

HONEY BEE  
DISEASES AND  
PESTS

Fungal diseases

- Several fungi generally regarded as beneficial, commensal, symbiotic, or opportunistic are found in bee colonies and their nests in particular in the beebread.
- However some fungi are or may become pathogenic for *Apis mellifera* and hence able to damage colonies:
  - these are fungi belonging to the division Ascomycota, namely *Ascospaera apis* and *Aspergillus spp.* which are pathogenic for the brood; and to the division Microsporidia, namely *Nosema apis* and *Nosema ceranae*, which are potentially pathogenic for adult bees.

Chalkbrood disease:

*Ascosphaera apis*

- **Chalkbrood disease**, also called brood mycosis, is an invasive disease of the capped brood caused by the fungus *A. apis*.
- The disease affects and is fatal to immature forms.
- **Chalkbrood disease** rarely causes collapse of the colony, but may weaken colonies by reducing the bee population and consequently may affect honey production and pollination activity.

- The ascospores are on average 2.7-3.5  $\mu\text{m}$  x 1.4-1.8 in size.
- The ascospores have a thick wall and a spore membrane providing protection against extreme environmental conditions.
- The development and growth of *A. apis* depends on the larva food.
- Ascospores are the resistant and transmissible form of the fungus.
- They may remain viable for 15 years in mummified bees, 4 years in the environment, and for extended periods in honey and wax.

- The main routes of dissemination inside the colony are **trophallaxis, food sharing, nursing tasks, and cleaning tasks.**
- Between colonies and apiaries, drifting and robbing are responsible for the spread of the disease.
- Migratory beekeeping and trade as well as beekeeping practices are important means of dissemination between apiaries.

- The predisposing factors are various stressors of the colony:
  - Cold and dampness
  - Drop in brood temperature
  - Stress factors weakening colonies, e.g., viral diseases, Varroa infestation, foulbrood disease.
  - Protein deficit
  - Beekeeping practices
  - Honeybee strain susceptibility
  - Honeybees that exhibit poor hygienic behavior



- Larvae are contaminated by ingestion of ascospores contained in the brood-food secreted by the food-producing glands of nurse workers.
- Larvae are more susceptible to being infected when they are young: 1-2 or 3-4 days old according to sources.
- Pupae are not affected.

- The infected larvae die within the capped cells.
- They become pale yellow colored, soft, and eventually covered with a fluffy white mycelium.
- Later, the dead larvae may dry and become white or black so-called chalkbrood mummies, depending of the presence or not of ascospores.
- It is mainly considered that young mummies are white, becoming black if the development of ascospores occurs.

## • Clinical signs

• Clinical signs are the presence of mummies and, at the colony level, a progressive weakening of the colony:

- The brood cells appear often punctured and mottled (a consequence of the labour of cleaner workers removing dead larvae).
- In the cells, the presence of dead larvae covered by a fluffy white mould can be observed.
- When the cadavers dry, they become white then black mummies.
- Mummies are observed inside brood cells or on the floor and in front of the hive after they have been removed from the cells by cleaner workers.

## • Diagnosis

• The diagnosis of chalkbrood is mainly the consequence of a clinical examination and the observation of the following signs:

• Fluffy white mould in brood cells.

• White, grey, and/or black mummies at the entrance, on the floor of the hive, or in capped and uncapped brood cells.

- Control and prevention
- If chalkbrood disease is detected, re-queening with queens that exhibit good hygienic behavior potential and replacing combs may be sufficient, if prophylactic methods are established and predisposing factors corrected.
- It may be interesting to implement the shock swarm method to provide the colony with a pathogen-free hive.
- Strongly affected colonies should be eliminated and the material disinfected and sterilized.
- There is no known treatment against brood mycosis.
- Antifungal drugs must not be used within colonies.

- The management and prophylaxis of chabrood disease involves the following beekeeping practices:

- Hives must be well ventilated.

- Damp, cold, and shadowed apiary sites should be avoided.

- Hives must be kept as clean as possible and combs should be replaced annually in the case of overt disease.

- Combs should not, as far as possible, be exchanged between hives, especially in cases of the disease.

- Avoid any pollen deficiency.

- Honeybees must display good hygienic behavior.

Stonbrood disease:  
Aspergillus spp.

- **Stonebrood disease** is a rare fungal infection of the brood caused by several fungi belonging to the genus *Aspergillus*;

- *Aspergillus fumigatus*

- *Aspergillus flavus*

- *Aspergillus niger*

- In humans and other mammals, aspergillosis may affect the skin, eyes, and respiratory system from the nasal cavities to the lungs.

- The fungi can produce **toxic** and **carcinogenic** aflatoxins.

- Thus, beekeepers must be aware of this disease both for their own health and for protection of consumers of hive products.



- Stonebrood disease mainly occurs in weakened colonies, irrespective of the causes of this weakening.
- Contamination is caused by ingestion of spores or by penetration through the cuticle of the larvae.
- Infected larvae become hardened and difficult to crush.
- They may turn yellow-green (*A. flavus*), grey-green (*A. fumigatus*), or black (*A. niger*) in color.
- Adult bees may also be infected and die.

- Diagnosis of stonebrood disease is not easy and requires laboratory identification.
- Considering the risks to human health, precautions must be done to manage and control the disease.
- Strongly affected colonies should be eliminated and the material disinfected and sterilized.
- All the infected brood combs must be destroyed and good sanitary beekeeping measures implemented.
- Prophylaxis against the diseases requires strong colonies and good sanitary beekeeping practices.