

What is European foulbrood?

European foulbrood (EFB) is a bacterial infection that negatively impacts honey bee colonies world-wide. The disease infects larvae and is caused by the bacterium *Melissococcus plutonius*.

Once a young larvae becomes infected, EFB bacteria begin reproducing in its midgut, deriving nutrients from the larva, and ultimately killing it a few days after the initial infection. Typically death occurs before the cell is capped. Secondary bacteria often cause larvae to twist, become discolored, and occasionally develop a sour odor, depending on the bacterial community present.

EFB is considered a much less devastating infection than American foulbrood (AFB), as colonies are often capable of overcoming infections without antibiotics. Because EFB does not reproduce through spores, the infection does not remain viable in equipment for as long as AFB (several years instead of several decades) and can be treated with antibiotics. The incidence of EFB is higher when the colony is under stress.

Symptoms of Infected Brood

In some cases, you may observe the typically translucent, pale silver royal jelly to be discolored yellow or brown from bacterial contamination (Figure 1). Larvae eating this jelly can become infected.

Brood in the early stages of European foulbrood infection will gradually change from a healthy opaque creamy-white color to a more translucent yellowish-brown as the infection progresses.

Additionally, infected larvae will twist or contort into a corkscrew position (Figure 2) before slumping to the bottom of their cell. When slumped or sunken in their cells, their tracheal systems can be visible.

The decaying larvae often, but not always, give off a sour or fishy odor. Molten larvae can be brown and rope out a centimeter or two but will not rope out as far as an AFB-infected larva.

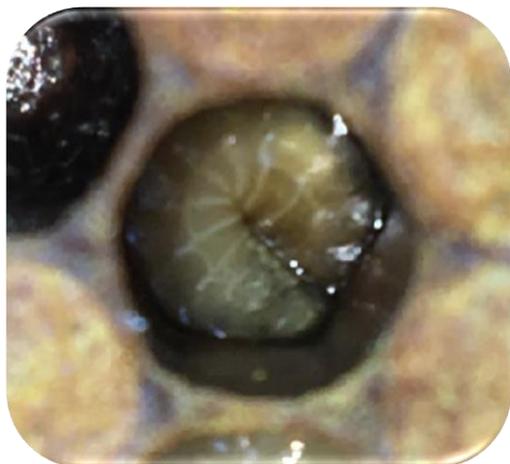
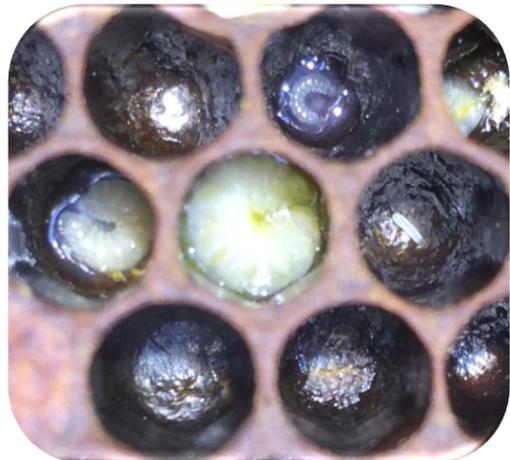


Fig 1. Yellow, EFB-contaminated royal jelly can be an early sign of infection (top). As the infection progresses, the larvae discolor, and their trachea are visible as white lines on the darker background (bottom).



Fig 2. Larvae with EFB often twist in their cell instead of holding their normal C-shape.



Fig 3. Larvae that die from EFB eventually desiccate, forming thin, dark, rubbery scales.

In the final stages of an EFB infection, the dead and decaying larvae desiccate to form thin, darky, rubbery scales, as seen in Figure 3. This scale can be easily removed with a toothpick.

Not every case of EFB will present the same suite of symptoms, so more examples from EFB-infected colonies are available for reference in Appendix A at the end of this document.



Fig 4. A severe infection of EFB. Several stages of the infection are visible, and the brood pattern is very spotty.

