

## American foulbrood

June 2015 Primefact 209 third edition

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American foulbrood (AFB) disease is the most serious brood disease of honey bees in New South Wales (NSW). It is caused by the bacterium *Paenibacillus larvae*. In Australia it has been found in all states.

It is a notifiable disease under the NSW *Apiaries Act 1985*. There is a persistent low level of infection in NSW. Early and accurate diagnosis of this disease is essential if control is to be effective.

### Examining brood

Honey bee 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.

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, with the light coming over your shoulder, so it shines on the lower sides of the brood cells. Hold the comb 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.

### Signs of the disease

- Brood infected with AFB generally dies after the cells have been capped over and larvae are stretched out on their backs with their heads towards the cell cappings.
- Affected brood becomes discoloured, turning light brown at first then darker brown as the disease progresses.
- After 1 month, infected brood dries to a dark scale which adheres to the wall of the cell. 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

**Figure 1. Healthy sealed brood. American foulbrood affects the sealed brood stage. One cell has the capping removed to show the age at which most larvae die from the disease.**



Photo: B Ward

(see Figures 2 and 3). This is a characteristic feature of AFB.

- Cappings over dead brood cells sink inwards, become moist and have a discoloured dark chocolate or purple appearance. Some of these capped cells are 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 infective.
- If a matchstick is thrust into the dead brood before the scale stage has developed, and then removed, the semi-fluid remains are drawn out in a ropy thread 3–5 cm long (see Figure 4). This ropy consistency is characteristic of AFB.
- In heavily infected colonies the brood has a scattered, uneven pattern due to the intermingling of healthy cells with uncapped cells, and capped cells of dead brood with punctured and sunken cappings. This 'peppered' appearance of the brood usually allows AFB to be distinguished from

European foulbrood (EFB). In AFB the cappings are discoloured, while in EFB the cappings are not normally discoloured to any great extent.

Figure 2. Brood affected with American foulbrood. The caps on the sealed brood are concave and perforated. In a number of the cells black scales can be seen on the lower 'v' of the cell. One cell shows the tongue of a diseased pupa attached to the top of the cell.

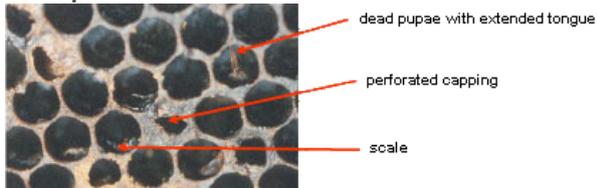


Photo: M Hill

Figure 3. Diagram showing the effect of American foulbrood

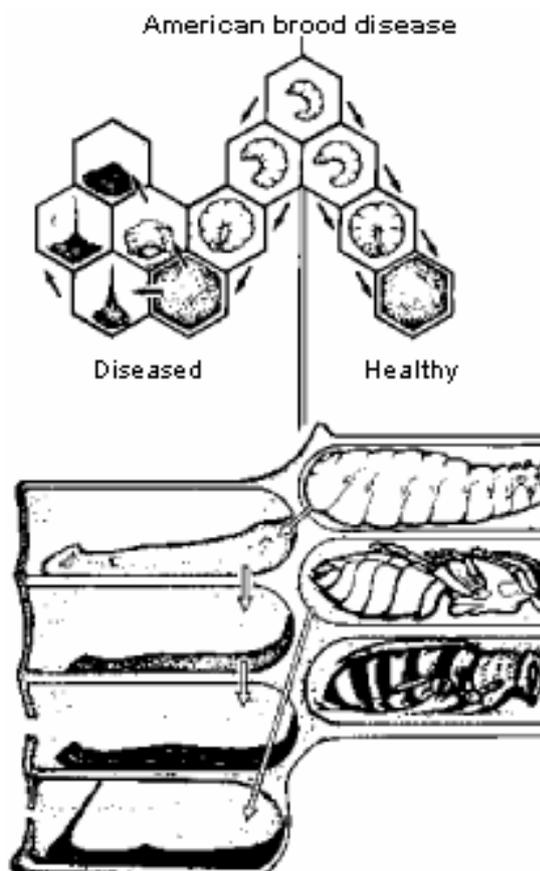


Figure 4. When the larva first dies the diseased material ropes or strings out when touched with a match. Later the diseased material dries to form a black scale.

