

American foulbrood identification and management

November 2020, Primefact 209, Fourth edition

Plant Biosecurity and Product Integrity, Total

American foulbrood (AFB) disease is the most serious brood disease of honeybees in NSW. It is caused by the bacterium *Paenibacillus larvae*. AFB has been found in all states and territories in Australia.

AFB is a notifiable disease under the NSW Biosecurity Act 2015. There is a persistent low level of infection in NSW and some evidence it is increasing. Early and accurate diagnosis of this disease is essential if control is to be effective.

Examining brood

Honeybee colonies must be carefully examined for disease several times each year. Brood should be thoroughly examined for AFB at least twice a year, in spring and autumn as a minimum.

Remove each brood comb from the colony and shake or brush most of the bees into the box, or at the entrance, leaving the comb clear for examination.

Hold the comb by the top bar, at such an angle that the light reaches the base of the cells being examined.

Examine each comb in a regular pattern, so all areas of the comb are thoroughly checked.



Figure 1 When the larva first dies the diseased material ropes or strings out when touched with a match.



Figure 2 As the ropy mass dries out it forms a hard scale (this image is looking into the bottom of cells with top bar closest to viewer).

Signs of the disease

Infected brood becomes discoloured, turning light brown at first then darker brown as the disease progresses.

If a matchstick is thrust into the dead brood and then removed, the semi-fluid remains can be drawn out in a ropy thread 3–5 cm long (Figure 1). This ropy consistency is characteristic of AFB.

After about one month, infected brood dries to a dark scale (Figure 2) which adheres to the wall of the cell. Unlike other brood diseases, AFB scale is quite hard to dislodge and its removal generally results in the destruction of the brood cell. Difficult to remove scale is another in-field diagnostic tool for suspecting AFB. In cases where the mouthparts have developed, that is, when the larva dies at an older age, the fine threadlike tongue of the dead pupa is sometimes attached to the top side of the cell. This is often a sign of an advanced or heavy infection as it takes many more spores to infect older larvae.

Cappings over dead brood cells sink inwards, become moist with a discoloured dark chocolate or purple appearance. Some of these capped cells may be punctured, the result of attempts by bees to remove the dead brood. Other cells may have the cappings totally removed, leaving the remains exposed. These remains are highly infective and cause the reinfection rate to accelerate rapidly once they are present in a hive.

Brood infected with AFB generally die after the cells have been capped over. Larvae may be observed stretched out on their backs with their heads towards the cell cappings.

In heavily infected colonies the brood may have a scattered, uneven pattern due to the intermingling of healthy cells,



Figure 3 It is important to look for suspect cells amongst otherwise healthy brood (three potentially infected cells have been enlarged).



Figure 4 As the infection rate increases, more dark coloured cappings with a peppered appearance are evident.

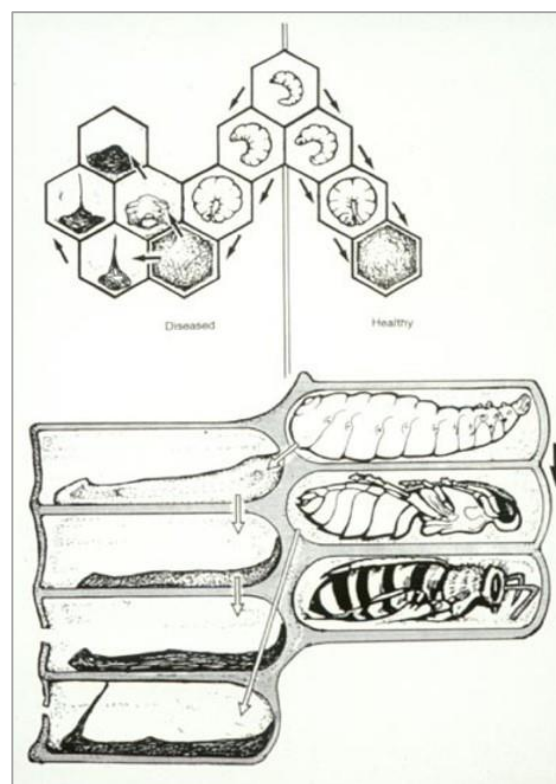


Figure 5 Progression of American foulbrood (on left) compared with the normal progression of healthy brood (on right).

uncapped cells, and capped cells of dead brood with punctured and sunken cappings. This 'peppered' appearance (Figure 4) of the brood usually allows AFB to be distinguished from European foulbrood (EFB). In AFB the cappings are usually discoloured, while in EFB the cappings are not normally discoloured to any great extent.

Spread

The most common method of spread of AFB is by use of contaminated equipment in healthy colonies. Interchanging of equipment within the apiary should be avoided if possible or done with the greatest of care to minimise the likelihood of spreading any disease.

