Nuclear polyhedrosis Virus (NPV) MIC 204

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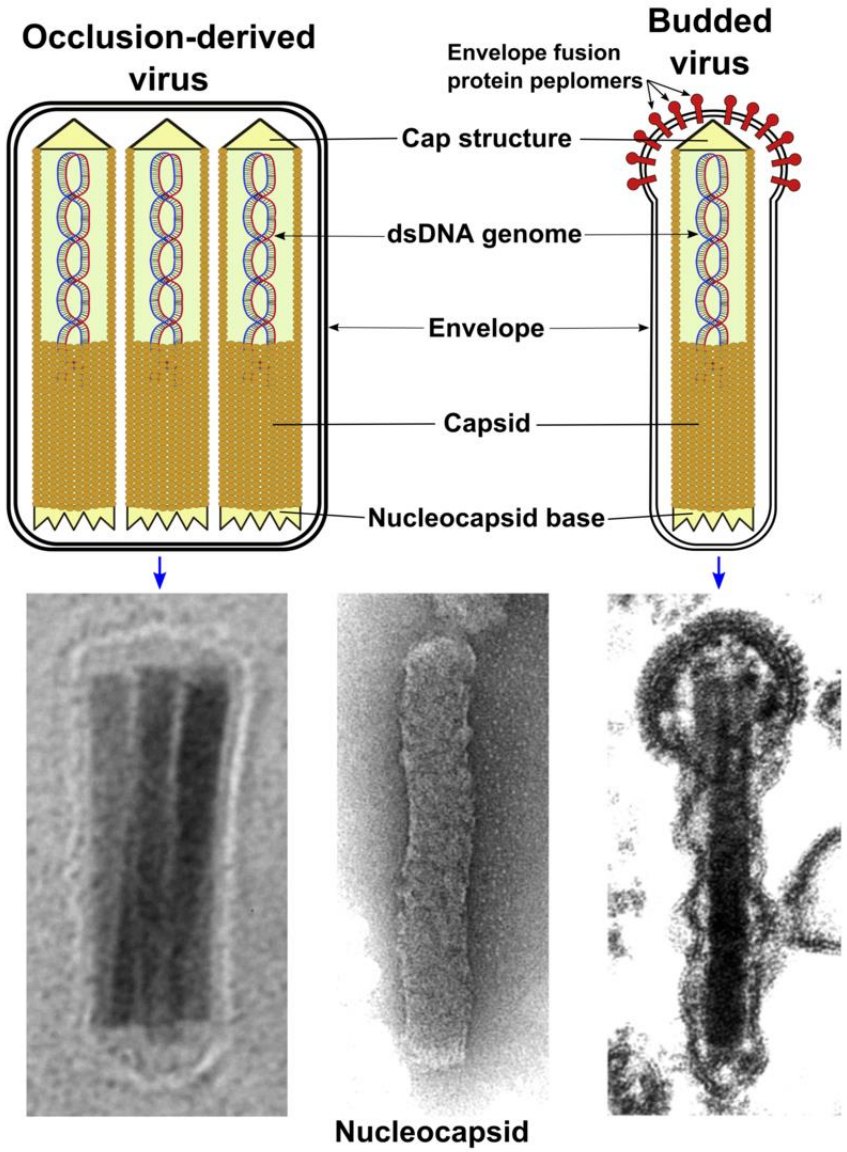
IMPORTANT POINTS

- Viral biopesticide:Nuclear Polyhedrosis Virus (NPV) is host specific for Spodoptera litura and Helicoverpa armigera. NPV is a stomach poison. NPV is effective when it is ingested by the larvae
- Baculovirus family
- Group I: ds DNA
- Class: Naldaviricetes
- Order: Lefavirales
- Family: Baculoviridae

