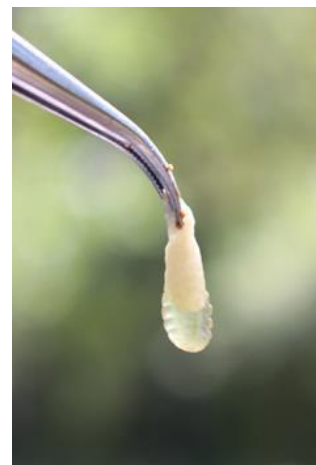
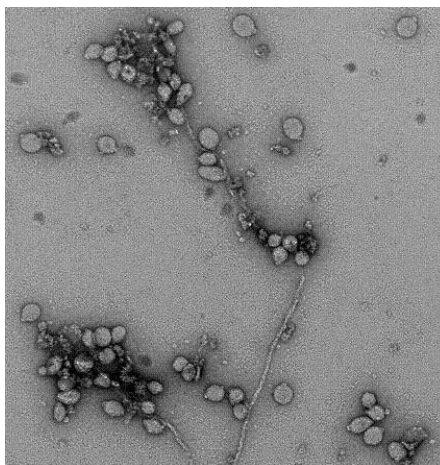
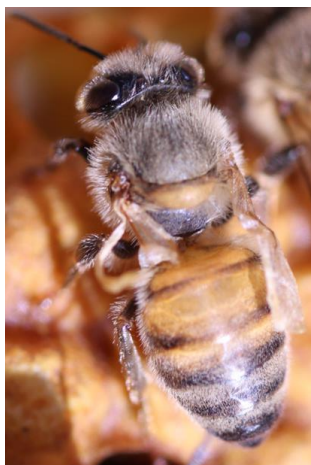


Viral diseases of honey bees

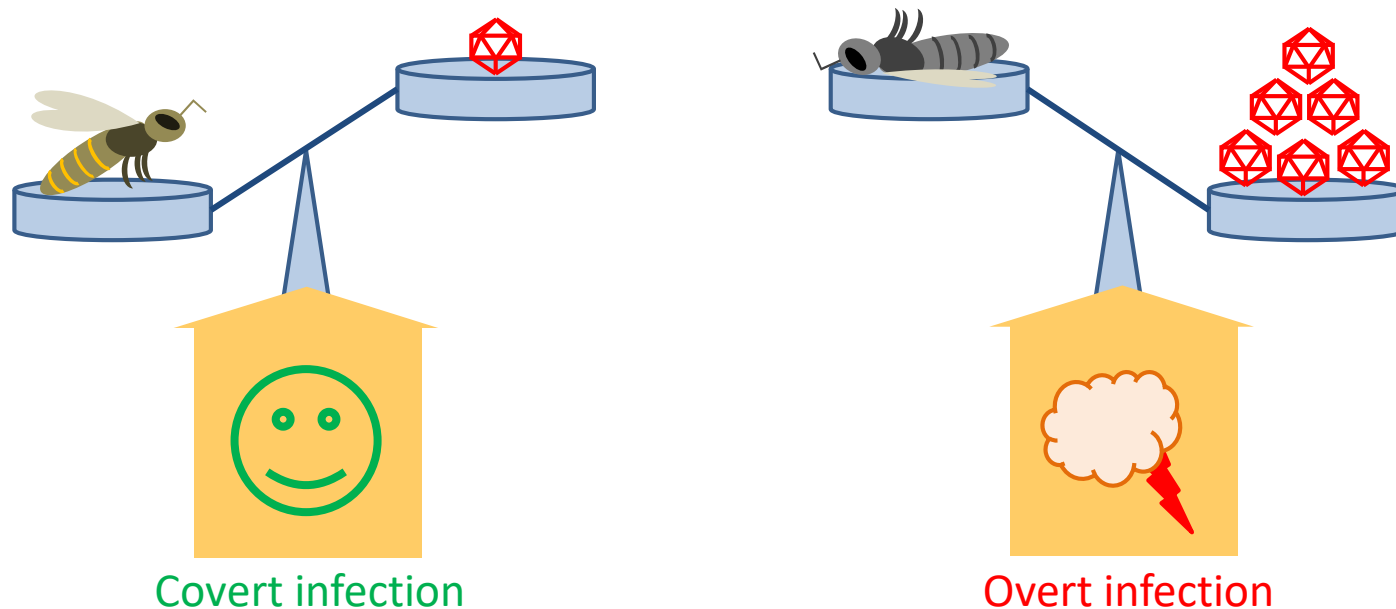


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ANSES Sophia Antipolis
European Union Reference Laboratory for Bee Health
OIE Reference laboratory for Varroosis

