Identifying AFB infections

By Dr Mark Goodwin, Apicultural Research Unit, Plant and Food Research, Ruakura

Any discussion on American foulbrood (AFB) must also include the issue of when is and isn't a colony diseased.

The issue is important for both legal reasons and for reasons of disease control. As far as AFB is concerned a honey bee colony can be uninfected, contaminated, or diseased.

Uninfected hives

Uninfected means that the colony does not contain any AFB-diseased larvae or any AFB spores. However, I have heard it suggested that if you looked hard enough you would find AFB spores in all hives. This is probably true of outfits with high disease levels. For example, we tested bees from hives belonging to a commercial beekeeper with a 25% AFB incidence. Eighty-two percent of 400 hives with no symptoms of disease tested positive for AFB spores. If we had looked hard enough we would have probably found spores in the remaining 12% of hives.

However, this case is not typical. No positive results were obtained from samples from 200 hives belonging to a beekeeper who had not reported any AFB hives for many years. These hives probably contained few if any spores.

Contaminated hives

Contaminated means that the hive contains AFB spores but not enough to create an infection, or there are enough spores but they are in the wrong location to create an infection. The contamination may come about for a variety of reasons. It may be because the bees have robbed honey from another hive that was contaminated with AFB spores or because of bees drifting from a diseased colony. It may also have had contaminated hive parts added by a beekeeper.

In one trial we added 20 extracted supers from hives with low-level AFB infections to 20 uninfected colonies. We were very careful that the outside of the supers was clean. We could not see any evidence of robbing or even any bees investigating the outside of the supers we added. However, when we tested samples of bees from 20 uninfected hives at the same site that had not received added supers, they all tested positive for AFB spores.

Generally the numbers of spores in a hive will decline over time if no further spores are introduced to a hive. Contaminated honey is consumed and contaminated bees defecate outside or die and are removed. While it is possible that enough spores will find their way to a larva to create an infection, this will become less and less likely with time as the number of spores reduces.

Although lab tests can identify contaminated colonies for the presence of spores, their presence does not legally require the hive to be destroyed. However, the presence of spores suggests that the colony is at risk of developing AFB and that there may be a diseased hive nearby.

Diseased hives

Technically a colony is diseased if it contains one or more diseased larvae (Figure 1), irrespective of whether diseased larvae are visible to the beekeeper or not. For every diseased larva seen in a hive there may be many more diseased larvae that cannot be seen.

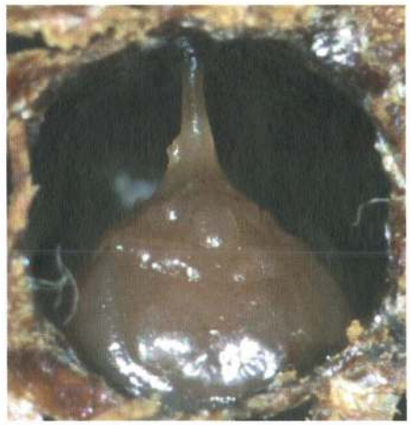

Figure 1: A larva with AFB.

If the infection is very recent the diseased larvae may be hidden by cell cappings that have none of the symptoms we usually associate with AFB (e.g., darkened, sunken or chewed cappings). The bees themselves can also affect the clinical expression of the disease. Bees with good hygienic behaviour can recognise and remove diseased larvae before they exhibit disease symptoms that might be recognised by a beekeeper.

> "*Legally* a colony is classed as having AFB if it contains, or has contained, a diseased larva."

Others do not chew cappings but either leave the cells untouched or remove the cell cappings and the diseased larvae completely. One hive we inspected had no sunken or chewed cappings but did have a very spotty brood pattern, suggesting there was something wrong with the colony. As AFB is always a possibility with a spotty brood pattern, we started uncapping cells and found more than 70% of them to be infected.

Legally a colony is classed as having AFB if it contains, or has contained, a diseased larva. Colonies with only a few cells exhibiting disease symptoms may at times eliminate the disease symptoms, either with or without eliminating the actual disease. Many beekeepers have reported being unable to find any sign of AFB when they have checked a hive a week after an inspector had diagnosed AFB in a hive. Even though a colony may no longer contain larvae with AFB symptoms, once it has been diagnosed with AFB it must be destroyed as specified in legislation.

Apart from the legislative requirements, beekeepers are sometimes tempted to keep