



European foulbrood and its control

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INTRODUCTION

European Foulbrood (EFB) is also known as European brood disease. It 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 has long been recognised in the northern hemisphere but was identified only recently in Australia (1977 – Victoria, South Australia and New South Wales; 1980 – Queensland; 1984 – Tasmania). EFB has not been found in Western Australia.

EFB can cause extensive losses in both amateur and commercial apiaries. This Agnote 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.

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 (also known as AFB or American brood disease).
- 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 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 and 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 produce 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 may be submitted to the local apiary inspector or direct to the nearest Regional Veterinary Laboratory. In either case, samples should be accompanied by a covering letter that states the condition of the colony and why disease is suspected.

ANTIBIOTIC TREATMENT

The only antibiotic recommended for the treatment of EFB is oxytetracycline hydrochloride (OTC). Three products are registered in NSW for use on honey bees and are available through registered suppliers (see page 4). These three products are

- Oxymav 100[®] (active ingredient 100 g/kg)
- Tetravet 100[®] (100 g/kg)
- Broodmix[®] (10 g/kg).

These medications are available on prescription from a veterinarian or an order to supply from an apiary officer. They will be issued only if the prescriber or Regional Veterinary Laboratory has diagnosed the disease.

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.

There are a number of ways to treat colonies for EFB. If the apiary has a history of EFB, all colonies need treatment, particularly if the problem is widespread. This is best done well before any anticipated honey flows, usually early in spring or late in autumn.

Many beekeepers only treat colonies that show signs of EFB. Signs and treatment may occur at any time. These 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 the NSW Department of Primary Industries.

Feed 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 between brood nest frames. Queen excluders should be removed before 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.

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 medications 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 and the colony is actively breeding. 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.

SUPPLIERS OF OXYTETRACYCLINE

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

Penders Supplies
28 Munibung Road
Cardiff NSW 2285
Phone (02) 4956 6166
Fax (02) 4956 6399

John L Guilfoyle Pty Ltd
Shop 6, 82 Victoria Street
Werrington NSW 2747
Phone (02) 9623 5585
Fax (02) 9673 3009

Parker Engineering Pty Ltd
Parkers Plastic Bee Hive
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

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 anticipated honey extraction.

DIAGNOSTIC LABORATORIES

Address samples to the Officer in Charge at:

- Regional Veterinary Laboratory
Orange Agricultural Institute
Forest Road
Orange NSW 2800
- Regional Veterinary Laboratory
Wollongbar Agricultural Institute
PMB, Wollongbar NSW 2477
- Regional Veterinary Laboratory
Elizabeth Macarthur Agricultural Institute
PMB 8, Camden NSW 2570

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The information contained in this publication is based on knowledge and understanding at the time of writing (November 2004). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Agriculture or the user's independent adviser.

This Agnote was originally written by Doug Somerville and Michael Hornitzki, Research Scientist, Camden

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