

Diseases of bees



Diseases of bees

There are thousands of different species of bees in the world, but the two most important for beekeeping are the western honey bee, *Apis mellifera*, and the eastern honey bee, *A. cerana*. Bees are social insects living in hives consisting of one queen, many workers, all female, and a few drones, the males whose only role is to mate with the queen. The queen, the only fertile female, lays eggs in the hexagonal cells made of beeswax in the comb. These quickly hatch into larvae, which are fed royal jelly by the workers for the first few days. When they pupate the cells are capped, and the adults emerge several days later. The life cycle of bees can be as little as 12 days. The term brood is used to refer to the embryo or egg, the larva and the pupa stages.

Bees, like all animals including humans, are susceptible to bacteria, viruses, and parasites. When in a state of optimum health and nourishment their resistance to adverse factors is higher. Environmental challenges, including chemical products to protect crops from insects and weeds, can have detrimental effects on bee health, particularly when they host pathogens.

Diseases of bees are listed in the OIE *Terrestrial Animal Health Code* and member countries and Territories are obligated to report their occurrence (OIE *Terrestrial Animal Health Code*).

What are the diseases of bees listed by the OIE?

Six diseases of bees are listed in the OIE *Terrestrial Animal Health Code*:

- Acarapisosis of honey bees
- American foulbrood of honey bees
- European foulbrood of honey bees
- Small hive beetle infestation (*Aethina tumida*)
- *Tropilaelaps* infestation of honey bees
- Varroosis of honey bees.

Acarapisosis is caused by a microscopic mite, *Acarapis woodi*, called the tracheal mite, an internal parasite of the respiratory system of adult bees that feeds on hemolymph. Acarapisosis has been found in North and South America, Europe and the Middle East.

The mortality rate varies, but a heavy infestation causes high mortality. They spread to bees by direct contact, and newly hatched adults are most susceptible. Diagnosis is by visualizing the mites in the trachea.

American Foulbrood (AFB) is a serious disease of honey bees. It is caused by a spore forming bacteria called *Paenibacillus larvae*. It occurs throughout the world. The bacteria kill the larvae in the brood cell. In infected hives the colony has a mottled look due to empty cells, there may be a typical smell, and the brood is slimy or slumpy. AFB is spread by bacterial spores formed in infected larvae which are very resistant and survive many years. The spores spread the disease by transfer of wax, of queens, in exchange of combs, or of contaminated honey. The diagnosis is confirmed by identifying the bacteria by molecular means, by culture or microscopy. Treatment with antibiotics will destroy the vegetative bacteria, but does not kill the spores, so the disease will recur. Therefore it is often recommended to burn the hive and equipment, as this may be the only way to destroy the spores.

European Foulbrood (EFB) of honey bees is caused by the bacteria *Melissococcus plutonius*. In spite of the name, it is found in North and South America, the Middle East and Asia. Like AFB, EFB bacteria kill the larvae leaving empty cells left in the comb. The disease is spread by mechanical contamination of honeycombs, and tends therefore to persist from year to year. It can also be spread by bees that survived infection as larvae, and spread the bacteria in their feces.

Diagnosis is made by microscopy.

Small Hive Beetle Infestation: The small hive beetle, *Aethina tumida*, is a scavenger and parasite of honey bee colonies. The beetle is native to Africa, but was introduced to the US, Egypt, Canada, and Australia by commercial movement of bees. Considered a minor pest in its home range, it has become a major problem in introduced areas. Both adult and larval beetles feed on larvae, pollen, honey and bee brood. The adult female lays her eggs in the hive. The larvae hatch and feed on brood, pollen and honey, then leave the hive to pupate in the soil, where the adults hatch, then fly to look for new hives. Spread can therefore be rapid, as the adults have a range of several kilometres. When infestation is heavy, the bees may desert the hive.

The diagnosis is made by identifying adult beetles in the hive. Treatment is possible with insecticides that kill the beetle and not the bees, but there is a risk of residue in honey.



Tropilaelaps: There are several species of Tropilaelaps mites, notably *Tropilaelaps clareae* and *T. koenigerum*. Each species has a different geographic range, but they are all found in Asia. These mites are external parasites which feed on brood (bee larva and pupae) and cause an irregular pattern of sealed and unsealed brood, as well as deformities in adults. They spread by direct contact from bee to bee or by movement of brood.

They are large enough to be seen with naked eye, and morphologic and molecular diagnostic tests are available. Chemical treatments are available to reduce or eliminate these mites.

Varroosis: Varroosis is caused by a mite, an external parasite of adults and brood. There are four species of varroa mite, but *Varroa destructor* is the most important. They are found throughout the world except for Australia and the south island of New Zealand. Known to spread a virus that causes deformed wing disease, adult bees affected with varroosis also have shrunken abdomens. Early signs of infection normally go unnoticed, and only when infection is heavy does it become apparent, with adult mites being seen on bees. The infection spreads by direct contact from adult bee to adult bee, and by the movement of infested bees and bee brood. The mite can also act as a vector for viruses of the honey bee.