Resistance/Tolerance to viral infections

High viral prevalence: unapparent infections

Disease = break in the balance between bees and viruses¹



**72 honey bee viruses²:
How many impact the bee health?**

The six main honey bee viruses

- Quantification of ABPV, BQCV, CBPV, DWV-A, DWV-B, and SBV by real-time RT-PCR*



* Methods available on EURL's website (<https://eurl-bee.anses.fr/>).

Chronic bee paralysis virus (CBPV)

- **Disease of adult bees (>10⁷ virus/bee):**
 - trembling of the wings and bodies,
 - bloated abdomen,
 - inability to fly, crawling on the ground and upward on grass,
 - “black robbers”: hairless (thus appearing smaller), darker, greasy in appearance, shiny, (suffer nibbling attacks by the healthy bees)
 - death within 5 or 6 days in front of the colony
- **Favoring factors¹:** bee genetic, **contacts between bees** (colony density or clustering), queen trade, pollen traps, pesticides



Distribution of honey bee picornaviruses

Dicistroviridae

BQCV



Iflaviridae

DWV



ABP-complex



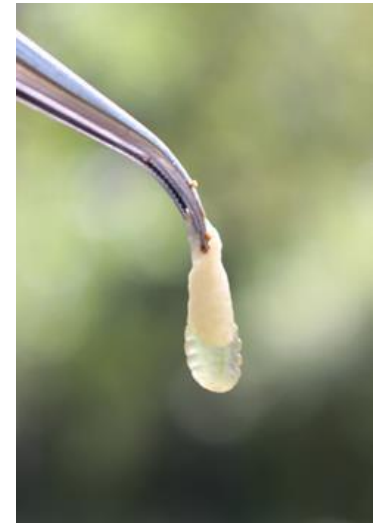
SBV



■ Detected ■ Not detected ■ No data

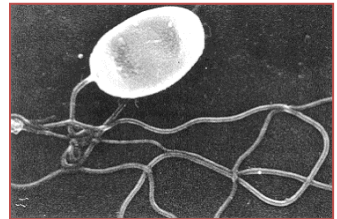
Sacbrood virus (SBV)

- **Brood disease (>10⁹ virus/bee):**
 - pupation failure, 'sac' phenotype: swollen larvae filled with ecdysial fluid full of viral particles,
 - precocious and impaired foraging activity,
 - reduction of adult life span
- **Favoring factors¹:** cold stress, brood density, **few nurse bees**, *Apis cerana*



Black queen cell virus (BQCV)

- **Brood disease ($>10^8$ virus/bee):**
 - yellowish queen larvae with sac-appearance that resembles SBV and with time evolves to dark brown,
 - infected pupae turn brown and die, dark
 - brown to black colored walls in queen cells,
 - significantly shortened life span in adult bees



Notice: the most prevalent virus (84% in Germany¹)

- **Favoring factors²:** *Nosema*, pesticides

Acute bee paralysis virus (ABPV)

- **Viral complex including:** Kashmir bee virus and Israeli acute paralysis virus
- **Disease of brood and adult bees (>10⁵ virus/bee):**
 - trembling, inability to fly, crawling on the ground and upward on grass,
 - gradual darkening and loss of hair from the thorax and abdomen,
 - rapid death for highly infected bees

