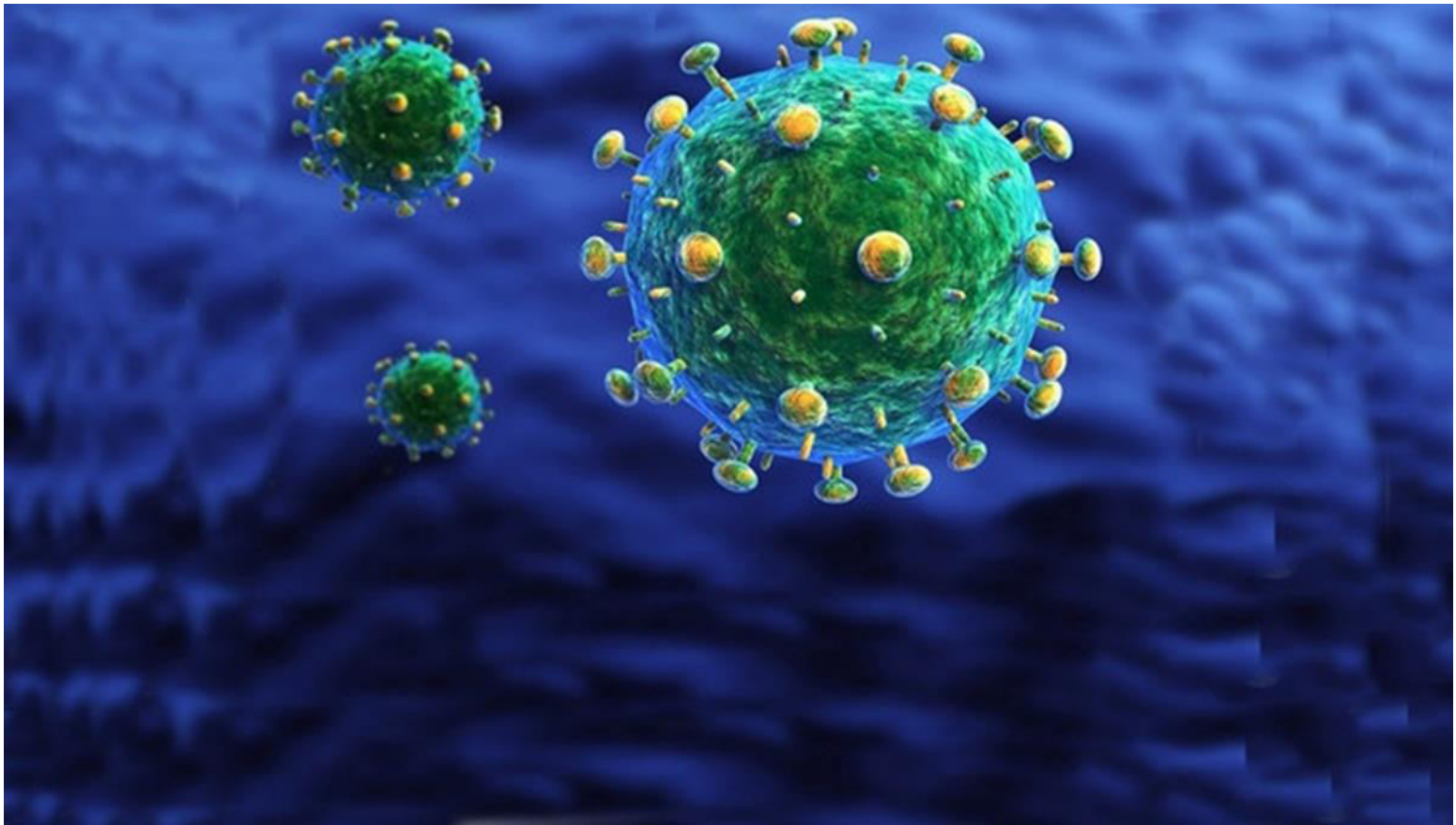


# Viruses Part II



# Herpesviridae Family

Herpesviridae family divided into 3 subfamilies:

## 1. Alpha-herpesvirinae

- Fast replicating
- Latency established in sensory ganglia
  - ✓ Herpes simplex virus type 1
  - ✓ Herpes simplex virus type 2.
  - ✓ Varicella-zoster virus.