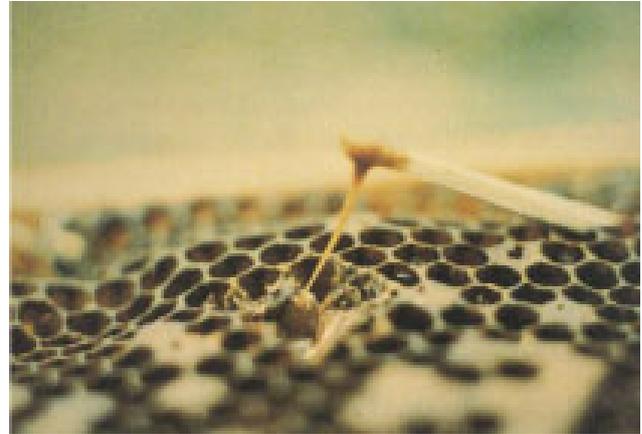


Photo: B Ward

## Spread

The most common method of spread of AFB is by use of contaminated equipment in healthy colonies. Interchange of equipment within the apiary should be done with the greatest of care to avoid spreading any brood disease.

Colonies may also become infected if bees are allowed to consume contaminated honey.

Exposing honey in the open to robber bees is illegal under the Apiaries Act.

In wild or feral colonies, robbing of contaminated honey from colonies which have died from the disease is the major mode of spread.

## Diagnosis

An experienced beekeeper can usually make a field diagnosis of AFB on the basis of the signs already described. Occasionally it becomes necessary to depend on laboratory diagnosis when very early infections, or dual infections with EFB, are encountered.

Laboratory diagnosis is carried out by microscopic examination for evidence of the bacteria that cause AFB.

Beekeepers can avail themselves of laboratory diagnosis by submitting a sample of infected brood comb, or a smear of suspect brood on a glass microscope slide, to the nearest Regional Veterinary Laboratory, accompanied by a covering letter explaining the condition of the colony and the suspected disease. Refer to

**Primefact 895 Samples for bee disease diagnosis.** A cost may be charged for samples submitted for diagnosis. Contact your nearest laboratory for current details.

## Treatment

AFB is a notifiable disease under the Apiaries Act. Any beekeeper who suspects this disease is present in their colonies must notify their nearest apiary inspector. Refer to 'Directory of beekeeping services' at:

[www.dpi.nsw.gov.au/reader/honeybees](http://www.dpi.nsw.gov.au/reader/honeybees) or contact your nearest **NSW Department of Primary Industries (NSW DPI) office** for details.

Infected materials are either burnt or sterilised using gamma irradiation. In both situations the colony is killed. The two methods of treating AFB-infected materials have been historically very successful in minimising the incidence of this disease in NSW. The incidence of AFB is much lower than other frequently occurring brood diseases such as EFB, sacbrood and chalkbrood disease.

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 30 cm of soil.

Sterilisation using gamma irradiation of contaminated hive material is also available. Any honey is removed and extracted. 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 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 in their colonies. They should frequently inspect the brood in their colonies, and contact their local apiary Regulatory Officer if any abnormalities are discovered. More than one disease can occur in a colony at one time.

Colonies can be placed in irregular patterns to reduce the chance of worker bees 'drifting' into neighbouring colonies. Do not feed honey to bees, unless the source is known to be disease-

free. Never expose honey to bees in the open, as robbing may result, spreading any disease present.

The use of a barrier system has proven benefits. 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.

If you suspect disease, send a slide or sample of brood to the Regional Veterinary Laboratory. For further details, contact your **nearest NSW DPI office**.

## Further information

- *American foulbrood disease – inspection management* (Primefact 39)
- *Beekeepers and registration—NSW Apiaries Act 1985* (Primefact 193)
- *American Foulbrood and Small Hive Beetle in bees* - video series
- *Samples for bee disease diagnosis* (Primefact 895)
- *American foulbrood – barrier systems* (Primefact 824)
- *American foulbrood in NSW* (Primefact 878)

## Acknowledgments

This Primefact is a revised version of an earlier publication, Agfact A8.9.3 *American brood disease of bees* (1985), written by Bruce Ward, Michael Hornitzky and Bruce White.

The Primefact was reviewed by NSW DPI staff Dr Michael Hornitzky, Bruce White, John Rhodes, Nick Annand and Mick Rankmore.

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Published by the NSW Department of Primary Industries.

PUB15/258 Job number 6625