

# European foulbrood and its control

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## Introduction

European foulbrood (EFB) is caused by the bacterium *Melissococcus pluton*. EFB can become a serious bee disease reducing productivity of affected hives. The condition occurs in New South Wales, Queensland, South Australia, Tasmania and Victoria. EFB has not been found in Western Australia.

EFB can cause extensive losses in both amateur and commercial apiaries. Severe EFB outbreaks can be avoided through sound management practices, good nutrition, regular checks for disease and early treatment when disease is confirmed.

## Pathways of infection

EFB remains in a vegetative cell state all the time and can remain viable for up to 3 years. The bacterium is only treatable by antibiotics when the disease is multiplying in the bee larvae. EFB is highly contagious and all stages of developing larvae are susceptible to infection.

Incidences of the disease are strongly correlated with climatic, nutritional and management stress factors. Cooler wet weather and poor nutrition can promote EFB symptoms. Bees can also be in poor condition and susceptible to EFB as a result of working a



*Figure 1 The bright white larvae are healthy. The larvae that have a yellow colouring are infected with EFB. The uneven aged larvae in the comb also suggests that the colony may be diseased as the worker bees regularly remove diseased larvae.*

pollen-deficient honey flow or shaking bees for package bee production.

## Signs of the disease

Brood affected by EFB may have a scattered, patchy appearance with healthy brood cells intermingled with dead or dying ones (figure 1).

Larvae are mostly affected in the unsealed, curled up stage, although in severe cases brood of all ages may be affected.

Diseased larvae collapse and become dislodged from their normal position in the cells. Their colour changes from pearly white to yellow and finally, yellowish brown. After two to four weeks, larvae dry up to form a brown scale which can easily be removed from the cell.

In some cases sealed brood is affected and the capped brood takes on a mottled appearance with scattered sunken and perforated cappings. Pupae may have a similar appearance to those affected by American foulbrood.

The odour of infected brood varies from odourless to sour or foul, depending on the secondary invading bacteria present.

Outer combs of the brood nest may show signs of the disease earlier and may have a heavier infection than inner combs in the same colony.

Dead brood probed with a matchstick usually has a watery consistency, although the sealed brown pupae may exhibit a slightly ropy consistency.

Worker bees may remove and discard diseased larvae as they die and thus a colony may show few signs of disease.

## Colony inspection procedure

Bee colonies should be carefully examined for disease several times each year. When looking for EFB, carefully examine combs containing unsealed brood.

To look for EFB, shake or brush bees from combs to allow an unimpaird view of brood cells. Hold the comb so that light illuminates the base of the brood cells being examined. Examine each comb in a regular pattern to ensure that you examine all areas of brood.

## Spread

EFB is highly contagious but infection may remain without visible signs for a long period. Sudden outbreaks of disease can occur – these probably result from a change of seasonal conditions and other stress related factors such as:

- nutritional deficiencies
- transporting hives

- hive dominated by older workers, especially in early spring.

## Diagnosis

Diagnosis solely on the basis of the signs described above is not always reliable. EFB can be easily confused with a number of non-disease conditions and viral diseases. The only accurate diagnostic method is laboratory examination, particularly where the stages resemble signs of AFB:

- In both EFB and AFB the brood pattern is poor and appears scattered.
- Both EFB and AFB can result in diseased larvae under sealed cells exhibiting a sunken, dark appearance with perforated cell cappings.
- Dead brood probed with a matchstick may show signs of a brown ropy consistency in infections of both EFB and AFB.

To conduct tests, diseased larvae or pupae are smeared on a glass microscope slide. Then they are stained and microscopically examined for evidence of either the bacterium causing EFB or the secondary invader *Paenibacillus alvei*.

Beekeepers can use a laboratory diagnostic service by submitting comb samples or smears of diseased larvae on a glass microscope slide. Samples should be submitted to the NSW DPI State Veterinary Laboratory. The samples should be accompanied by a completed sample submission form. A downloadable copy can be found here

[https://www.dpi.nsw.gov.au/\\_data/assets/pdf\\_file/0004/834250/emai-bee-disease-diagnostics-form-July2020.pdf](https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0004/834250/emai-bee-disease-diagnostics-form-July2020.pdf)

## Treatment

While there may be times when antibiotic treatment is the only answer, the practice is

becoming increasingly less attractive because of the possibility of honey contamination and the development of resistant strains of EFB.

In some commercial operations antibiotics are not used at all. Consider the following forms of prevention – all factors combined will certainly reduce your dependence on antibiotics.

### Requeen on a regular basis

A hive headed by a young, well-mated queen has a better chance of overcoming stressors and combating EFB than a hive headed by an older queen. Select EFB-resistant breeding stock.

### Maintain hive hygiene

Regular replacement of brood nest combs will help to reduce the concentration of disease-causing organisms in the brood nest. This can be done by placing two or more white combs or foundation in the brood nest each year.

### Transport bee hives with care

Transporting hives has long been recognised as stressful to bees. Moving hives at night with an open entrance will minimise stress. Moving hives closed up, without ventilation may lead to excessive heat production and associated stress. Bees are more likely to show signs of EFB soon after hive transport.

