

Group I: ds DNA viruses

Assist.prof. Zainab A. Tolaifeh

Order: Herpesvirales

Family: Herpesviridae

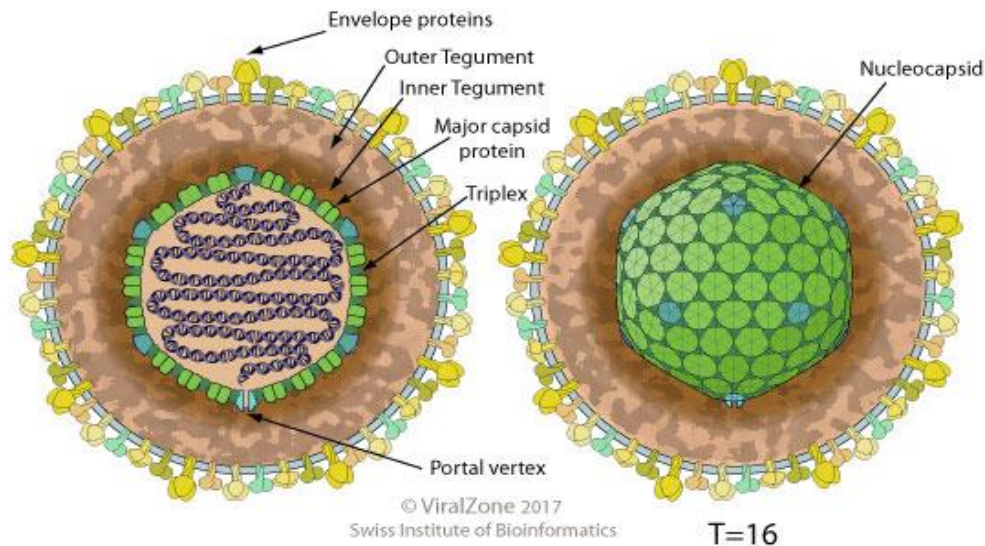
Herpesviridae

VIRION

Enveloped, spherical to pleomorphic, 150-200 nm in diameter, T=16 icosahedral symmetry. Capsid consists of 162 capsomeres and is surrounded by an amorphous tegument. Glycoprotein complexes are embedded in the lipid envelope.

GENOME

Monopartite, linear, dsDNA genome of 120-240 kb. The genome contains terminal and internal reiterated sequences.



REPLICATION: NUCLEAR

Lytic replication:

1. Attachment of the viral gB, gC, gD and gH proteins to host receptors mediates endocytosis of the virus into the host cell.
2. Fusion with the plasma membrane to release the core and the tegument proteins into the host cytoplasm.
3. The capsid is transported to the nuclear pore where viral DNA is released into the nucleus.
4. Transcription of immediate early genes which promote transcription of early genes and protect the virus against innate host immunity.

5. Transcription of early viral mRNA by host polymerase II, encoding proteins involved in replication of the viral DNA.
6. A first round of circular genome amplification occurs by bidirectional replication
7. Synthesis of linear concatemer copies of viral DNA by rolling circle.
8. Transcription of late mRNAs by host polymerase II, encoding structural proteins.
9. Assembly of the virus in nuclear viral factories and budding through the inner lamella of the nuclear membrane which has been modified by the insertion of herpes glycoproteins, throughout the Golgi and final release at the plasma membrane.

Latent replication: replication of circular viral episome in tandem with the host cell DNA using the host cell replication machinery.

Viral latency

Viral latency is the ability of a virus to remain dormant within the host cell, sometimes establishing lifelong occult infection. Depending on the virus, the trigger of latency is highly variable but the host cell context is always determining. Latency can stop upon viral genome reactivation, often promoted by stress cellular signals.

❖ **Subfamily: Alphaherpesvirinae**

- **Genus:** *Simplexvirus*
Strains: Herpes simplex type 1 and 2

The capsid

The virions are spherical particles, 150-200 nm in diameter, containing icosahedral capsid and glycoprotein spikes protruding from each virion.

The tegument

The tegument is a set of proteins that are present in the space between the envelope and the capsid. It contains proteins that allow early immune system inhibition, and prepare the host cell for viral replication.

The glycoproteins

Herpesvirus entry and membrane fusion require three virion glycoproteins, that function as the core fusion machinery.

Associated diseases:

HSV is involved in a variety of clinical manifestations which includes:

- Herpes Labialis (cold sore)
- Ocular Herpes
- Herpes Genitals



Genus: *Varicellovirus*

Double stranded DNA enveloped virus. One antigenic serotype only. Primary infection results in **varicella (chickenpox)** Incubation period of 14-21

Reactivation: **Herpes Zoster (Shingles)**



❖ **Subfamily: Betaherpesvirinae**

Genus: *Cytomegalovirus*

- double stranded DNA enveloped virus
- Congenital infection - may result in cytomegalic inclusion disease
- Perinatal infection - usually asymptomatic
- Postnatal infection - usually asymptomatic.
- Immunocompromised patients such as transplant recipients and AIDS patients are prone to severe CMV disease such as pneumonitis, retinitis, colitis, and encephalopathy.
- Reactivation or reinfection with CMV is usually asymptomatic **except** in immunocompromised patients.

❖ **Subfamily: Gammaherpesvirinae**

Genus: *Lymphocryptovirus*

dsDNA viruses in the Herpesviridae family that infect many mammals, including humans. Human herpesvirus 4 (formerly called Epstein-Barr virus (EBV)) is responsible for mononucleosis in humans.

Associated disease:

- Infectious Mononucleosis
- Burkitt's lymphoma
- Nasopharyngeal carcinoma