## 2. Beta-herpesvirinae

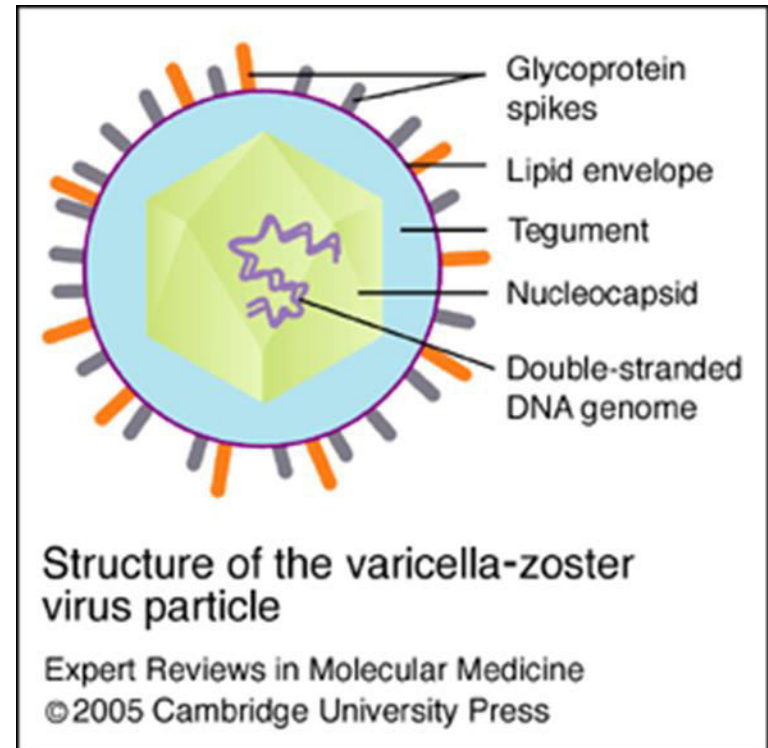
- Slowly replicating.
- Infected cells enlarge (*cytomegalia*)
- Latency established in secretory glands, lymphoreticular cells, kidneys
  - ✓ Cytomegalovirus.
  - ✓ Herpesvirus type 6
  - ✓ Herpesvirus type 7.

## 3. Gamma-herpesvirinae

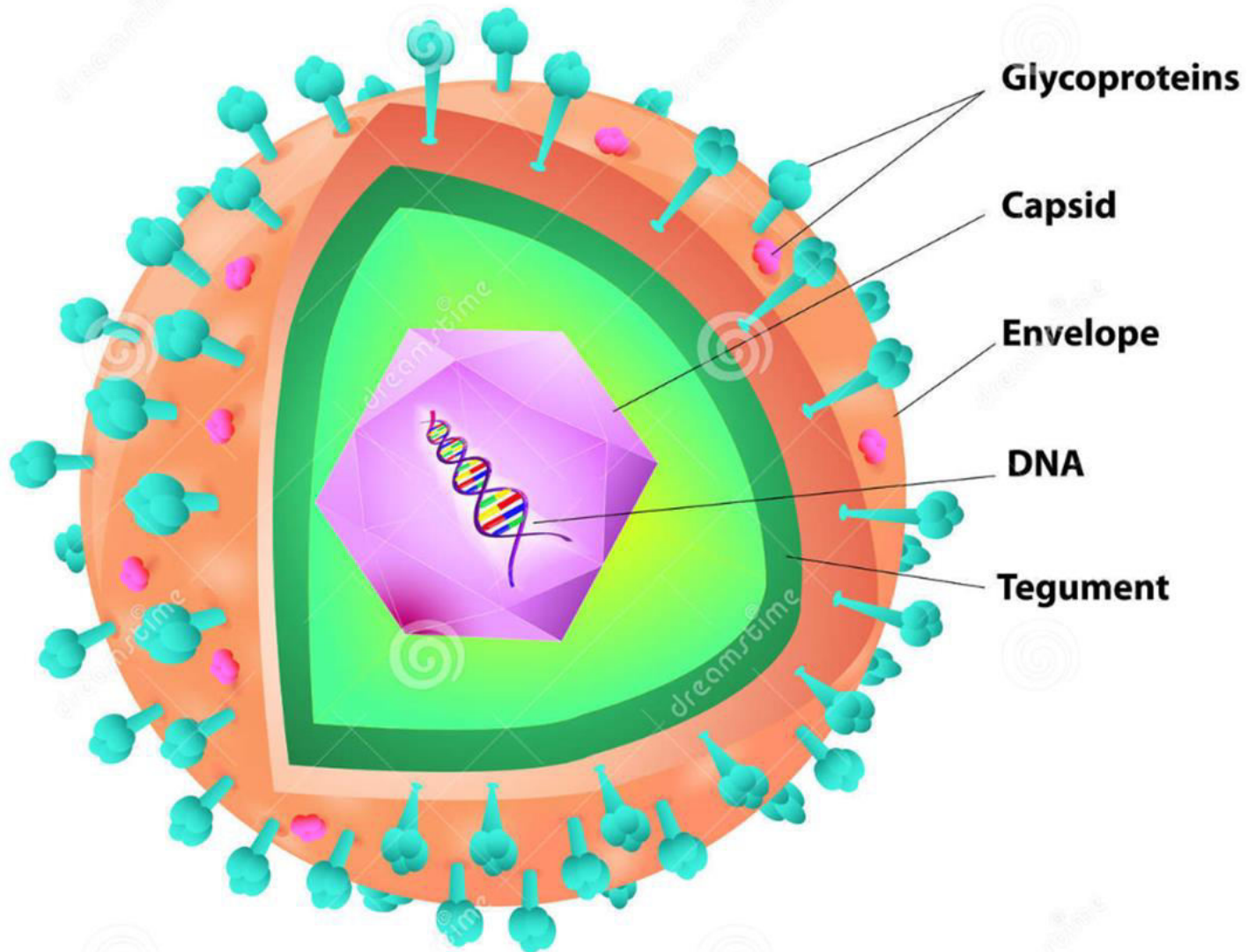
- Replicate poorly
- Latency established in lymphoid tissue (T-cell or B-cell specific)
  - ✓ Epstein-Barr virus.

