AMERCAN FOULBROOD CONTROL BY NUMBERS

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Epidemiology is the study of epidemics and the way they spread. To the dismay of those of us with an aversion to maths, epidemiology is in part a study of numbers. Aspects of the epidemiology of American foulbrood disease (AFB) can also usefully be described by numbers which provide some useful insights into the spread of the disease.

The first issue is the spread between colonies. Any swapping of equipment between colonies carries a risk with it. However the way the equipment is exchanged affects the size of the risk.

In the first example three frames of bees and brood are removed from one hive and papered on to a second to increase its strength. At worst, taking it from an unrecognised AFB hive will create one more AFB hive. Fortunately most beekeeping activities fits this model where the activity doubles the number of AFB hives.

The second group is where an activity more than doubles the number of AFB hives. A good example of this is extracted honey supers. The infectivity of these has not been properly determined but it is safe to assume that it is less than exchanging frames of brood. For the sake of discussion we will assume that an extracted honey super from an undiagnosed AFB hive infects 75% of the hives they are placed on. The bigger the honey crop the greater the risk from the AFB hive. Two extracted honey supers from an AFB hive will infect 1.5 other colonies and 4 supers will infect 3 other hives if the supers are placed on different hives.

The situation gets worse when the components of an AFB hive are spread further. For example we saved a few supers of honey to feed nucleus we are over wintering. We went to great lengths to ensure the hives we took the honey from did not have AFB. This consisted of taking it from an apiary that hadn't had an AFB hive for a long time. Giving the hives 3 AFB inspections and testing the honey for AFB spores. This is because we are taking about 18 frames from each hive and putting one frame in each nucleus colony. If we took them from an AFB hive, assuming a 75% chance of a frame infecting a colony, then an AFB hive has the potential to create 13.5 new AFB hives.

Feeding extracted honey or pollen can be even more disastrous. There are a number of cases where beekeepers have fed extracted honey or pollen to a large number of other colonies. One of the hives supplying the honey or pollen had AFB with the result that one hive was turned into 20 or 30 AFB hives.

Another example of this is one we are sometimes contacted about. This is where a beekeeper has been producing queens and has found out the starter being used has AFB. Several hundred queen cells may have been started and placed in several hundred hives.

A good principle is therefore to assess the risk of removing something from a hive to place it into another. If it is only being placed in a single hive be careful. At least carry out a complete brood check. However if what you remove is going to be placed in more colonies you need to be very sure that the source of the material doesn't have AFB. If what you remove is going to be placed on or in 20 or more colonies then don't do it. Or at least understand the risks being taken and decide

whether you really want to face the potential consequences if things go wrong.

Looking at the disease levels in a whole beekeeping outfit rather than in individual hives the numbers again provide some interesting lessons. Unchecked the AFB incidence in an outfit probably increases exponentially. Assuming each AFB hive creates a new AFB hive each year and none are found then the incidence will double each year (Fig 1). A doubling of AFB hives each year will increase AFB incidence from 1% to > 60 % in 6 years. If each AFB hives produces 2 AFB hives each year than the incidence will increase from 1 to > 60% in 4 years.

Fig 1 Increase in the percentage of AFB hives when the number doubles and trebles each year.

These rapid increases are the reason beekeepers are sometimes caught unaware with a major problem. If you have only a 0.5% incidence the worst that you can expect next year is 1% or 2% if things go wrong as there are not that many AFB hives available to infect other colonies. However if you have a 5% AFB incidence you are sitting on a potential time bomb. Get it wrong and you may have 20% next year.