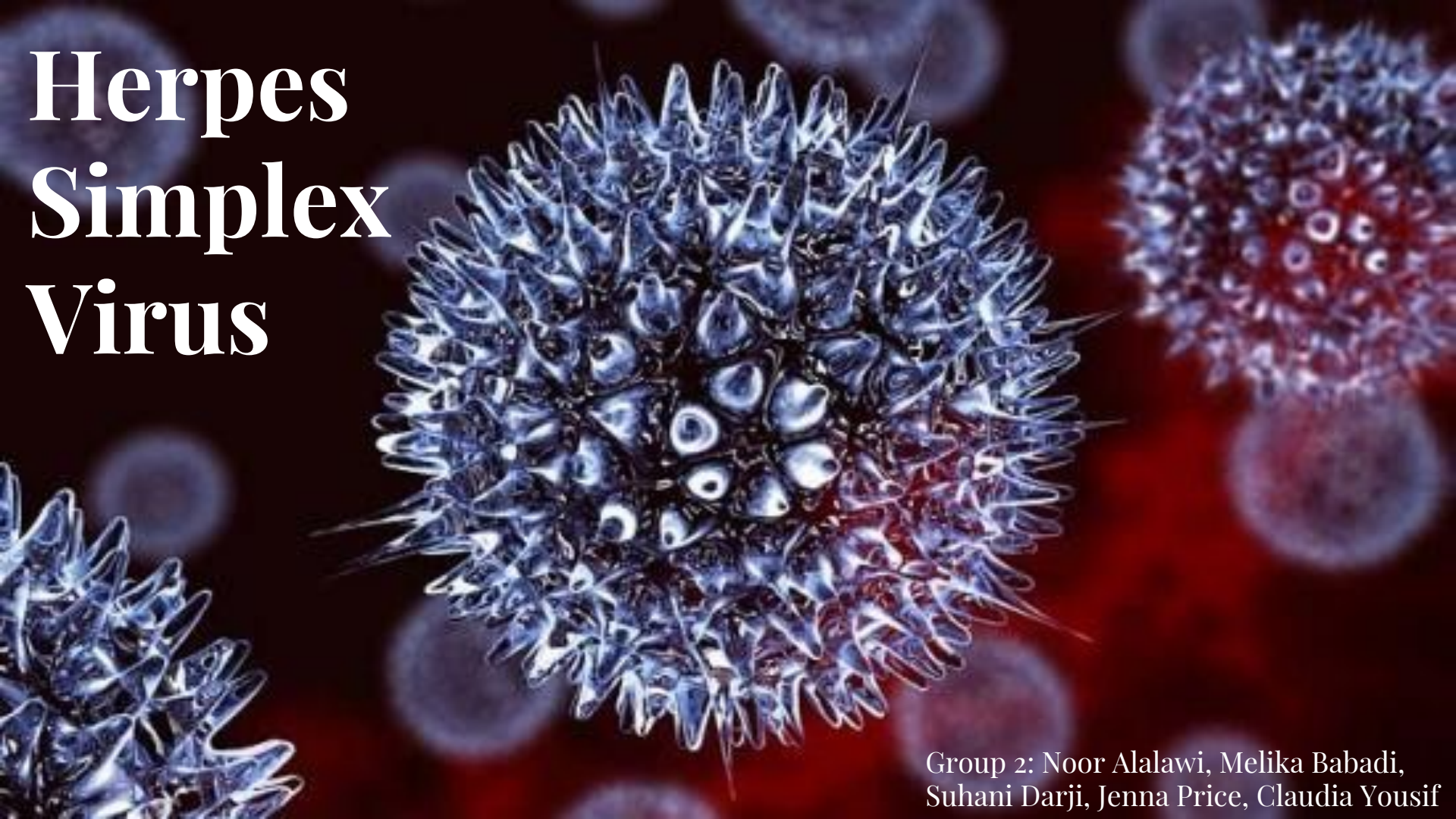


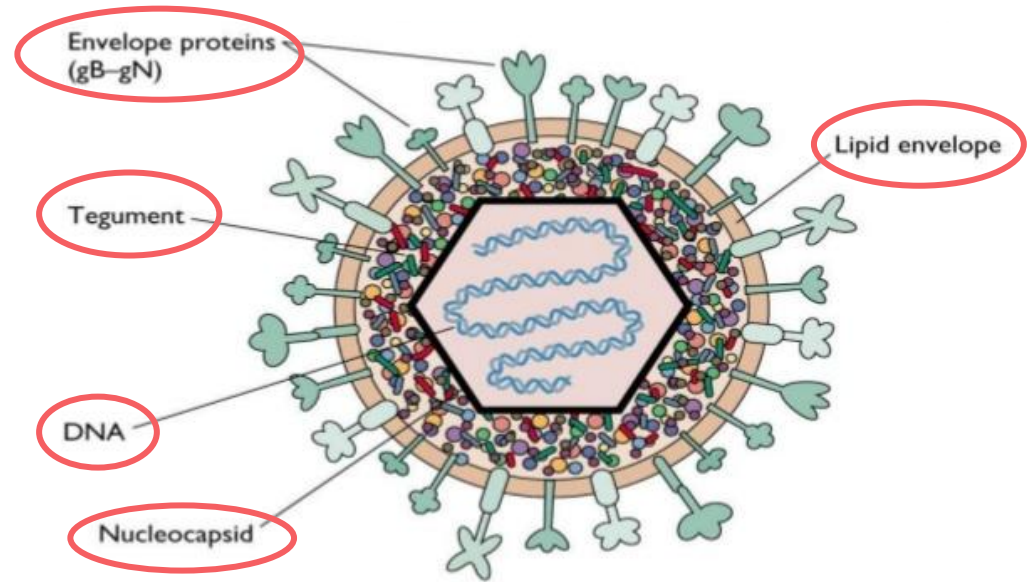
Herpes Simplex Virus



Group 2: Noor Alalawi, Melika Babadi,
Suhani Darji, Jenna Price, Claudia Yousif

Herpes Simplex Virus (HSV)

- Ancient Greek: 'creep' or 'crawl'
- Most commonly infectious to humans: HSV-1 and HSV-2
- Structure
 - Double Stranded DNA
 - Icosapentahedral capsid
 - Tegument
 - Envelope (Lipid, protein)



<http://www.onlinebiologynotes.com/herpes-simplex-virus-hsv-structure-genome-mode-transmission-pathogenesis-infection-laboratory-diagnosis-treatment/>

Fact or Fiction?

“

Increasing the number of sexual partners
puts individuals at greater risk of acquiring
HSV

”



Epidemiology



