Farm Production & Practice

Ministry of Agriculture and Fisheries

Honey Bees Overseas Diseases and Pests

Features and Potential Damage

Keywords: Bees (honey), import controls, diseases, pests.

New Zealand is fortunate to be free from a number of serious honey bee diseases, pests, and undesirable genetic characteristics which currently affect beekeeping in many other parts of the world. Beekeepers and MAF personnel should be familiar with these pests and diseases, and their possible spread to this country, so that effective importation control programmes can continue to be maintained.

New Zealand enjoys a higher honey bee health status than any other honey producing nation of equivalent or larger size. Such a status ensures that our honey, queen bees, and other hive products have ready access to overseas markets and allows New Zealand beekeepers to receive high returns for their exports abroad.

Varroa Disease (or Varroasis)

Caused by the parasitic mite ***Varroa jacobsoni,*** varroa disease is of major international concern as a result of its rapid spread from Asia into many countries in Europe, Africa and South America. To date the mite has not been found in New Zealand, Australia or the South Pacific region. ***Varroa*** is considered by many authorities to be the most serious bee disease found in the world today.

Identification: The ***Varroa*** mite is an external parasitic mite large enough to be seen by the naked eye. It is reddish-brown in colour, and 1 mm long by 1.6 mm wide (fig. 1). Mites are occasionally visible on the upper (dorsal) surfaces of the bee, especially near the wing bases on the thorax. More frequently, however, the mites prefer the under (ventral) areas of the bee's abdomen near the wax secreting glands. A single adult bee may carry over a dozen mites.

Biology: Much of the life cycle of ***Varroa*** is spent within the brood cells of the honey bee. The adult mated female mites enter brood cells just before capping and each lay 2–5 eggs. Drone brood is preferred, especially in early stages of the infection. Within 24 hours the eggs hatch and both mother and young feed on the haemolymph, or blood, of the pupating bee.

Mating takes place within the same brood cell and the female mites continue to feed on the honey bee pupa until emergence of the adult bee. At this point the mites spread to other honey bees and sustain themselves prior to egg-laying by sucking haemolymph from the intersegmental membranes of the bee.

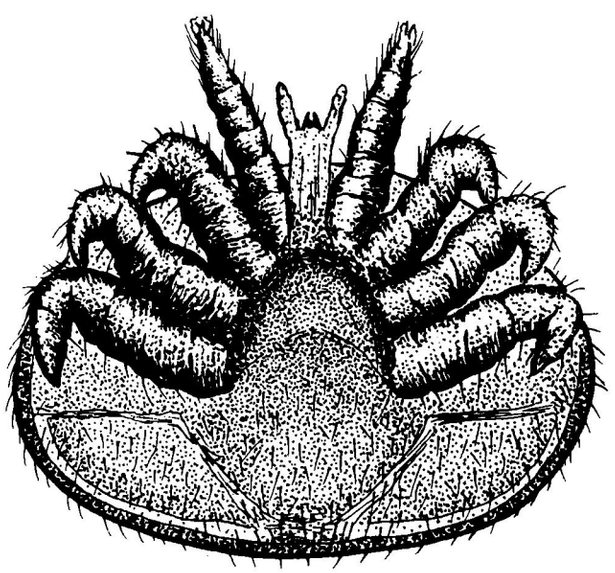

Fig. 1: The ***Varroa*** mite (ventral or underside view).

Symptoms: Early stages of ***Varroa*** infestation can be difficult to detect unless the beekeeper carefully examines brood cells as well as adult bees. Pupae, and especially drone pupae, should be examined for small pale to reddish-brown surface spots.

In heavier infestations adult bees may appear disfigured or display crippled movements. As with a number of other bee diseases, ***Varroa*** may result in both crawling bees at the entrance of the hive and patchy brood patterns caused by nurse bees attempting to remove infected brood. High population levels of the mite can greatly affect hive performance and may ultimately lead to colony death.

Spread: Colony drift as well as robbing bees can distribute female mites from one colony to another. However, the major cause of ***Varroa's*** rapid spread throughout the world has been beekeeper activity; in particular the shifting of hives, interchange of equipment and uncontrolled or illegal shipment of queen bees.

Control: Any suspicion of ***Varroa*** infection must be reported immediately to a MAF apicultural advisory officer so that a sample can be obtained for diagnostic testing.

If ***Varroa*** is confirmed, the control measures established for a First Schedule disease under the Apiaries Act 1969 will be imposed, with the object of initially confining and then eradicating the disease.

Acarine Disease

Another mite disease of honey bees, acarine, is caused by the internal parasite ***Acarapis woodi.*** The mite is found throughout Europe, in India and Japan, and in many parts of Africa, South America, and Mexico. ***Acarapis woodi*** is not present in New Zealand, but the country does have three related species of harmless external mites.

