AMERICAN FOULBROOD DISEASE PART III: SPREAD

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To be able to control the spread of American foulbrood disease (AFB), it is important to understand how the disease spreads between colonies. A number of possible means of spread has been suggested by beekeepers. These include:

- robbing
- drift,
- transfer of brood frames,
- extracted honey supers,
- other contaminated hive parts,
- beekeeping equipment (gloves, hive tools, honey extractors etc),
- foundation,
- requeening,
- spores on flowers and the ground in front of hives,
- feeding contaminated honey and pollen.

In discussing possible sources of infection it is important to remember that although it is theoretically possible to infect a colony with a single *Bacillus larvae* spore, this probably never happens. Large numbers of spores are usually required to initiate an infection within a colony. In our studies we were able to create an infection by feeding nucleus colonies as many as 500,000 spores in sugar syrup. Infection only occurred when we increased the dose to five million spores per colony. With this in mind we can weigh up the relative importance of the suggested means by which cross infection can occur.

ROBBING

Honey bees robbing honey from an infected colony is an obvious means of spreading AFB. We were presented with a graphic case of this several years ago. A group of 80 colonies were returned from kiwifruit pollination to a dump site. Twenty of the colonies were moved to another apiary site within a couple of days. A further 20 were removed from the dump site to another apiary two weeks later. Of the remaining 40 colonies, 88% had to be destroyed over the following three months because they had contracted AFB. None of the first 20 that were removed developed the disease while 80% of the 20 colonies that were removed two weeks later had to be destroyed. At some time between the moving of the first group of hives and the second two weeks later, 85% of the colonies at the dump site developed AFB. The only reasonable explanation for this is that a large number of the colonies left on the site must have robbed an infected hive or supply of honey. The source of the infection was never found.

This example emphasises the dramatic effects that can occur with robbing. There are, however, anecodotal examples of AFB colonies being robbed without the remainder of the colonies in the apiary becoming infected. Whether this occurred because the spore levels were not high enough to create an infection or whether the robbers belonged to a neighbouring beekeeper is not known. There is no data to indicate how frequently AFB is spread by robbing.

Now to the causes of robbing. In most cases robbing is caused by the action, or inaction, of a beekeeper and not necessarily the beekeeper whose bees are doing the robbing. The beekeeper concerned may have disposed of infected material in an inappropriate manner, allowed AFB colonies to die out, or they may not have protected their hives from stock well enough so that an AFB colony gets knocked over and robbed. In some cases it may be a feral colony being robbed however we can only guess at how frequently this occurs.

DRIFT

Bees drifting between colonies is often mentioned as a major factor in the spread of AFB. Beekeepers cite examples where if one colony develops AFB the one next to it will also develop AFB, and we have seen examples of this. However, there are of course, many more examples where this does not happen, so that coincidence cannot be ruled out. It must also be remembered that the hive next to the AFB colony will usually be the next one to be worked by the beekeeper, and if hive parts are intentionally or inadvertently moved between colonies, they are mostly likely to end up in the hive next to the

one with AFB. It is therefore very difficult to be sure whether a colony developed AFB through drift or from other means.

We have been conducting trials to determine whether bees drifting from colonies with low level AFB infections are likely to spread AFB. We were particularly interested in colonies with low level infections (colonies with less than 50 larvae exhibiting clinical symptoms) because these are the type of AFB colonies that a beekeeper is most likely to miss and so leave at any apiary site.

We set up 24 pairs of colonies, each pair consisting of one hive with a light AFB infection and one uninfected colony. The colonies in each pair were facing the same way and positioned as close together as possible to maximise the level of drift. When we measured the level of drift between the colonies we estimated that the equivalent of 50% of the bees swapped colonies over a 20-day period. This may of course have been due to a smaller number of bees moving backwards and forwards between hives rather than a total of 50% of the bees swapping colonies.