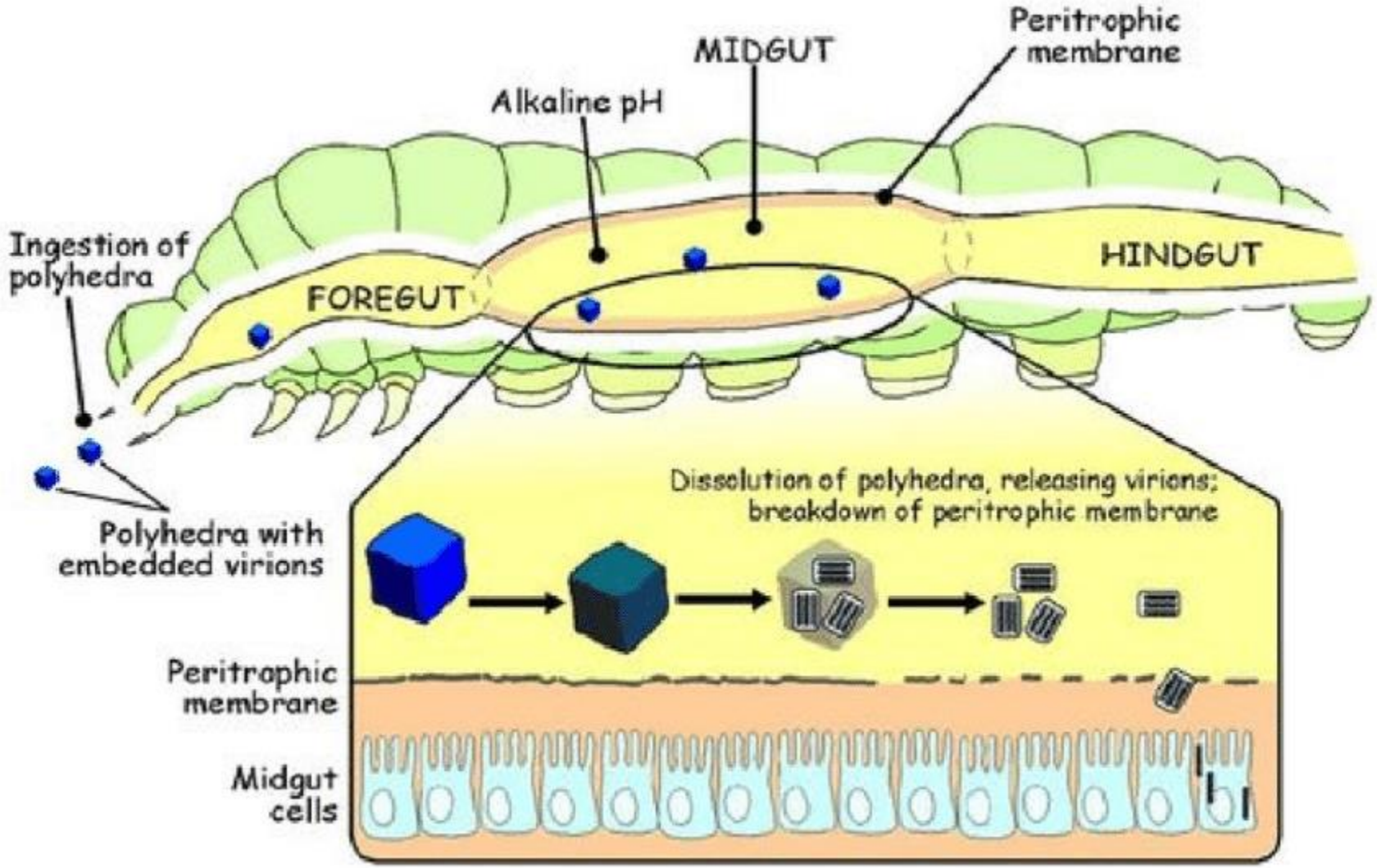
NDV

- Baculoviridae is a family of viruses. Arthropods, among the most studied being Lepidoptera, Hymenoptera and Diptera, serve as natural hosts.
- The virus is unable to infect humans in the way it does insects, because human stomachs are acid-based and NPV requires an alkaline digestive system in order to replicate.
- The baculovirus lifecycle involves two distinct forms of virus.
  - Occlusion-derived virus (ODV) is present in a protein matrix (polyhedrin or granulin) and is responsible for the primary infection of the host,
  - Budded virus (BV) is released from the infected host cells later during the secondary infection