# Structure of Herpesviridae Family

- Genome: linear double strand DNA.
- Capsid: Icosahedral (150-200 nm).
- Surrounded by a lipid envelope (enveloped viruses).
- The envelope contains glycoprotein spikes that enable the virus to identify and bind to its target neuron cells.



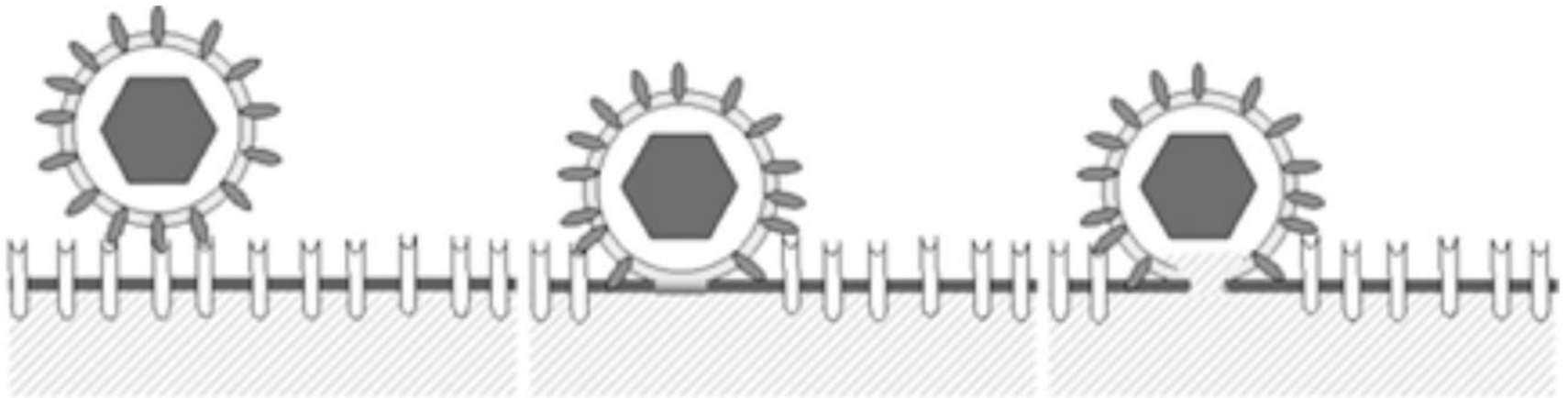
# Structure of the Herpesvirus virion



# *Herpesviridae*- Replication

## 1. ADSORPTION (*Attachment*):

- Envelope glycoproteins are required for binding, adsorption and fusion.
- Then the virus envelope fuses with the host cell membrane.

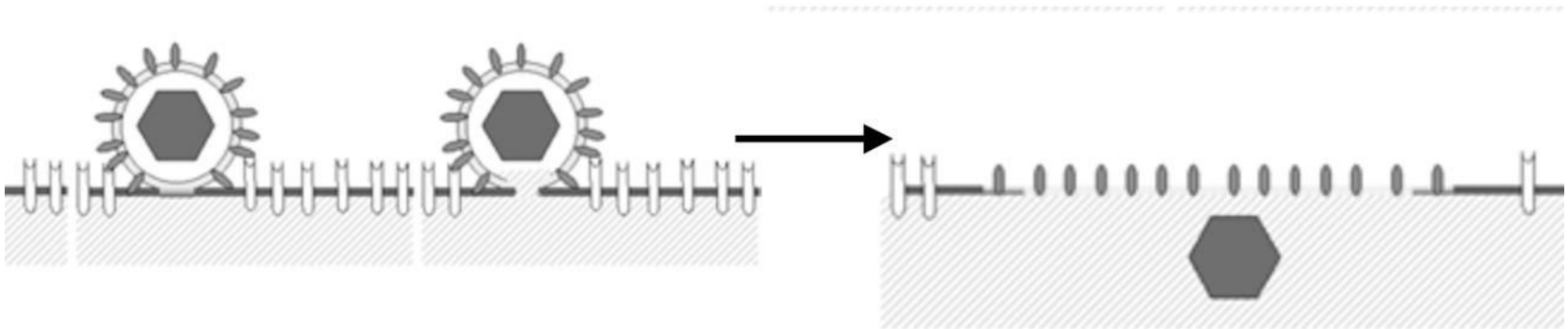


## 2. PENETRATION:

- The nucleocapsid proteins enters the cell.