We know that most bees in an AFB infected colony carry *B. larvae* spores, even those colonies with low level infections. We have tested individual bees from different parts of infected hives. The bees left on frames after the frames are shaken are on average the youngest bees, while those found on the frames before shaking are the next oldest. Bees in the honey supers are older still while foraging bees are likely to be the oldest. Bees found on the brood frames are more likely to be dealing with infected larvae and are therefore more likely to be contaminated with spores. We found that the percentage of bees carrying enough spores to be detected depends on where they there are taken from (Fig. 1). This also affects the total number of spores carried (Fig. 2).

In the experiment, no equipment was swapped between hives and all the equipment used to inspect the colonies was sterilised after each hive was managed. The pairs of colonies were together for a total time of seven years (an average of 103 days for each pair). Only two of the non infected control colonies developed AFB. They both developed AFB at the same time as 12 hives in two apiaries close by that were involved in another experiment also developed AFB so it is not possible to rule out robbing. As only 8% of the control colonies developed AFB it is possible to conclude that bees drifting from colonies with light AFB infections are not a major factor in the spread of AFB. Whether the same can be said for drift from colonies with heavy infections is unknown.

TRANSFERRING BROODFRAMES

Transferring a frame of brood from an AFB infected hive to a clean colony has to be a very effective way of spreading AFB. To put this into context, a colony may need to be fed five million *B. larvae* spores to become infected. However, one diseased larvae can contain 2,500 million spores or 500 times the number required to initiate an infection. Nevertheless, placing a diseased larvae into a hive is probably still no guarantee that the colony will develop AFB.

WET HONEY SUPERS

Honey supers are probably the pieces of equipment that are most frequently swapped between hives. The colonies that they come from are often not checked thoroughly when the honey is removed, and in some outfits not checked at all. We are currently conducting a trial to determine the importance of wet honey supers in the spread of AFB. We collected 20 supers of honey from colonies with light AFB infections. Most of the supers came from colonies with less than five larvae exhibiting clinical AFB symptoms. These are the type of infections you would be likely to miss if you were only checking three brood frames in a colony. The honey was extracted, all of which tested positive for the presence of *Bacillus larvae* spores, and the supers placed back onto AFB-free colonies in the spring. The colonies were split between two sites and situated with a further 20 AFB free colonies.

There were no obvious symptoms of robbing when we placed the supers on the colonies. However, when we tested bees from the hives two days later all

INFORMATION REGARDING LIFE MEMBERSHIP

Both the Executive Secretary and the Librarian have been asked several times for information regarding NBA members who have received Life Membership of our Association for services rendered to the beekeeping industry. Records seem to be sadly incomplete and probably incorrect. We would like to put this matter right and ask readers for their cooperation. Please peruse the following list to see if certain names are missing which should have been recorded, or if present information is not correct. We need the name, address at time when the Life Membership was bestowed, still alive, or passed on and the year in which this L.M. was received. This only concerns Life Membership of the Association not Branch Life Membership.

Please pass on your info to the Librarian, NBA Technical Library, C/ Post Shop, Milton. Your help with completing this "ROLL OF HONOUR" will be much appreciated.

