EFB (European Foulbrood)

SUMMARY:

The European Foulbrood (EFB) is a bacterial disease that affects the honey bee brood. The genetic resistance of some species of bees to this disease may allow, especially in favourable environmental conditions, to overcome the infection without suffering serious damage. However, it should be noted that, even if characterised by a better prognosis than the American Foulbrood, in some areas the EFB has a more malignant manifestation, seriously damaging even very strong bee colonies.

This practice describes the causes and symptoms of EFB, how the disease spreads, and how to address and prevent the disease.

KEYWORDS:
- european foul brood [1]
- Honeybees [2]
- beekeeping [3]

CATEGORY:
- Capacity development [4]
- Natural Resources Management [5]

DESCRIPTION:

CAUSES

EFB is caused by the streptococcus bacterium *Melissococcus pluton (M. pluton)*, often associated with other bacterial agents, including: *Bacillus alvei*, *Streptococcus faecalis*, *Achromobacter eurydice*, *Paenibacillus alvei* and *Bacillus laterosporus*. Depending on the type of bacteria associated with the bacterium *M. pluton*, the EFB can occur with different symptoms (e.g. the presence / absence of an unpleasant acid smell).

*M. pluton* is a germ that is quite resistant to adverse environmental conditions (e.g. it remains viable for several months in pollen).

TRANSMISSION

The bacterium develops inside the hive at the brood level. This disease spreads orally inside the hive by the nurse bees that, in an attempt to clean up the cells by the dead larvae, get contaminated with the spores and they transmit them to the brood when they go to feed it.

The disease can be spread from hive to hive or apiary to apiary by the bees (especially when bees rob a diseased hive) and by the beekeeper (with the use of infected honey to feed healthy colonies, moving diseased colonies during migratory beekeeping, trade of infected tools, use of contaminated equipment, moving of combs from one hive to another, etc.).

The disease, while being able to occur throughout the year, is more common in spring when there is more brood. The bacterium can spread through honey with infected combs (through pollen, honey, brood, etc.).
The development of EFB could be favoured by an imbalance between the number of larvae and that of the nurse bees. In addition, the EFB would seem to be more common in cold and rainy springs, where there may be food shortages, particularly of protein for the brood (lack of pollen). It has also been observed that the quality and quantity of the sources of nectar and pollen are able to influence the course of the disease.

The health status of the colony is very important for the development of the disease inside the colony: weak colonies or colonies that are stressed for any reason (food shortage, migratory beekeeping, pesticides, etc.), as well as genetically more sensitive colonies, are especially prone to this disease.

Healthy and strong colonies will be able to recover from the disease by themselves if the season guarantees adequate food sources (pollen, nectars and flowers).

**SYMPTOMS**

The transmission of EFB from the adult bee to the larva takes place orally. After the infection, the larvae die in a few days (regardless of whether the larvae are working bees, drones or queens). Unlike the American Foulbrood, *M. pluton* kills the larvae before the cells’ capping.

The death of the larvae occurs with open cells and this is one of the features that allows to differentiate the EFB from the AFB (Fig. 1). Only in the case of serious infection with EFB, the larvae can die in capped cells.

Another important feature useful to recognise this disease, is that the affected larvae instead of being horizontally positioned on one side in a C-shape, adhering to the back of the cells, they often change position.

The infected larvae initially lose their pearly white colour to become first opaque, then yellowish and finally yellowish-brown (Fig. 2). After death, the larva becomes darker and decomposes, turning into a soft brown...
mass which is neither viscous nor stringy, unlike the larvae infested with AFB (Fig. 3).

This mass dries up forming a dark rust flake similar to that of AFB but, unlike the latter, it is easily removable from the cell.

Fig. 2: The infected larvae initially lose their pearly white colour to become first opaque, then yellowish and finally yellowish-brown

Fig. 3: After death, the larva becomes darker and decomposes, turning into a soft brown mass which is neither viscous nor stringy
The brood appears scattered, with cells containing yellowed dead larvae. Depending on the bacteria present the dead larvae may give off smells of different intensity.