## 3. Un-coating:

- Release of viral DNA from its protective capsid to the nucleus and enable the viral DNA to replicate.



#### 4. Viral replication:

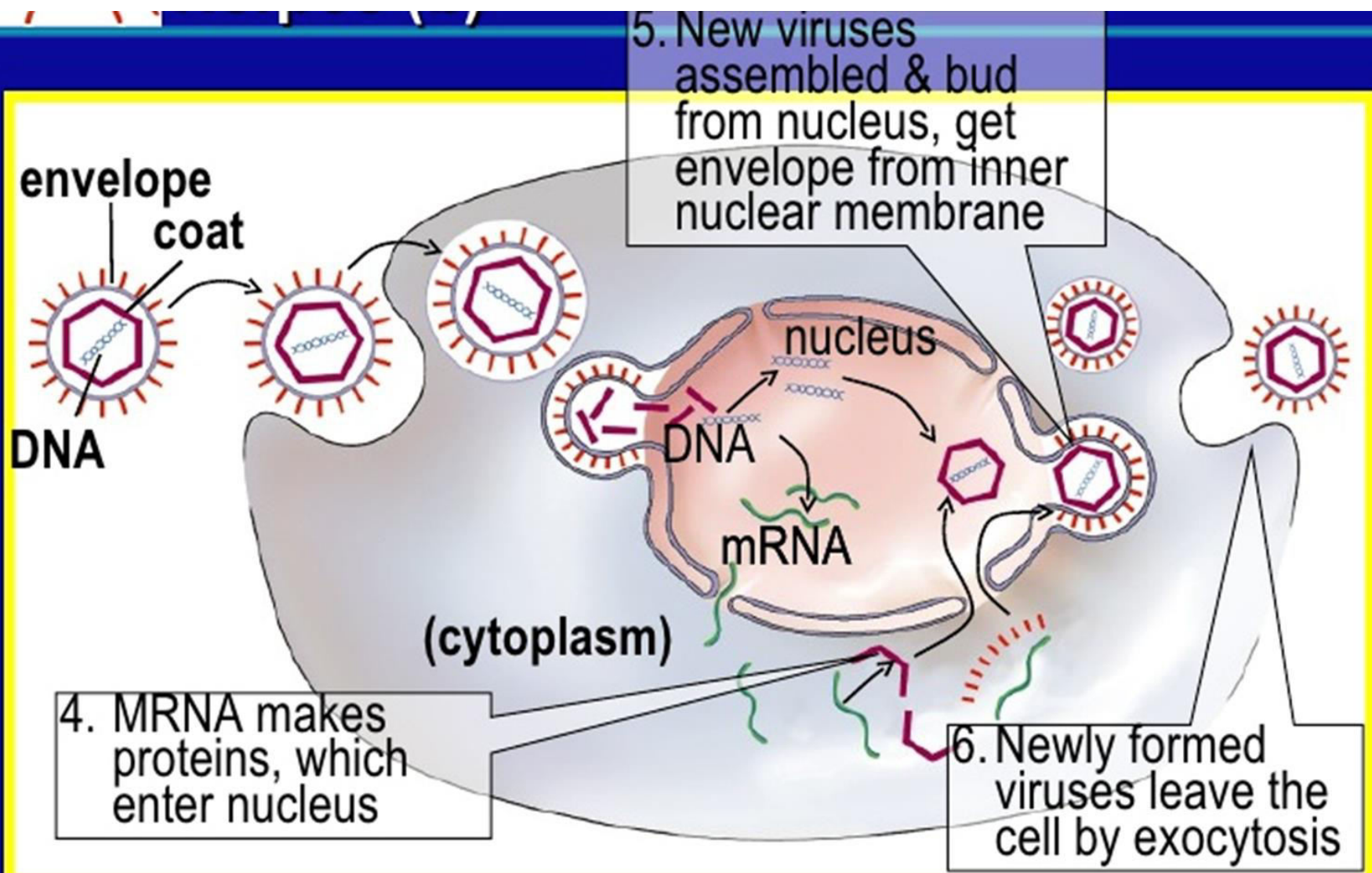
- It is a complex and multi step process (inside host nucleus).

#### 5. Assembly:

- Assembly of the *nucleocapsid* occurs in the nucleus.
- Newly synthesized envelope proteins accumulate in patches on the nuclear membrane.

#### 6. Release:

- Virus acquires envelope by budding through nuclear membrane.
- The completed virus is transported by a vacuole to the surface of the cell.



