



World Organisation
for Animal Health

Integrating Antimicrobial Resistance Mitigation into Beekeeping Practices in Eastern Africa

Nairobi, Kenya

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Ministry of Agriculture &
Livestock Development



The
Fleming Fund



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Bee Pests and Diseases

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World Organisation
for Animal Health

Factors responsible for pollinator losses



Climate change



Landscape degradation



Invasive plant species



Pressure from human

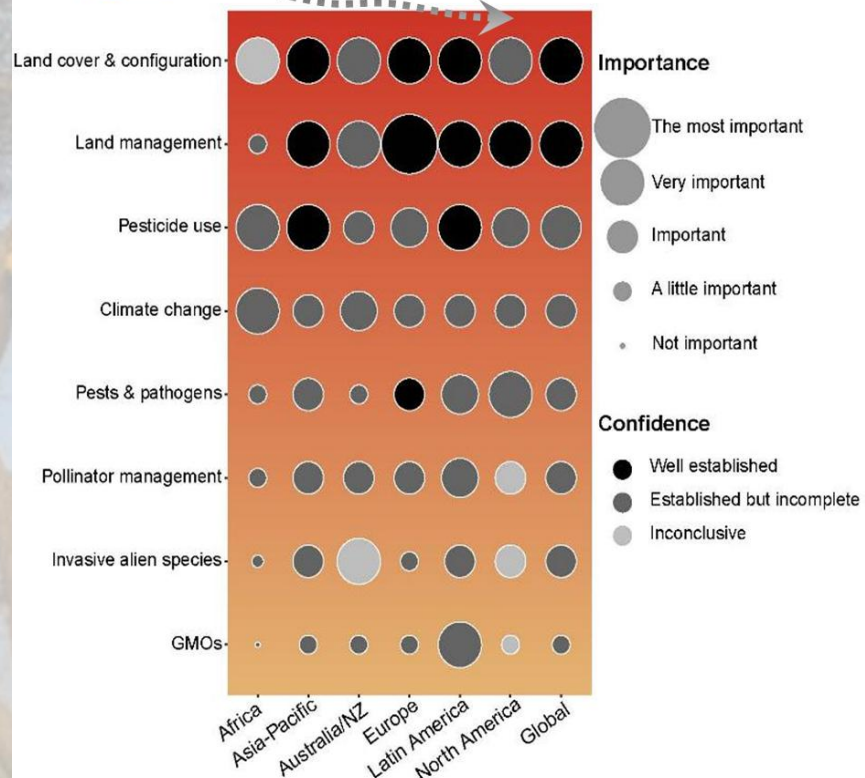


Pests and diseases

Intensive agriculture



What's driving **pollinator decline** in different parts of the world





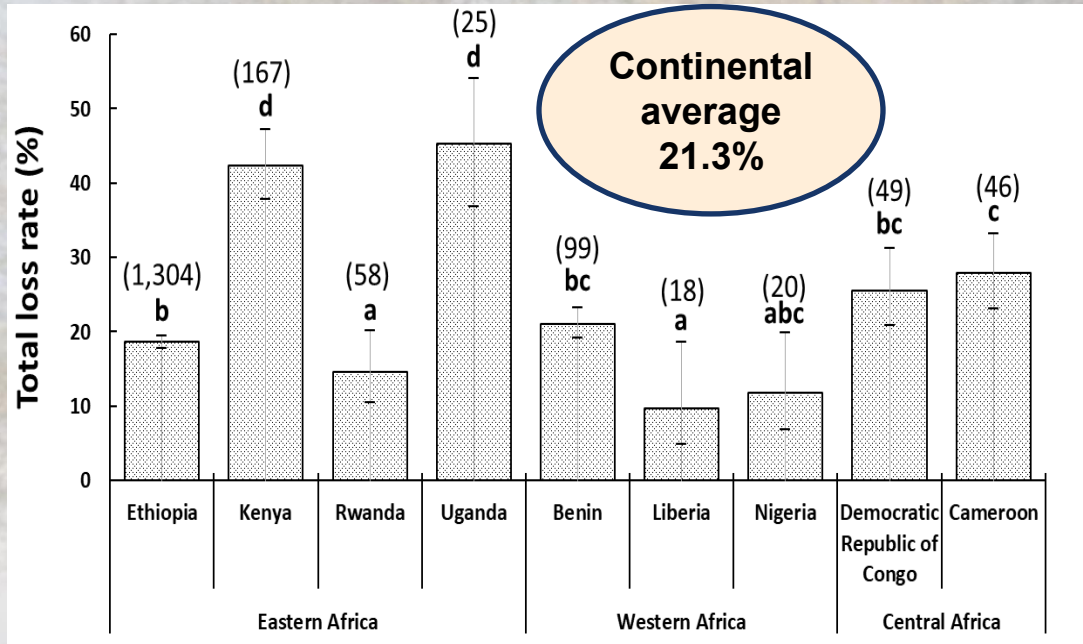
Managed honey bee colony loss rate and causes across Africa