<http://www.freeworldmaps.net/political.html>

- **Seroprevalence in Ontario:**
 - HSV-1: 51.1% and HSV-2: 9.1%
- **Globally:**
 - HSV-1: 67% and HSV-2: 11.3%
- **In America:**
 - Prevalence of HSV-2 infection has decreased from 21% to 16% from 1990 to 2010
- **Risk factors:**
 - Socioeconomic status
 - Geographical location/population
 - Number of sexual partners
 - Mother-fetus transmission

(Howard et al., 2003), (LeVay & Baldwin, 2012), (WHO, 2015), (Looker et al., 2015)

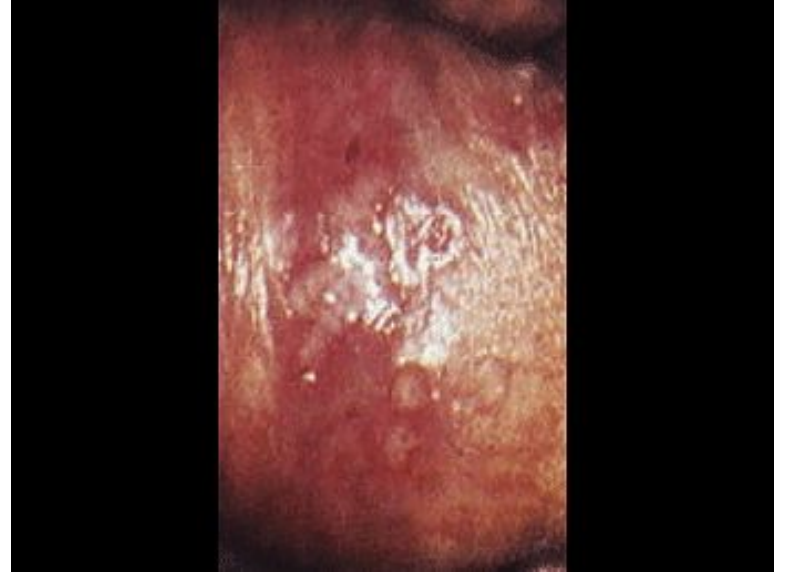
Symptoms: HSV-1

- Blisters/open sores in or around the mouth
- Majority of infections are asymptomatic and initially acquired through childhood
- Episodic infections