### Maintain nutrition

Nutritional problems can be divided into two categories – lack of nectar or lack of pollen. If ample honey is stored, shortage of nectar should not be a problem. But good quality pollen is another matter. Pollen is available either when it is stored or when it is available from currently flowering plants. A good supply of pollen with adequate protein levels and a well-balanced group of amino acids is most important to reduce any nutritional imbalance and thus stress on the bees. A lack of quality pollen can be overcome by artificially feeding

previously collected, irradiated pollen or pollen substitutes.

## Antibiotic treatment

The only antibiotic recommended for the treatment of EFB is oxytetracycline hydrochloride (OTC). Four products are registered in NSW for use on honey bees.

Company	Pack Sizes	Name
Bayer	200 g, 1 kg, 2 kg, 15 kg, 20 kg	Tetravet 100 soluble antibiotic powder
Agricon	20 kg	Tetracin 100 soluble powder
Agricon	20 kg	Tetracin 10 soluble powder
Specialised Bee Med.	20 kg	Broodmix for the treatment of European brood disease in bees ( <i>Melissococcus pluton</i> )

These medications are available on prescription from a veterinarian. The protocols for a veterinarian to issue an order to supply OTC include:

- The veterinarian must sight samples of diseased brood or the State Veterinary Laboratory has confirmed the disease.
- The quantity of OTC prescribed must not exceed the dose rate to treat all the hives infected in the apiary or apiaries.
- The order can only be issued if the disease has been diagnosed within the past 8 weeks.

- The beekeeper must be registered with NSW DPI.
- The quantity of OTC for which the order is made will not exceed the number of hives the beekeeper has registered with NSW DPI.
- The issuing of an authority to purchase OTC is at the discretion of the veterinarian.

## When to treat

To minimise the possibility of antibiotic residues in honey, the antibiotic must not be applied to colonies within eight weeks of any anticipated honey extraction. Any surplus honey should be removed before treatment.

If advanced EFB infection is diagnosed, you should consider treating your colonies to assist in their recovery and thus maximise their production.

EFB is commonly referred to as a stress related disease and this is one reason why, when transporting bees, it is better to treat EFB-positive colonies after they have been transported rather than before. The stress on bees associated with transport may cause the failure of a treatment given before hive transport.

Beekeepers may only treat colonies that show signs of EFB and have a positive diagnosis. If more than 10% of the colonies in an apiary show signs of the disease, all colonies could be considered for treatment. Colonies to be treated should be identified so that the next honey extraction from these colonies can be recorded as being produced from OTC-treated colonies.

## How to use OTC

Dry feeding is the only treatment method recommended.

Treat each full-sized hive (8 frame full depth, or greater, size hive) with 1 gram of soluble

OTC (active ingredient) mixed thoroughly in 100 grams of castor sugar. Formulations containing 10 grams/kilogram of active oxytetracycline hydrochloride made up with castor sugar can be used direct from the container (one example is Broodmix®). Nucleus colonies may be treated with 0.25 gram of soluble OTC (active ingredient) mixed thoroughly in 25 grams of castor sugar.

When mixing antibiotics, do it with caution, using gloves and a face mask. Avoid getting the product on your skin, breathing it, or ingesting it.

The OTC formulation and the castor sugar must be thoroughly mixed before treatment. If prolonged transport of mixed formulations is necessary, re-mix the formulation on arrival in case the mixture has settled out.

Apply the dry mixture by sprinkling it between brood nest frames. Queen excluders should be removed before applying the treatment. Treatments should not be applied by dusting the face of combs with powder – colonies treated this way may suffer additional stress when larvae are exposed to concentrated antibiotic. Antibiotic treatment is effective only if fed to larvae with normal food from worker bees and not by direct contact of larvae with the antibiotic powder.

Identify all honey extracted after any treatments of OTC. Ensure when selling bulk honey that this information is made available to the buyer of your honey.

## Storage of oxytetracycline hydrochloride preparations

Once the mixture of OTC reaches its expiry date, its effectiveness is no longer reliable and it must be disposed of. Expiry dates are determined after evaluation of all data from effectiveness and toxicity studies.

Do not compensate for outdated antibiotics by feeding more medication than

recommended. You may be still using a far lower concentration than required, or even a far higher concentration. The low concentration may not reduce the EFB infection and could also promote the development of resistant strains of EFB bacterium. The higher concentration may be toxic to the bees.

OTC storage temperature on the manufacturers' label should be strictly followed. Recommended storage by manufacturers is typically below 25°C. Storing OTC in the freezer reduces deterioration of the potency quite considerably. Do not store OTC in a car or truck as it reduces the life of the antibiotic.

## Diagnostic laboratory

Send your completed sample submission form and comb or larval smear samples of suspect EFB-infected larvae to:

NSW DPI Laboratory Services - EMAI  
Private bag 4008  
Narellan NSW 2567

## Suppliers of OTC

Contact your local veterinarian.

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Figure 1 – NSW DPI

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