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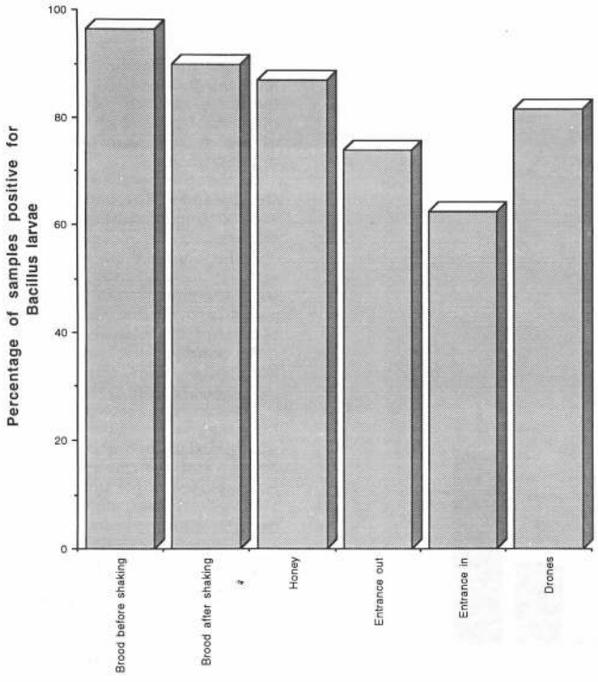
the samples tested positive even those from the colonies that did not receive AFB supers. The colonies were given a complete brood check every month. The first clinical AFB symptoms were recorded two months after the supers were put on and further clinical symptoms up to five months afterwards. The colonies are being followed to determine if any more develop AFB. It is interesting to note that some of the colonies did not develop clinical AFB symptoms for a considerable time (five months) after the wet supers were added. The effects of contaminated supers placed on hives in the spring may therefore not become fully evident till the following spring. Four (20%) of the control colonies have developed AFB to date and eight (40%) of the colonies given infected honey supers. Extracted honey supers are therefore a important factor in the spread of AFB.



OTHER HIVE PARTS

The importance of other hive parts, such as empty supers, floor boards, hive mats, division boards, and lids, in the spread of AFB is unknown. They are likely to carry less spores than brood and honey frames and so are probably less important in the spread of AFB.

BEEKEEPING EQUIPMENT

Unless you use your hive tool or the fingers of your gloves to determine if a larvae will rope then they will not generally be carrying large numbers of spores and therefore will not be a major factor in the spread of AFB. Your extractor is also unlikely to be a major factor. Infected honey may be transferred between frames during the extracting process however the amount will be insignificant compared to the amount contained on a wet AFB super. However, you should still take precautions to ensure that gloves, hive tools and extractors are not a factor at all.

FOUNDATION

At least some of the wax that is melted down for foundation must come from AFB-infected colonies. In trials conducted last year we demonstrated that cappings honey and wax from AFB hives carry many more spores than the remainder of the honey. However most of the spores will be removed by the initial melting and the later processing. Although we have

tested eight lines of foundation to date, we have yet to find any *B. larvae* spores.

QUEENS

It is theoretically possible for queens to transmit AFB. Of the eight queens we have tested from AFB colonies, two tested positive for *B. larvae* spores. It is unlikely that they would carry enough spores to create an infection.

FLOWERS AND SOIL

Bees picking up chalkbrood spores from flowers has been suggested to be a means of spread of chalkbrood. However, it must be remembered, that compared with *B. larvae,* relatively few chalkbrood spores need to be carried back to a hive to create an infection. Except where bee-collected pollen is artificially added to flowers to effect pollination, bees are unlikely to pick up enough spores picked up from the soil in front of a hive to cause a problem. One study that looked for *B. larvae* spores in the soil in the front of AFB hives was unable to find any[1].

HONEY AND POLLEN FEEDING

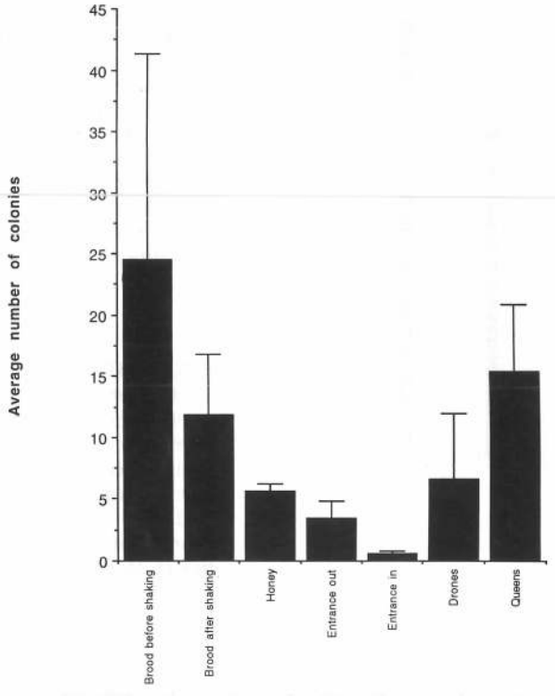
Both honey, and pollen taken from pollen traps, can contain high levels of *B. larvae* spores. If fed to a colony, both honey and pollen taken from an AFB colony could be a major source of infections.

