Viral Skin Infections

Date: 12/03/2025

Dr. Sulaiman Mahmoud Bani Abdel-Rahman

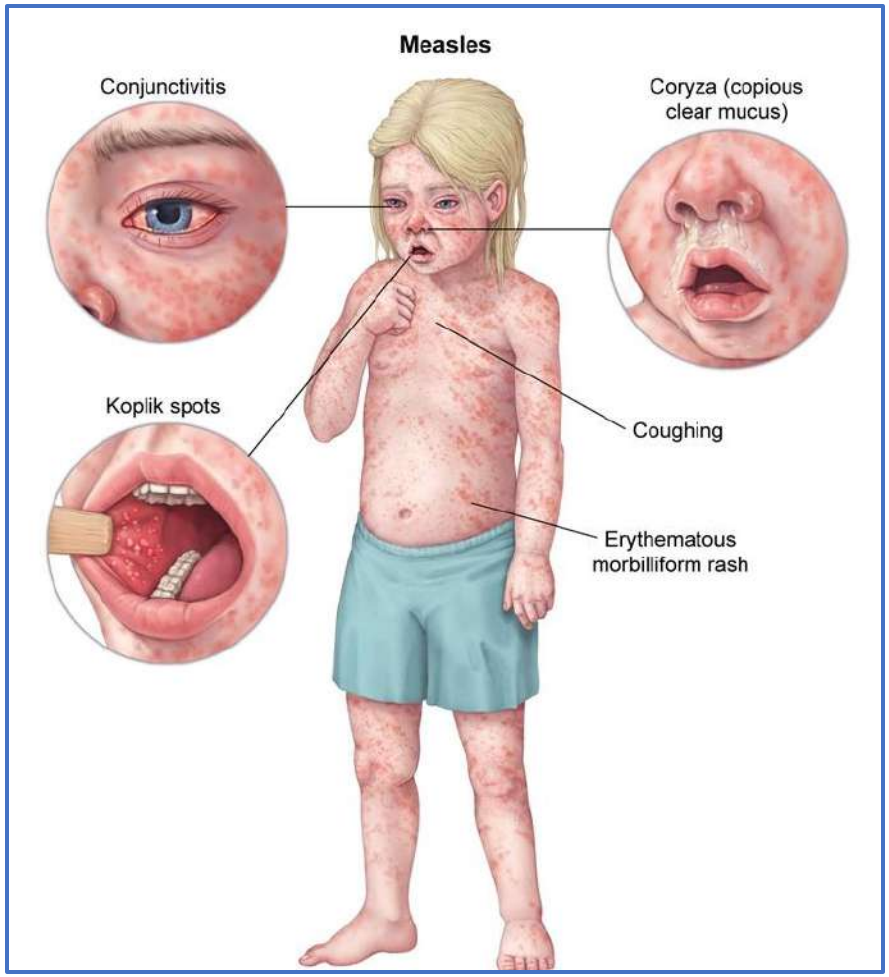
Bachelor degree in Medicine and Surgery - Mutah university

