

# Viral Skin Infections

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**MSS Module**

# Objectives

- To be familiar with the common types of viral skin infections.
- To differentiate between the various types.
- To know a basic approach towards each of these disorders.

# Terminology

- **Macule**: Flat, nonpalpable lesions usually <10 mm in diameter.
- **Patch**: A large macule.
- **Papule**: Elevated lesions usually <10 mm in diameter that can be palpated .
- **Plaque**: Palpable lesions >10 mm in diameter that are elevated or depressed compared to the skin surface.
- **Vesicle**: Clear, fluid-filled blisters <10 mm in diameter
- **Bulla**: Clear fluid-filled blisters > 10 mm in diameter.
- **Pustule**: Pus filled blisters <10 mm in diameter.
- **Reticulated**: Networked pattern

# Viral skin infections

## Localized

- Herpes simplex (cold sores and genital herpes)
- Herpes zoster (shingles)
- Molluscum contagiosum
- Viral warts (genital warts or condylomas and squamous cell papillomas)

## Childhood viral infections cause widespread rashes (exanthems)

- Measles ( Other names include **morbilli**, rubeola, red measles, and English measles).
- German measles (rubella)
- Chickenpox (varicella)
- Erythema infectiosum (parvovirus)
- Roseola (due to herpes virus 6 and 7)

# Herpes Simplex Virus (HSV)

## HSV-1 and HSV-2:

- Human is the natural host for both of them.
- They are distinguished by two main criteria:
  - a. Antigenicity.
  - b. Location of lesions.
    - HSV-1 lesions are above the waist
    - HSV-2 lesions are below the waist.

## Diseases

- HSV-1: acute gingivostomatitis, recurrent herpes labialis (cold sores), keratoconjunctivitis (keratitis), herpetic whitlow and encephalitis.
- HSV-2: herpes genitals (genital herpes), neonatal herpes, and aseptic meningitis.

# Herpes Simplex Virus (HSV)

## *Transmission*

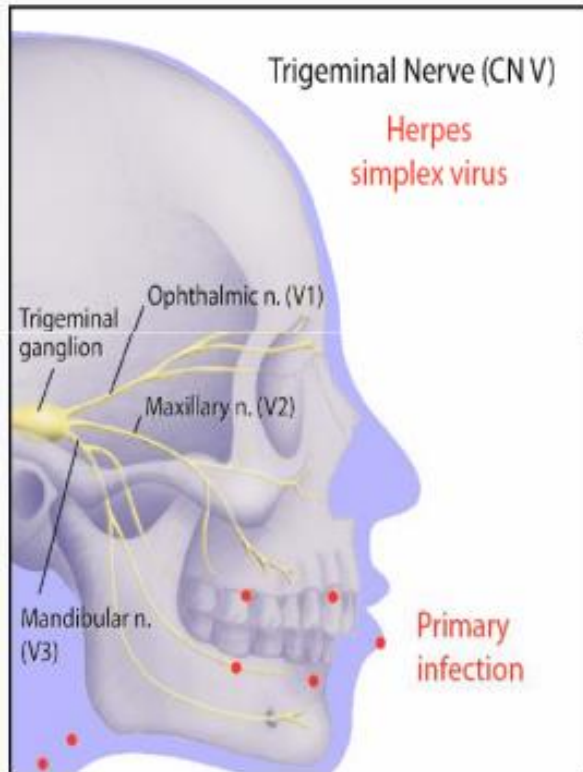
- **HSV1:** Saliva or direct contact with virus from the vesicle.
- **HSV2:** Sexual contact in adults and during passage through the birth canal in neonates.