How are bee diseases transmitted and spread?

Movement of bees and equipment, movement of supplies, and shipping of bees (queens, eggs, etc.) all over the world have spread most of their diseases to all areas where bees are raised.

How are the diseases diagnosed?

The OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* describes the recognised diagnostic approaches for the various bee diseases.

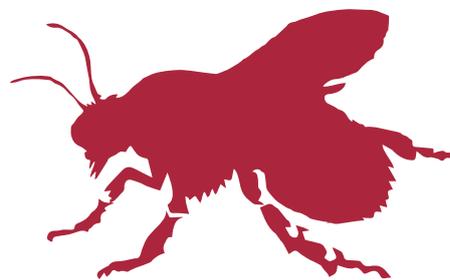
Diseases of bees

What is being done to prevent or control the disease?

The *Terrestrial Animal Health Code* has control measures for trade and movement of bees which details the measures that importing countries should put in place to prevent the introduction of new bee diseases into their territory. There are no vaccines for the bee diseases listed above, so controlling the spread of disease by following the recommendations in the Code is of paramount importance.

What is the public health risk associated with this disease?

None of the disease of bees is infectious to humans.



More Information?

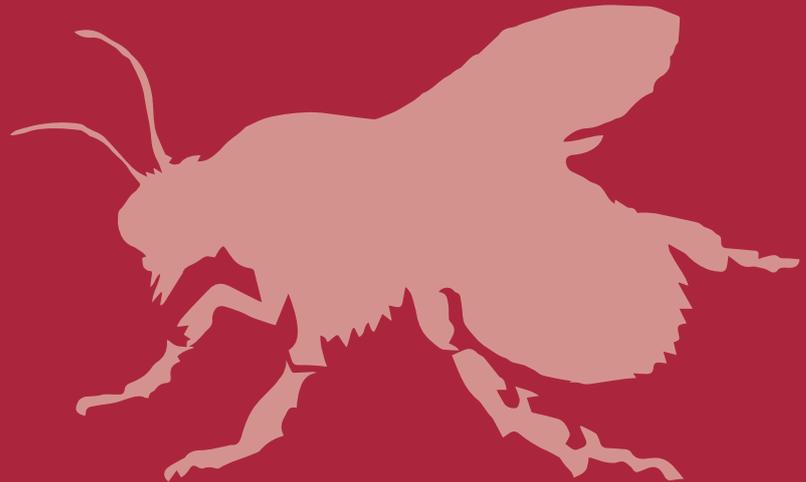
References:

1. OIE *Terrestrial Animal Health Code*:
www.oie.int/en/international-standard-setting/terrestrial-code/access-online/
2. OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animal*:
www.oie.int/en/international-standard-setting/terrestrial-manual/access-online/
3. OIE Technical Disease Card:
www.oie.int/en/animal-health-in-the-world/technical-disease-cards/
4. The Center for Food Security and Public Health, Iowa State University
www.cfsph.iastate.edu/
5. Merck Veterinary Manual:
www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/toc_50000.htm
6. *Atlas of Transboundary Animal Diseases Animales Transfronterizas*
P. Fernandez, W. White;
Ed.: 2011

Ask our experts:

List of Reference Laboratories:
www.oie.int/en/our-scientific-expertise/reference-laboratories/list-of-laboratories/

List of Collaborating Centres:
www.oie.int/en/our-scientific-expertise/collaborating-centres/list-of-centres/





Key Facts

- All bees are susceptible to all the listed diseases, but some populations are more resistant than others.
- Honeybees were domesticated before recorded history. In addition to producing honey, bees are essential for pollinating crops, from field crops to tree fruit and nuts to berries.
- Three quarters of the worlds crops, with a value estimated at 150 billion euros, require pollination by insects and bees are the main insect pollinator. (Inra and CNRS)
- Nearly one million tonnes of honey are produced worldwide each year, with China as the world's largest producer of honey at almost 400,000 tonnes.
- Colony Collapse Disorder is a term coined to describe the disappearance or death of entire colonies. While there are many associated factors, no single cause has been identified. Several viruses including Israel Acute Paralysis Virus have been associated with the syndrome, as has the presence of pesticides in the environment. The conjunction of infections linked to viruses, bacteria and parasites with chemical factors such as insecticides can worsen the health situation of hives.

- 12, rue de prony • 75017 paris france
- tel. 33 (0)1 44 15 18 88 - fax 33 (0)1 42 67 09 87
- www.oie.int • oie@oie.int

Cover photo: © J.Weber INRA.
Inside photos: © S.Carré INRA, © V.Joubert INRA,
© Y.Le Conte INRA, © N.Morison INRA.

Oie