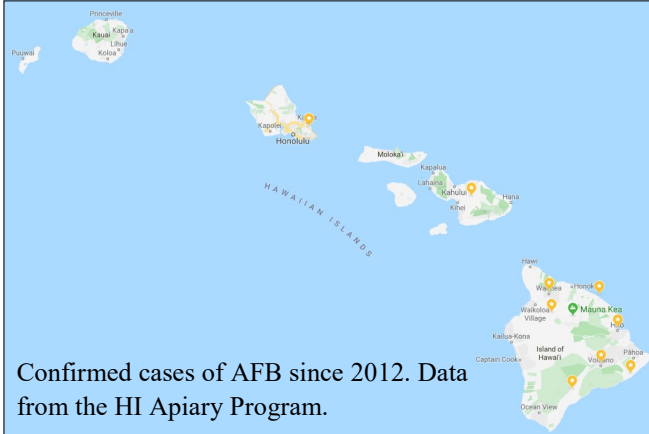




# COOPERATIVE EXTENSION

UNIVERSITY OF HAWAII AT MĀNOA  
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

## American Foulbrood (AFB) in Hawaii



### Introduction

AFB is a widely distributed disease of honey bee brood (larvae and pupae) caused by the spore-forming bacterium *Paenibacillus larvae* that leads to colony and economic losses. Spores of the bacterium are heat and cold tolerant and antibiotic resistant, and may persist on contaminated beekeeping equipment for over 50 years. While not common in Hawaii, the disease was accidentally introduced and decimated the state's beekeeping industry in the 1930s. It was common through the 1950s, though there is a lack of consistent record keeping. Since 2012, there have been at least 10 confirmed cases, mostly on the Big Island.



◀ Sunken and punctured cell caps (yellow); dead larval scales (blue); discolored larvae (pink). Photo by R. Snyder, [beeinformed.org](http://beeinformed.org) ▶ AFB positive rope test. ▶▶ Pupal tongue. Photos by I. Ashe, West Hawaii Today.



### Transmission

Spores are fed to 12-36 hour old larvae by adult nurse bees, which infect their gut. They eventually invade other areas of their body and kill the insect. Spores are moved between colonies by robbing or drifting adult bees. Beekeepers may facilitate the spread of spores by using contaminated equipment in healthy colonies, recycling used equipment, or combining weak colonies. Rapid spread of AFB between colonies is most common in areas with high colony densities.

### Symptoms

The primary clinical symptoms are brownish, semi-fluid larvae that form a "ropey mass." Other symptoms include irregular brood capping ("shotgun" brood pattern); dark, sunken, greasy, irregularly punctured caps; a foul odor like rotting fish\*\*, and; a hard scale formed by dead larvae at the bottom of the cells. Larvae may appear caramel colored, and pupae may have tongues sticking out.

\*\*The absence of odor does not mean an absence of AFB, and an odor does not necessarily mean the presence of AFB as larval decay for any reason will smell unpleasant. Look for a combination of relevant symptoms present within the colony.



▲ Shotgun brood. ▼ Robbing behavior.

### Diagnosis

AFB infection may be confirmed by performing a rope test: cells with dead larvae are punctured and the mixed contents drawn out. If they can be pulled to one inch before breaking, this suggests AFB. More concrete diagnostics may be performed with a Vita® AFB test kit, which functions similarly to a pregnancy test.



Interested in learning more? Check out our website: <https://cms.ctahr.hawaii.edu/pollinators>  
Follow the lab on Twitter: @UHBees  
Questions? Email Dr. Chrissy Mogren ([cmogren@hawaii.edu](mailto:cmogren@hawaii.edu))

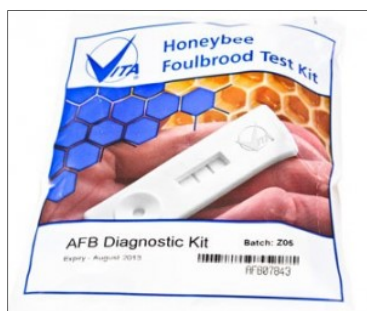
## Treatments

- Antibiotics—Oxytetracycline, tylosin, and lincomycin are registered for use against AFB infections but are only available by prescription from a veterinarian. However, antibiotics may mask symptoms by not killing spores which are the drivers of infection, so long-term use is not sustainable. Overuse may lead to resistance. Residues may appear in bee products such as honey. Remove honey supers before treating. Use judiciously in mild to moderately infected colonies.
- Burning—This is the recommended strategy for infected colonies to prevent the spread to healthy neighboring colonies. After dark, seal the colony and place the entire colony (hive bodies, frames, adults and queen) in a hole, burn to ash, and bury. Acquire a burn permit before doing so. Other colonies in the apiary should be treated with antibiotics.
- Shook-swarm method—The queen and adults are shaken into a brand new colony, with new frames and foundation. The hive body, frames with larvae, and pollen and honey stores are all burned. This strategy is not recommended as adult bees may still transport spores in honey from their stomachs. Other colonies in the apiary should be treated with antibiotics.
- Essential oil therapies—While many EOs have been evaluated, none have proven effective at controlling or preventing AFB in colonies in the field long-term.

## Prevention

Beekeeping management practices that avoid spreading AFB to other colonies and areas is the best preventative measure. Consistently monitor colonies and destroy symptomatic colonies, especially if maintained in high density areas for beekeeping. Infected hives are a major source of infection to neighboring colonies. Wear disposable gloves when working in AFB positive colonies. Disinfect hands and beekeeping tools between healthy and diseased colonies. Do not combine weak colonies with other colonies. Because it is impossible to determine if old equipment is contaminated with AFB spores, burn old frames and scorch the inside of old hive boxes until blackened before reuse.

Propolis from certain sources has been proven effective at controlling AFB naturally, so encouraging propolis collection and deposition within hives may confer a degree of hive immunity for AFB and other diseases. Bacteriophage therapy is a promising prophylactic feed additive against AFB (Broodsaf<sup>TM</sup>) and may be fed to colonies adjacent to infected colonies as a preventative measure and to cure mild to moderate infections once it becomes commercially available.



## Further Information

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- Hayes G (2019) The next generation in disease control. *Bee Culture*, May 2019.
- Milbrath, M (2018) Diagnosing and treating American Foulbrood in honey bee colonies. Michigan State University. <https://bit.ly/2VNfV7s>

**If you suspect AFB, please contact the Hawaii Apiary Inspectors (808) 973-9538**



Interested in learning more? Check out our website: <https://cms.ctahr.hawaii.edu/pollinators>  
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