## *Pathogenesis*

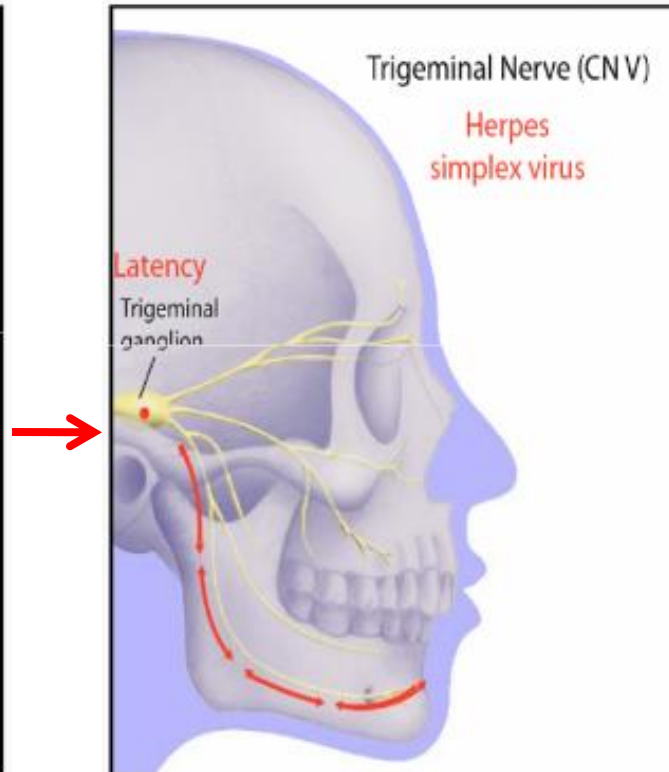
- Initial vesicular lesions occur in the mouth or on the face.
- For HSV1: the virus then travels up the axon and becomes latent in sensory (trigeminal) ganglia.
- For HSV2 (the genital area): latent in sensory (lumbar or sacral) ganglion cells.
- Dissemination to internal organs occurs in patients with depressed cell-mediated immunity with life-threatening consequences

# Pathogenesis

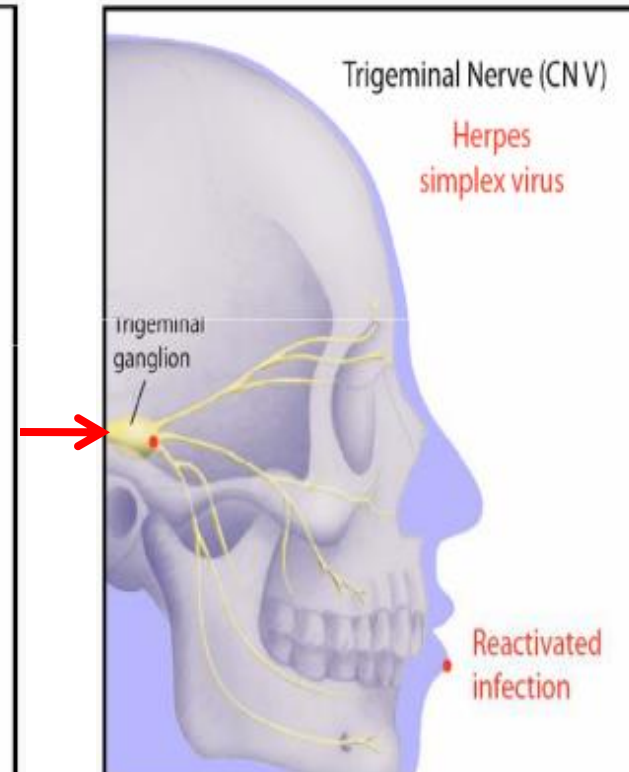
## Primary infection



## Latent infection



## Reactivation



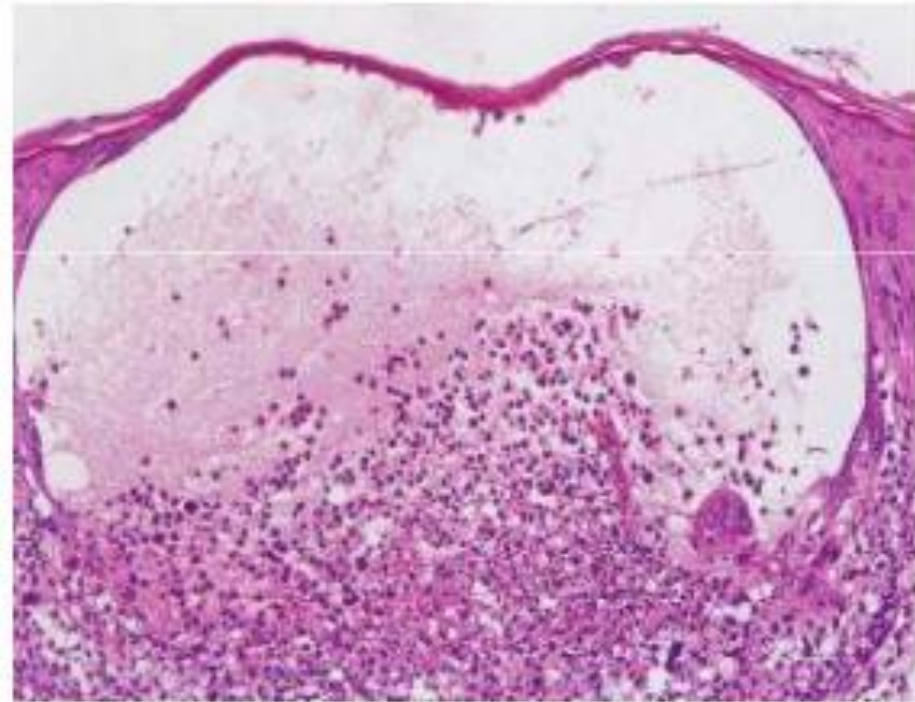
**Reactivation**

Cold  
fever  
Surgery  
Stress  
Trauma  
unknown



# HSV-1 & HSV-2/ Pathogenesis

Intraepidermal vesicle produced by profound degeneration (Ballooning) of epidermal cells → marked acantholysis.



