

## How bees spread AFB disease

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It is quite difficult to infect a colony with American Foulbrood disease (AFB), although some beekeepers seem to be very good at it.

Under trial conditions you need to feed about five million AFB spores per litre of sugar or honey to infect a colony. Other bee diseases like chalkbrood (fungus) and nosema (protozoa) are very contagious by comparison. Nosema can be found in all colonies in New Zealand. When chalkbrood was first introduced to New Zealand in the early 1980s, it very quickly spread through the country in a couple of years.

American foulbrood disease can spread between colonies by a large number of mechanisms. These can be divided into two basic types: honey bee assisted and beekeeper assisted. This article describes the mechanisms by which bees spread AFB. Bee spread is much less common than beekeeper spread. Many examples of this can be seen where two beekeepers utilise the same area. One beekeeper's hives may have a very high AFB disease incidence while the other has a very low incidence.

### Robbing

Probably the most common way bees spread AFB is by robbing other colonies that are weak or have died. In many cases, beekeepers have contributed to this problem by allowing colonies to become weak enough to be robbed.

Several years ago I was lucky enough to see what can happen when bees rob out a diseased colony. Eighty colonies were returned to the same site after they had been used for kiwifruit pollination. Twenty of these colonies were immediately moved to a second site. Two weeks later, a further

20 were moved to a third site again. Of the 40 colonies remaining at the original site, 35 contracted AFB and had to be burnt. None of the first group of 20 hives moved contracted AFB; however, 18 of the second 20 hives moved developed AFB. Sometime in the two weeks between removing the first and second group of hives from the site, the bees from the remaining 60 hives must have robbed out one or more diseased colonies.

As none of these 60 hives were robbed out the bees must have robbed a hive situated on a different site, or a feral colony. The most intriguing thing about the case was that at least 53 colonies had robbed out the same source. Unfortunately we were unable to find what they had robbed.

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**"Bee spread is much less common than beekeeper spread."**

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### Drift

Bees drifting between colonies is another way AFB spreads; however, it would appear to be reasonably uncommon. It would have been even less common before humans took up beekeeping because of the relatively large distance there is usually between feral colonies. The practice of keeping large numbers of colonies in close proximity increases the amount of drift and the chances of drift spreading AFB.

We carried out a trial with 24 pairs of hives. Each pair was as close together as possible to encourage drift. One hive had a low-level AFB infection (less than 50 disease cells) while the other was uninfected. When we measured the level of drift, the equivalent of 50% of the bees swapped hives over a 20-day period. The pairs were together for an average of 103 days. Only two of the uninfected colonies developed AFB. Drift is, however, likely to be a larger problem when colonies have more extensive AFB infections.

Anything that can be done to decrease drift will help reduce this source of spread.

Having hives in straight lines and all painted the same colour increases drift. Circles and U-shaped apiary patterns reduce drift.

### Swarms

Swarms can carry AFB with them. The second colony I ever had was a swarm which developed AFB very soon after it was hived. For this reason it is better to hive swarms in old equipment so the loss is less painful.

Swarms are best hived on foundation rather than drawn comb. By the time the bees have drawn comb and the queen has laid eggs, many of the AFB spores they were carrying should have disappeared, which will decrease the chance of the disease reappearing. This is similar to the methods used for shook swarming (shook swarming is illegal in New Zealand).

### Swarms occupying infected cavities

Swarms sometimes utilise cavities that have previously been occupied by another colony. This is probably how much AFB spread before humans started keeping bees. The AFB spores themselves suggest this mechanism was important. The spores are very resistant and are able to survive long periods of time, probably more than 50 or 100 years. They can, therefore, survive the relatively long periods of time that may elapse before a cavity is re-inhabited.

*[Editor's note: This is the eighth article of a series that has been written for the Management Agency for the American Foulbrood National Pest Management Strategy. These articles were first published beginning in 2003, and have been reviewed and updated where necessary. The original title was How bees spread American foulbrood disease.]*

*We will run these articles on a regular basis over the year. The articles will cover a range of aspects of American foulbrood control, including how to inspect for and identify diseased colonies, the management of colonies to prevent American foulbrood and a beekeeper's legal obligation with regard to American foulbrood.]*