MSC Medical Microbiology – University of Manchester

PhD Medical Virology - University of Manchester

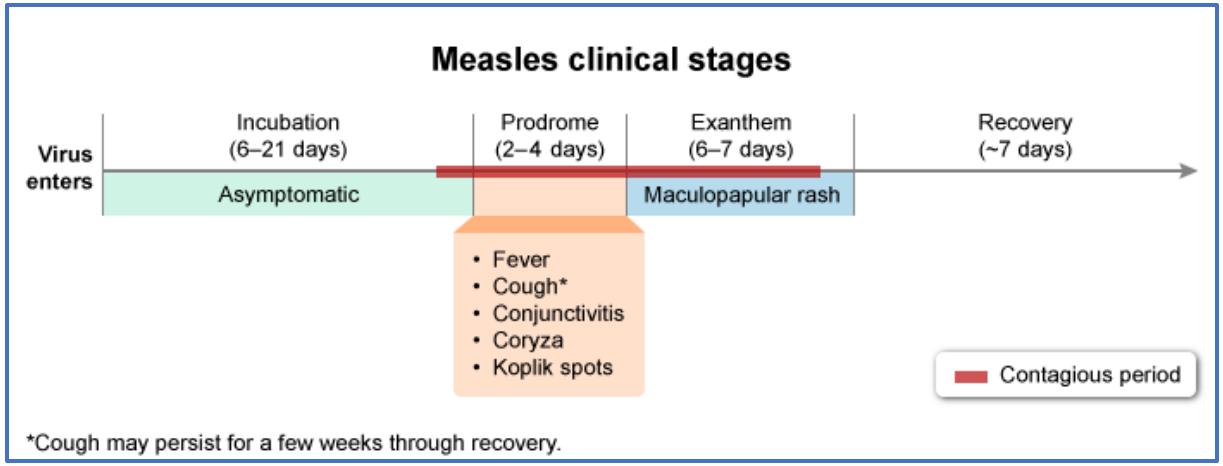
Measles مرض الحصبة

- Measles (rubeola) is a highly infectious disease caused by the measles virus.
- **Pathogen:**
  - measles virus (MV), an RNA virus of the *Morbillivirus* genus belonging to the *Paramyxoviridae* family
- **Route of transmission:**
  - Inhalation of airborne particles (<5 µm) or direct contact of the virus with a mucosal surface (eg, mouth, eyes).
- **Infectivity:**
  - Highly contagious 4-5 days before and up to 4-5 days after the onset of exanthem (The disease is most contagious prior to the onset of exanthem)
- **Incubation period:**
  - ~ 2 weeks after infection



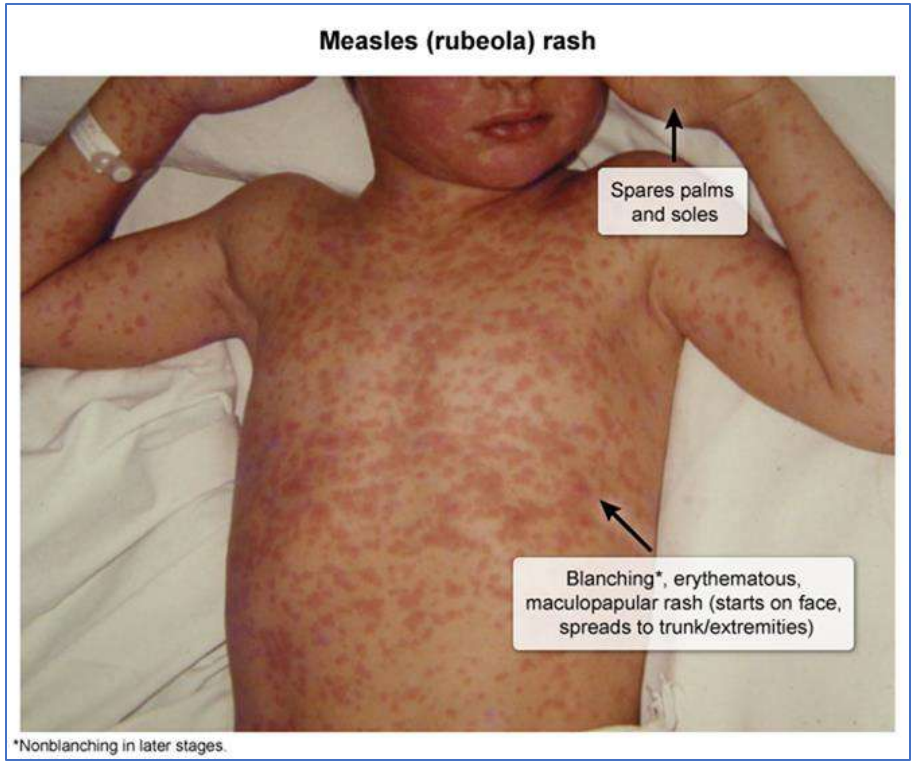
Measles – Clinical Stages

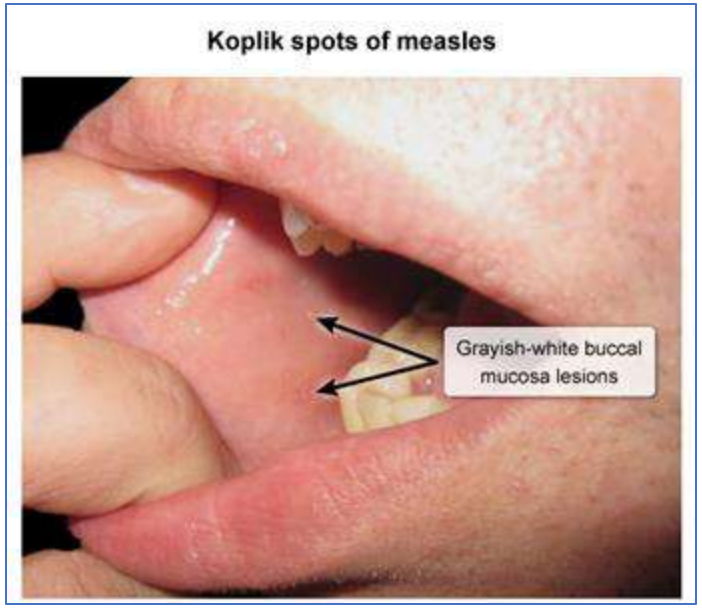
- There are three phases of disease: a prodromal stage, an exanthem stage, and a recovery stage.
- **The prodromal stage** is characterized by a high-grade fever with **c**onjunctivitis, **c**oryza, **c**ough, and pathognomonic Koplik spots on the buccal mucosa.
- **The exanthem stage** is characterized by an erythematous **maculopapular** rash that originates at the hairline and spreads from the face and neck to the rest of the body **(palms and soles are spared)**
- **Recovery stage:** Cough may persist for up to 10 days.
- Then Lifelong immunity

