

Honey Bee Viruses

Honey Bee Viruses and Their Effect on Honey Bee and Colony Health

There are numerous viruses within the hive which have been there for years. Once the virus is stimulated they have a tendency to grow at a fast rate.

Viruses have been found in Nosema, varroa mites and hive beetles. There are 18 known viruses in the Honey Bee.

There are more viruses than Honey Bee pathogens. Viruses are the ultimate parasite. They are dependent on the host for reproduction. Numerous viruses are found in the brain of the Honey Bee. Which causes behavioral changes, disorientation, learning difficulties, accelerated aging, reduced sensory ability, foraging difficulties, trembling, crawling, and flightless behaviors. Viruses also cause reduced life expectancy. Normally if a few Honey Bees have problems the hive is large enough to compensate for the problem. Some of the causes for the epidemic within the hive is excessive confinement, stress, cold, humidity, starvation, poisoning and other pathogens/parasites.

Transmission Routes for Viruses

Horizontal transmission Route

The spread of viruses between individuals of the same generation in the same population.

Direct Contact: Oral contact, air, and venereal transmission

Indirect Contact: Transfer of virus from mother queens to offspring via eggs; transovum, surface of the egg; transovaial, within the egg; transspermal, within the sperm during fertilization.

Vertical transmission route

Spreading the virus is done through fertilization. The virus is transmitted either by the surface of the egg or in the egg.

Covert infections can be either or both overt/symptomatic infections are both proceeded by:

1. Environmental stress
2. Mites
3. Other Pathogens or Parasites
4. Excessive confinement
5. Inadequate food stores
6. Toxicity of pesticides in the hive
7. Chemical treated foraging crops

Overt infections are a rapid production of viruses which can cause death and collapse of the whole bee colony.

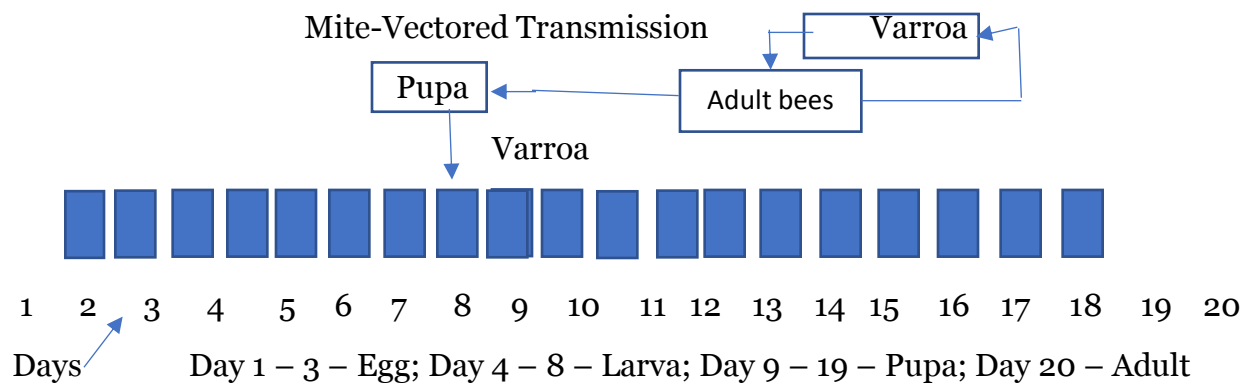
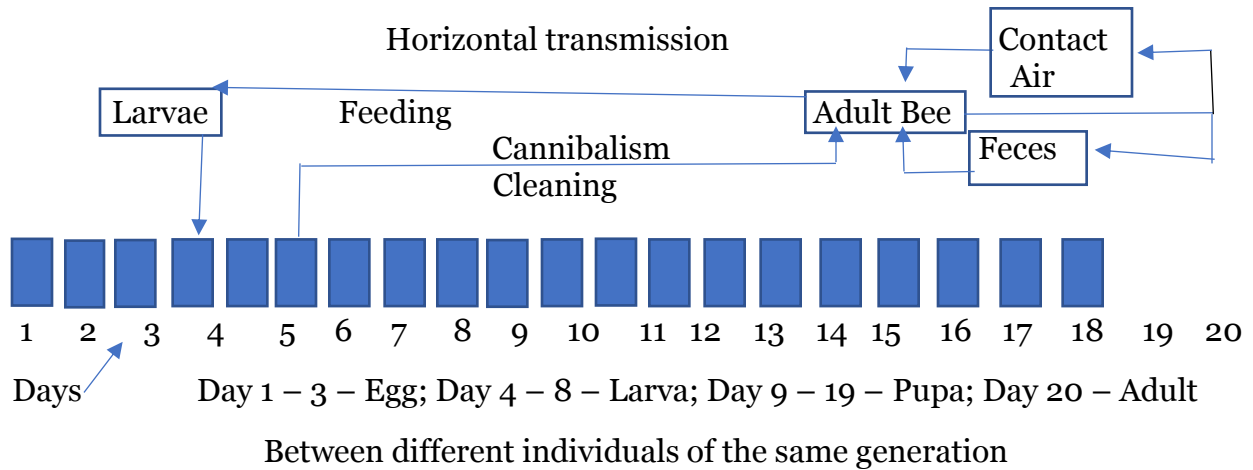
When the hive is stable the viruses decline in activity. When the environmental stresses increase the viruses grow and create problems. Environmental stresses include Varroa Mites, Nosema, excessive confinement, inadequate food stores, toxicity of pesticides in the hive used to treat pests and disease, and chemical-treated crops.

