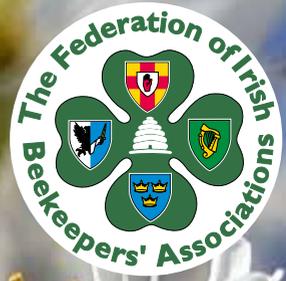


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BEE DISEASE DIAGNOSTIC SERVICE: ITS ROLE IN BEEKEEPING

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Controlling pests and pathogens in a colony is one of the most serious challenges facing beekeepers. Not only is the number of pathogens increasing, but also the interaction between these pathogens. Colonies may be infected with more than one pathogen, often with different pathogens affecting different developmental stages of the honeybee. However, as a beekeeper it is difficult to ascertain the damage these pathogens are having on the health of the colonies, but it is best reflected in the number of winter colony losses being experienced. Therefore, since 2008, as part of the National Apiculture Programme winter losses being experienced by beekeepers have been monitored on annual basis using the standardised questionnaire produced by the COLOSS network. This year's survey is available for completion in this edition of the magazine (centre pages) or may also be completed online on both the FIBKA/ NIBHS webpages.

In addition to recording winter colony losses and reporting these losses by completing this year's survey, beekeepers also need to continuously monitor their colonies for symptoms of disease as part of their day to day management of their colonies. To achieve this endeavour, a beekeeper must have a clear understanding of the appearance of healthy bees and developing brood at all stages of development and a working knowledge of the clinical symptoms of at least some of the most serious pathogens. Any variations on what is considered healthy bees and brood warrants further investigation.

A honeybee as it develops from an egg to an adult undergoes complete metamorphosis, that is it changes from an egg to larvae, to pupa and finally an adult. Figure 1 shows healthy brood at all stages of development.

Figure 1



Egg and larvae stage



Pupae (sealed brood) stage



Adult stage

In a queen right colony, a single egg will be laid at the bottom of each cell, while multiple eggs with a number of eggs stuck to the side of the cell (Figure 2) indicates the presence of a worker layer, which generally results in the demise of the colony.



Figure 2

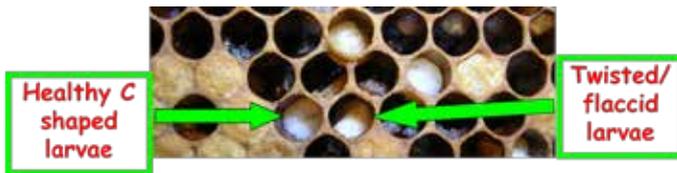


Figure 3

Healthy unsealed larvae are shown in Figure 1. Each larva is provisioned with royal jelly, is pearly white in colour and has a typical “C” shape. This shape should be maintained as the larva grows until the cell is capped. However, if on inspecting a colony some larvae have an off white/yellowish appearance, have lost the typical “C” shape and have become flaccid (Figure 3), it is possible that the colony is infected with the bacteria, *Melissococcus plutonius*, more commonly known as European Foulbrood (EFB). This is a notifiable disease and thus a sample must be sent to Bee Disease Diagnostic Service for further analysis.

Possibly the most serious brood disease in honeybees is American foulbrood. This is also a notifiable disease and is caused by a spore forming bacteria, *Paenibacillus larvae* and affects developing larvae at the sealed brood stage. Clinical symptoms are diverse within the colony but typical symptoms include spotty brood pattern, sunken and /or perforated cells, cells with a ropy mass (matchstick field test) and AFB scale (Figure 4). As a beekeeper, it is important to remember that each infected cell transitions from the “ropy stage” to the “hard scale stage”. When inspecting brood comb in a colony that has died out during the winter months, if infected with AFB, then it is likely that most of the cells will have transitioned from the “ropy stage” to the “scale stage” and these can be difficult to identify. As with EFB, suspect AFB infected brood should be submitted to the Bee Disease Diagnostic Centre and if the sample tests positive then the colony must be destroyed by burning.

Figure 4



Spotty brood pattern

Sunken/perforated cells

Ropy mass

AFB Scale

AFB is not the only pathogen which affects sealed brood. Other pathogens include Chalkbrood (fungal disease), viral diseases (for example, Sac brood viruses and Black queen cell virus) and a condition known as parasitic mite syndrome (PMDS), which is associated with high Varroa mite load and viral infection.

The three most common adult bee diseases are Acarine, Nosemosis and Deformed Wing virus. Acarine is caused by the tracheal mite and affects the respiratory system of the bee. To confirm its presence, bees need to be dissected; however bees crawling out of the hive and up stems of grass on a sunny morning in Spring/early summer warrants further investigation. To confirm the presence or absence of Acarine, a total of 30 adult bees should be submitted to the Bee Disease Diagnostic Centre. Nosemosis, is caused by a microsporidia. Two species exist, *Nosema apis* and

Nosema ceranae, but in many instances both species co-infect. Again, microscopy is necessary to confirm its presence, but defecation at the front of the hive or on the top bars often indicates, *N. apis* infection. Deformed Wing Virus (DWV) is one of 18 viruses known to exist in honeybee colonies. It is associated with high Varroa loads in colony and as the name suggests, the wings of the adult bees become crumpled or reduced to stumps and generally the abdomen of the bee becomes swollen. DWV infected bees can survive in the colony, but since they are unable to fly and subsequently forage, the colony will dwindle unless Varroa levels in the colony are controlled.