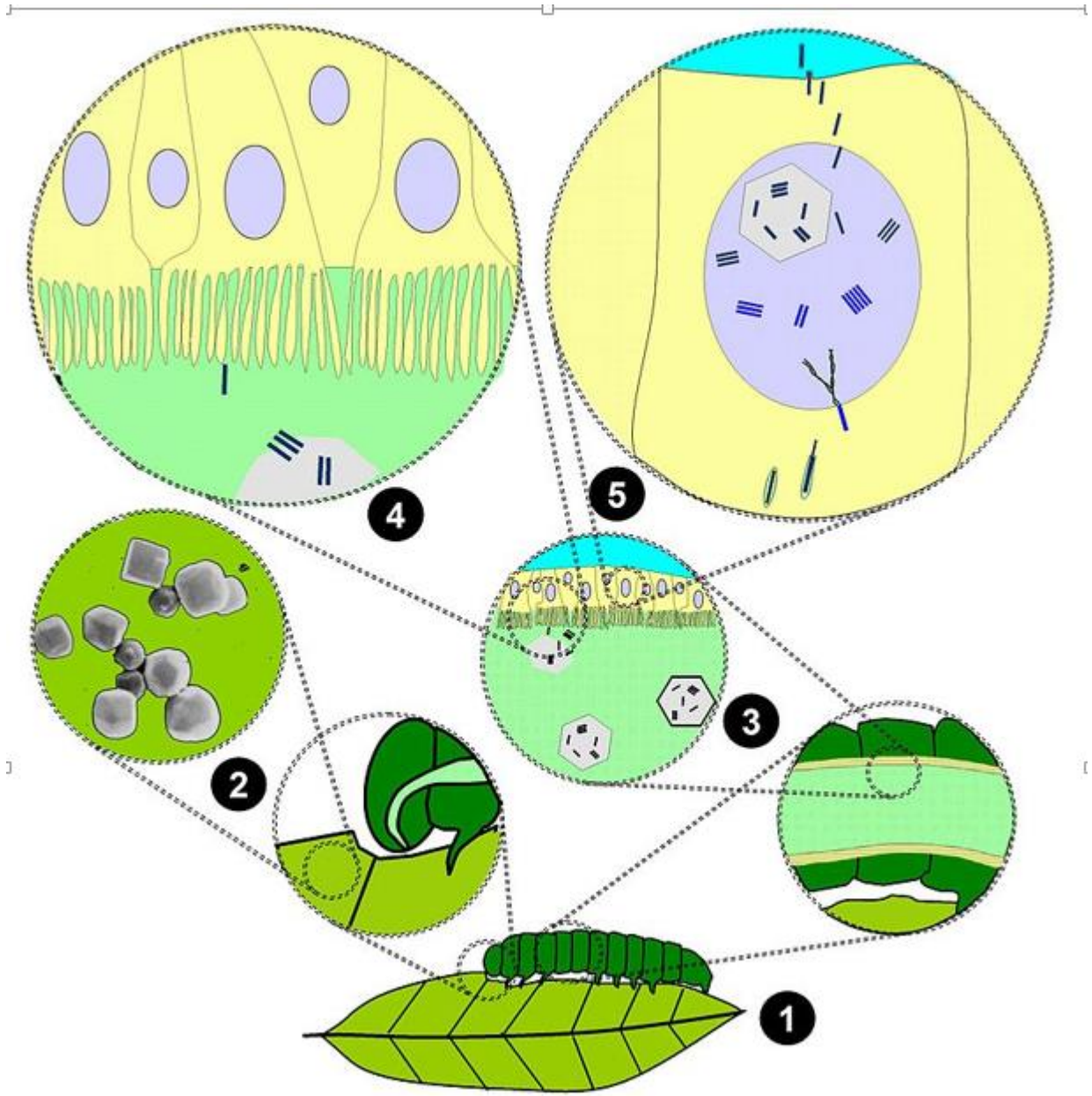


https://en.wikipedia.org/wiki/Baculoviridae#/media/File:ODD.Baculo.Fig1.v3.png

- Typically, the initial infection occurs when a susceptible host insect feeds on plants that are contaminated with the occluded form of the virus.
- The protein matrix dissolves in the alkaline environment of the host midgut (stomach), releasing ODVs that then fuse to the columnar epithelial cell membranes of the host intestine and are taken into the cell in endosomes.
- Nucleocapsids escape from the endosomes and are transported to nucleus. This step is possibly mediated by actin filaments.
- Viral transcription and replication occur in the cell nucleus and new BV particles are budded out from the basolateral side to spread the infection systemically.
- During budding, BV acquires a loosely fitting host cell membrane with expressed and displayed viral glycoproteins
- While BV is produced in the late phase, the ODV form is produced in the very late phase, acquiring the envelope from host cell nucleus and embedded in the matrix of occlusion body protein.
- These occlusion bodies are released when cells lyse to further spread baculovirus infection to next host.
- The extensive lysis of cells frequently causes the host insect to literally disintegrate, thus the reason for the historic name "wilting disease".