# Herpes Simplex Virus Type 1 Infections

Infections occur in children and adults

## + Herpes labialis – fever blisters or cold sores :

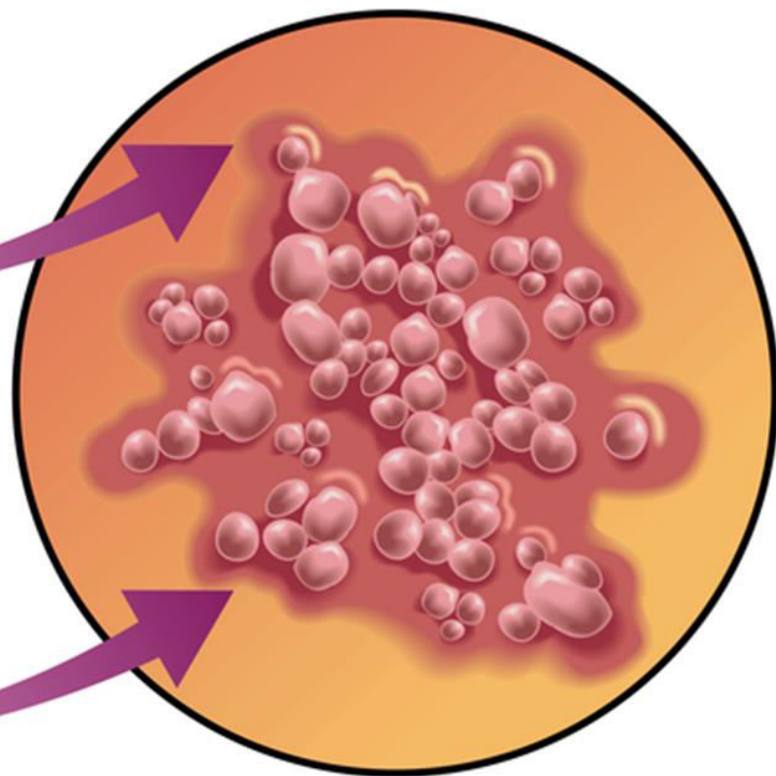
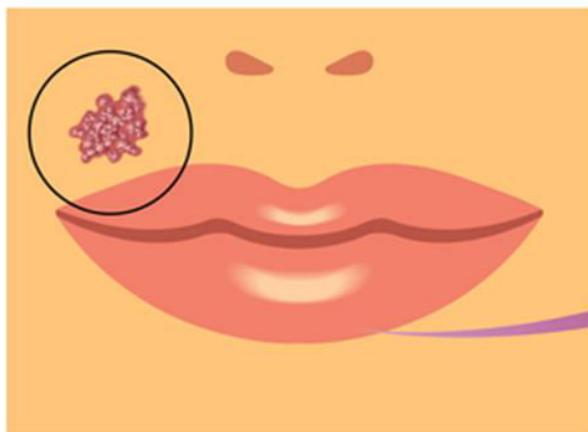
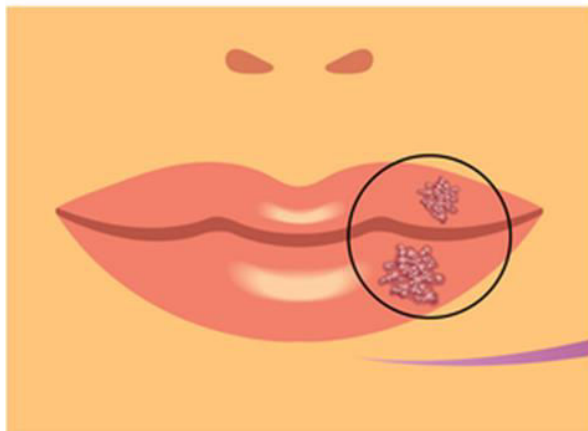
- ✓ Most common recurrent HSV-1 infection.
- ✓ Vesicles occur on skin or mucus membrane of the mouth and lips.
- ✓ Itching and tingling prior to vesicle formation.
- ✓ lesion crusts over in 2-3 days and heals