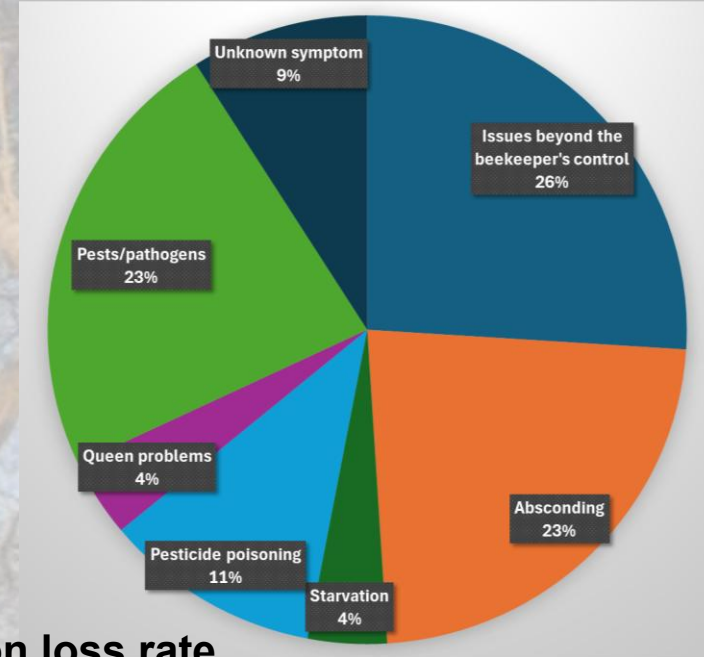
Year of study	Country	Study period	Loss rate	Causes of losses
Pirk et al. 2014	South Africa	Active beekeeping season	29-46%	Small hive beetles, <i>Varroa destructor</i> mite, absconding and chalkbrood disease
Gray et al 2023	Egypt and Algeria	Winter season	24% and 10-12%	Queen problems (e.g. drone-laying queens) and natural disaster (mostly theft)
Hailu et al 2024	Ethiopia	Non-active beekeeping season	24-66%	Natural disaster (mostly war) and absconding
Sibaja Leyton et al. 2025	Kenya	Annual	36.6%: dry (32%) and wet (20%)	Absconding due to water scarcity



Colony loss rate and causes in nine Sub-Saharan Africa countries-2023/2024



Causes of losses



Impact of hive types and colony management practices on loss rate

- ❖ Movable-frame hives < frameless hives, $p < 0.001$
- ❖ Professional/ migratory beekeepers < Semi-professional/ stationary beekeepers, $p < 0.001$
- ❖ Lower with beekeepers trained on best colony management practices, $p < 0.001$
- ❖ Supplementary feeding at the onset of swarming reduced loss rate, $p < 0.001$