Symptoms: HSV-2

- Genital/anal blisters or ulcers
- Mostly transmitted through sexual contact
- Mostly asymptomatic
- Initial infection can be accompanied with fever, body aches, swollen lymph nodes
- Episodic infections
 - More mild



Infections in Other Parts of the Body

Eyes: Ocular herpes



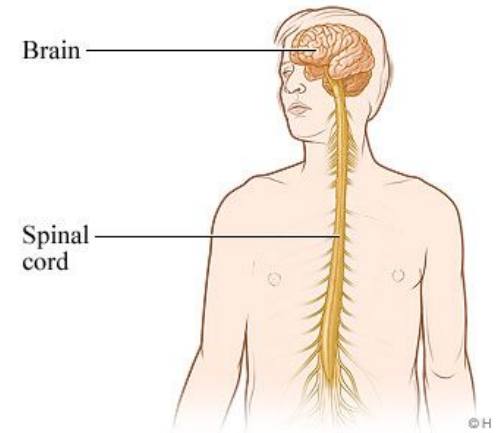
<https://eyexan.com/ocular-herpes-causes-symptoms-treatment-virus-eye-infection/>

Skin or mucosa:
Herpetic whitlow



https://en.wikipedia.org/wiki/Herpetic_whitlow#/media/File:Herpetic_whitlow_in_young_child.jpg

CNS: Encephalitis



<https://www.webmd.com/brain/central-nervous-system>

Fact or Fiction?

“ You will not transmit HSV to a sexual partner if you are not exhibiting symptoms ”

FICTION

HSV-1: Transmission

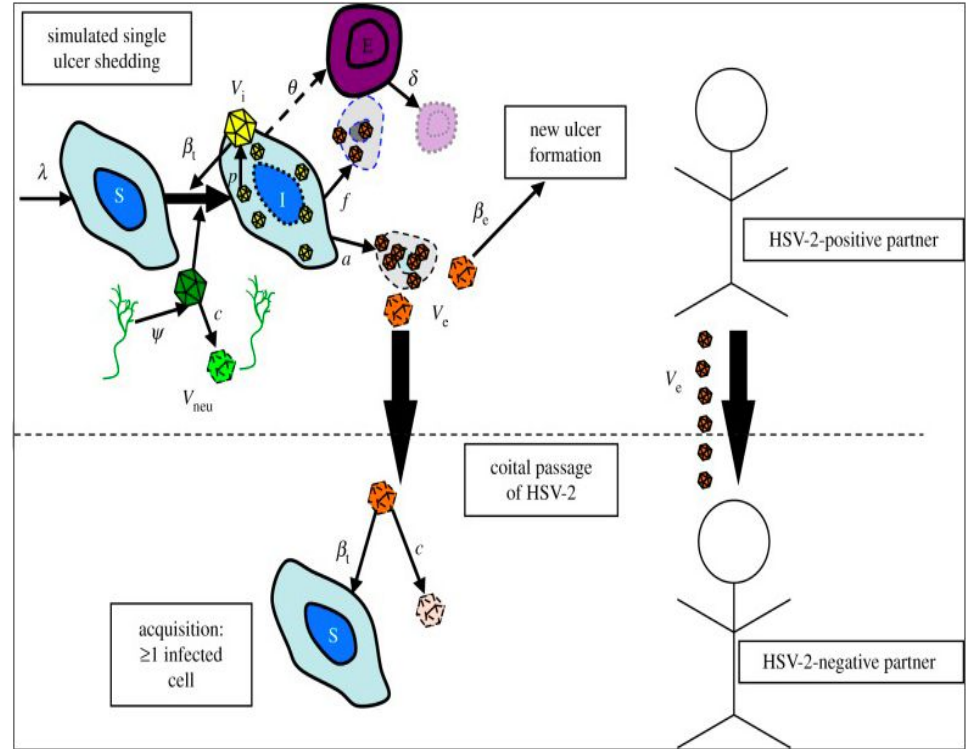
- Contact with mucosal surfaces/abraded skin on lips, mouth, skin above waist, or infected saliva (**shedding**)
- Close nonsexual contact
- Nectin-1 & HVEM (cell surface receptors) interacting with viral glycoproteins
- Invades epithelium via basal membrane