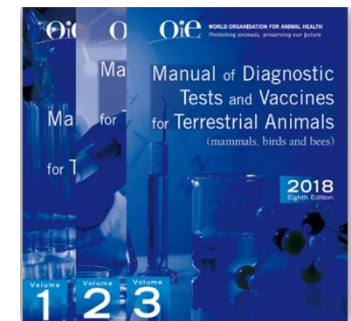
Notice: dead pupae are cannibalized



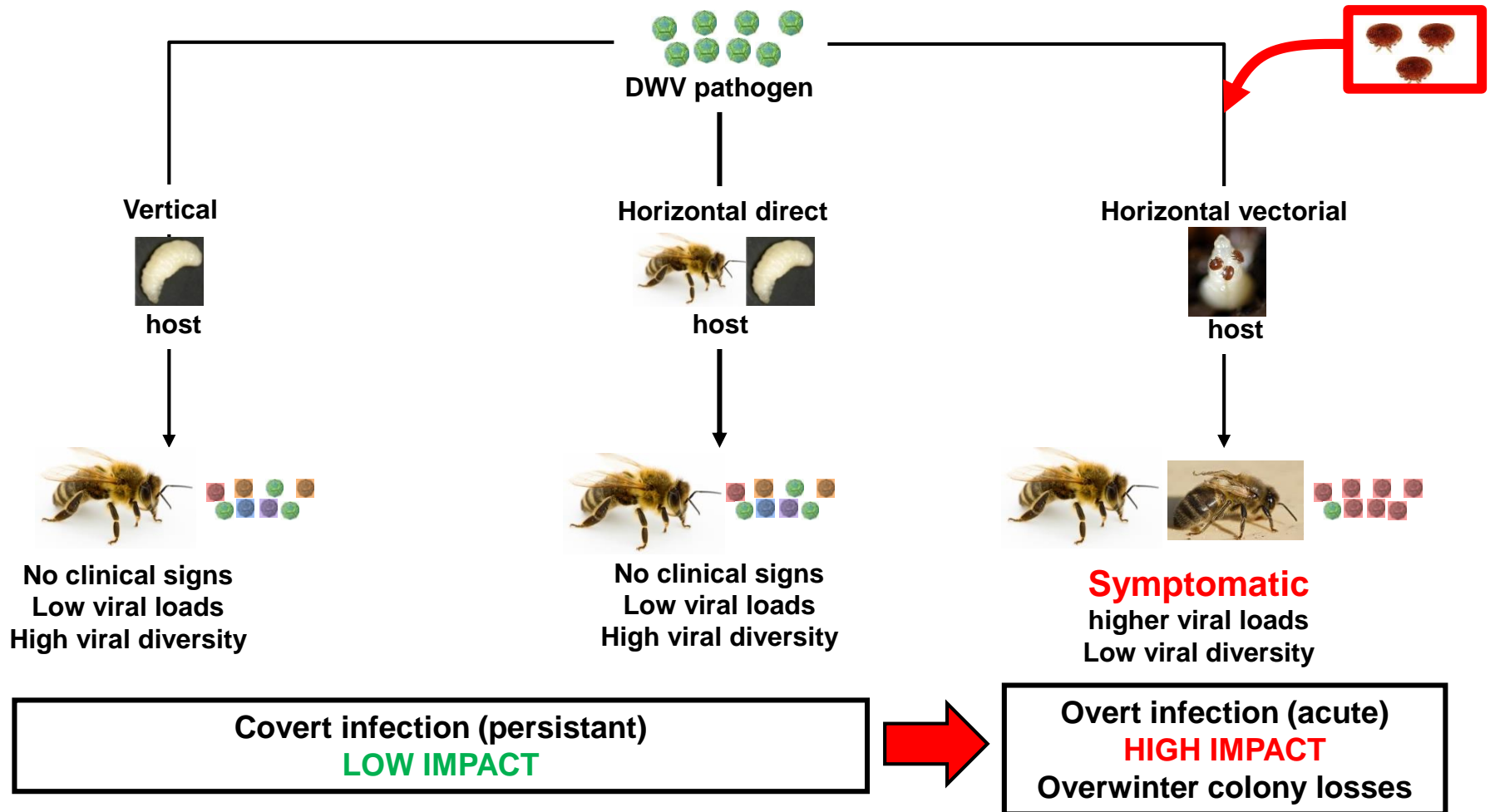
- **Favoring factors:** *Varroa destructor*

Deformed wing virus (DWV)

- **Viral complex including:** four master variants (A, B, C & D) and recombinant viruses
 - **Disease of young bees (>10⁶ to 10⁷ virus/bee):**
 - crumpled or aborted wings,
 - shortened abdomens,
 - severely shortened adult life span for emerging worker and drone bees,
 - impaired learning and foraging behavior
 - **Favoring factors:** pesticides,
Varroa destructor (OIE, 2021 Chapter 3,2,7)
- Notice: replication of DWV-B in varroa mite***



Varroa infestation and DWV pathogenicity



***Varroa destructor* control = Reduction of viral disease severity**



Thank you for your attention

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