The transmission routes, parasite associations, infection characteristics, and seasonal incidences of the Honey Bee viruses

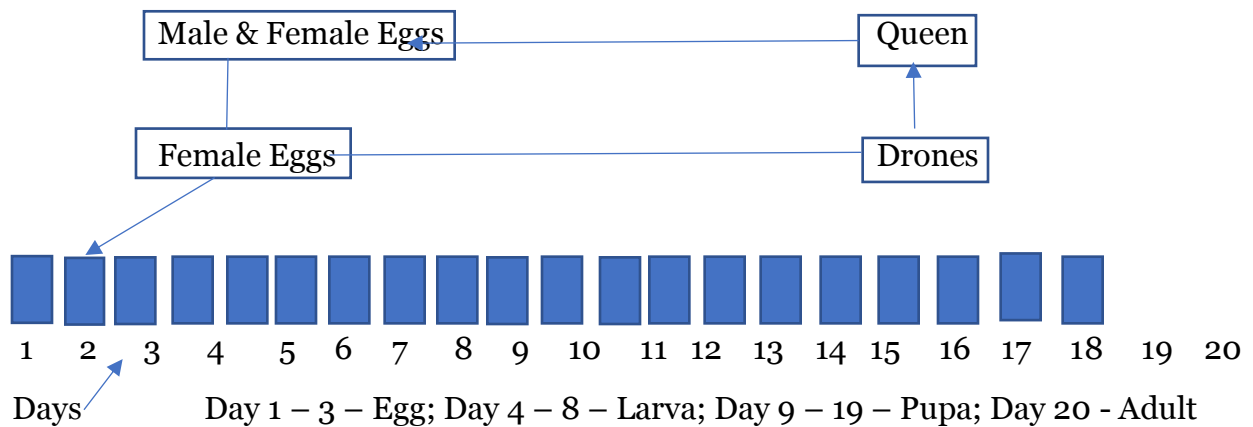
Viruses	Transmission	Association	Life stage	Seasonal
Acute bee paralysis virus ABPV	H – Oral, Varroa V – Eggs	Varroa	Egg, Larva, Pupa, Adult	Spring, Strong summer, fall
Kashmir bee virus KBV	H – Oral, Varroa V – Eggs	Varroa	Egg, Larva, Pupa, Adult	Spring, summer, Strong fall
Israeli Acute Paralysis virus IAPV	H – Oral, Varroa V – Eggs	Varroa	Egg, Larva, Pupa, Adult	Spring, summer, fall
Black Queen cell virus BQCV	H – Oral V – Eggs	Varroa – Maybe Nosema	Egg, Larva, Pupa, Adult	Spring, Strong summer, fall
Deformed Wing virus DWV	H – Oral, Varroa V – Eggs	Varroa	Egg, Larva, Pupa, Adult	Spring, summer, Strong fall
Sacbrood virus SBV	H – Oral	None	Larva, pupa, Adult	Strong spring, summer, fall
Slow Bee paralysis virus SBPV	H – Oral, Varroa	Varroa	Larva, pupa, adult	Spring, summer, fall
Chronic Bee paralysis CBPV	H – Oral, Contact	None	Larva, pupa, adult	Strong spring, strong summer, fall
Cloudy Wing virus CWV	Unknown	unknown	Adult	Spring, summer, fall

Key – H – horizontal, V – Vertical

An outline shows the three transmission routes of viruses in a Honey Bee



Direct Contact: Oral, Physical Contact, Air, Venereal Contact
Vertical Transmission



Transmitted by

1. Viruses
 - a. Queen to egg during reproduction
2. Within the egg from the Queen
3. In the sperm, from the drone, and transmitted during fertilization to the egg.

Oral Transmission of Viruses:

1. Feeding royal jelly
2. Feeding pollen
3. Cannibalize of eggs when deprived of protein
4. Cleaning the cells of dead larva, feces, diseased brood.
5. Contaminated comb.
6. The cleaning of the comb that have high levels of pathogens and is the source of oral transmission.

Viruses have been found in food stores, honey, pollen and royal jelly.

The gut is the primary source for viruses.

Oral transmissions are not the best way to transmit viruses. A very large amount is required to cause a problem.

Contact Transmission of Viruses:

1. Crowded colonies
2. Not able to get out of the hive, like commercial beekeeping using transportation.
3. The viruses enter the body through the root of the hair when it is broken

Airborne Transmission of Viruses:

1. Very little is known about this process.

Vector Born Transmission:

1. The Varroa Mite transmits the most viruses. This is done when the varroa mite puncture the cuticle of the Honey Bee

The Tracheal Mites does live in the tracheal of the Honey Bee. It does reproduce there. It lives by penetrating the lining of the tracheal. But very little viruses are transmitted.

Vertical Transmission:

The direct transmission is from mating. Drones from different hives go to the drone congregation areas. These drones have different viruses and when they mate with the Queen the viruses are mixed and passed on. The newly mated Queen takes the sperm from the numerous Drones back to the hive. New viruses are now introduced in to the hive.

Wasps and bumblebees are also hosts for Honey Bee viruses. Once the Honey Bee dies outside the hive the wasp and bumblebees pick up the carcasses and take them back to their nests.