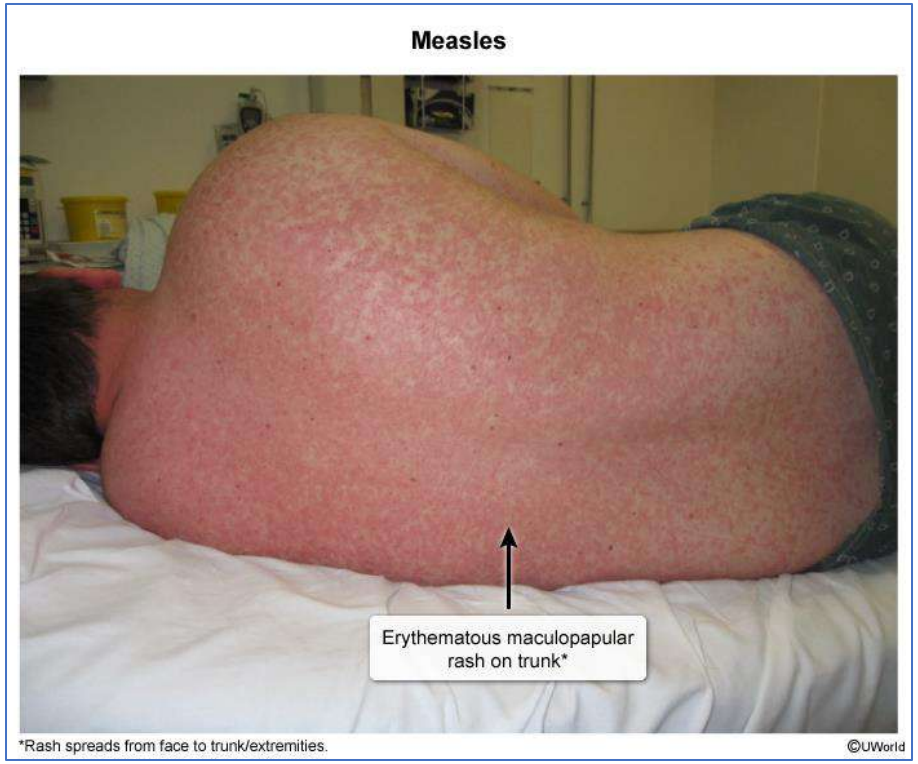


coryza = rhinitis (nasal inflammation with discharge)

Measles – Rash







Classically, measles presents with a **prodrome** of fever, cough, rhinorrhea, and conjunctivitis (conjunctival injection [hyperemia]). **Koplik spots** on the buccal mucosa are a **pathognomonic** finding and consist of small white, blue, or gray lesions on an erythematous base. These symptoms are followed by a **maculopapular exanthem** that starts on the face and spreads down the trunk and extremities.

Measles - Summary

Measles virus (rubeola)	

Clinical presentation	• Prodrome (eg, cough, coryza, conjunctivitis, fever, **Koplik spots**)
	• Maculopapular exanthem
	  • Cephalocaudal & centrifugal spread
	  • Spares palms & soles

Complications*	• Primary measles pneumonia
	• Secondary bacterial infections (pneumonia & otitis media)
	• Neurologic
	  • Encephalitis (within days)
	  • Acute disseminated encephalomyelitis (within weeks)
	  • Subacute sclerosing panencephalitis (within years)