**Acantholysis:** loss of coherence between epidermal cells due to the breakdown of intercellular bridges.



# Herpes Simplex Virus (HSV)

## *Laboratory Diagnosis:*

- Cytopathic effect (CPE) in cell culture, identified by antibody neutralization or fluorescent antibody test.
- Tzanck smear of cells from the base of the vesicle reveals multinucleated giant cells with intra-nuclear inclusions.
- A rise in antibody titer can be used to diagnose a primary infection but not recurrences.
- HSV encephalitis can be diagnosed using a PCR assay to detect HSV-1 DNA in spinal fluid.



**Herpes labialis**



**Herpes of the mucous membrane**

# Herpes Simplex Virus (HSV)

## *Treatment and Prevention:*

- Protection from exposure to vesicular lesions.
- Recurrences can be prevented by avoiding the specific inciting agent.
- Acyclovir can reduce recurrences.
- Neonatal infection can be prevented by cesarean section.
- No vaccine is available.

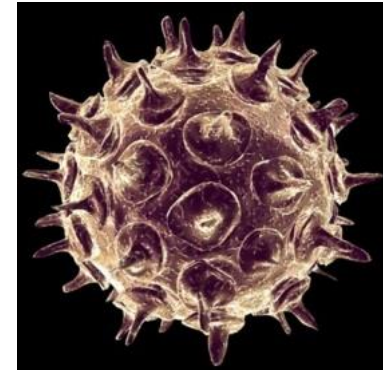
# Varicella-Zoster Virus

## *Diseases:*

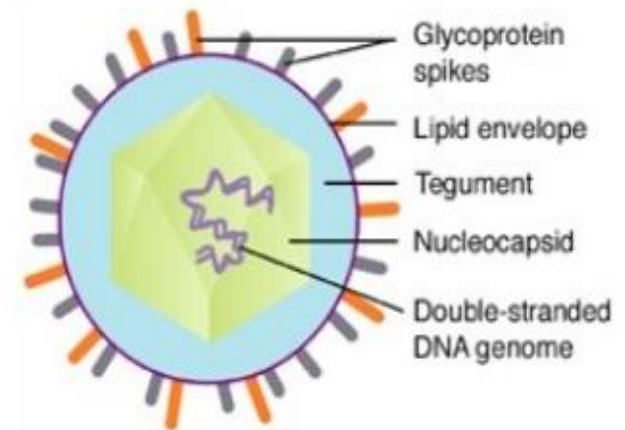
- Varicella (chickenpox) in children
- Zoster (shingles) in adults.

## *Characteristics:*

- Enveloped virus with icosahedral nucleocapsid and linear double-stranded DNA.
- One serotype.