## + Herpetic gingivostomatitis – infection of oropharynx in young children:

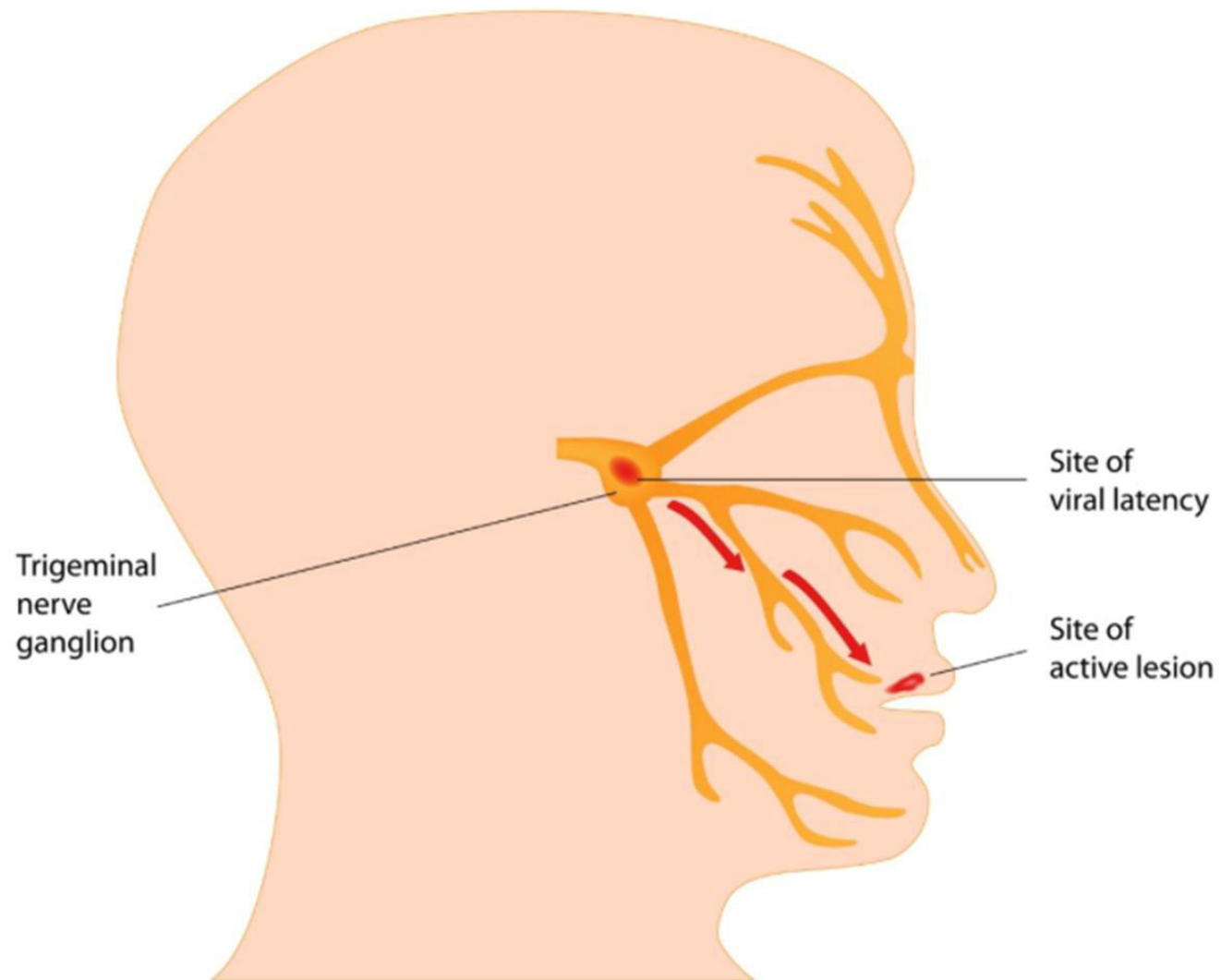
- ✓ fever.
- ✓ sore throat.
- ✓ swollen lymph nodes

## + Herpetic keratitis – ocular herpes – inflammation of eye.

## HSV-1 Labial Herpes



# Herpesvirus (type 1) Infection



# Herpes Simplex Virus Type 2 Infections

## + Genital herpes – herpes genitalia:

- ✓ starts with malaise, anorexia, fever.
- ✓ bilateral swelling and tenderness in the groin.
- ✓ clusters of sensitive vesicles on the genitalia, perineum, and buttocks.
- ✓ urethritis.
- ✓ painful urination.
- ✓ cervicitis, itching.
- ✓ vesicles ulcerate