Colonies may also become infected if bees are allowed to consume contaminated honey. Even apparently healthy colonies may have AFB spores stored within their honey, which whilst lying dormant are not immediately harmful but when accessed by bees can allow the opportunity of spores to be fed to young brood and infection to occur. Exposing honey in the open to robber bees is illegal under the Biosecurity Act 2015.

In wild or feral colonies, robbing of contaminated honey from colonies which have died from the disease is a major pathway for further spread. Robbing of contaminated honey also occurs within apiaries of managed colonies. It is therefore very important to manage weak hives to avoid robbing and remove any infected hives as soon as they are discovered (even if still appearing strong).

Diagnosis

AFB is a notifiable disease under the Biosecurity Act 2015. Any beekeeper who suspects that this disease is present in their colonies must notify NSW DPI:

- call the Biosecurity Hotline 1800 680 244
- email biosecurity@dpi.nsw.gov.au
- submit an [online form](#)

Submitting a sample for lab analysis meets your reporting obligation.

An experienced beekeeper can usually make a field diagnosis of AFB based on the signs described above. When very early infections (or potential dual infections with AFB and EFB are encountered) or if you are in doubt, then it is best to submit a sample to the laboratory.

Laboratory diagnosis is carried out by microscopic examination for evidence of the bacteria that causes AFB. You can submit a sample to be tested for AFB by preparing a [slide](#) from any suspect diseased cells and sending it, along with a [submission form for diagnosis](#) to:

NSW DPI Laboratory Services

Courier address:

Woodbridge Road, Menangle NSW 2568

Postal address:

Private Bag 4008, Narellan NSW 2567

Phone: 1800 675 623

Email: laboratory.services@dpi.nsw.gov.au

For more information on sample collection please refer to [Primefact 895 Samples for bee disease diagnosis](#).

Treatment

The incidence of AFB in NSW has been steadily increasing over the last 20 years, but for most beekeepers it will be seen far less than other brood diseases such as EFB, sacbrood and chalkbrood.

AFB-infected materials should be either burnt or sterilised using gamma irradiation. Do not dispose of beekeeping equipment in the rubbish bin or at the local tip. In both situations the colony is

killed. These two methods of treating AFB-infected materials have historically been very successful in minimising the incidence of this disease in NSW.

The burning of infected materials should be carried out in a pit so as to contain any wax and honey. Local fire restrictions must be adhered to if burning is used to dispose of infected materials. The remaining ashes must be covered with at least 30 cm of soil.

Sterilisation using gamma irradiation of contaminated hive material is also available. Any honey is first removed and extracted before the bees in the infected colonies are killed, then burnt or buried under at least 30 cm of soil. The extracted combs, boxes, hive covers, bottom boards and queen excluders are then prepared for irradiation. After sterilisation the hive materials are restocked with disease-free bees. For further details on preparation of equipment for irradiation refer to: <http://www.steritech.com.au/content/agriculture-and-pet>

Avoiding major disease outbreaks

Beekeepers can and should regularly take action to minimise the potential danger of AFB to their colonies. They should frequently inspect the brood in their colonies and contact NSW DPI if any abnormalities are discovered. More than one disease can occur in a colony at any one time.

Colonies can be placed in irregular patterns to reduce the chance of worker bees 'drifting' into neighbouring colonies. Never feed honey to bees or leave equipment (or dead hives) exposed so that bees can rob, as this may result in the further spread of any disease present. Locating your hives at a distance from waste disposal areas also reduces risks.

The use of a barrier system has proven benefits in managing AFB in apiaries. This can be an apiary barrier or individual hive barrier system. The main form of barrier system in practice is one where the materials (boxes and frames) are kept separate, that is, the boxes of honey removed from an apiary for extraction are returned to that apiary and not another. It is possible to have the same system for single hives where boxes, frames etc. are always placed back on the same hives. The smaller the number of hives per barrier system, the lower the risk of spreading AFB, so a single hive barrier is the most effective option for controlling AFB.

Further information

- [American Foulbrood and Small Hive Beetle in bees](#) - video series available on YouTube
- [Primefact 895 Samples for bee disease diagnosis](#)
- [Primefact 824 American foulbrood – barrier systems](#)
- [Primefact 878 American foulbrood in NSW](#)

Acknowledgements

The first edition (1985) of this Primefact was written by Bruce Ward, Michael Hornitzky and Bruce White. Figure 1, 2 and 4 courtesy of Rod Bourke, NSW DPI. Figure 3 courtesy of Mark Page NSW DPI. Figure 5 courtesy of NSW DPI.

Your Reference number PUB15/258

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