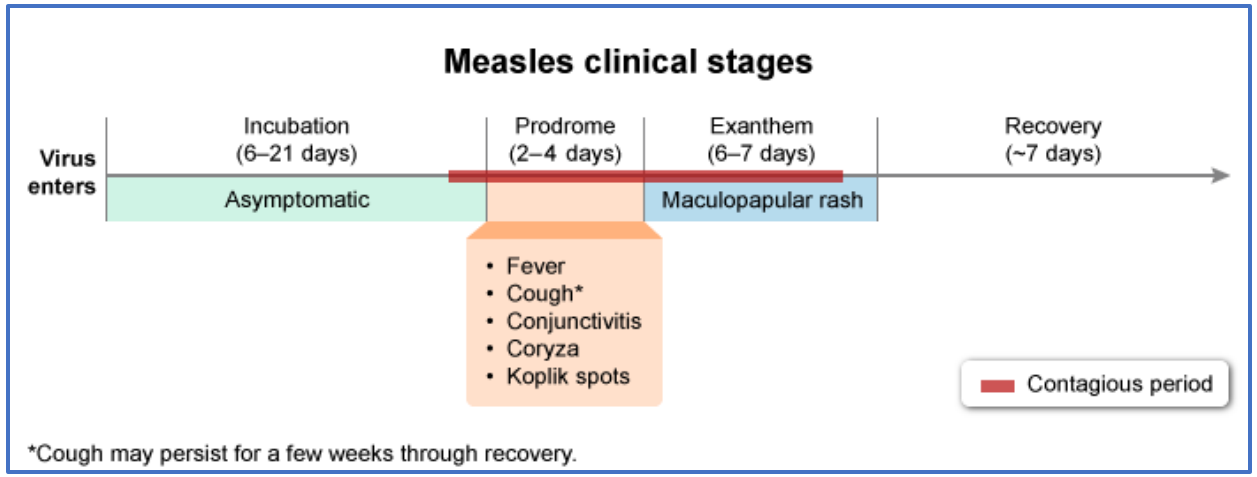
Diagnosis	Confirmatory results include any of the following:
	  • Positive RT-PCR or viral culture
	  • Positive measles-specific IgM antibodies
	  • A 4-fold increase in measles-specific IgG antibodies seen on two serum samples taken ~ 2 weeks apart, starting from symptom onset

Prevention	• Live attenuated measles vaccine (95% efficacy rate)
*Increased risk in those with vitamin A deficiency.	

Measles – **USMLE** question 1

A 4-year-old boy is brought to the office due to high fever, nasal discharge, and cough for 3 days. His family recently returned from a vacation in Mexico. Physical examination shows an ill-appearing, febrile child. The patient has bilateral conjunctival injection and several small white spots with an erythematous base on the buccal mucosa. Medical records show parental refusal of preventive health services. Over the next several days, which of the following is most likely to develop in this patient?

A. Jaundice
B. Maculopapular rash
C. Parotid swelling
D. Paroxysmal cough
E. Upper airway obstruction
F. Vesicular rash
G. Watery diarrhea



Measles – **USMLE** question 2

An unvaccinated 20-month-old girl is brought to the emergency department with a rash. Three days ago, she developed a fever along with cough, congestion, and red eyes. The rash appeared on her face yesterday and spread to her trunk, arms, and legs today. The patient's temperature is 39.4 C (103 F). She is lethargic and ill appearing. Physical examination shows conjunctival injection and a diffuse, maculopapular, erythematous rash. She is admitted to the hospital for further management. Deficiency of which of the following is associated with a high rate of complications from this patient's condition?

