundation or irradiated frames, and consider keeping it in a quarantine apiary until you can determine its disease status
- Keep strong healthy colonies headed by a young hygienic queen. Hygienic colonies will remove diseased brood before they become infective.
- Immediately close up dead-outs to prevent other colonies from robbing the hive
- Sanitize your hive tool between apiaries by scraping it clean then burning with a torch
- Familiarize yourself with honey bee diseases, their life cycles and management options.

Management Options for Symptomatic Colonies

If you see a brood cell that may be infected with AFB, look closely at every brood frame in your colony to determine the level of infection. If you find an AFB infection, inspect all the colonies in your apiary.

Please contact the [provincial apiculturist](#) if you have or suspect you have AFB in your colonies. **Infected colonies must be dealt with immediately to prevent the further spread of the disease.**

Your management strategy depends on the infection level, your location, resources, number of colonies and the time of year. The standard recommendation for a heavy infection is to properly and safely destroy (burn/incinerate) the colony and bees as soon as possible, to limit its spread. You must inspect all other colonies in the apiary for signs of disease. Monitor them every two weeks for the rest of the brood rearing season to check for signs of disease.

Note that antibiotics are not used to control the disease as they only prevent replication of the vegetative stage of the bacteria which produces spores. Medicating will prevent the buildup of spores but



will not eliminate spores already produced (see the section below on Treatment with Antimicrobials).
AFFECTED EQUIPMENT MUST BE REMOVED.

Based on what you find, do the following as appropriate:

Light to Medium infection — one to 100 cells infected

You can use the “shook swarm” method if you detect a light to moderate infection in spring or early summer. This method emulates the conditions seen during swarming. It removes all infected equipment and results in bees using any infected honey in their crops before larvae are produced. This prevents replication of the bacteria and can be a cost-effective management strategy to save the bees. However, this method requires advanced beekeeping knowledge. Please consult the [Bee Health Assurance staff](#) for more information on this method.

Consult a veterinarian to discuss potential management and treatment options of the infected colony or other colonies in the same location. If it is the mid-summer or later, the colony cannot be saved and should be destroyed. Combs with visible symptoms must be destroyed. Combs from an infected colony that do not have visible symptoms can be reused *only if irradiated*. Other infected equipment can be reused only if sterilized by one or more of irradiation, bleach, torching, or paraffin wax dip. If you cannot do these, the equipment must be burned or incinerated. Please contact the [Provincial Apiculturist](#) for more details on these methods of sterilization.

Heavy Infection - more than 100 cells infected

Heavily infected colonies must be destroyed to prevent the spread of the disease. Contact the [Provincial Apiculturist](#) to discuss disposal options or directions on how to safely burn or incinerate your infected colony.

Treatment with Antibiotics

Antibiotics only mask AFB symptoms, they do not eliminate the underlying cause. You will still have spores in your colonies after treating with antibiotics. Antibiotics only prevent replication of the bacteria and are not effective against spores.

Historically, some beekeepers in Alberta and other jurisdictions have prophylactically applied antibiotics to their colonies to prevent visible symptoms of AFB. This has led to strains of Oxytetracycline-resistant American foulbrood (rAFB) being present throughout Alberta. If AFB is diagnosed, a resistance test should be carried out to ensure the applied antibiotic will be effective in treating your colonies.

Beekeepers with colonies infected with rAFB may be provided with a prescription from their veterinarian for tylosin (Tylan) or lincomycin. Both are currently effective, but use of these drugs in spring is associated with a high risk of residues in the honey and should be avoided.

Always carefully follow antimicrobial labels and apply the correct dose, mixed in the correct application material as prescribed by your veterinarian. **Avoid applying tylosin or lincomycin to your colonies in the spring as there is a high risk of residues in your honey.**

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Proactively contact your local veterinarian to discuss establishing a Veterinarian-Client-Patient-Relationship (VCPR) — don't wait until you have a problem to establish a relationship with a veterinarian. Do not purchase antibiotics illegally from internet suppliers. A qualified registered veterinarian will work with you to understand your operation and establish a treatment plan that will maximize both bee health and human safety using products that are registered for apicultural use in Canada. For more information on responsible use of antimicrobials and antimicrobial resistance, [visit the Government of Canada's site](#).

Additional Considerations

- Non-chemical methods of control are available and long-term reliance on medically important antimicrobials is no longer considered to be prudent.
- There are large commercial honey producers in Alberta (in addition to many small-scale producers) who have moved away from antimicrobial use and are successfully controlling of AFB within their operations. While such operations, and indeed entire countries, have shown that it can be done, there are significant risks associated with discontinuing prophylactic antimicrobial use. These risks must be assessed for each operation and mitigated through appropriate management changes in order to minimize the potential for rapidly increasing rates of AFB disease, spread to neighbouring operations, and associated economic losses.
- Antimicrobials mask AFB's visible symptoms; therefore, beekeeping operations that use antimicrobials prophylactically should be considered to have an unknown prevalence of AFB in their colonies. The "baseline" incidence of AFB disease in an operation, which may vary between apiary sites, will not be known until prophylactic antimicrobials are withdrawn.
- Veterinarians and beekeepers are encouraged to work together to develop tailored strategies and management plans to control AFB while moving away from the routine use of antimicrobials. The decision whether to use antimicrobials in a colony, apiary site, or operation should consider the risk factors present and the mitigation measures in place. An operation's capacity to implement necessary management changes should be honestly assessed and considered. In some operations, the continued use of antimicrobials may, in the short term, be a prudent part of a management plan.
- Veterinarians and beekeepers are welcome to contact the [provincial apiculturist](#) for assistance with disease management planning. In addition, other beekeepers who have discontinued routine use of antimicrobials may be a valuable source of information.

Recommended Resources

- Alberta [Bee Health App](#)
 - Available on both the App Store and the Play Store)
- [Honey Bee Diseases and Pests](#), Canadian Association of Professional Apiculturists, Stephen Pernal ed.
 - Available in French, English and Spanish
- [Elimination of American Foulbrood Disease without the use of Drugs](#) by Mark Goodwin
 - An excellent resource, but does contain some information specific to New Zealand
- [Diagnosing and Treating American Foulbrood in Honey Bee Colonies](#) by Megan Milbrath, 2018
 - Excellent resource, but note that it refers to US regulations
- Purchasing Honey Bees or Equipment in Alberta – [Apiculture Publications and Resources](#)
 - Questions to ask and things to consider

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