## + Recurrent bouts usually less severe, triggered by menstruation, stress, and concurrent bacterial infection.

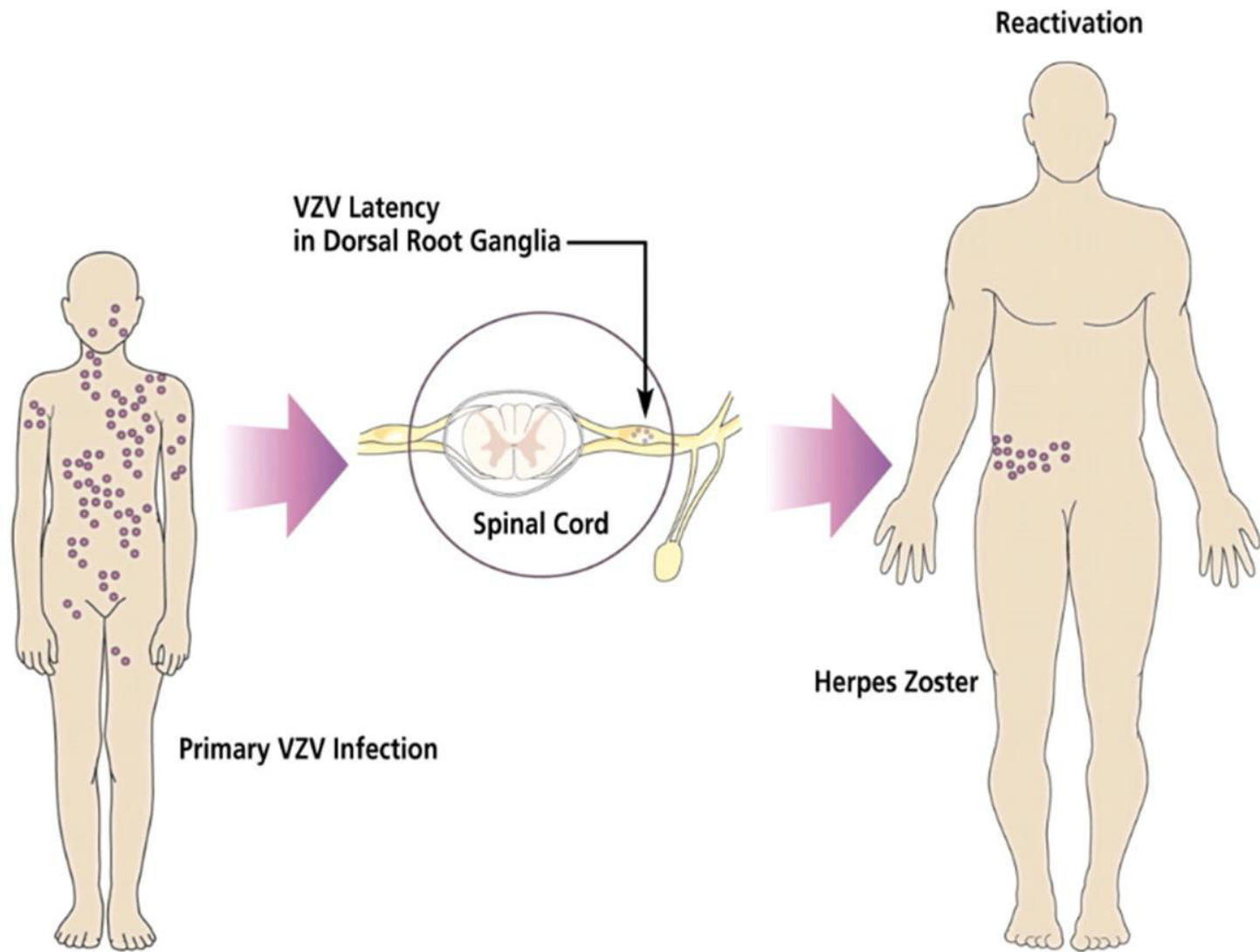
# Herpes Simplex Virus

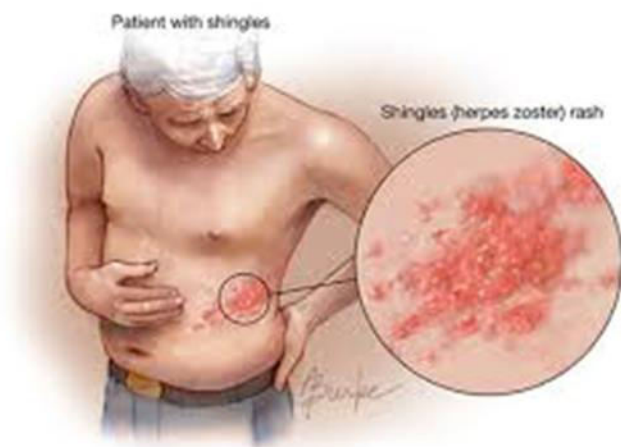
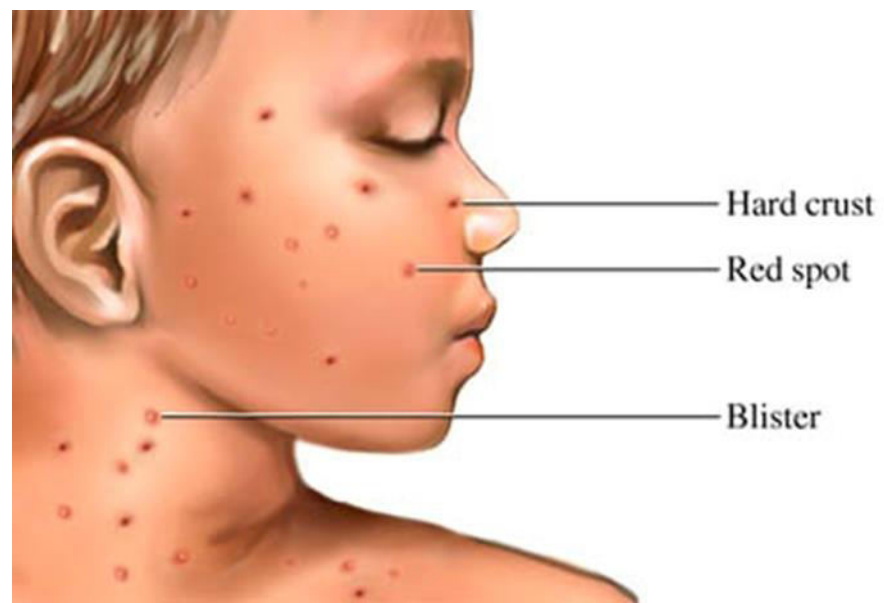
- + Transmission by direct exposure to secretions or lesions containing the virus; genital herpes can be transmitted in the absence of lesions.
- + Recurrent infection is triggered by various stimuli – fever, UV radiation, stress, mechanical injury

# Varicella-Zoster Virus

- + Highly infectious.
- + Primary infection leads to acute varicella or “chickenpox”.
- + VZV establish lifelong latency, and can reactivate years to decades later as herpes zoster (HZ) or “shingles”. characteristically results in a rash with a unilateral dermatomal distribution, which usually resolves within 2 to 4 weeks
- + It is estimated to occur in up to 20% of individuals during their lifetime.







