CHAPTER 2.2.6.

TROPILAELAPS INFESTATION OF HONEY BEES (*Tropilaelaps* spp.)

SUMMARY

The mites in the genus Tropilaelaps *are parasites of honey bee brood. Feeding on bee larvae and pupae causes brood malformation, death of bees and subsequent colony decline or absconding. Development requires about 1 week, and the mites are dispersed on bees. There are at least four species in the genus* Tropilaelaps. *Each species is closely associated with a particular giant honey bee in Asia. Two species* (Tropilaelaps clareae *and* Tropilaelaps mercedesae) *are damaging pests of* Apis mellifera. *The other two species* (Tropilaelaps koenigerum *and* Tropilaelaps thaii) *appear to be harmless to* Apis mellifera (1).

Identification of the agent: *Molecular and morphological methods are available for identifying each species* (*1*)*. An infestation by* Tropilaelaps *can be recognised either visually on bees or by examining hive debris. Irregular brood pattern, dead or malformed immatures, bees with malformed wings that crawl at the hive's entrance, and especially the presence of fast-running, large, red-brown, elongated mites on the combs, are diagnostic for the presence of* T. clareae*. An early diagnosis can be made after opening brood cells and finding immature and adult mites therein. The hive* (*colony*) *may be treated with various chemicals that cause the mites to drop off combs and bees. Sticky boards on the bottom of the colony can be used to examine hive debris and mites.*

Serological tests: *No serological tests are applicable.*

Requirements for vaccines and diagnostic biologicals: *No biological products are available.*

A. INTRODUCTION

The mite species *Tropilaelaps clareae,* previously assumed to be ubiquitous in Asia, has been found to be two species. *Tropilaelaps clareae* occurs in Asia where it is a parasite of the native honey bee *Apis dorsata breviligula.* It is also a parasite of the introduced honey bee species *A. mellifera* in the Philippines and the native honey bee species *A. dorsata binghami* on Sulawesi Island in Indonesia. *Tropilaelaps mercedesae*, which until now was mistaken for *T. clareae*, together with *T. koenigerum*, parasitises the native *A. dorsata dorsata* in mainland Asia and Indonesia (except Sulawesi Island). *Tropilaelaps mercedesae* is also a parasite of the introduced *A. mellifera* in these and surrounding regions and, with another species, *T. thaii*, also parasitises *A. laboriosa* in mountainous Himalayan regions (1).

1. Life cycle

The colonising *Tropilaelaps* female (or females; as many as a dozen may occur within individual a single cells) places from one to four eggs on mature bee larvae shortly before the brood cell is capped. The drone brood is preferred by *Tropilaelaps* and may be almost 100% parasitised (4). The mite progeny, usually one male and several females feed on and seriously damage the bee brood. Development of the mite requires about 1 week. The adults, including the foundress female, emerge with the adult bee and search for new hosts.

The short life-cycle, as well as a very brief stay on adult bees, explains why populations of *T. clareae* increase faster than those of *Varroa* mites. When both *T. clareae* and *Varroa destructor* infest the same colony, the former may out-compete the *Varroa* mite (4, 13). It has been reported that when both mite species are in the same cell, the reproduction of both mites declines (12).

Phoretic survival on bees is quite short (only 1–2 days) because *Tropilaelaps* cannot pierce the integument of adult bees. The phoretic time for *Tropilaelaps* spp. is important in understanding the life cycle, and recent research suggests the period can be as long as 5–10 days (15, 16). Gravid female mites will die within 2 days unless they deposit their eggs (17).

Infestation by *Tropilaelaps* causes the death of many bee larvae (up to 50%), resulting in an irregular brood pattern and of which the cadavers that may partially protrude from the cells. Many malformed bees occur, with distorted abdomens, stubby wings and deformed or missing legs. Some of the affected bees crawl at the hive's entrance (2). In addition, perforated cappings are seen, the result of sanitation activities by the worker bees, which evict the infested bee pupae or young adults. Some infested colonies abscond, carrying the mites to a new location.

B. DIAGNOSTIC TECHNIQUES

1. Identification of the agent

The first sign of an infestation by *Tropilaelaps* species is often the occurrence of large, red-brown, elongated mites on the combs or on adult bees (Figs 1 and 2). *Tropilaelaps clareae* (<1 mm in length), and *T. mercedesae* (< 9 mm in length) differ in body size but otherwise are alike. *Tropilaelaps koenigerum* is slightly smaller, only about 0.7 mm in length (5). The females also differ in the structure of their ventral anal plate and subapical tooth of the chelicerae (1). *Tropilaelaps* can easily be recognised and separated from the *Varroa* mite using a ×10 magnifying glass. The body of the *Varroa* mite is wider than it is long and it moves slowly, whereas the body of *Tropilaelaps* is elongated, with a heavily sclerotised holoventral or similar shield (Fig. 3), and it is a fast-running mite.