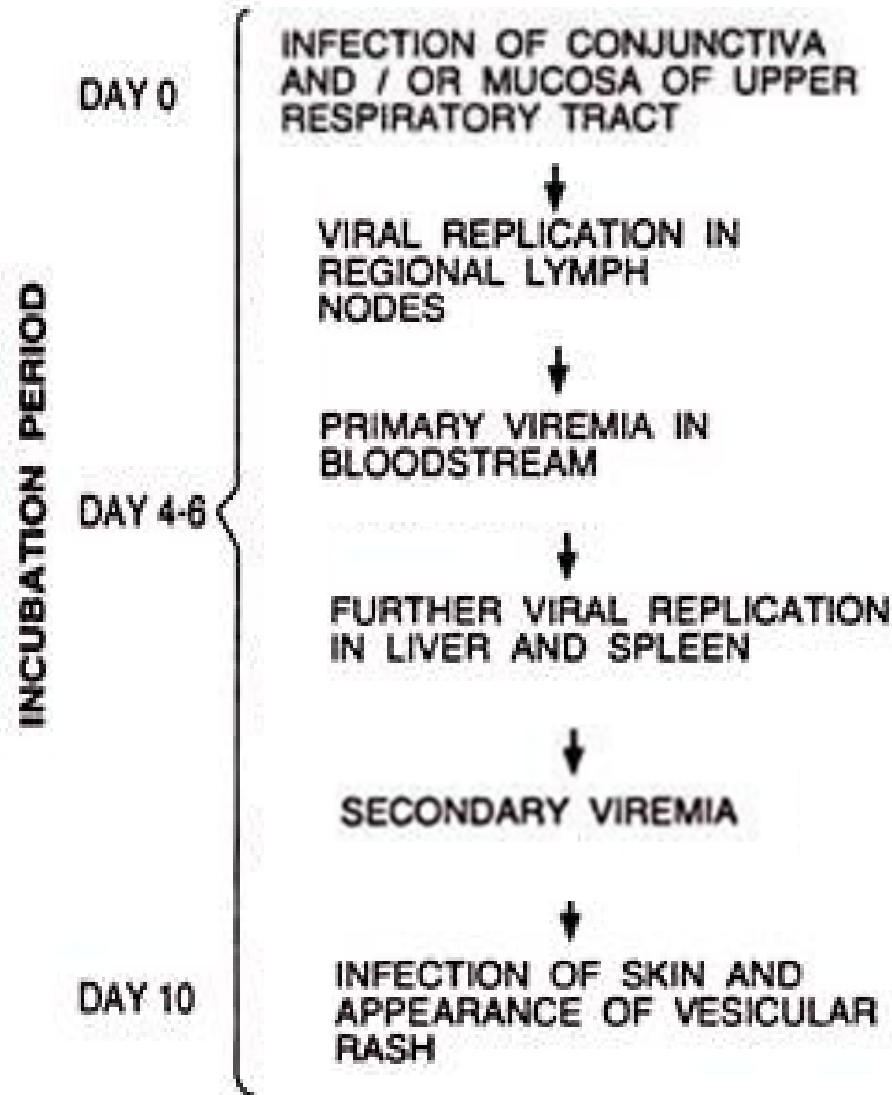
## Varicella zoster virus



# Pathogenesis of **Varicella** (chickenpox)

## Transmission

Varicella → respiratory droplets.



# Manifestations

## Varicella (Chickenpox)

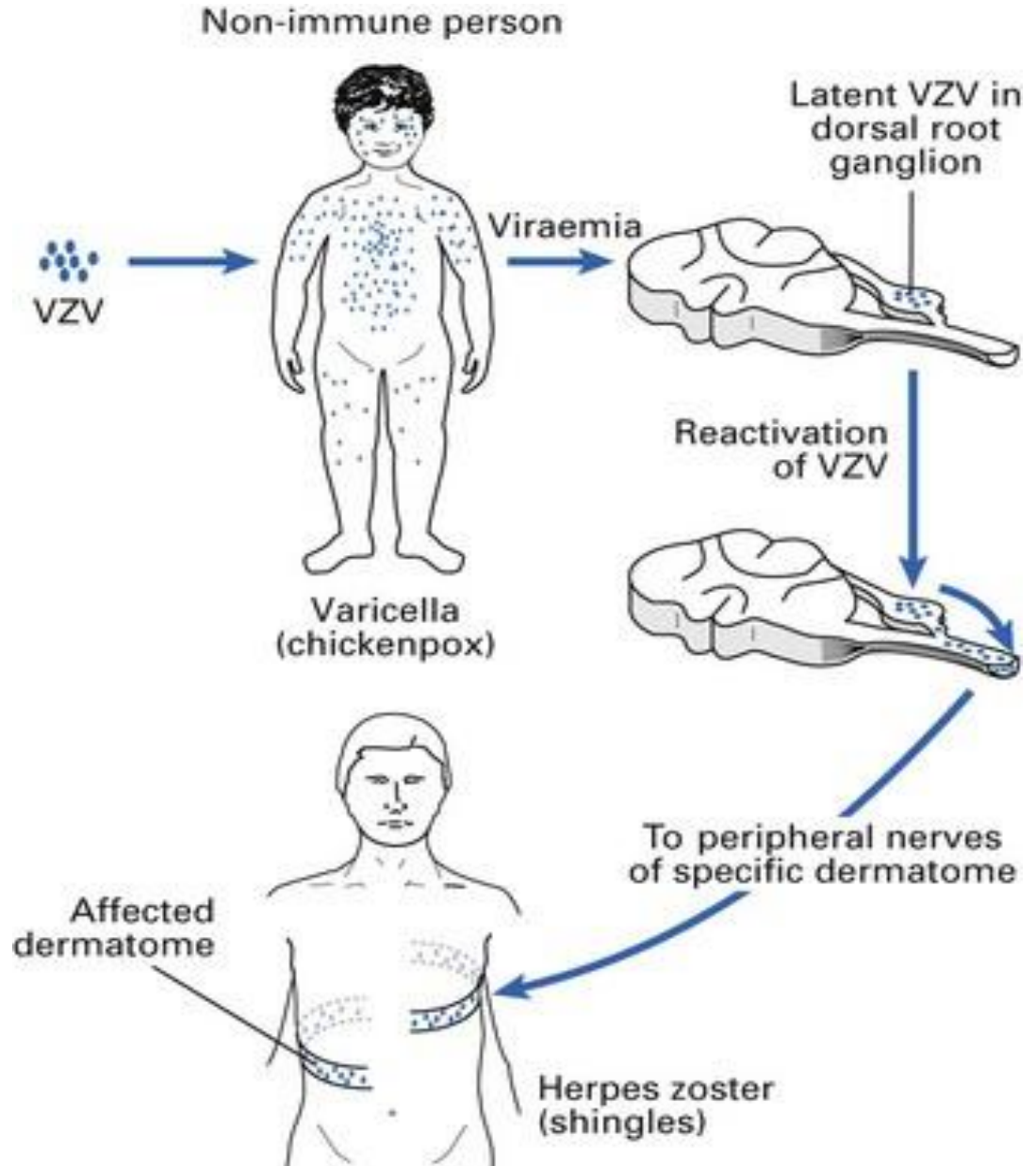
- Lesions generally appear on the back of the head and ears, and then spread centrifugally to the face, neck, trunk, and proximal extremities.
- Involvement of mucous membranes is common.
- Fever may occur early in the course of disease.
- Skin lesions form rapidly as fluid-filled vesicles that are itchy.
- Immunocompromised children may develop progressive varicella, visceral dissemination as well as pneumonia, encephalitis, hepatitis, and nephritis (mortality rate of 20%).
- After the acute episode of varicella, the virus remains latent in the sensory ganglia and can reactivate to cause zoster years later, especially in older and immunocompromised individuals.



