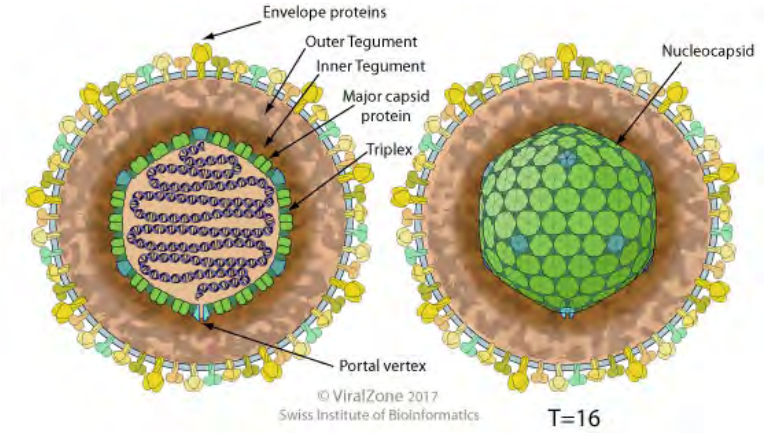
Herpesviridae

VIRION



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

GENOME

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

GENE EXPRESSION

Each viral transcript usually encodes a single protein and has a promoter/regulatory sequence, a TATA box, a transcription initiation site, a 5' leader sequence of 30-300 bp (not translated), a 3' non-translated sequence of 10-30 bp, and a poly A signal. There are many gene overlaps. There are only few spliced genes. Some of the expressed ORFs are antisense to each other. Some ORFs can be accessed from more than one promoter. Certain proteins are downregulated translationaly by a leaky scanning from an upstream ORF.

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.

DB LINKS

Nucleotide DB: NCBI
Protein DB: UniProtKB
Virus DB: VBRC genome browser

TAXONOMY

Group I: dsDNA viruses

Order:	***Herpesvirales***
Family:	***Herpesviridae***
Subfamily:	*Alphaherpesvirinae*
Genus:	*Iltovirus*
	Mardivirus
	Scutavirus
	Simplexvirus
	Varicellovirus
Subfamily:	*Betaherpesvirinae*
Genus:	*Cytomegalovirus*
	Muromegalovirus
	Roseolovirus
	Proboscivirus
Subfamily:	*Gammaherpesvirinae*
Genus:	*Lymphocryptovirus*
	Rhadinovirus
	Macavirus
	Percavirus

SPECIES

Host

NATURAL HOSTS

Vertebrates

CELL TROPISM

INTERACTIONS

Cell receptors HHV-1 and HHV-2: heparan sulfate,TNFRSF14 PVRL1
HHV-2: PVRL2
BoHV: heparan sulfate, CD155 PVRL1
SuHV-1: heparan sulfate, CD155 PVRL1 PVRL2
HHV-7: CD4
HHV-8: Integrin alphaV -beta3
HHV-4: CR2 BMRF2
HHV-5: heparan sulfate
Host-virus interaction

Ecology and disease

GEOGRAPHY

Worldwide

ASSOCIATED DISEASES

HHV-1 and HHV-2: skin vesicles or mucosal ulcers (oral and/or genital). Rarely, encephalitis and meningitis.
HHV-3: chickenpox (Varicella) and shingles. Congenital varicella syndrome may be caused by infection in utero during the first trimester.
GaHV-2: Marek's disease.
HHV-5: congenital CMV infection.
HHV-6: "sixth disease" (roseola infantum, exanthem subitum).
HHV-7: symptoms analog to the "sixth disease".
HHV-4: B lymphocytes.
HHV-8: B lymphocytes.

TRANSMISSION

HHV-1: contact with lesions and body fluids.
HHV-2: sexual. Infection at birth by a genitally-infected mother.
HHV-3: contact, respiratory route.
HHV-5:Infected body fluids (urine, saliva), transplacentary, transplantation, blood transfusion.
HHV-4: Saliva, sexual (probable), transplacentary.
HHV-8: Saliva, sexual.

VACCINE

ANTIVIRAL DRUGS

Nucleoside analogs (Acyclovir, famcyclovir, valacyclovir...). These drugs are activated by the viral specific enzyme, thymidine kinase, and are therefore specific to herpes-infected cells. These drugs act against the replicating virus (they are incorporated into the DNA as it is copied) and are ineffective against a latent virus.