Pests associated with honey bee colonies

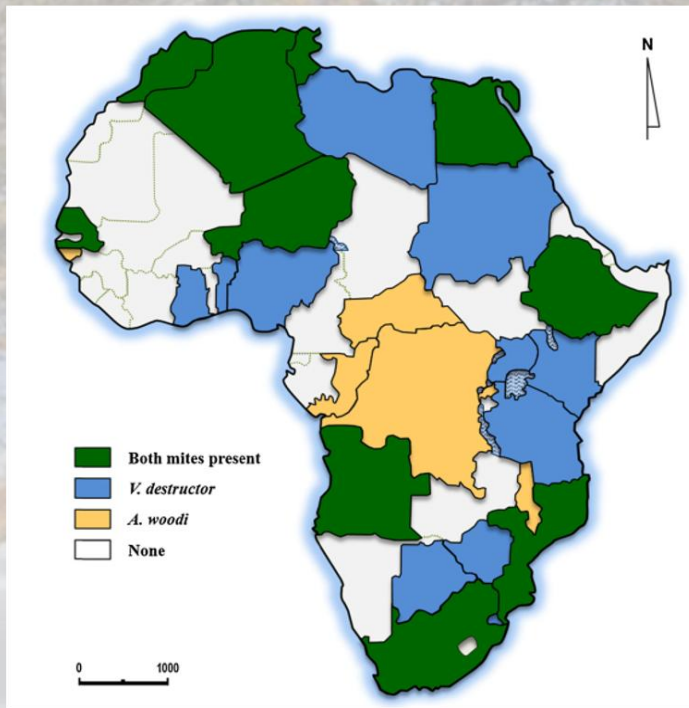


Varroa mites
(*Varroa destructor*)

Tracheal mites
(*Acarapis woodi*)



Tropilaelaps mites
(*Tropilaelaps clareae*
and *Tropilaelaps mercedesae*)



Pirk et al 2016: *Apidologie*



Small hive beetle
(*Aethina tumida*)



Large hive beetle
(*Oplostomus* sp.)



Greater wax moth
(*Galleria mellonella*)



Bee louse
(*Braula coeca*)



Pathogens associated with honey bee colonies

Bacteria

- ❖ **American foulbrood (AFB) disease** caused by *Paenibacillus larvae*
- ❖ **European foulbrood (EFB) disease** caused by *Melissococcus plutonius*

Fungi

- ❖ Nosema disease caused by *N. ceranae*, *N. apis*, *N. neumannii*
- ❖ Chalkbrood disease caused by *Ascosphaera apis*

Viruses

- ❖ Deformed wing virus (DWV)
- ❖ Acute bee paralysis virus (ABPV)
- ❖ Kashmir bee virus (KBV)
- ❖ Israeli acute paralysis virus (IAPV)
- ❖ Sacbrood virus (SBV)
- ❖ Slow bee paralysis virus (SBPV)
- ❖ Black queen cell virus (BQCV)
- ❖ Chronic bee paralysis virus (CBPV)

Negative-sense single-stranded RNA (-ssRNA) viruses

- ❖ Lake Sinai Virus (LSV1-7)
- ❖ Apis rhabdovirus-1 (ARV-1&2)

