

## CONTROL OF AMERICAN FOULBROOD BY ERADICATION OF INFECTED COLONIES

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The National Bee Unit is responsible for the implementation of the Defra (Department for Environment, Food and Rural Affairs) and NAWAD (National Assembly of Wales Agriculture Department) bee health programmes in England and Wales respectively. Such a programme primarily involves control of statutory diseases, although there are many other aspects. These include field inspections, extension work, laboratory diagnostics, beekeeper training, research and development, consultancy, policy formation and import risk assessments. There are several honeybee diseases present in the UK, and of these, three are statutorily notifiable diseases, meaning if they occur, they must be reported to the NBU. These diseases are American foulbrood (AFB), European foulbrood (EFB) and varroa infestation, with diseases such as chalkbrood, sacbrood and nosema being present, but not subject to statutory control. The support and education provided by the NBU for beekeepers includes training in disease recognition for all diseases, made easier by that fact that the NBU has a close working relationship with beekeeping associations throughout England and Wales.

Non-statutory diseases are controlled by the beekeeper, although advice is given by the NBU for recommended strategies. Varroa infestation, although statutorily reportable, is also left in the hands of beekeepers, although currently there are only two registered treatments in the UK, Apistan and Bayvarol. Both foulbrood diseases are dealt with by the NBU field team of Appointed Bee Inspectors (comprising of 8 full-time Regional Bee Inspectors and approximately 35-40 part-time Seasonal Bee Inspectors). The NBU field team inspects at least 25,000 colonies each year, approximately 10% of the total number of colonies covered by the NBU. If a colony has suspicious signs on inspection, a sample will be taken and sent to the NBU diagnostic laboratory in York. The sample is examined for the presence of the causative bacteria, either *Melissococcus plutonius* (for EFB) or *Paenibacillus larvae* subsp. *larvae* (for AFB). If positive for bacteria, the disease is confirmed and either treatment or destruction is recommended by the laboratory diagnostic team.

In cases of EFB, colonies may be treated (by appointed officers only) with oxytetracycline (Terramycin ®) if likely to recover, or are otherwise destroyed by burning. AFB-affected colonies are always destroyed by burning the bees, brood combs and all movable hive parts. The hive box and other components such as queen excluders are scorched with a blowtorch to destroy any bacteria present. In some countries, AFB is treated with OTC. However, this policy is not adopted in the UK as the bacterium that causes AFB forms spores, which are the infective stage of the life cycle. OTC has no effect on these spores, meaning that although the antibiotic will eliminate vegetative cells from the colony, there will always be some spores left. These may lead to AFB recurrence later in the life of the colony.

The question is does this destruction policy, enforced in the UK since 1942 when the legislation for control of foulbrood diseases was introduced, actually work to reduce AFB

cases? The number of reported cases of AFB in England and Wales since 1942 is shown in figure 1. The level of AFB in the 1950s averaged at 1032 cases per year, and before the introduction of the legislation, it is almost certain that the actual numbers of cases were greater than these reported levels. In the 1990s this average figure had fallen to 164 cases, so destruction of infected colonies does work with respect to lowering disease levels. Unfortunately, as the levels of AFB have fallen, cases of EFB have risen, most notably in the last decade; the reason for this increase is unknown. Cases of AFB tend to be sporadic, but are generally confined to a local area which makes dealing with outbreaks relatively straightforward. If either brood disease is suspected and confirmed, ABIs will inspect colonies around the affected area to attempt to contain the disease.

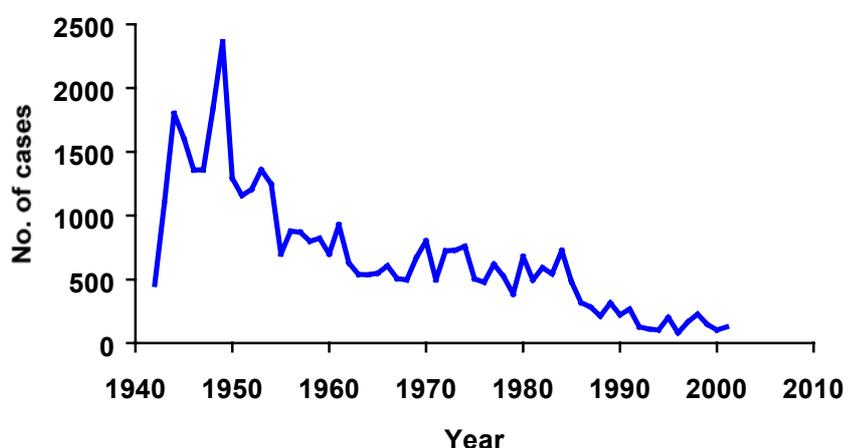


Figure 1. Cases of AFB in England and Wales from 1942 to 2002

The future control of AFB in the UK is likely to continue to be a destruction policy. However, there is research being carried out at the NBU to make its detection and therefore control easier. This involves the development of field test kits, to be used by both ABIs and beekeepers, which will detect *P. larvae* subsp. *larvae* in diseased larvae. Unlike the current system, where the disease is confirmed at the NBU laboratory, this will allow for confirmation in the field, resulting in faster responses to AFB-infected colonies. The kits are based on pregnancy test kit technology, and utilise monoclonal antibodies to the bacterium. The kits are made at CSL (Central Science Laboratory) by Pocket Diagnostic™, a company within CSL that has developed similar kits for many other pathogens, including viruses of potatoes and tomatoes and some bacterial diseases of plants. If the bacterium is present in a sample, the kit will give a positive reaction. This still means that beekeepers will need to recognise the disease, as suspect samples showing clinical symptoms have to put through the device. The kits have been validated in the laboratory, and are specific to *P. larvae* subsp. *larvae*, as there is no cross reaction with other bacteria present in bee colonies or with larvae, pupae, adult bees or hive products. The next stage is to carry out a full field validation, which is currently in progress. A similar kit for EFB detection is also being developed.

In summary, the destruction policy enforced by the NBU since 1942 has led to a considerable decrease in reported AFB cases. The field test kits should help to increase the speed at which outbreaks are dealt with for future control of this disease.

For further information please consult the following web pages or contact the NBU at the address given above.