Identification: Since acarine mites are microscopic and cannot be observed with the naked eye, only trained personnel can give a positive identification of this disease.

Biology: Acarapis woodi live in the tracheae, or breathing tubes of adult drones, workers and queen honey bees. The prothoracic tracheae leading from the first spiracles are the most favoured points of infestation (fig. 2). All stages of

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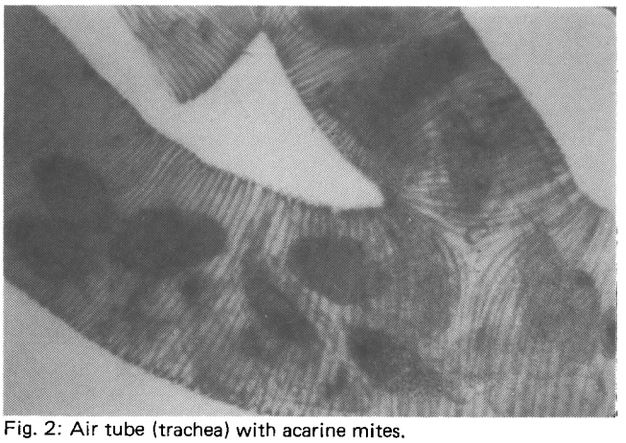

Fig. 2: Air tube (trachea) with acarine mites.

the mite life cycle (egg, larva, nymph, and adult) can be found in the tracheae at any one time and mating of adult females takes place there as well.

Once mated the females leave the tracheae and, by attaching themselves to the body hairs of the bees coming into contact with the original host, they are then able to infect new bees.

Symptoms: Without microscopic diagnosis acarine disease can be easily mistaken for other adult honey bee disorders including nosema and paralysis. In moderate to heavily infected colonies crawling bees may congregate at the hive entrance. In severe infestations population dwindling may ultimately lead to the death of the colony.

Spread: As with varroa disease, drift, robbing and the actions of beekeepers themselves can lead to the rapid distribution of this disease.

Control: Acarapis woodi is classified as a First Schedule disease under provisions of the Apiaries Act, 1969. If identified in New Zealand immediate steps would be taken to confine and eradicate the disease.

European Brood Disease

European brood disease, also known as European foulbrood, is a disease of honey bee larvae caused by the bacterium ***Streptococcus pluton.*** The disease has a worldwide distribution but to date has not been diagnosed in New Zealand. In 1977 European brood disease was confirmed in South Australia and has since spread to other Australian states. The Australians regard it as a serious disease and have destroyed numerous infected colonies in an effort to curb its spread. In North America, however, European brood disease is not considered to be a disease of major economic importance.

Identification: As with all bacteria, positive identification of ***Streptococcus pluton*** can only be made in the laboratory using proper microscopic techniques.

Biology: Infection by ***Streptococcus pluton*** occurs in honey bee larvae within 48 hours after emerging and is usually transmitted by nurse bees during cleaning and feeding. The bacteria establish in the larval midgut and multiply rapidly, competing with the larvae for food. Larvae die at 4–5 days-of-age, usually prior to the capped brood stage. Larval death may be accelerated by other secondary bacteria.

While there is no spore formation associated with this organism, European brood disease can readily be transmitted within a colony by nurse bees carrying the bacteria on their mouth parts. ***Streptococcus pluton*** can overwinter on brood comb, as well as in faeces deposited in the hive, and can remain viable under most conditions for at least three years.

Symptoms: Infected larvae lose their distinct form and change from their characteristic pearly white colour to yellow and finally dark brown. Infected larvae move about inside the cell instead of remaining in a normal curled position and thus appear twisted after death (fig. 3).

In medium to heavy infections some larvae may die after capping. In this case the brood pattern may appear patchy and some cappings may be sunken or perforated. While such symptoms are also characteristic of American brood disease, in European brood disease dead larvae rarely "rope out" when a matchstick inserted in the larval remains is slowly withdrawn. Once the larvae have dried down to form a thin scale they can easily be removed from the cells, and unlike sacbrood, the dried scales appear rubbery rather than brittle.

