

AMERICAN FOULBROOD (AFB)

Caused by:

- *Paenibacillus larvae*, a gram-positive, rod-shaped spore-forming bacterium.

Life Stage Most Affected:

- Larvae less than 24 hours is most susceptible, but larvae up to 3 days old can become infected. Affects larvae but kills pupa and pre-pupa.

Biology of How it Spreads:

- Adult bees are carriers of the disease but are not killed by AFB.
- Nurse bees feed the young larvae food with AFB spores in it. Spores begin to germinate in the larvae's midgut about 1 day after ingestion. The bacteria's vegetative form begins to grow, getting nourishment from larvae, eventually rupturing the gut wall and invading the larvae's body cavity. Infected larvae usually die in an upright position after cell is sealed. If the bee dies in pupal stage, you may see its tongue sticking out. The vegetative form of bacteria then dies after producing spores. Each dead larva may contain up to 2.5 billion spores which remain viable for decades. Only 1-10 spores are needed to infect one larva, but in a controlled experiment, it took several million spores, being fed via sugar water or honey, to infect a colony enough to cause an infection to start in the colony.
- Some larvae may be infected by AFB spores already in the cell. The spores will not germinate in larvae 4 or more days old.
- As the larvae die, they sink to the bottom of the cell and their remains harden into scale. This is very hard and black. It is difficult for the bees to remove. It is hard for beekeeper to remove without tearing cell. The spores in the scale can infect future bees for years to come.
- As workers clean out cells with dead AFB infected larvae, including scale, they spread spores throughout the colony.
- Nectar and pollen can be contaminated when stored in cells containing AFB spores.
- Honey can contain AFB spores. These spores Do NOT hurt humans but will infect bees feeding on the honey.

Causes of Spread:

- As disease spreads through colony, weakening and killing the bees, robbers can enter and take contaminated honey, nectar and even wax back to their hives.
- Bees may drift from colony to colony, spreading AFB spores.
- Occasionally purchased nuc colonies and/or package bees **may** carry and spread AFB.
- Swarms coming from an infected colony can spread AFB.
- Beekeeper management practices may be the most common spread AFB. Beekeepers can spread AFB by moving brood or honey frames or boxes from colony to colony and apiary to apiary. Beekeepers should be sure to check for AFB symptoms first. **Be aware that not all symptoms may show on an infected colony at one time.** If a colony has AFB, swapping frames of brood from this colony to other colonies will spread AFB. Adding empty brood frames (with scale) from an AFB infected colony will likely transfer the disease.
- Placing extracted honey supers on hives (sometimes months later) can spread AFB (spores in honey). Some say this is the most common way to spread AFB.
- Placing extracted honey frames out for bees to clean up can spread AFB spores.
- Feeding a colony pollen from another colony may also spread the disease.
- Sometimes dead out equipment can contain scale. Carefully check for disease. Do not spread equipment around. Keep it together and use for one colony to see how this colony does.
- When reusing bottom boards, be sure to thoroughly scrape/clean hive debris before placing them under a new hive. Beekeepers want to remove disease material may have fallen to the bottom board.

- A common way to spread AFB is to buy used equipment which has scale (spores). This can be easy to miss when examining used equipment.
- There is no “season” for AFB. It can occur anytime there is brood.
- Adult bees can be carriers of AFB and the disease does not show up in the hive. Sometimes, if this delicate balance is upset, AFB will show up. Common stressors include floral availability, nutritional deficits, pesticides, pests, and/or diseases.
- Queens can carry AFB spores, but since they are not feeding the larvae, they are not a source of infection for the hive. (Does this weaken the queen?)
- Packages of bees carrying AFB spores can, sometimes transmit AFB, especially when placed on frames with drawn comb.
- Purchased nucs and/or used equipment may contain AFB.
- Wax that is melted down, processed, and used to make foundation does not appear to be an important factor in spreading AFB. It is interesting to note that wax cappings taken from AFB colonies do contain spores.
- Studies have shown that if a new colony is placed at the same location where a colony that had AFB was, the existing flowers and soil do not appear to be a factor in the spread of AFB.

How to Help:

- Shaking adult bees from an AFB-infected colony, packages, or swarms into a new hive with undrawn-out frames (foundation or starter strips). Many suggest introducing a new queen following proper procedures. Feed colony sugar syrup (1:1) to encourage them to draw out comb. As bees draw out all new comb, any infected honey in their stomachs is used up and spores are passed out of their digestive systems.
- In bee yard, place hives in horseshoe, circle, or other random design rather than a straight line.
- When a beekeeper catches a swarm or adds new bees to their apiary, it is best to keep them in a special apiary or as far away from existing bees in the yard as possible until it can be determined that they are healthy.
- When a beekeeper opens their hives, they should always be looking for anything that does not look “normal” and healthy.

References:

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