A. Vitamin A
B. Vitamin B6
C. Vitamin B12
D. Vitamin D
E. Vitamin E

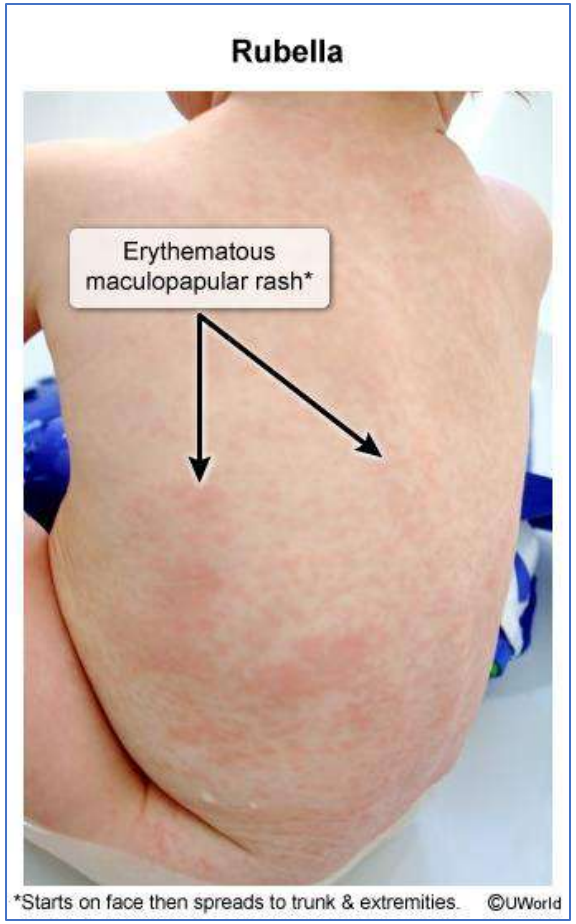
Measles – **USMLE** Questions IDs

USMLE®

- **Step 1:**
  - 910, 1045, 1670
- **Step 2:**
  - 2431, 2782, 3077

Rubella - الحصبة الألمانية

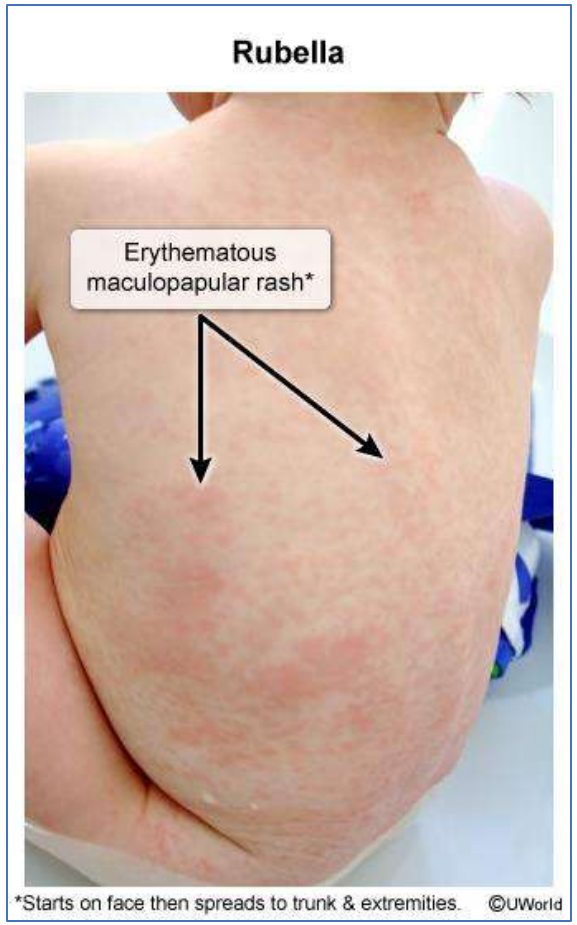
- Rubella (German measles) is an infectious disease caused by the rubella virus and transmitted via respiratory droplets or transplacentally
- **Pathogen:**
  - Rubella virus, an RNA virus of the family Matonaviridae. Enveloped, icosahedral, positive-sense single-stranded RNA virus
- **Transmission**
  - Respiratory droplets
  - Transplacental (vertical transmission)



Rubella – Clinical features

- The clinical course is mild, characterized by an erythematous maculopapular rash that typically starts on the face and progresses distally **sparing palms and soles**.
- The rash may be preceded by nonspecific flu-like symptoms and postauricular and/or suboccipital lymphadenopathy.
- Infectivity: 7 days prior to and 7 days following the appearance of an exanthem (Infants with congenital rubella are an exception and remain infectious until 12 months of age.)
- Incubation period: 2–3 weeks after infection

Rubella - Rash



Rubella

Rubella	

Clinical presentation	• **Congenital:**
	  • Sensorineural hearing loss
	  • Cataracts
	  • Patent ductus arteriosus
	• **Children:**
	  • Fever
	  • Cephalocaudal spread of maculopapular rash
	• **Adolescents/Adults:**
	  • Same as children + arthralgia/arthritis

Diagnosis	• Positive IgM antibodies • A 4-fold increase in IgG antibodies seen on two serum samples taken ~ 2 weeks apart, starting from the onset of symptoms • Positive RT-PCR or viral culture
Prevention	• Live attenuated rubella vaccine

Rubella – Congenital Rubella Syndrome (CRS)

Congenital rubella syndrome	
Pathogenesis	• Transplacental transmission
Classic features	• Growth restriction • Sensorineural hearing loss • Congenital heart disease (eg, patent ductus arteriosus) • Eye disease (eg, cataracts, glaucoma, retinopathy) • CNS abnormalities (eg, developmental delay)
Diagnosis	• Rubella IgM • PCR or viral culture
Prevention	• Maternal preconception immunization with live attenuated rubella vaccine
CNS = central nervous system; **PCR** = polymerase chain reaction.	