Double-stranded DNA (dsDNA) viruses

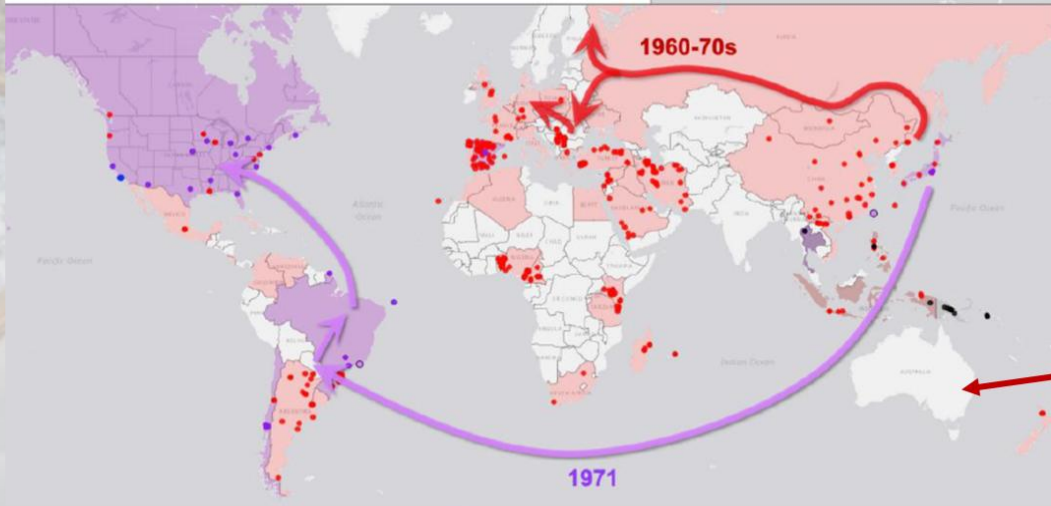
- ❖ *Apis mellifera* filamentous virus (AmFV)



Varroa destructor (Acari: Varroidae)



Distribution of Varroa mites haplogroups based on mtDNA COX1



Since June
2022

Traynor et al., 2020: *Trends in Parasitology*



Behaviours contributing to *Varroa* tolerance among African honey bees



Varroa-specific hygienic behavior

Behaviour	Reference
Varroa-specific hygienic behavior_Kenya and Ethiopia	Cheruiyot et al., 2018, Alemu et al. in review
grooming behavior_Kenya and Tunisia and Ethiopia	Boecking & Ritter, 1993; Nganso et al., 2017, Wanore et al., 2025
Suppression of mite reproductive success in worker brood cells_Kenya, South Africa and Ethiopia	Nganso et al., 2018; Strauss et al., 2016; Alemu et al., in review
A high-level of cell- recapping behavior_South Africa	Martin et al., 2019



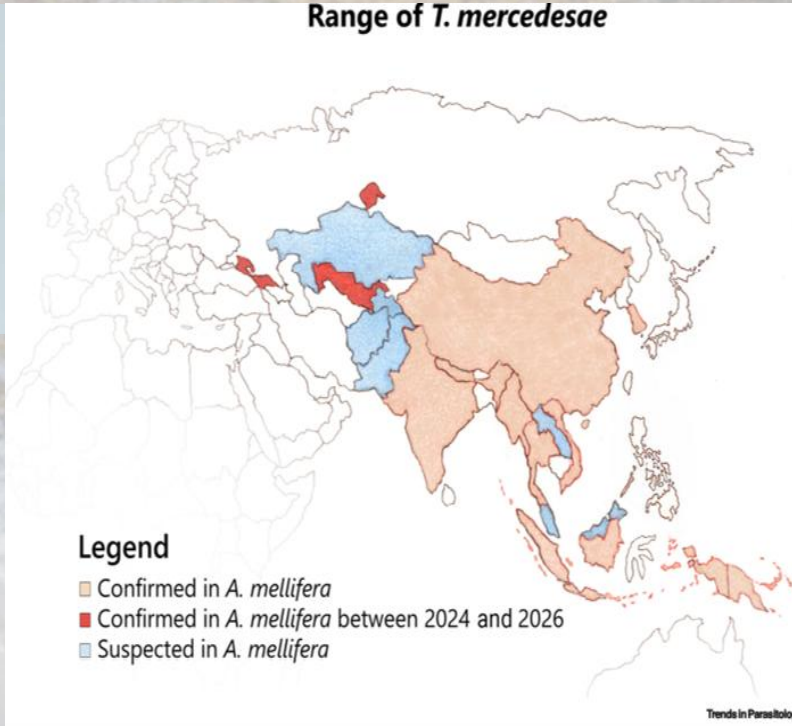
Grooming behavior



Tropilaelaps mites (*Tropilaelaps mercedesae*)