<https://www.britannica.com/science/herpes-simplex>

HSV-2: Transmission

- **Shedding** of a lesion in the genitals onto a mucosal surface during sex
- Most often during **asymptomatic reactivation**
- Increased viral load + >3mm lesion = high transmission





JUST HERPES.com

HERPES VIRAL SHEDDING RATES



VIRAL SHEDDING OCCURS ABOUT 20% OF THE TIME.

MORE SHEDDING IF:

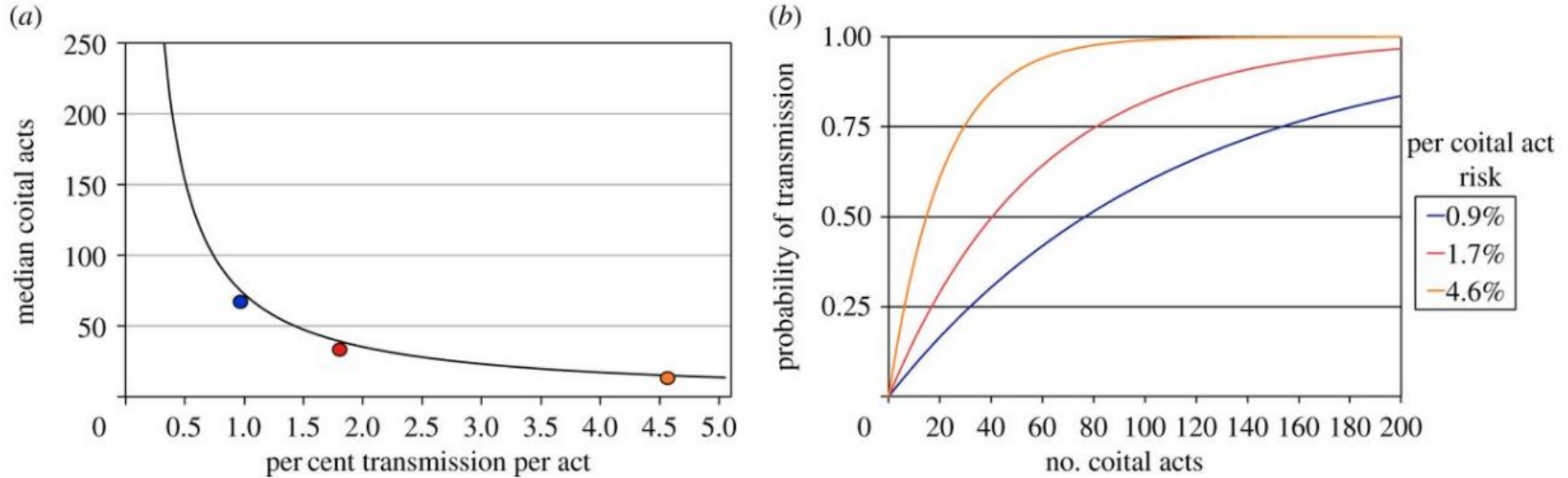
- Asymptomatic shedding is higher within the **first three months** of a first outbreak.
- Asymptomatic Shedding is higher in genital herpes cases caused by HSV-2 than those caused by HSV-1.
- For **seven days** after an outbreak has cleared up, there is a higher likelihood of asymptomatic shedding.
- In people who have had outbreaks before, there is more shedding.

LESS SHEDDING IF:

- The rate of shedding **decreases** after the first year of infection.
- Daily antivirals are shown to reduce shedding by more than 90%.

