

## European Foulbrood – the NBU perspective

Having experienced European Foulbrood (EFB) first hand, in his article in the Autumn 2015 edition of 'The Welsh Beekeeper', Greg Nuttgens of Bridgend BKA, raises some interesting questions about the epidemiology of this notifiable disease. Together with Giles Budge and Ben Jones of Fera, we've set out to address some of the points which Greg raised concerning EFB and its causative organism *Melissococcus plutonius* (Mp).

- Just how widespread is EFB in the UK? The NBU records are of cases where disease symptoms have been found through random inspections, or through beekeepers reporting symptoms to the NBU. On random inspections Bee Inspectors look for symptoms, and do not routinely carry out lateral flow tests. They may therefore be missing 'dormant' cases of EFB.

*The Random Apiary Survey (RAS) was useful to address this point because it visited 4600 apiaries at random in England & Wales and screened for EFB and Mp - i.e. symptomatic (disease) and asymptomatic (infection). Very few cases of a symptomatic infection were found outside of known areas of disease risk, suggesting that in 2009-2011 we had a good idea about the location of EFB (and Mp). Our inspections continue to be risk based, which means that they are grouped around locations known to have disease, but we retain a percentage of random inspections.*

- Can a lateral flow device (LFD) detect the infection when the disease is dormant? (I have had conflicting responses on this, from both experienced beekeepers and bee inspectors).

*The disease is not dormant per se, but can be 'subclinical'. In theory LFDs can detect Mp at sufficiently low levels to use on infected but symptomless larvae – which do sometimes occur in colonies. Practically, it is very difficult to find the correct larva to test when there are no symptoms to target your selection. In addition, LFDs are a field diagnostic test kit and the use of too many larvae will quickly overload it, so this combination of having to test a high number of larvae individually (or at least in small bulks) presents a sampling issue.*

- How persistent is the bacterium? How long will it remain dormant in unused brood frames or honey stores?

*We have data to suggest that Mp can survive at least 18 months in honey and there is evidence from the literature that it can survive 3 years + on used brood comb.*

- How infectious is EFB? Why do only some colonies in an apiary contract the disease? Or is it likely to be present but dormant in every hive in the apiary?

*Research has shown that infected apiaries are more likely to have symptomless carriers. There is currently some work being completed in Switzerland looking for genetic resistance to EFB. But Mp is not ubiquitous in the UK, meaning that it is not found in every colony in the country.*

- Can the bacterium survive in or on wax? (I would expect the bacterium might survive on the surface of wax, but it seems unlikely to be present within the wax itself).

*Evidence from the literature has identified Mp on wax cappings, but it is unclear whether Mp would survive in wax.*

- Can the bacterium survive in or on propolis?

*Interesting question, we've never seen anything on this. Given propolis' supposed antibiotic properties it would be surprising.*

- Can the bacterium survive on dry timber surfaces?

*Whilst Mp is not a spore former, it has demonstrable ability to survive season to season on brood frames and in honey.*

- I have read that microscopic examination of infected brood to identify the accompanying bacterium *Paenibacillus alvei* can be used to identify EFB – is this a realistic method of identification?

*No. Although P. alvei (Pa) can be a secondary infection in colonies with EFB, legislatively we have to confirm the presence of Mp. in symptomatic colonies to identify colonies with EFB. It is possible to find Pa without Mp.*

- Can disinfecting combs with Acetic acid destroy EFB bacteria? The literature here is confusing: the National Bee Unit's leaflet 'Hive cleaning and sterilisation' states "there is no evidence that this treatment is effective against AFB or EFB" (May 2013).

*Acetic acid fumigation of comb is an accepted part of good hygienic practice but concerns around it not being able to 'get to' all the Mp cells are very valid and it is why we say there is no evidence that Acetic acid is fully effective against EFB (or AFB).*

- Would washing frames with water eliminate the disease? Granulated or fermented honey stores can be removed from super frames by soaking them in water, after first ensuring that any cappings are removed. The water is changed several times, the water shaken thoroughly out of the frames each time and the clean frames then dried. Would such a treatment eliminate EFB? Would soaking the cleaned frames in a dilute bleach solution at the end of the process ensure the elimination of EFB? Or would the washing and drying alone effectively remove the bacteria?

*We're not sure anyone has tried 'washing', the concern is that it would be very difficult to ensure removal of infected material and it's unlikely that washing alone would be able to remove scales.*

- The destruction of all super frames (after extraction) within an infected apiary, combined with shook swarms and scorching of boxes, has been suggested as an effective way of eliminating EFB. Even if this is effective, it is hugely expensive, and is likely to lead

to many small beekeepers giving up beekeeping altogether. So, is this really an effective control?

*Yes, we have good experimental evidence that it works, also practical evidence from large scale operations who have adopted this approach, despite the cost.*

- I have read about changing queens as a means of controlling the disease. Clearly, the break in brood production will assist in control. But if we don't understand the persistence of the bacterium, how can we know if this method is effective?

*Brood cycle breaks are an important part of the shook swarm procedure, allowing the colonies to clear the bacterium.*

- Is there any evidence that some strains of bees are resistant to EFB, as is suggested in some of the literature? If so, this would seem to be an important line of research.

*The UK supports an eradication policy. Having resistant colonies that can harbour the bacterium without showing symptoms might make the problem better for some but worse for many.*

- Can the presence of EFB in its dormant state have an effect on queens? Many of us have experienced problems recently with queens failing to thrive, dying out, or not mating properly. Could this be related to the prevalence of EFB?

*Good question, we do not know. However problems with queen mating are not solely confined to areas with known EFB.*

*As part of the Insect Pollinators Initiative, the NBU led a research project entitled 'Modelling systems for managing bee disease: the epidemiology of European foulbrood'. Working in collaboration with Newcastle University, we constructed a model that used meteorological data to help predict disease outbreaks. This work is currently in preparation for publication.*

Whilst American Foulbrood (AFB) instils fear in the heart of many beekeepers, it is an infection which follows a defined progression in the hive, leading to the eventual death of the colony. The statutory treatment is destruction of the colony, the burning of the contents of the hive and scorching of the boxes to sterilise them. If the job is done properly and suitable hygiene measures are taken, recurrence is rare and incidence of the disease is now much reduced from post war levels. We have good evidence that our control policy will lead to local eradication of AFB, despite the persistence of AFB spores.

However European Foulbrood is more insidious in its progression, the infection is not always visible and, as Greg points out, symptoms can appear and disappear in the infected colony. Regular brood inspections are required, especially if you are in a known area of disease or have been moving bees or equipment. Treatment options are destruction, as with AFB described above, or shook swarming of the infected hive and, more effectively, the whole apiary.

We are fortunate in Wales that levels of EFB infection are generally lower than the rest of Southern Britain and the NBU has the inspection capacity to cover the ground, but we do need to be vigilant to avoid further spread. With this in mind it is incumbent on all beekeepers as livestock holders to regularly check the health of their colonies and be able to recognise disease if present. The inspectorate works hard to find and eliminate disease outbreaks but it is more effective if beekeepers play their part and any disease is spotted early. If you are not sure about recognising disease, come to one of our NBU Disease Recognition Workshops in the summer and see it 'in the flesh'..

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