Sources of infection

Larvae typically acquire *Melissococcus plutonius* from nurse bees during feeding. The nurse bees first acquire the bacteria from trophallaxis with other infected bees or by cleaning cells infected with *M. plutonius*. Through their efforts to remove infected and dead brood, they can inadvertently spread the disease to healthy brood.

EFB can be transferred between colonies by honey bees, either through robbing or by drift. Additionally, EFB can be transferred between hives by adding contaminated equipment or frames of sick brood to an otherwise healthy colony or by using contaminated tools.

Diagnosing EFB

During colony inspections, beekeepers may observe spotty brood patterns, cells with perforated cappings, and diseased-looking larvae. Most larvae infected with European foulbrood die before they are capped, and those capped will likely die in the prepupal stage.

In the event even a single larva is exhibiting symptoms of EFB described above, a preliminary test for EFB can be performed with an EFB Vita® Test Kit (Figure 5). These tests are easy to perform, available at select honey bee supply stores, and generate results in a few minutes.

With EFB-infected larvae, Vita® Test Kits are most effective in larvae while they are twisted but before major discoloration sets in. The kits test for *Melissococcus plutonius* and are less effective once the secondary bacteria start to infect the dead and dying larvae. If you do not have a Vita® Test Kit, or your Vita® Test Kit positively indicates an EFB infection, a sample can be sent to the USDA Beltsville Bee Lab to 1) confirm the presence/absence of EFB, and 2) test for resistance to antibiotic treatment.

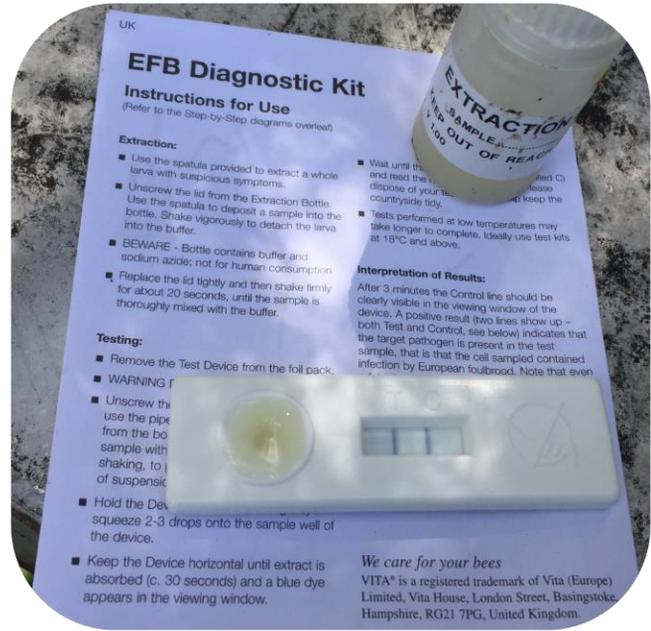


Fig 5. An EFB Vita® Test Kit shows a positive result for infection.

What to do if EFB is confirmed in your bee yard

In the United States, European foulbrood does not need to be reported to the state apiculturist and the colony does not need to be destroyed or quarantined. Some European countries require reporting, quarantine, and/or destruction of the colony, so it is worth looking up the laws specific to your country. It is helpful to 1) discard infected brood combs and replace them with newer comb, foundation, or frames of healthy brood from another colony 2) eliminate any additional stress the colony may be experience (e.g., feed protein or carbohydrate supplements if they are nutritionally stressed), and/or 3) requeen the colony.

If a colony does not overcome the infection on its own after these actions, or in the case of a severe infection, beekeepers can contact a veterinarian for an antibiotic prescription. Oxytetracycline is the antibiotic available for treating EFB.

Tips for preventing EFB in your bee yard

Keeping healthy bees is the ultimate tool for preventing an infection with EFB in your colonies, as EFB is often regarded as an infection more likely to surface during times of colony stress. Beyond that, keeping your equipment clean and being conscious of contact with infected colonies can prevent transmission of EFB between colonies. Prophylactic antibiotic use is not recommended, as it increases the likelihood of EFB developing drug-resistance.

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Appendix A: Additional Photos of EFB-infected brood