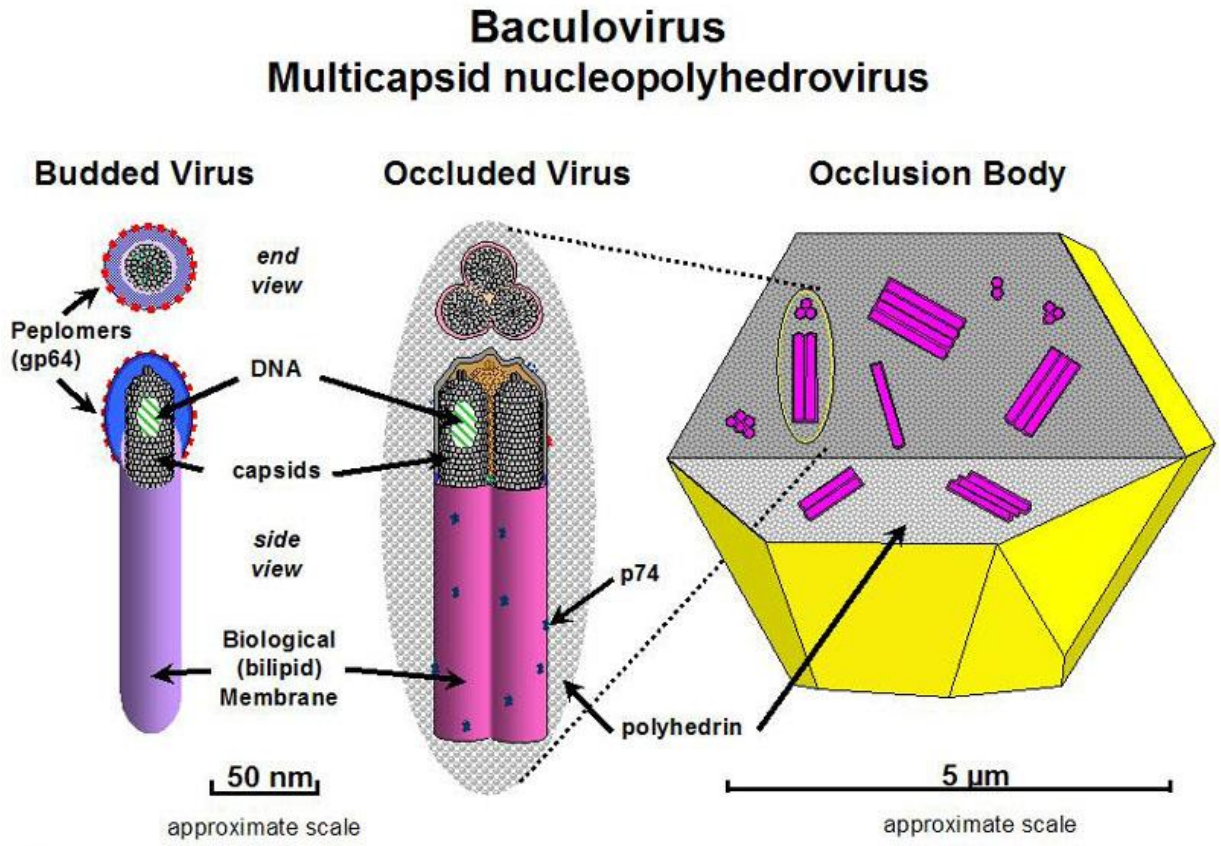


Sabbahi, Rachid & Hock, Virginia & Azzaoui, Khalil & Saoiabi, Sanaa & Hammouti, Belkheir. (2022). A global perspective of entomopathogens as microbial biocontrol agents of insect pests. Journal of Agriculture and Food Research. 10. 100376. 10.1016/j.jafr.2022.100376.



1. Insect feeding on virus-contaminated foliage
2. Close up of occlusion bodies (OBs)
3. Lumen of digestive tract (alkaline conditions)
4. Virus particles being released from OBs and attaching to brush border of gut cells
5. Replication of virus in insect cell

- Virus
- Occlusion body
- Nucleus
- Cytoplasm
- Hemocoel
- Gut lumen
- Plant



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