- **Classic Triad**
  - Sensorineural deafness
  - Congenital heart defects (PDA, pulmonary artery stenosis)
  - Cataracts/glaucoma

Rubella - fact sheet

Rubella
Third disease, German measles

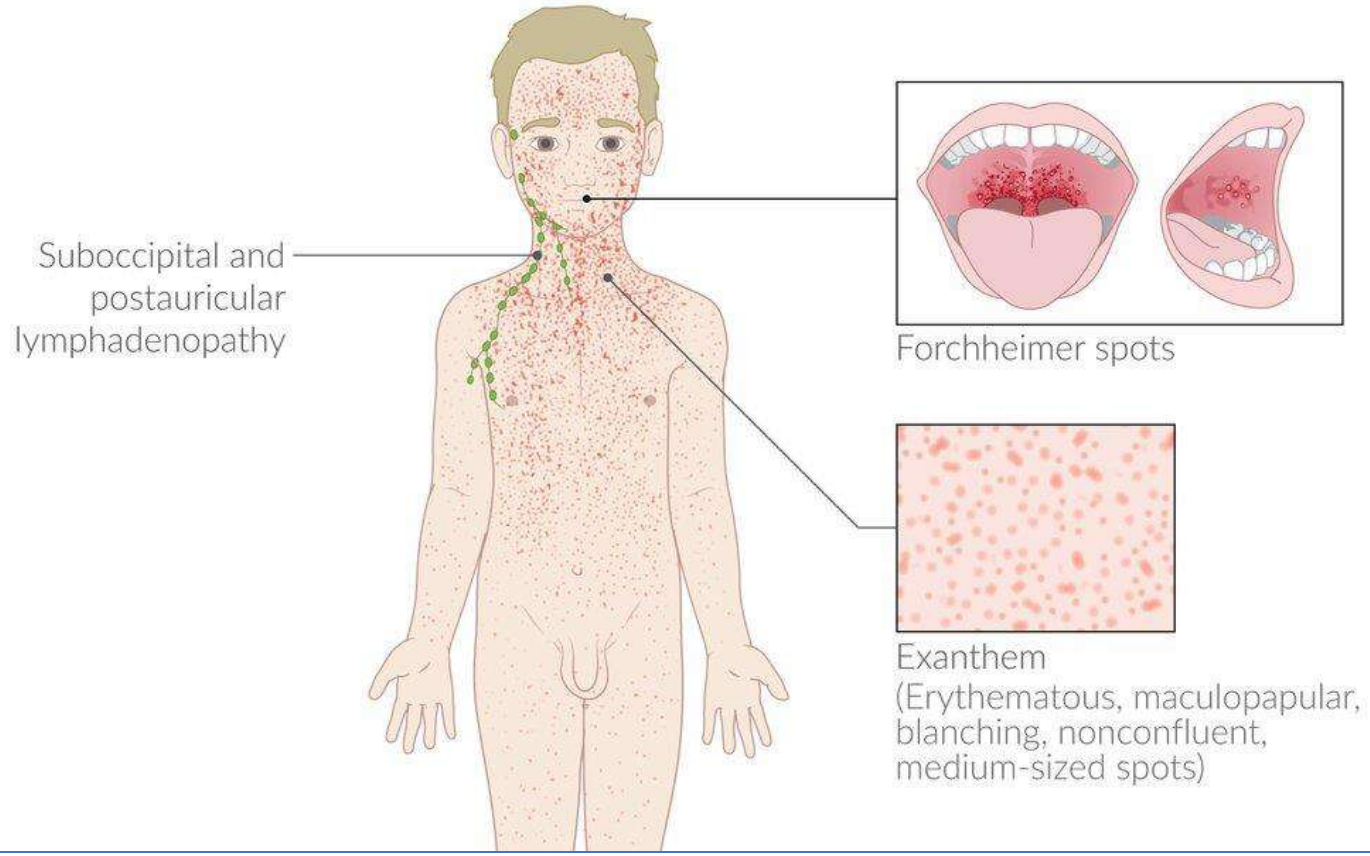
Pathogen
Rubella virus

Course
Exanthem that resolves within 3 days

Complications
Arthritis
Encephalitis
Thrombocytopenic purpura
Congenital rubella syndrome