Because European brood disease can easily be mistaken for either sacbrood or American brood disease, two diseases common in New Zealand, a summary of the distinguishing features of brood diseases is presented in the following table:

TABLE 1 : COMPARISON OF BROOD DISEASE CHARACTERISTICS

	European Brood Disease	*American Brood Disease*	*Sacbrood*
Appearance of brood comb	Unsealed brood. Some sealed in advanced cases.	Sealed brood. Sunken. Darker in colour. Perforated.	Sealed brood. Perforated or completely removed. Sometimes sunken.
Age of dead brood	Usually younger unsealed larvae.	Older sealed larvae or young pupae.	Older sealed larvae.
Colour of dead brood	Off-white, yellowing to dark brown.	Off-white, then coffee-brown, then dark brown to black.	Yellow to brown, sometimes with head-end grey.
Consistency of dead brood	Watery or pasty. Does not "rope".	Smooth "rope", 10–30mm at brown stage. Later tacky.	Plastic sac. Watery contents often lumpy.
Odour of brood	Sour.	Glue pot.	None to slightly sour.
Scales	Twisted in cell. Removes easily. Rubbery.	Flat in cell. Adheres tightly to cell wall. Pupal tongue may be present.	Head curled. Removes easily. Brittle.

Spread: European brood disease can be spread from hive to hive by both colony drift and robbing bees, although the action of beekeepers in transferring contaminated equipment and feeding infected honey is a major means of disease spread. In this country illegal importations of even small containers of honey from overseas could be the cause of a major outbreak of the disease.

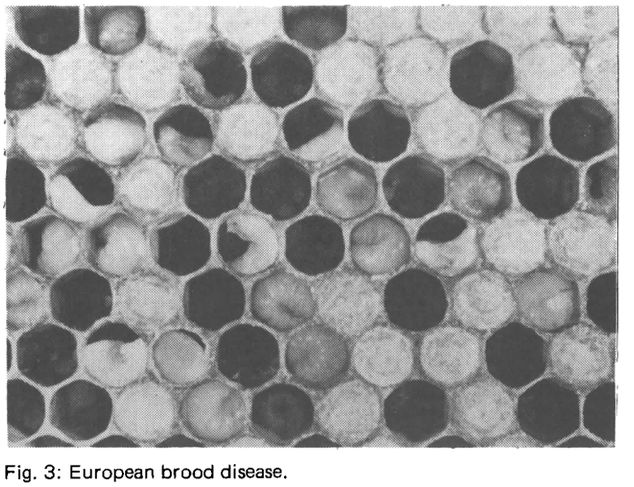

Fig. 3: European brood disease.

Control: Should European brood disease be detected in New Zealand, every effort will be made by MAF personnel to confine and eradicate the disease. The experiences of overseas countries suggest, however, that total eradication may be exceedingly difficult to achieve. As part of such an effort, MAF, in consultation with the beekeeping industry, may declare a honey bee disease control area. Within this area the movement of bees, honey, and beekeeping appliances will be regulated. The burning of diseased bee hives may be used as it is the best means of control.

Chalkbrood Disease

Chalkbrood disease, caused by the fungus ***Ascosphaera apis*** is another disease of honey bee larvae. The disease is endemic in Europe and following surveys in the 1970's has now been recorded throughout North America. A suspected case of chalkbrood disease was reported in Southland in 1957 but no further cases have ever been reported.

Identification: Suspect samples should be verified by microscopic examination. Mouldy pollen, either in cells or discarded on the hive bottom board, can at times be mistaken for chalkbrood infection.

Biology: The growth of chalkbrood, like most other diseases of fungal origin, is favoured by damp, cool conditions. As a result most infections occur in colonies during the spring—early summer period.

Four-day-old larvae are the most susceptible to infection with larvae usually dying in the elongated position. Infected larvae first take on a fluffy white appearance, then gradually change to hard, flat, chalky lumps (called mummies) as the larvae dry out (fig. 4). In most cases the larval head appears clearly visible in these remains.

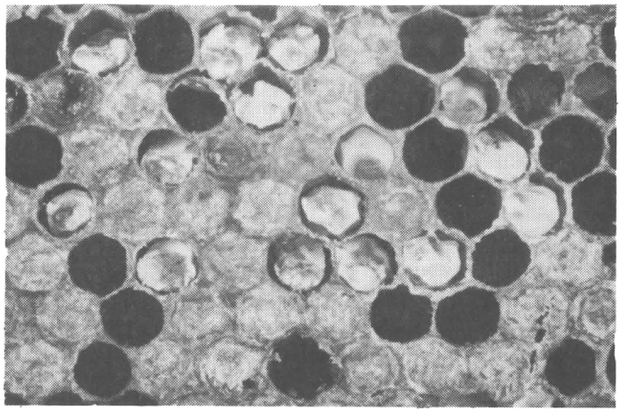

Fig. 4: Chalkbrood disease.

During fungal spore germination, the chalkbrood mummies darken in colour to grey or black. The spores produced are then spread to new host larvae on the mouth parts of attending nurse bees.