# Pathogenesis of Zoster



Shingles





# Manifestations

## Herpes Zoster (Shingles)

- **Reactivation** of **VZV** is associated with **shingles**.
- **Shingles** greatly increases **with** advancing **age**.
- Clinically, pain in a sensory nerve distribution may sign the onset of the eruption, which occurs several days to 1 or 2 weeks later.
- The **vesicular eruption** is usually **unilateral**, involving **one** to **three dermatomes**.
- **Immunosuppressed** patients may develop **localized zoster** followed by **dissemination of** virus with **visceral infection**, **bacterial superinfection** is also possible.

# Varicella-Zoster Virus

## Diagnosis

- Diagnosis usually on clinical symptoms
- A four-fold or greater rise in antibody titer in convalescent-phase serum is diagnostic.
- Rapid confirmation by immunofluorescent staining or PCR

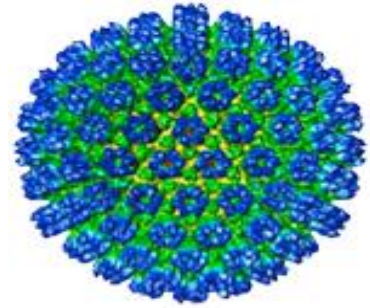
## Treatment

- VZV is less susceptible than HSV to acyclovir, so the dosage for treatment is substantially higher.
- Famciclovir or valacyclovir are more convenient and may be more effective.

## • Prevention

High-titer immune globulin (VariZig) administered within 96 hours of exposure is useful in preventing infection or ameliorating disease in patients at risk for severe primary infection.

# Human Herpes virus 8



- Causes Kaposi's sarcoma, especially in AIDS patients.
- Purple color of lesions due to collections of venous blood.
- Transmitted sexually.
- Diagnosis made by pathologic examination of lesion biopsy.
- No specific antiviral treatment and no vaccine.



Kaposi's sarcoma

# Smallpox Virus

## Disease:

Smallpox

One serologic type.

## Transmission:

Respiratory droplets or direct contact

## Pathogenesis:

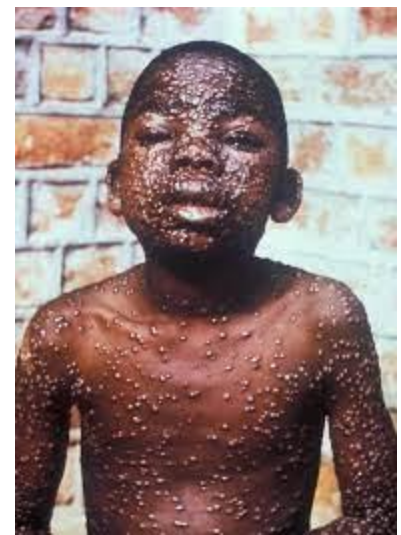
- The virus infects the mucosal cells of the URT → the local lymph nodes → viremia → the liver and spleen → later the skin.
- Skin lesions: macule, papule, vesicle, pustule, crust.

