European Foulbrood

European Foulbrood (EFB) is a bacterial infection caused by *Melissococcus plutonius*. The bacteria that causes EFB contaminate larval brood food. After consuming contaminated food, the bacteria replicate in a bee's midgut. The bacteria derive nutrients from the larva, usually killing it within five days. Larvae typically die before the cell is capped. EFB is often considered a stress-related disease. It is more common in colonies experiencing cool, wet weather, inadequate nutrition, high Varroa mite infestations, pesticide exposure, or other stressors. Nonetheless, EFB can sometimes spread in seemingly robust colonies.

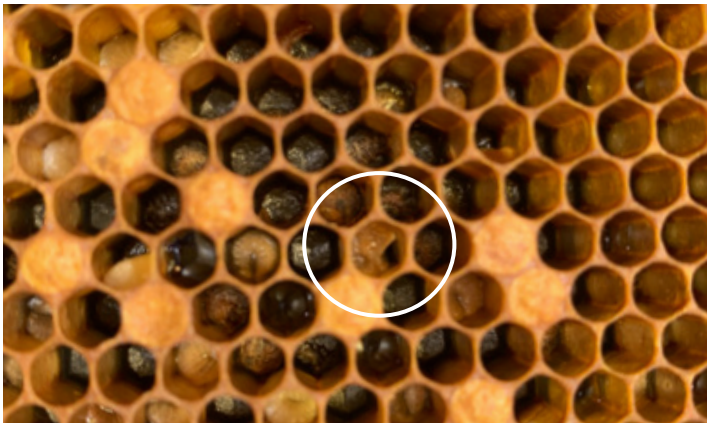
Unlike American Foulbrood (AFB), EFB does not produce a long-lived spore form. While EFB bacteria may remain viable on equipment for several years, AFB spores may survive more than 40 years. This shorter period of viability, together with the fact that many colonies recover from EFB infection without antibiotics, is why EFB is considered a less severe infection than AFB.

SIGNS OF EFB IN A HIVE

EFB is highly variable in appearance, depending on the stage and severity of infection. Larvae become infected from eating contaminated brood food. In the early stages, brood food may appear discolored yellow or brown from bacterial contamination.

Larvae in various stages of disease from early signs of discoloration to hard scale.

As the infection progresses, larvae gradually change from a healthy white color to yellow-brown. Rather than laying in a c-shape in the cell, infected larvae often contort into a twisted



Larvae with EFB often twist in the cell instead of maintaining their normal c-shape at the bottom of the cell.

"stomach-ache" or "corkscrew" position. When probed with a toothpick and pulled out of the cell, infected larvae may form a stringy mass that stretches and ropes out to about half an inch, especially when there is secondary contamination by other bacteria. AFB-infected larvae rope out to about an inch.

Larvae eventually dry into a hard "scale." In the above image, the queen has laid an egg on top of an EFB scale. Note that the tracheal system of the larva is still visible.

HOW DOES EFB SPREAD?

Bee larvae become infected with EFB during feeding by nurse bees. Nurse bees acquire the bacteria when receiving food from other infected bees or cleaning infected cells. EFB can be transmitted between hives through robbing or drifting. Robbing occurs when stronger colonies steal honey from weaker colonies and is a significant pathway of disease transmission. Robbing bees may steal honey contaminated

with *Melissococcus plutonius*. Drifting occurs when bees return to the wrong colony due to disorientation and may also lead to the spread of EFB. Contaminated equipment such as frames and hive tools can also spread EFB. Moving frames of diseased brood to another colony can also spread the infection.

PREVENTION

- Clean hive tools when moving between apiaries and after inspecting a colony with disease symptoms.
- Avoid transferring frames of contaminated equipment or sick brood to another colony.
- Since the bacteria that causes EFB can remain on equipment for up to three years, regularly replacing older frames can help to reduce pathogen build-up. Replacing frames can also reduce colony stress by preventing the build-up of pesticide residues in the comb.
- Requeening colonies with weak laying patterns helps to maintain a strong hive population.
- Reduce entrances on colonies with EFB to prevent robbing behavior. In addition to reducing the likelihood of spreading EFB to other hives, preventing robbing behavior can reduce stress on infected colonies.
- Check Varroa mite loads and treat colonies with high infestations as this may help to control EFB.
- Feed syrup and/or a pollen patty to boost nutrition in the hive. When feeding pollen patties, be sure to place the patty directly over the top bars of the brood frames to maximize access for nurse bees tending the brood. Since pollen patties are a favorite food of small hive beetle larvae, use half or even a quarter patty for weaker hives to ensure that the bees can consume the whole patty.

TREATMENT OF APIARY

Many of the strategies listed under “Prevention” also apply to treating infections. Reduce entrances on infected colonies. Treating Varroa mites, supplementing nutrition, and requeening may be sufficient to clear an infection.

In cases of severe infections, the colony may not recover without antibiotics. The antibiotics available for the treatment of EFB in Delaware are oxytetracycline (Terramycin and Pennox 50). Effective January 1, 2017, both treatments must be prescribed by a veterinarian before purchasing, according to Rule #213 by the US Food and Drug Administration (FDA). This process of obtaining a prescription via a veterinarian is referred to as a Veterinary Feed Directive (VFD). In Delaware, the Office of the State Veterinarian at the Delaware Department of Agriculture provides VFDs at no cost to the beekeeper.

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