Symptoms: Diseased larvae may be found in both capped and uncapped brood cells and are most commonly found on the periphery of the brood nest. Infected larvae can easily be removed whole from these cells and in heavy infestations chalkbrood mummies may be found on the bottom board or at the entrance of the hive. Where the dead larvae remain capped in their cells the comb will rattle when shaken.

Spread: Although the natural rate of spread of chalkbrood from hive to hive and between apiaries is generally quite low, the spores are highly resistant and can remain viable for at least 15 years. Movement of bees, pollen and hive appliances, are the main reasons cited for the widespread distribution of the disease throughout the United States and Canada.

Control: Overseas, chalkbrood has seldom been sufficiently serious to warrant direct disease control measures. Colonies rarely die of the disease and strong colonies can usually remove dried larval mummies from the brood cells. Recommendations usually call for the destruction of severely affected combs.

Other Diseases and Pests

There are many other diseases, pests, and predators of honey bees occurring throughout the world which if introduced to New Zealand could seriously affect the beekeeping industry. These include species of bacteria, fungi, mites, moths and even parasitic flies. Of particular concern are several parasitic and commensal mites, mainly of tropical origin, of which very little is known at present.

Also in recent years a number of viruses affecting bees and brood have been identified by researchers overseas.

Undesirable Genetic Characteristics

Besides harbouring dangerous honey bee diseases and pests, importations of honey bee stock into New Zealand could also carry undesirable genetic characteristics. The harm such characteristics can cause is evident from experience of the African strain of honey bee ***(Apis mellifera adansonii)*** in South America. Following the accidental release of African swarms from experimental stock imported to Brazil in 1957, hybridization with local strains resulted in a bee so aggressive and prone to swarming that it seriously hampered commercial beekeeping and honey production. And because of selective mating behaviour, these genetic characteristics have actually intensified, rather than diminished in resident stocks. To date the "Africanized Bee" has moved throughout much of South and Central America as far north as Costa Rica and has adversely affected beekeeping wherever it has spread.

Honey bees kept in New Zealand are fortunately free of such dominating traits. Genetic material present in this country is of sufficient quality, depth, and adaptability that no introductions are required to maintain and improve current honey bee stocks.

CONTROLS ON THE IMPORTATION OF BEES, BEE PRODUCTS AND EQUIPMENT

Control on Introduction

The importation of honey bees, honey and other bee products as well as used bee equipment is strictly controlled under provisions of the Apiaries Act, 1969. In administering this law MAF has prohibited the entry of all live honey bees since 1956. This prohibition is maintained because the bee itself is the major means of spreading most serious honey bee diseases and pests. With few exceptions, importations of used bee appliances are prohibited as well.

European brood disease and other bacterial diseases can also be transmitted through honey. Since foraging bees can be attracted to exposed honey, even in containers dumped with household rubbish, the entry of honey into New Zealand is prohibited from all countries or states where European brood disease has been detected.

Import Entry Permits

All importers of honey, pollen, royal jelly, beeswax, and other bee products, whether for resale or personal consumption, require a prior entry permit issued by the Director, Advisory Services Division, MAF. Entry may be approved provided MAF is satisfied that the products pose no apparent health risk to New Zealand honey bees.

Agricultural Quarantine Declaration

Agricultural quarantine officers supervise the entry of all animal and plant products into New Zealand, including honey bees and bee products. All such products, with or without a prior entry permit, must be declared by the importer upon entry to New Zealand.

Nevertheless, illegal introductions do occur. Unapproved introductions of bees, bee products, or hive appliances, either accidentally or wilfully, should be reported **immediately** to any office of MAF.

WHAT THE BEEKEEPER CAN DO

The current high health status of New Zealand honey bees is worth preserving. It not only provides for an efficient domestic industry but places all beekeepers in a highly favourable position when developing international trade.

To help maintain a healthy beekeeping industry beekeepers should:

- Carry out brood inspections regularly, especially during the spring build-up period. Report all suspect disease or other abnormalities to an apicultural advisory officer.
- Check for dead, dying or crawling bees in front of hive entrances. Report any such finding to a MAF office so that samples can be taken for analysis.
- Reduce bee drift in apiaries by placing hives in anti-drift patterns.
- Prevent or minimise robbing. Do not expose honey or bee combs to robbing bees.
- Check colonies for brood disease before interchanging or shifting equipment.
- Report any instance where an illegal introduction of bees, bee products or used bee equipment is suspected.
- Set an example to others in terms of healthy hive management.

Further reading in AgLink

FPP 124: American Brood Disease/in Honey Bees/Significance and Control

Apiary Section
MAF Advisory Services
Hamilton

MAF Information

At time of going to press (January 1984) occurrence of chalkbrood has been confirmed in the Kerikeri area of Northland.