Read the data and research at: justherpes.com/facts/herpes-viral-shedding

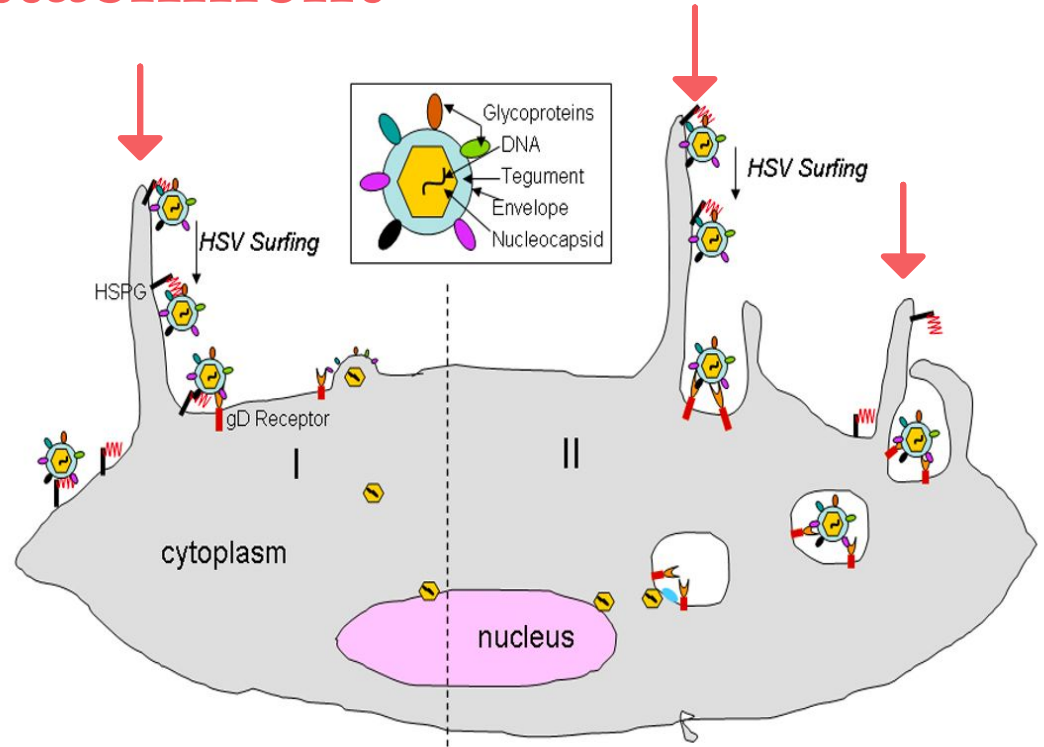
HSV-2: Transmission



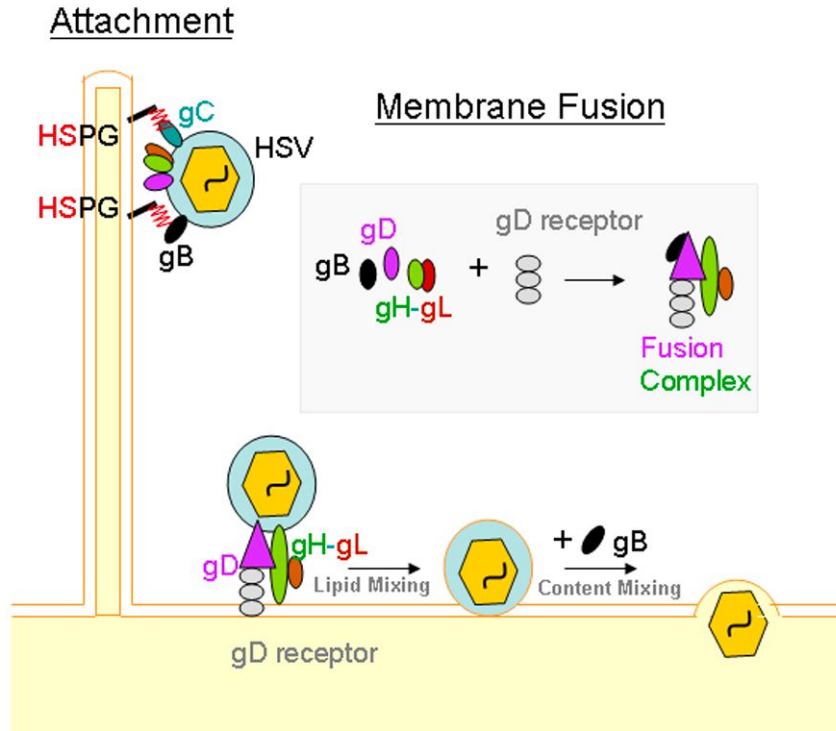
A median of 3.5 sexual acts can result in transmission