## Laboratory Diagnosis:

- CPE in cell culture, Electron microscopy, Viral antigens in the vesicle fluid by precipitin tests.

**Treatment:** None.

**Prevention:** vaccine contains live, attenuated vaccinia virus.



# Molluscum Contagiosum Virus

- Causes:
  - pinkish, papular skin lesions with an umbilicated center.
  - Lesions usually on the face, especially around the eyes.
- Transmitted by direct contact.
- Diagnosis made clinically.
- There is **no** antiviral **therapy** and **no vaccine**.
- Cidofovir may be useful in the treatment of the extensive lesions that occur in immunocompromised patients.



# Parvovirus B19

**Causes Fifth Disease** or erythema infectiosum.

- Fifth disease: known for a rash that makes a child's cheeks bright red "slapped cheek rash".
- Affect kids ages 5 to 15.
- A few days later, the rash spreads down to the trunk, arms, and legs. It usually lasts 1 to 3 weeks.
- The rash can be itchy. After a few days, it takes on a lacy net-like look



## What Are the Signs & Symptoms of Fifth Disease?

- Usually asymptomatic
- Low fever
- headache
- a stuffy or runny nose
- Then rash appears
- **In older kids and adults**, fifth disease might not cause the red cheek rash, but can cause joint swelling and pain that can last from weeks to months and, very rarely, years. But in time, it usually goes away without any lasting problems.





# Parvovirus B19

## What Causes Fifth Disease?

- Caused by **parvovirus B19**.
- The virus spreads in droplets.
- It is most contagious before the rash appears.
- The patient is not infectious after appearing the rash.

## How Is Fifth Disease Diagnosed?

- Clinically.
- PCR, Serologic tests (by ELISA for IgM) if the someone doesn't have the rash but does have other symptoms.

## How Is Fifth Disease Treated?

- In most cases, it is a mild illness that clears up on its own, so no medicine is needed.

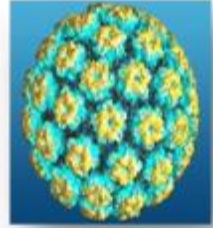


# Human herpes viruses 6 and 7

Cause a benign disease of young children between 6 months and 2 years old called **exanthem subitum (roseola)**, which is characterized by a rapid onset fever and an immune-mediated generalized rash.



# Human Papillomavirus (HPV)



## *Diseases:*

- Papillomas (cutaneous warts); condylomata acuminata (genital warts); associated with carcinoma of the cervix and penis.
- There are at least 60 types

## *Transmission:*

Direct contact of skin or genital lesions.



# Human Papillomavirus

## Pathogenesis:

- Two early viral genes, E6 and E7, encode proteins that inhibit the activity of proteins encoded by tumor suppressor genes (p53 gene and the retinoblastoma gene, respectively).

## Laboratory Diagnosis:

- Diagnosis is made clinically
- DNA hybridization tests are available

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Human papillomavirus as an independent risk factor of invasive cervical and endometrial carcinomas in Jordan

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# Measles Virus (rubeola)

## Transmission:

- Airborne transmission

## Pathogenesis:

Upper respiratory tract → local lymph nodes → blood → to other organs, including the skin.

## Disease:

**Measles** : maculopapular rash , Koplik spots on buccal mucosa.

## Complications including

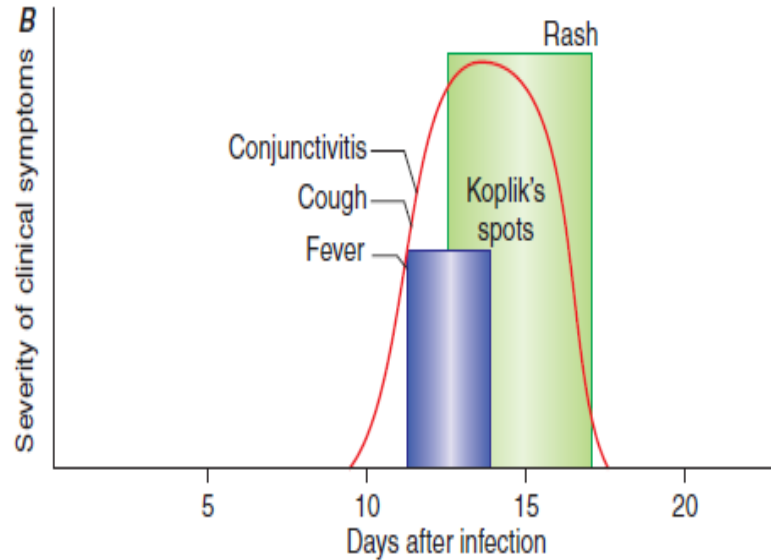
- post-infectious encephalitis
- giant cell pneumonia
- Subacute sclerosing panencephalitis (SSPE)





# Pathogenesis

- The incubation period for measles is ~10 days to fever onset and 14 days to rash onset. It is up to 3 weeks in adults.



