

HONEY BEE
DISEASES AND
PESTS

Sacbrood virus (SBV)
disease

- Sacbrood disease is a viral infectious disease of honeybee immature forms within the capped brood and adult bee due to an Iflaviridae.
- SBV may remain as a covert infection in colonies.
- SBV may cause overt infection in the brood.
- The infection is mainly considered asymptomatic in adults but may be responsible for problems, in particular through the secretion of the brood-food.
- The disease is usually unimportant in *A. mellifera* (affecting some larvae, which are quickly removed from the cells and the hive by cleaners), but is highly lethal in *A. cerana*.

Clinical signs

- SBV disease usually occurs in spring or at the beginning of summer (when the brood is reared).
- Clinical signs may not be observed due to the actions of cleaner bees.
- The brood may appear irregular or scattered with punctured capped cells.
- The cells with punctured cappings contain sac or scales.
- Larvae infected by SBV fail to pupate after cell-capping and die.

- Recent studies show that SBV is found in Varroa, which is believed to be a vector of this virus.
- Factors contributing to overt SBV infection are usually the consequence of nutritional deficiency:
 - Lack of food
 - Confinement
 - Population unbalance
 - Poisoning is also supposed to be a predisposing factor
- Diagnosis
 - Clinical signs
 - Laboratory confirmation (RT-PCR)

Management

- The management of SBV disease involves good beekeeping sanitary practices, including optimal and measured control of *V. destructor* infestation.
- Good practices usually allow clinical recovery, associated with a high-quality nectar flow and sufficient pollen.
- It is sometimes considered that if more than 20% of the brood is infected, then the colony should be eliminated because it is likely to be too weak to allow a sufficient renewal of its population.

Acute bee paralysis
virus (ABPV) disease

- ABPV is a single-stranded RNA *Dicistroviridae* virus.
- This virus has been reported in several countries and is believed to have been a main cause of mortality of bees in some countries.
- Before the *Varroa* pandemic, ABPV was rarely considered as responsible for disease and/or mortality of bees and colonies.
- ABPV may remain in colonies as a covert infection.

Clinical signs

- ABPV virus is reported to become pathogenic following its direct injection into the hemolymph by *V. destructor* mites.
- Bees walking around, unable to fly, wandering more or less close to the hives before dying.
- The position of the wings is abnormal, asymmetric, and/or pointing straight out from the body.
- The brood cells can be punctured and mortality of immature forms can be observed.
- At the colony level, it may cause weakening and acute collapse.

- ABPV is able to replicate and infect the brain and food-producing glands, allowing persistent infection in colonies.
- Several infected larvae may die.
- Infested by *V. destructor*, adults and pupae die rapidly.
- The diagnostic method is to perform a RT-PCR test in the laboratory if ABPV infection suspected.

Management

- The control of ABPV mainly involves
 - sanitary and prophylactic methods,
 - good husbandry practices,
 - and in particular control of *Varroa* infestation within the colonies.

Kashmir bee virus
(KBV) disease

- To date, KBV is considered experimentally as one of the most virulent honeybee-infecting viruses.
- When inoculated experimentally into the hemolymph of honeybees, it multiplies very rapidly and may induce bee mortality within three days.
- When inoculated via feeding it does not induce any clinical signs or mortality.
- As with many honeybee viruses, KBV has been described in asymptomatic and healthy colonies.

- KBV can become virulent and lethal for honeybees due to the mite *V. destructor*, which inoculates the virus through the cuticle into the hemolymph while feeding.
- *Varroa* is a vector of the virus.
- KBV induce mortality without characteristic symptoms at all stages of honeybee life.
- At the colony level, KBV may be responsible for sudden colony weakening and mortality in association with even moderate *Varroa* infestation.
- Prophylactic and control management of KBV must mainly take into account optimal and measured *Varroa* infestation control.

Israeli acute
paralysis virus (IAPV)
disease

- Discovered in 2004 in Israel, IAPV was prematurely and wrongly thought to be major cause of colony collapse disorder (CCD) in the US.
- The virus may affect all stages and castes of *A. mellifera*.
- IAPV in experimental conditions is responsible for shivering wings, progressive paralysis, and death, while the body of the bee becomes darker and hairless.
- *V. destructor* is an active vector of this virus as well as ABPV and KBV, thus controlling mite infestation is necessary to prevent the associated IAPV infection.

Black queen cell
virus (BQCV)

- BQCV was first detected in affected queen larvae and pre-pupae.
- It is today found worldwide and may persist as a covert infection in colonies.
- The cells with infected larvae develop dark brown or black cell walls.
- Within queen cells, the diseased pre-pupae or pupae cannot develop into adult queens, and die.
- The diseased larvae is a pale-yellow color and forms a sac-like skin (a symptom somewhat similar to that induced by SBV).

- The main transmission route is horizontal (oral transmission).
- BQCV infection is closely associated with *Nosema* infection and co-infection seems to be required to convert infection.
- BQCV is also thought to be transmitted vertically because it has been found in queen ovaries.
- Controlling *Nosema* infection is necessary to control as far as possible BQCV infection.