SUMMARY

The four most important ways in which AFB probably spreads are:

- swapping brood
- robbing
- extracted honey supers
- feeding honey and pollen.

Of lesser importance will be drift and contaminated hive parts and very much in last place other beekeeping equipment (gloves, hive tools and extractors), queens, foundation and flowers.



Even though some factors are more important than others in the spread of AFB it is important to endeavour to minimise the risks involved with very beekeeping operation.

REFERENCES

1 Gochaur T.A. 1981: The distribtion of *Bacillus larvae* spores in the environs of colonies infected with American Foulbrood disease. *American Bee Journal 121:* 332 - 335.

Fig. 1 The percentage of bees taken from different places in AFB infected colonies that tested positive for the presence of *B. larvae* spores.

Fig. 2 The average number of B. larvae colonies cultured from bees taken from different places in AFB infected colonies.

Dealing with disaster

THE KEY TO SUCCESSFULLY MANAGING A CRISIS IS BEING PREPARED FOR IT.

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The reputation of a company and its brands is a fragile thing. Public opinion is highly fickle and can switch from warm support to cold rejection overnight.

A badly managed crisis can often be the trigger for such a drastic swing in attitude. There have been numerous examples, both in New Zealand and overseas, of crises which have led to the devastation of brands and even, in extreme cases, entire organisations.

On the other hand, a well managed crisis can be shrugged off with a minimum of disruption and can even be turned to advantage if the circumstances allow it.

Perhaps one of the best-documented crises and certainly one of the most capably handled occurred when the manufacturers of Tylenol, the leading pain killer in the United States, became the victim of a deliberate poisoning campaign.

As word of the sabotage became public knowledge, sales of Tylenol plumeted and threatened to destroy the brand altogether.

The company reacted by withdrawing Tylenol from the market and re-packaging it in the first widespread use of "tamper-proof" packaging. This action, and the communication process that accompanied it, not only saved the brand from annihilation but actually improved its market share over the following years.

In addition to resolving the crisis as quickly and efficiently as possible, preserving and re-building public confidence is one of the principal objectives of any crisis management plan. From a marketing perspective this is also the most important aspect of planning.

The first step to be taken in planning is therefore to assess the potential crises that may befall the organisation. These may range from relatively minor occurrences, such as equipment failure, to more serious possibilities, such as loss of life arising from negligence or product contamination.

The next step in the plan is to determine executive responsibilities during the crisis. Usually, a crisis management team will be nominated, each with clearly defined responsibilities to be undertaken.

At this stage of planning, the various components of the crisis strategy are prepared by the personnel responsible. Developing systems for product withdrawal, testing and reintroduction are all part of this aspect of the plan.

From an image perspective, having a media strategy is essential. This will entail having a spokesperson appointed for the organisation and a clearly defined policy for informing the media of developments if the crisis is of sufficient scale to warrant public attention.

The plan will also include a strategy for rebuilding the brand or company image in the event of certain types of crisis. Preparation of this aspect of the crisis will ensure that there is no delay in beginning the recovery process and returning to normal trading.

It is an unfortunate truism that most organisations do not see the need for crisis management planning until they actually have a crisis. Regrettably, once the crisis is upon them they realise that it's too late to plan and the best they can do is react.

There have been enough highly visible instances of crises afflicting New Zealand organisations in recent times to convince even the most sceptical that planning should be an essential part of any organisation's routine activity.