Treatment
Symptomatic

Vaccine
Yes



Measles VS Rubella

- Prodromal Symptoms:
  - Measles: 3-4 days of high fever (often >39°C/102°F), cough, coryza (runny nose), conjunctivitis
  - Rubella: Minimal or absent prodrome, milder fever (if any)
- Rash
  - Measles: Red > Dark
  - Rubella: More pinkish
- Pathognomonic Signs:
  - Measles: Koplik spots
  - Rubella: Forchheimer spots (petechiae on soft palate) in some cases
- Lymphadenopathy:
  - Measles: Minimal
  - Rubella: Prominent posterior auricular, suboccipital, and cervical lymphadenopathy
- Duration and Severity:
  - Measles: More severe illness, rash lasts 5-7 days
  - Rubella: Milder disease, rash typically fades within 3 days
- And arthralgia is not seen in measles

Rubella – **USMLE** Questions IDs

- Step 1
  - 1464, 1575
- Step 2
  - 2783, 3266, 4734, 3663, 4734, 20522

Human herpes viruses

- HHV-1 → Herpes simplex virus type 1 (HSV 1)
- HHV-2 → Herpes simplex virus type 2 (HSV 2)
- HHV-3 → Varicella zoster virus (VZV)
- HHV-4 → Epstein Barr virus (EBV)
- HHV-5 → Cytomegalovirus (CMV)
- HHV-6 → Human herpesvirus 6 (HHV 6)
- HHV-7 → Human herpesvirus 7 (HHV 7)
- HHV-8 → Kaposi's sarcoma-associated virus (KSHV)

Herpes Simplex Viruses
Introduction

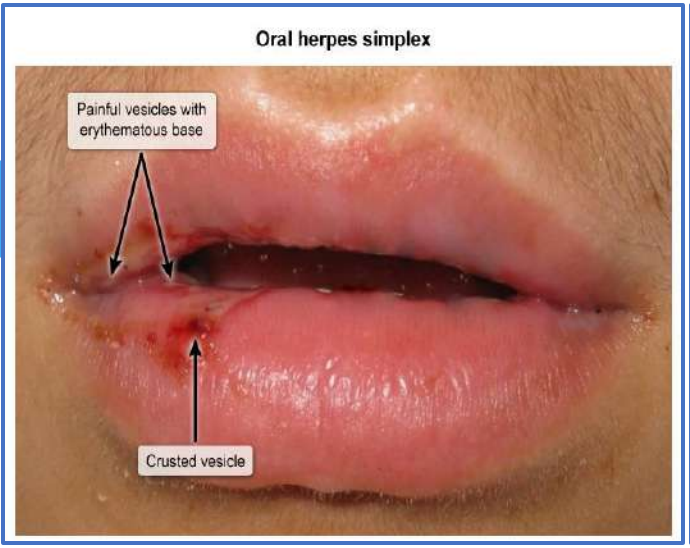
- **Species:**
  - Herpes simplex virus type 1 (HSV-1)
  - Herpes simplex virus type 2 (HSV-2)
- **Structure**
  - Enveloped, linear double-stranded DNA genome, icosahedral capsid
- **Transmission**
  - Direct contact with mucosal tissue or secretions of another infected person
  - **HSV1:** usually via saliva or direct contact with virus from the vesicle.
  - **HSV2:** mostly through sexual contact and during birth.

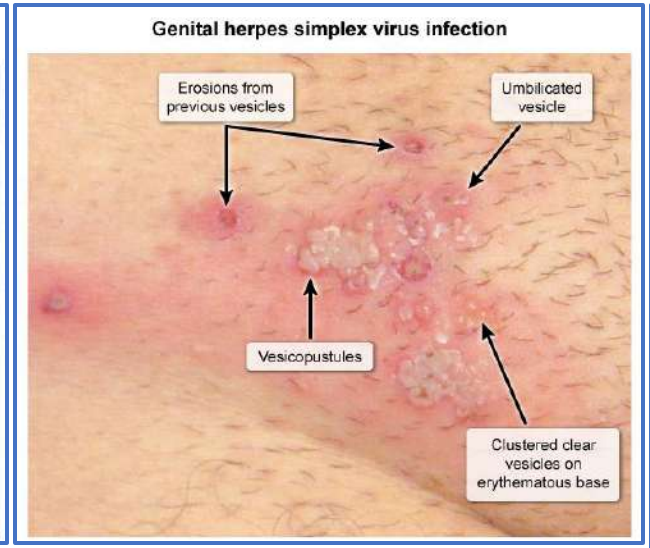
Herpes Simplex Viruses
Type of infection

- **Primary infection**
  - Mostly asymptomatic (up to 80% of cases, but virus is still shed)
  - If symptomatic, the infection is often sudden and severe with systemic symptoms (e.g., fever, malaise, myalgias, and headaches)
- **Reactivation of infection**
  - Frequency and severity vary individually
  - Often at the same site as primary infection

