NSW GOVERNMENT Department of Primary Industries

FACTSHEET

European foulbrood and its control

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Introduction

European foulbrood (EFB) is caused by the bacterium *Melissococcus pluton*, and has become one of the most serious bee diseases in NSW in terms of reduced productivity of affected hives. The condition was identified in Australia in 1977 in Victoria, South Australia and New South Wales; 1980 in Queensland; 1984 in Tasmania. EFB has not been found in Western Australia.

EFB can cause extensive losses in both amateur and commercial apiaries. This Primefact has been written to help beekeepers to avoid severe outbreaks through sound management practices, regular checks for disease and early treatment when disease is confirmed.

Pathways of infection

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

Incidences of the disease are strongly correlated with climatic and nutritional stress factors. Cooler wet weather and poor nutrition will promote the incidence of this disease.

Signs of the disease

- Brood affected with EFB may have a mottled, peppered appearance, with healthy brood cells intermingled with dead or dying ones.
- 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.

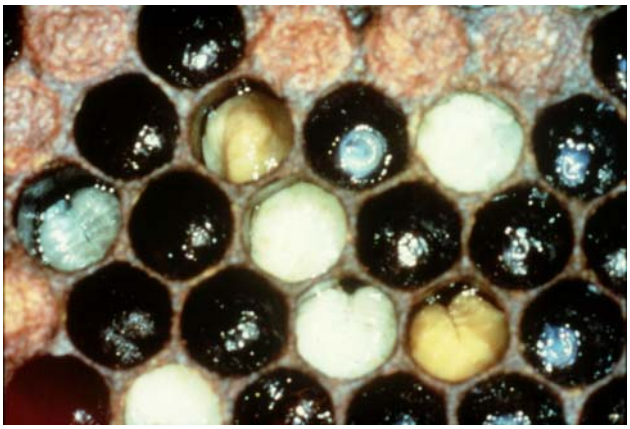

Figure 1. The bright white larvae are healthy. The larvae that have a yellow colouring are infected with EFB. The uneven aged larvae in the comb also suggests that the colony may be diseased as the worker bees regularly remove diseased larvae.

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 unimpaired 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
- shifting the bees
- domination 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.

- With both diseases the brood appears mottled, peppered.
- Both EFB and AFB can result in diseased larvae under sealed cells exhibiting a sunken, dark appearance with perforated 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 State Veterinary Laboratory. The samples should be accompanied by a covering letter that states the condition of the colony and why disease is suspected; also your contact details.

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 and are available through registered suppliers (see page 4).

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 (*Melissococcus pluton*)

These medications are available on prescription from a veterinarian or an order to supply can be obtained from an Apiary Officer of Industry & Investment NSW (I&I NSW). The protocols for an Apiary Officer to issue an order to supply OTC include:

- The officer or an inspector 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 I&I NSW.
- The quantity of OTC for which the order is made will not exceed the number of hives the beekeeper has registered.
- The issuing of an authority to purchase OTC is at the discretion of the Apiary Officer.

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. Surplus honey should be removed before treatment.

If EFB 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 moving bees, it is better to treat colonies after they have been shifted rather than before. The stress on bees associated with shifting may cause the failure of a treatment given before shifting.

Many beekeepers only treat colonies that show signs of EFB. If more than 10% of the colonies in an apiary show signs of the disease, all colonies could be considered for treatment. Signs and treatment may occur at any time. Treated colonies should be identified so that honey is not extracted from them for at least eight weeks.

Bees can be in poor condition as a result of working a pollen-deficient honey flow due to seasonal conditions or shaking bees for package bee production; these bees are susceptible to EFB and may require antibiotic treatment.

Treating EFB

Dry feeding is the only method recommended by I&I NSW.

Treat each full-sized hive (two-decker or better) with 1 g of soluble OTC (active ingredient) mixed thoroughly in 100 g of castor sugar. Formulations containing 10 g/kg of active oxytetracycline hydrochloride made up with castor sugar can be used direct from the container (one example is Broodmix®).

When mixing antibiotics, do it with caution, using gloves and a face mask. Avoid getting the dust 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 home 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 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 (OTC) preparations

Once the mixture of OTC reaches its expiry date, its effectiveness is questionable. Expiry dates are determined after evaluation of all data from effectiveness and toxicity studies. Do not ignore expiry dates on the basis of supposed economics. It may well cost you more in the long run.

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 clean up the EFB adequately and this could promote the development of resistant strains of EFB organisms. The higher concentration may actually be toxic to the bees.

The ideal storage temperature recommended by the manufacturers is below 25°C. Storing OTC in the freezer reduces deterioration of the potency quite considerably. Do not store OTC in a car or truck – this is a common practice, but is detrimental as it reduces the life of the antibiotic.

The alternatives

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 young vigorous queen will always do better than an older queen. Select disease-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.

Shift bees with care

Shifting bees has long been recognised as stressful to bees. Moving bees at night with an open entrance will minimise stress. Moving bees closed up may lead to excessive heat production and associated stress. Bees are more likely to show signs of EFB soon after being moved.

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 pollen or pollen substitutes.

Conclusion

EFB is a serious disease but, with careful management and thought, its incidence can be reduced. If colonies need treatment, apply the antibiotic to the brood nest under the queen excluder at least eight weeks before any anticipated honey extraction.

Diagnostic laboratory

Address samples to the Officer in Charge at:

- Ag & Biosecurity
  Elizabeth Macarthur Agricultural Institute
  Woodbridge Road, Menangle NSW 2568
  Private Bag 4008, Narellan NSW 2567

Suppliers of OTC

Contact your local veterinarian or one of the following who are licensed by NSW Health to supply OTC to beekeepers.

- Hornsby Beekeeping Supplies
  63A Hunter Lane
  Hornsby NSW 2077
  Phone (02) 9477 5569
  Fax (02) 9477 7494
- Parker Engineering Pty Ltd
  (Parker Beekeeping Supplies)
  21 Shellharbour Road
  PO Box 9
  Dunmore NSW 2529
  Phone (02) 4237 8377
- EC Tobin & Son
  Apiary Supplies Raglan
  77 Locke Street
  Raglan NSW 2795
  Phone (02) 6337 3412
  Fax (02) 6337 3585
- Chris Williams Rural Supplies
  120 Gaskill Street
  Canowindra NSW 2804
  Phone (02) 6344 1680

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