HSV-1 & HSV-2: Attachment

1. Fusion of the viral envelope to the plasma membrane
 2. Endocytic pathway using phagocytosis
- Attachment via filopodia membrane protrusions to heparan sulphate proteoglycans (HSPG)
 - **HSV SURFING**



HSV-1 & HSV-2: Entry



- Binding of glycoprotein-D to Nectin-1 (HSV-1 & 2) and Nectin-2 (HSV-2)
 - Conformational change
- **Multi-glycoprotein complex**
- Cellular membranes fuse
 - Lipid mixing
- Viral nucleocapsid and tegument proteins released into host 's cytoplasm

HSV-1 & HSV-2: Post Entry

Nucleocapsids & motor dyenin

- Nucleocapsids dissociate from tegument proteins to bind to microtubule dependent motor dyenins
- Propels virus towards nuclear membrane

Nuclear Membrane

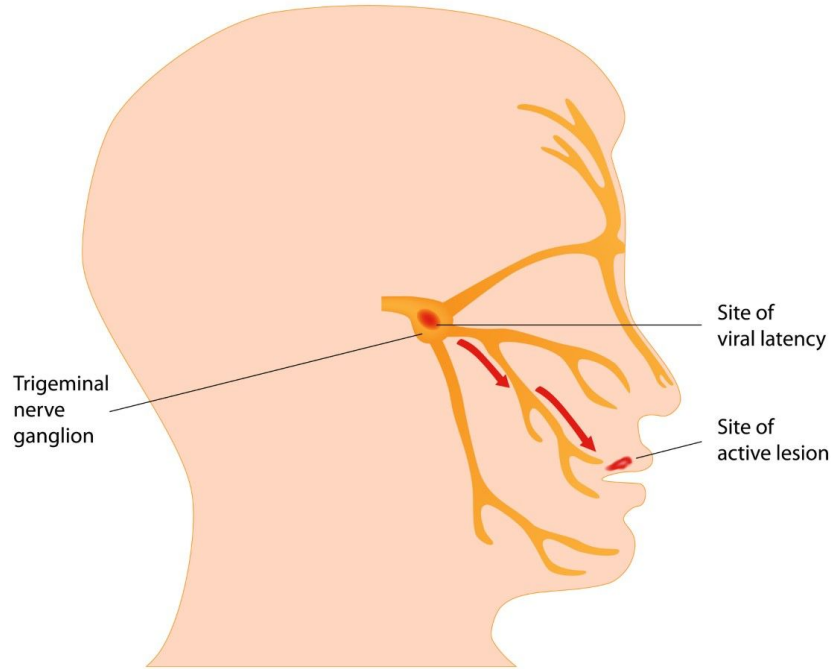
- Virus is uncoated and viral DNA is released into nucleus