The *Melissococcus pluton* leads to a sour smell, with flabby, but intact larvae; if, however, it is associated with *Bacillus alvei*, the brood has a putrid smell with molten larvae (but not ropey as with AFB). There are also intermediate forms in which the combs do not give off any smell.

When the disease is not well developed, especially if you replace the queen and you are in a favourable time of the year (with the presence of abundant flowers providing nectar and pollen), bees may be able to clean up all the affected cells and the disease can disappear spontaneously, thus preventing the infection from spreading to the rest of the apiary.

### Main differences between European and American foulbrood

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<tr>
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<th>European Foulbrood (EFB)</th>
<th>American Foulbrood (AFB)</th>
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<tbody>
<tr>
<td>Dead larva in uncapped cell</td>
<td>Dead larva in capped cell</td>
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<tr>
<td>Sour smell</td>
<td>Smell of fish gelatin</td>
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<tr>
<td>Absence of blackening of honeycombs</td>
<td>Dark honeycombs, deep set and perforated cappings</td>
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<tr>
<td>Non-ropey larva</td>
<td>Ropey larva</td>
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<tr>
<td>Removable flake</td>
<td>No removable flake</td>
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**DIAGNOSIS**

For the field diagnosis it is sufficient to examine the brood and to look for the symptoms described above (scattered brood, yellowed dead larvae in open cells, sour smell, etc.), which can be combined with the use of a rapid diagnostic kit, easily available on the market (Fig. 4). For disease confirmation, you can send a sample of the dead larvae to specialised laboratories where the pathogens responsible for the disease can be isolated (Fig.5).

**Fig.4: Rapid diagnostic kit (positive result above, negative below)**
Fig. 5: Sample of dead larvae taken to be sent to specialised laboratories for the diagnosis

CONTROL

Take the appropriate actions as soon as possible to control the infection, such as:

- destruction by incineration of the infected colonies (honeycombs and honey bees; the hives, if in good state, could be disinfected). This action is suggested in case of advanced stage of the disease, weak colonies or low prevalence of the disease in the apiary;

- accurate disinfection of all objects used for the manipulation of infected hives, including equipment used for operations by the beekeeper (e.g. the hive tool, the gloves, the suit, the honey extractor, etc.);

- shook swarm method, consisting in shaking the hives from the infected combs into a clean hive with new foundation.

PREVENTION

- Ensure that colonies have always available stocks of food (pollen and honey).

- Do not use honeys suspected of being infected to feed the bees.

- Do not move combs from a hive to another without checking their healthy conditions.

- Renew the combs every 2-3 years (about 30% of the combs per year).

- Remove the queen from the infected colonies.

See related technologies published on TECA by Apimondia and IZSLT on bee diseases:

1. Good beekeeping practices [12]
2. Main diseases of honey bees [13]
3. **Nosemosis** [14]  
4. **Varroa mites (Varroatosis or Varroosis)** [15]  
5. **AFB (American Foulbrood)** [16]  
6. **EFB (European foulbrood)**  
7. **Bee viruses** [17]  

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**FURTHER READING:**


Ellis J., Honey Bee Research and Extension Lab at the University of Florida, Video Field Guide to Beekeeping ? American & European Foulbrood, January 2012,  
https://www.youtube.com/watch?v=s74WIPpGRHs [18]

**SOURCE(S):**

**Apimondia** [19]  

**Country:**  
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**IZSLT - Istituto Zooprofilattico Sperimentale del Lazio e della Toscana ?Mariano Aleandri?** [20]  

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**Source URL:** http://teca.fao.org/technology/efb-european-foulbrood

**Links:**

[10] http://teca.fao.org/sites/default/files/imageRapid%20diagnostic%20kit%20-20%20positive%20result%20above%2020%20negative%20result%20below012001_0.jpg