Range of *T. mercedesae*



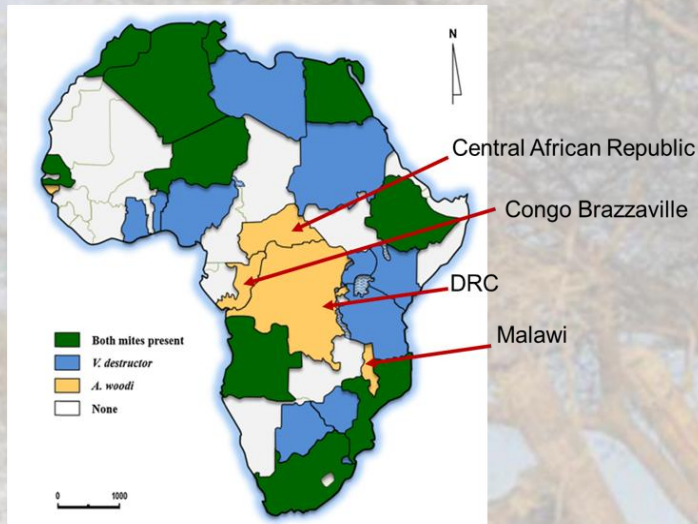
William et al., 2026 *Trends in Parasitology*

- ❖ *Tropilaelaps* mites are external parasitic pests that feed on the hemolymph of developing honey bees and are not found.
- ❖ They resemble *Varroa* mites in appearance and behavior: both mites act as vectors for pathogens like the deformed wing virus and infest bee brood.
- ❖ *Tropilaelaps* mites reproduce more rapidly due to their shorter lifespan and do not typically feed on adult bees, unlike *Varroa* mites.

See the full report here of official notification of *Tropilaelaps* mites in Turkey: <https://lnkd.in/gJ-398Gb>

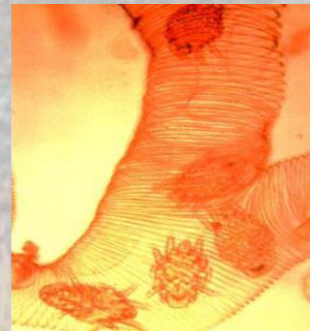


Trachael mite: *Acarapis woodi*



Pirk et al 2016: *Apidologie*

Signs of infestation include many crawling, flightless bees at the hive entrance, disoriented bees, 'K wing' posture, reduced foraging, and in severe cases, a dramatic population decline.



A bee Trachea with *A. woodi*



A healthy bee trachea is white or pale amber



An infested trachea has black stains



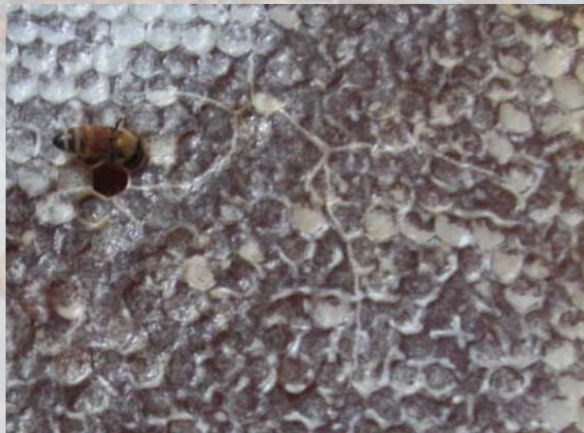
Wings held at odd angles, **K wing** is a common symptom



Bee louse (*Braula coeca*)



Adult bee louse is red-brown like *Varroa* mite, but has more prominent legs



Larvae burrowing under comb cappings.
Photo: Nick Annand

- ❖ Bee louse (*Braula coeca*) is a wingless ectoparasitic fly.
- ❖ Infest workers, drone and queen, but are most attracted to the queen because she receives the largest quantity of food, causing nuisance when found in large numbers on their host.
- ❖ The main damage is caused by larvae tunneling under cell cappings, giving the comb a fractured appearance, the most visible sign of bee louse infestation. While tunneling, larvae may also feed on honey and pollen residues.