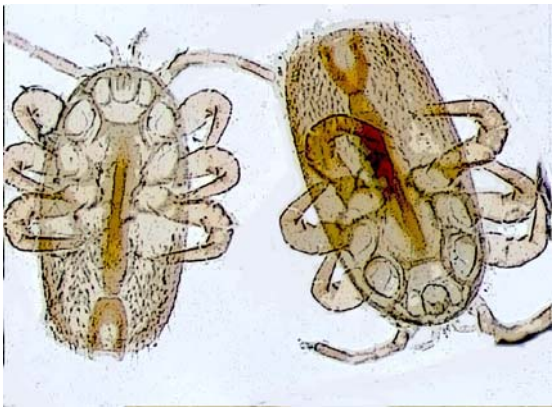

Fig. 1. Tropilaelaps clarea. Photo by J. Waddell.

Fig. 2. *Tropilaelaps* on *Apis dorsata* larvae. Photo by D. Anderson.

Fig. 3. *Tropilaelaps* offspring on *Apis mellifera* pupae. Photo by W. Ritter.

a) Mite collection

Methods to collect mites include an ether or sugar roll (13). Collect approximately 100–200 bees in a wide-mouthed jar with lid. Scrape the bees into the jar or use a modified vacuum to suck them in. Knock the bees to the bottom of the jar with a sharp blow; there should be about a 1–2 inch (2.54–5.08 cm) layer of bees on the bottom. Remove the lid and spray a 2-second burst with ether starter fluid. Alternatively, use enough 70% alcohol or soapy water to cover the bees; or add around 25 g (1 oz) powdered sugar (or flour). If using ether replace the lid and agitate or roll the jar for about 10 seconds; mites should stick to walls. If using soap or alcohol, agitate and then strain out the bees with a coarse hardware cloth or mesh strainer; mites will be in the liquid. If using sugar or other powder, put screening material (such as hardware cloth) on top of the jar and shake the mites on to white paper to count; repeat every 2 minutes. For a more accurate count, finish with an alcohol or soapy water wash to collect all the mites.

b) Colony and brood examination

When monitoring honey bee colonies for the presence of *Tropilaelaps* (or *Varroa*), an examination of both drone and worker brood may provide an early indication of infestation. Mites can be observed inside capped bee brood by using a honey scratcher (with fork-like tines) to pull up capped pupae. The mites are clearly visible. The younger mite stages are whitish and may be almost motionless while feeding on their hosts' bodies, as their mouthparts and front legs are fixed to the cuticle of the bee host (13). The extent of parasitisation can be estimated by opening a predetermined number of brood cells; infestation rates are then calculated as per cent of capped brood containing live mites (3).

c) Sticky board examination

A precise diagnosis can be made using a sticky board covered with a mesh, such as fly screen, that prevents the bees from removing the dislodged mites. The mesh must be large enough for mites to pass through. Make a sticky board with poster board, cardboard or other white, stiff paper coated with Vaseline or other sticky substance (8, 10, 14), or use a sheet of sticky shelf paper. Cut the paper to fit the bottom board of a hive. Cut a piece of hardware cloth or screen to fit on top of the sticky board. To keep the bees from cleaning off the board, fold under the outside edges of the screen to raise it off the board, and staple or tape in place. Leave the board in the colony for up to 3 days, collecting and examining the debris for mites. For faster mite diagnosis, smoke each colony adding 25 g (1 oz) pipe tobacco in the smoker. Puff the bees 6–10 times, close up the hive for 10–20 minutes. Pull out the sticky board after 10 minutes and count the mites. Acaricides are sometimes used to knock mites off bees and will appear on the sticky boards.

2. Serological tests

No serological tests are available for diagnosis.

3. Treatment

In countries with infestations of *Tropilaelaps* spp., fluvalinate in slow-release formulations controls *Tropilaelaps* (9, 11), as do monthly dustings with sulphur (2) and treatments with formic acid (6). The inability of this mite to feed on adult bees, or to survive outside sealed brood for more than a few days, such as caging the queen for a few weeks, is being used as a non-chemical control method (17, 18).

Many of the same acaricides used for *Varroa* will kill *Tropilaelaps*. Strips of plastic-impregnated fluvalinate (Apistan™) will kill mites. Alternatively, tobacco smoke in the smoker will cause mites to drop off bees. Strips of filter paper, available in some countries are prepared by soaking in an aqueous solution of 15% potassium nitrate to which two drops of amitraz (usually 12.5%) are added (9). After the paper dries, the strip is ignited and inserted into the hive. The smoke causes many mites to drop off. Another method is to use plates or pads soaked with 20 ml of 65% formic acid (very caustic and will burn hands and face). The pads are placed in the colonies, near the top (7).

C. REQUIREMENTS FOR VACCINES AND DIAGNOSTIC BIOLOGICALS

There are no biological products available.

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NB: There are OIE Reference Laboratories for Bee diseases (see Table in Part 3 of this *Terrestrial Manual* or consult the OIE Web site for the most up-to-date list: www.oie.int).