Nucleus

- Once internalized, transcription occurs to infect other cells

HSV-1: Neural cells affected

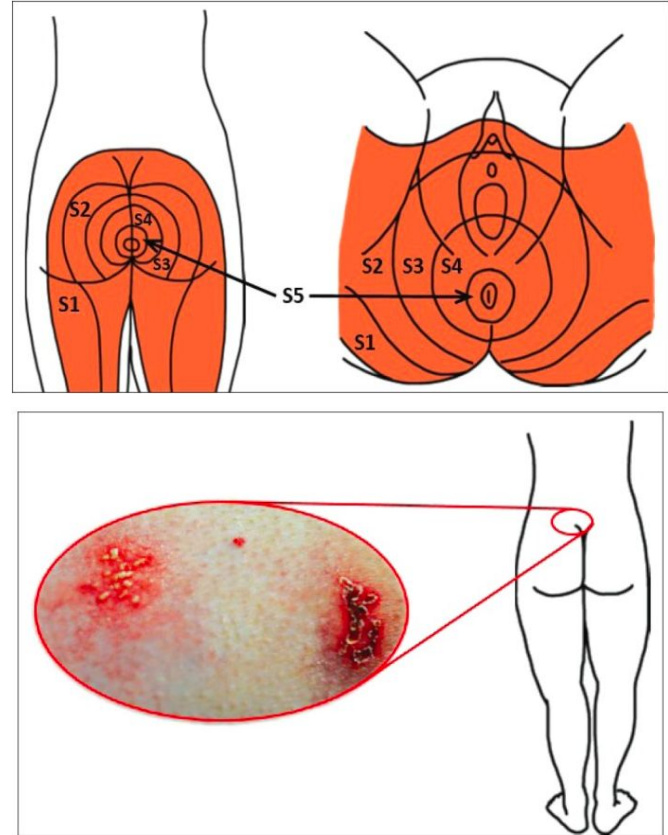
Herpesvirus (type 1) Infection



- **Latent period:** Travels to trigeminal ganglia and sensory neurons
 - A5 and KH10 receptors
- **Reactivation:** increased expression of lytic cycle genes
 - Physical/emotional stress
 - Tissue damage
 - Fever

HSV-2: Neural cells affected

- **Latent period:** lumbosacral dorsal root ganglia
 - Symptoms below the waist and predominantly in the genital area
- Virus binds to KH10 receptors on these neurons
 - **Alters gene expression**
- **Affected genes:** Gprc1g, Gabbr1, Kcnab2, and Kcnc1



HSV-1 & HSV-2: Crossover

- HSV-1 can cause genital herpes and HSV-2 can cause oral herpes
 - Oral sex
- Process of **shedding of lesions**
- HSV-1 binds to A5 and KH10 receptors
- HSV-2 binds to KH10
 - Located in **both** trigeminal ganglia and lumbosacral dorsal root ganglia



...scary eh?

Fact or Fiction?

“

It is possible to live with HSV infection throughout one's lifetime with proper treatment/management

”



Treatments for HSV

- Currently incurable
- HSV vaccine research is ongoing
- Current methods focus on:
 - Prevention
 - Reduction of discomfort
 - Increasing healing process during outbreak



http://www.slate.com/articles/health_and_science/medical_examiner/2016/09/the_zika_vaccine_could_convince_anti_vaxxers_of_vaccines_necessity.html

Treatment for Genital Herpes

- Medications
 - Acyclovir
 - Valacyclovir (Valtrex)
 - Famciclovir (Famvir)
- Genital Herpes can reoccur
- Two treatment strategies
 - Episodic Treatment
 - Suppressive Therapy



<http://nursingcrib.com/drug-study/acyclovir-drug-study/>



<https://www.dokteronline.com/en/famvir-famciclovir>



<http://hsvtype1.com/valacyclovir-hcl.html>

Genital Herpes

Episodic Treatment

- Immediately after onset
- Reduces severity and duration of lesion pain
- Does not reduce risk of HSV transmission
- Only effective when taken within one day of lesion onset

Suppressive Therapy

- Daily
- Reduces the recurrence rate by 70%-80%
- Decreases risk of transmission

**Increased quality of life for patients receiving
Suppressive Therapy over Episodic Treatment**



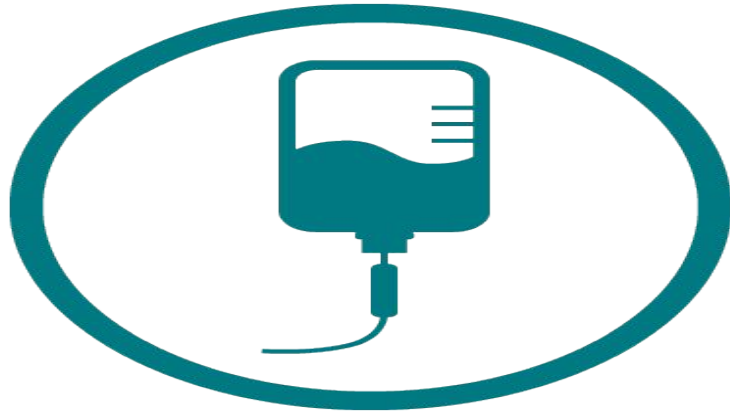
Management of Genital Herpes

- Drink more fluids to dilute the acid in the urine to reduce burning sensation during urination
 - Don't drink cranberry juice (acidic)
- Keep blisters dry and clean



Treatments for Oral Herpes

- Topical anesthetics to relieve pain
 - Lidocaine (Dilocaine, Nervocaine, Xylocaine, Zilactin-L)
- Oral or IV medication
 - Only for those with weakened immune systems (e.g. infants younger than 6 weeks old, people with severe diseases, etc.)



Preventative Measures



(American Academy of Dermatology, 2018)

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