The greater (*Galleria mellonella*) and the lesser (*Achroia grisella*) wax moths



Greater wax moth



Lesser wax moth

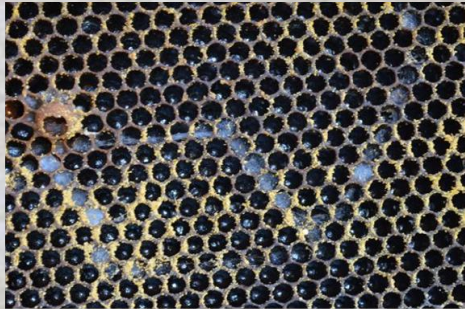


Key differences between greater and lesser wax moths

- ❖ **Size:** Greater wax moth is much larger than the lesser wax moth.
- ❖ **Coloration:** Greater moth has gray-brown, patterned wings; lesser moth has pale, uniform silver-gray wings.
- ❖ **Wings and Antennae:** Greater moth has broader wings and thicker antennae; lesser moth has narrower wings and fine, thread-like antennae.



Damage and management of wax moth



- ❖ Maintain strong colonies that can defend against wax moths.
- ❖ Remove unused or excess combs; add combs only as colony size grows.
- ❖ Store unused combs in airtight containers to prevent infestation.
- ❖ Clean bottom boards regularly to remove debris that feed larvae.
- ❖ Inspect weak or queenless colonies often for wax moth signs.
- ❖ For mild infestations, scrape larvae and debris, then freeze combs; burn heavily infested ones.



SHBs (*Aethina tumida*) and LHBs (*Oplostomus haroldi*, *O. fuliginous*)



Aethina tumida



Oplostomus haroldi, *O. fuliginous*



Damage and management of SHBs and LHBs



Aethina tumida

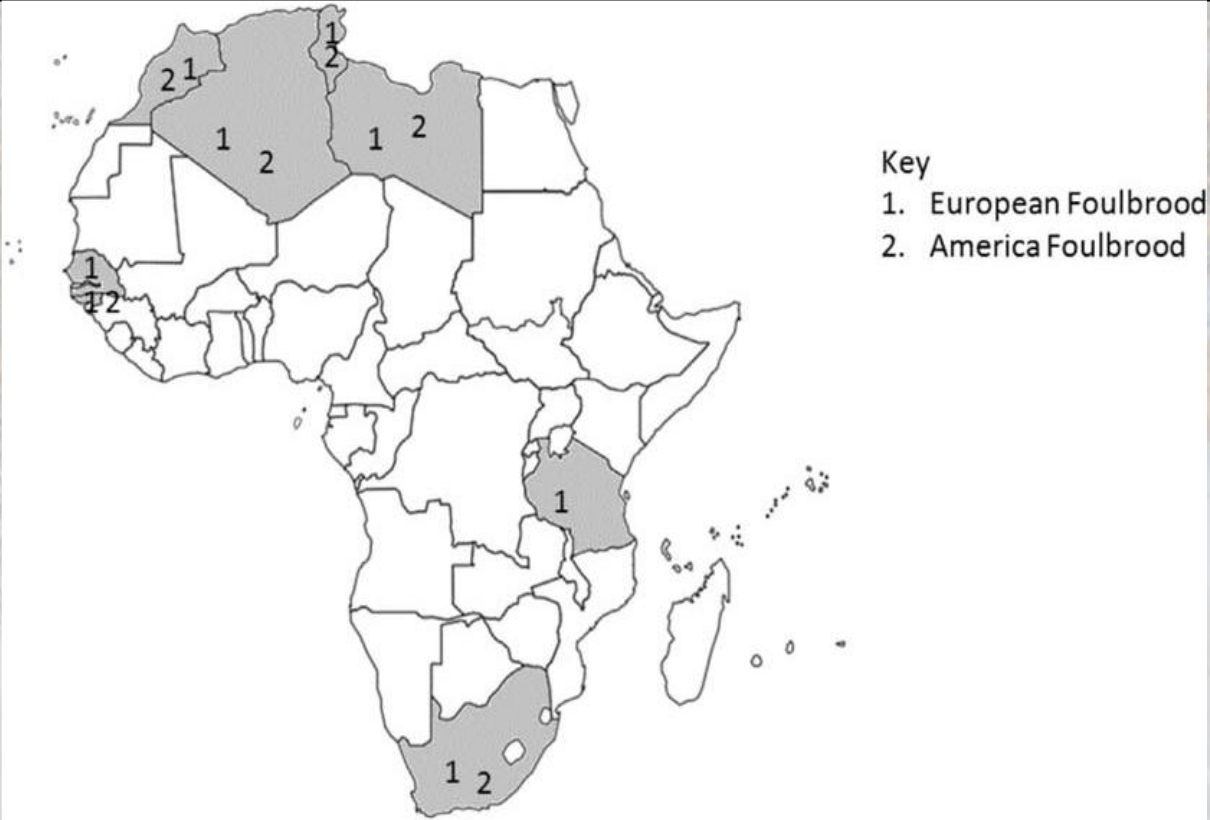
- ❖ Maintain strong and healthy colony, high bee-to-comb ratio
- ❖ Minimize cracks and crevices within the hive
- ❖ Clean debris from the bottom boards of hive
- ❖ Remove beeswax scraps, old combs and dead colonies from in and around apiaries.
- ❖ Manual removal of LHBs from the hive.
- ❖ Baited traps with chemicals such as fipronil for SHBs