Considering that a colony may be co-infected with a number of pathogens, it can be difficult for the beekeeper to identify all clinical symptoms associated with the pests and pathogens, however further clarification on the presence or absence of diseases in a colony can be obtained by submitting samples regularly to the Bee Disease Diagnostic Service, Teagasc, Oakpark Research Centre, Carlow. This service is free of charge but is grossly underused by beekeepers. At the Bee Disease Diagnostic Centre both adult bees and brood are tested for disease. Adult bees are tested for *Nosema* spp., Tracheal mite and clinical symptoms of Deformed Wing Virus and Varroa infestation. Brood comb is tested for AFB (sealed brood), EFB (unsealed brood), Small Hive Beetle (not present in Ireland) and clinical symptoms of Chalkbrood, Sacbrood virus and Varroa infestation. Each sample should be accompanied with the submission form recently produced by DAFM and can easily be downloaded from FIBKA webpage. Details on how to sample and the sample type required are all available at the end of this article, but hopefully will soon be also made available on the FIBKA webpage. Please ensure that when submitting comb, only submit brood as the presence of honey, nectar or pollen in the sample makes the identification of AFB scale and other brood diseases difficult.

Data accumulated to date for 2017 by the Bee Disease Diagnostic Service, is indicating that AFB appears to be quite prevalent in colonies this year post-winter. At the time of writing a total of 6 incidences have been confirmed and these are from 5 different geographical regions suggesting that AFB may be prevalent nationwide but this hypothesis can only be assessed if beekeepers send in samples for analyses. AFB is a very contagious disease and although it can be transmitted from one colony to another by bees through robbing and drifting, many common beekeeping practices facilitate and maximise its transmission. These beekeeping practices include movement of frames between colonies within an apiary, nuclei production and the sale and movement of infected colonies/nuclei. Therefore, as a beekeeper even within one's own operation prior to moving frames between colonies or making new splits or nuclei, it is important to check the parent stocks for clinical symptoms of AFB. Extra vigilance is required for beekeepers specialising in the production/sale of nuclei and those involved in bee breeding groups. Beekeepers purchasing a nucleus either from a local beekeeper or a commercial producer of nuclei also have the responsibility to monitor for clinical symptoms of foulbrood not only on the day of purchase, but through the active season. A beginner may need assistance identifying clinical symptoms of AFB, but experienced beekeepers in the area are generally willing to assist and samples may also be sent to the Bee Disease Diagnostic Service once the nuclei become established. Thus to maintain healthy stocks, continuous monitoring of colonies for disease must play an integral part in the day to day management of colonies and the Bee Disease Diagnostic Service is available free of charge to assist in this endeavour.

When and how to sample

When to Sample: Samples should be taken when any suspicious symptoms are found.

Symptoms of Bee Diseases

- Scattered brood pattern with evidence of dysentery at the hive entrance or on the top bars
- Paralysed bees, deformed bees (short wings) or bees with abnormal wing movements

Symptoms of Brood Diseases

- Scattered brood pattern
- Cell cappings appear greasy, darkened, concave and punctured with small holes
- Sealed brood: cell contents have to a light brown ropy consistency or have dried into a hard scale (cell appears empty under the capping)
- Unsealed brood: larvae have lost their coiled "C" shape in the cell and become flaccid

Testing for Adult Bee Diseases

Taking the sample of bees from the colony

- A sample of older bees is taken from the hive entrance or from peripheral frames in the brood box if the weather does not permit flight.
- If sampling from the brood box, find the queen to ensure she is not included in the sample if at all possible and select peripheral frames from either end of the Brood box. Do not mist bees with water. **It is important to select older nest bees or foragers.**
- If sampling from the hive entrance you will need to block hive entrance for few minutes
- Fill the sampling vial (plastic tube (50ml tube) or small match box) up to the top
- Close the lid and return the excess bees to the brood box and smoke gently. Alternatively, tap the front of the hive gently; bees will crawl onto the front of the hive. Take the sample and again smoke gently.

Storage and postage of bees

- Place the sampled bees in a freezer as soon as possible after sampling. Leave the sample in the freezer for a minimum of 2 hours.
- Complete the sample submission form.

BEE DIAGNOSTIC SERVICE

Please Send Samples for Testing

*Send live or newly dead bees, not those which died overwinter.
AFB: suspect comb containing sealed & dead brood, at least 6"square, packed so the comb is not squashed in transit.*

No Cost for sending Sample.

SEND TO:

*DR MARY COFFEY,
Bee Disease Diagnostic Services,
Teagasc, Oak Park, Carlow.*

BE WISE - send samples of bees and comb twice a year for testing.

- Please the sample and the completed form in a padded envelope.
- Post the sealed envelope to Mary F Coffey, Bee Disease Diagnostic Service, Teagasc, Oakpark Research Centre, Carlow

Testing for Brood Diseases

Taking a comb sample from the colony

What you need: Sharp knife, sheet of newspaper, plastic bag, duct tape or a stapler and a padded envelope.

Selecting the brood frame in the colony

- Estimate the total number of frames in the colony that have brood present (open and/or sealed)
- Select the brood frame in the centre of the brood nest
- Use a sharp knife to cut out a piece of brood comb measuring 15cm x 15cm (6 inches x 6 inches approx)
- Avoid sampling honey or nectar as much as possible as it makes analysis for American Foulbrood (AFB) and European Foulbrood (EFB) difficult
- To test for AFB a sample of **sealed brood** is required
- To test for EFB a sample of **unsealed brood** is required
- Wrap the sampled comb in a sheet of newspaper and place in a plastic bag
- Seal the bag with a piece of duct tape or staples
- Complete the sample submission form
- Please the sample and the completed form in a padded envelope.
- Post the sealed envelope to Mary F Coffey, Bee Disease Diagnostic Service, Teagasc, Oakpark Research Centre, Carlow



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