**B:** Appearance of clinical signs and symptoms, including Koplik's spots and rash.

## Sings and symptoms:

- Malaise
- **C**ough, **C**oryza, and **C**onjunctivitis -the three "C"s -.
- A pathognomonic enanthema (Koplik spots) followed by a maculopapular rash.



# Measles Virus (rubeola)

## ***Laboratory Diagnosis:***

- Clinical diagnosis.
- Serologic tests and PCR assay is available if necessarily

***Treatment:*** No antiviral therapy.

***Prevention:*** live, attenuated vaccine.

# German Measles (Rubella Virus)

**Characteristics:** Enveloped virus, icosahedral nucleocapsid and one piece of single-stranded positive-polarity RNA. It has a single serotype.

**Transmission:** Respiratory and trans-placental

**Pathogenesis:** nasopharynx → to local lymph nodes → blood → skin.

During maternal infection, infection during the first trimester → congenital malformations .

**Laboratory Diagnosis:** PCR assay, IgM, IgG antibody

**Treatment:** No antiviral therapy.

**Prevention:** live, attenuated Vaccine.

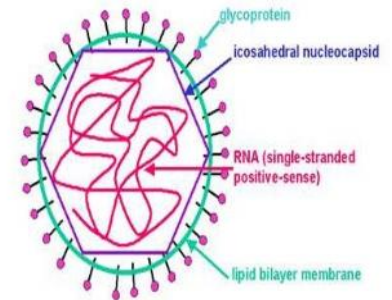
# German Measles (Rubella Virus)



## *Disease:*

Rubella: subclinical or symptomatic.

- Symptoms include a 3- to 5-day rash and swollen neck and sub-occipital lymph nodes.
- More severe disease in adults, complicated by arthralgia, arthritis, and a post-infectious encephalitis
- Congenital rubella syndrome is characterized by congenital malformations, especially affecting the cardiovascular and CNS, and by prolonged virus excretion.