Oplostomus sp.



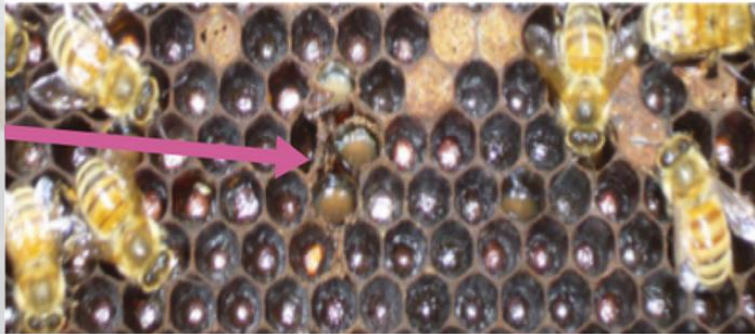
Bacteria diseases





Bacteria diseases

- ❖ American foulbrood (AFB) disease caused by *Paenibacillus larvae*



- ❖ Depressed edges around the cappings indicating larva death underneath
- ❖ Darken of capping and development of a hole as larva continue to decay and finally a caramel color biofilm appears



Bacteria diseases

Detection of European foulbrood (EFB) disease caused by *Melissococcus plutonius*



- ❖ Dead or dying larvae appear curled upwards and are brown or yellow in color



Fungi diseases

- ❖ Nosema disease caused by *N. ceranae*, *N. apis*, *N. neumannii*



- ❖ Dysentery that is excreta on combs or hive, dead or dying bees on the ground in front of the hive

- ❖ Chalkbrood disease caused by *Ascosphaera apis*



- ❖ Mummified larvae, white to grey-black colour

Management of bacteria and fungi diseases

- ❖ For AFB, compulsory destruction of infected colonies or use of antibiotic though not effective and allow for residence development.
- ❖ For EFB, weak colonies and colonies with a high proportion of diseased brood are destroyed, as with AFB, but lightly diseased colonies may in certain circumstances be treated with an antibiotics or use a husbandry method known as 'Shook Swarm'
- ❖ For Nosema, maintain strong, well-fed colonies headed by a young prolific queens and provide clean water to colonies
- ❖ For Chalkbrood, maintain strong, well-fed colonies headed by a young prolific queens

Thank You



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