# Prevention of VZV

- + CDC recommends two doses of chickenpox vaccine for children, adolescents, and adults.
- + Two doses of the vaccine are about 98% effective at preventing chickenpox.
- + Some people who are vaccinated against chickenpox may still get the disease. However, it is usually milder with fewer blisters and little or no fever.

# Viral Keratitis

- + The development of viral infection depends on:
  - ✓ Nature of the virus.
  - ✓ Susceptibility of the host cells.
  - ✓ Host resistance.
  
- + Common types of keratitis caused by viruses are:
  - ✓ Herpes Simplex Keratitis
  - ✓ Herpes Zoster Ophthalmicus

# Treatment of Viral Keratitis

- + Should be directed at eliminating viral replication within the cornea, while minimizing damaging effects of inflammatory response.
- + Can be treated with acyclovir topically
- + Oral acyclovir may be useful in treatment of severe herpetic eye disease.



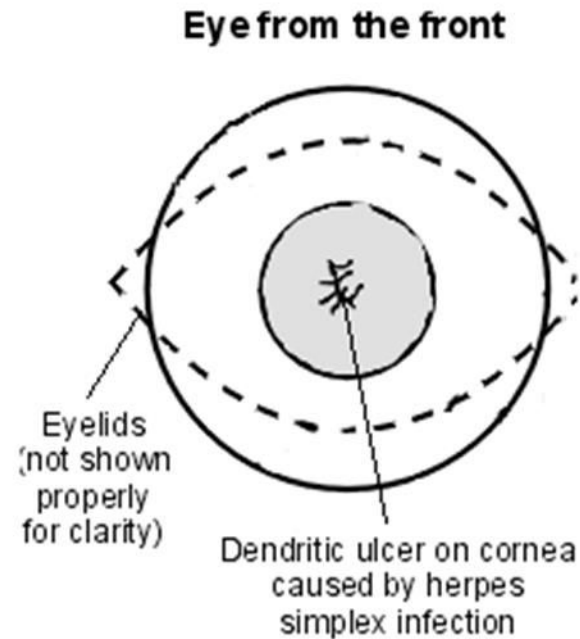
# Herpes Simplex Keratitis

- + Herpes simplex keratitis is usually caused by herpes simplex virus 1
- + It is accompanied by conjunctivitis in many cases.
- + It is considered the most common infectious cause of blindness in the United States.
- + The characteristic lesions of herpes simplex keratoconjunctivitis are **dendritic ulcers** best detected by fluorescein staining.

+ The virus causes a special type of corneal ulcer, called '**dendritic**' (Latin term that means 'many fingered').

+ The Herpes Simplex Virus (HSV) infection occurs in two forms:

- ✓ Primary infection
- ✓ Recurrent infection.



## Complications:

- + May progress and cause thick corneal scarring, and can cause blindness and corneal transplant is needed.



# Diagnosis of Herpes Simplex Keratitis

- + Viral culture.
- + Immunofluorescence staining.
- + A more sensitive test will be Polymerase Chain Reaction (PCR).
  - ✓ PCR finds the genetic material (DNA) of the HSV virus. This test can tell the difference between HSV-1 and HSV-2.
- + Serology. (IgG , IgM )

## Source of specimen:

- ✓ Corneal scraping
- ✓ Conjunctival swab / scraping.
- ✓ Tear fluid.

# Herpes Zoster Ophthalmicus

- + Herpes Zoster Ophthalmicus is an ocular disease which usually manifests eruption of multiple vesicles strictly on one side of the face along the distribution of ophthalmic division of the trigeminal nerve.
- + Usually preceded by severe neuralgia.
- + HZO occurs typically in older adults but can present at any age and occurs after reactivation of latent varicella-zoster virus (VZV).
- + More common in patients with acquired immune deficiency syndrome, malignancy or after exposure to radiation.

- + The disease starts abruptly with severe neuralgic pain.
- + Usually associated with fever, nausea, vomiting and malaise, pain usually diminishes within two to three days after the appearance of vesicles on one side of the forehead and scalp.
- + Vesicle may involve nose lid and cornea.
- + The lesions in the cornea may ulcerate.

## Treatment:

- + Therapy needs to be started within 72 hours after appearance of the rash.
- + Intravenous and oral acyclovir have been used successfully for treatment of herpes zoster ophthalmicus.