# Viral infections of the skin



**Measles**



**Maculopapular  
rash, does not  
involve palm  
and sole**

## Rubella (German measles)



- Erythematous papular rash begins on face then spreads to trunk

**Congenital infection is highly pathologic  
(major birth defects and death)**

# Viral infections of the skin



**Chicken  
Pox**

**Macules to  
Papules,  
Vesicles  
to Crust**



# Viral infections of the skin



**Erythema  
Infectiosum  
or fifth  
disease**

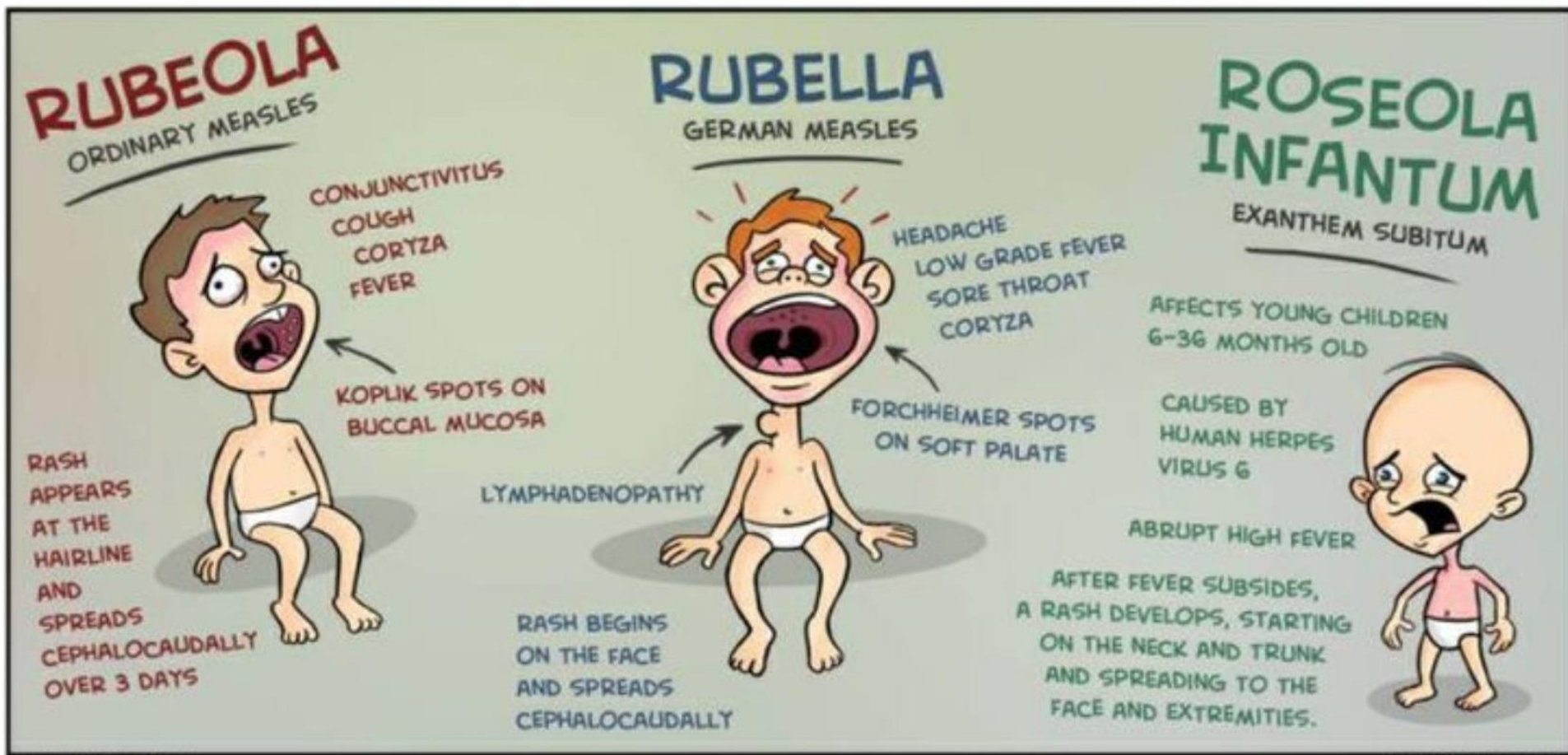
**Slapped Cheek  
Syndrome**



**Hand-foot-Mouth Disease**



# Rubeola vs. Rubella vs. Roseola Infantum



## Viral Infections of the Skin and Eyes

Disease	Pathogen	Signs and Symptoms	Transmission	Antimicrobial Drugs
Fifth disease	Parvovirus B19	May have initial cold-like symptoms; "slapped cheek" rash	Highly contagious via respiratory secretions of infected individuals	None
Herpes keratitis	Herpes simplex virus 1 (HSV-1)	Inflammation of conjunctiva and cornea; irritation, excess tears, sensitivity to light; lesions in cornea leading to blindness	Direct eye contact with discharge from herpes lesions elsewhere in the body or from another infected individual	Acyclovir, ganciclovir, famciclovir, valacyclovir
Oral herpes	Herpes simplex virus 1 (HSV-1)	May cause initial systemic symptoms; cold sores	Highly contagious via direct contact with infected individuals	Acyclovir, penciclovir, famciclovir, valacyclovir
Papillomas	Human papillomavirus (HPV)	Common warts, plantar warts, flat warts, filiform warts, and others	Contact with infected individuals	Topical salicylic acid, cantharidin
Roseola (roseola infantum, exanthem subitum)	Human herpesvirus 6 (HHV-6), human herpesvirus 7 (HHV-7)	Initial cold-like symptoms with high fever, followed by a macular or papular rash three to five days later	Spread by viral and respiratory secretions of infected individuals	Typically none; ganciclovir for immunocompromised patients
Viral conjunctivitis	Adenoviruses and others	Inflammation of the conjunctiva; watery, nonpurulent discharge	Associated with common cold; contagious via contact with eye discharge	None

# Viral infections of the skin

Infection	Organism causing the infection	Characteristics of the infection
<b>Viral</b>		
Rubella	Rubella virus	Mild red rash on the face, trunk, and limbs. Dangerous in pregnancy
Measles	Rubeola virus	Severe infection with fever, conjunctivitis, cough, and rash
Chickenpox	Varicella-zoster virus	Generalized itchy rash that develops into vesicles
Shingles	Varicella-zoster virus	Pain and skin lesions usually on the trunk
Smallpox	Smallpox virus	Raised, fluid-filled bumps that are dimpled in the middle
Warts	Human papillomavirus	Small growths on the skin or mucous membranes