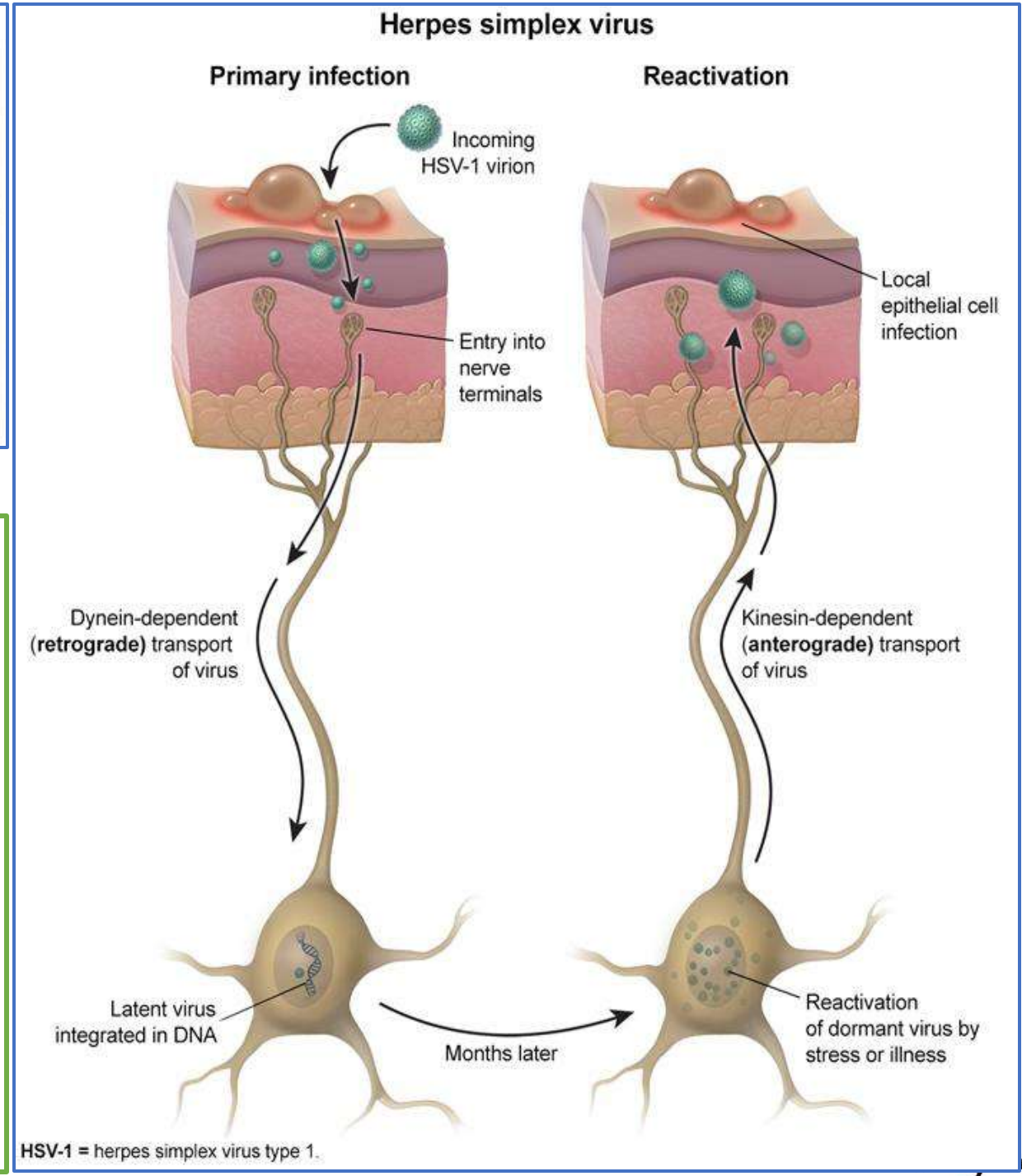
Herpes Simplex Viruses
Pathophysiology

- **Inoculation:** The virus enters the body through mucosal surfaces or small dermal lesions.
- **Neurovirulence:** The virus invades, spreads, and replicates in nerve cells.
- **Latency:** After primary infection, the virus remains dormant in the ganglion neurons.
  - Trigeminal ganglion: HSV-1
  - Sacral ganglion: HSV-2
- **Reactivation:** triggered by various factors (e.g., immunodeficiency, stress, trauma) → clinical manifestations





- Dynein is a microtubular motor protein that participates in retrograde axonal transport (ie, moving organelles toward the nucleus). Dynein is important in establishing the latent phase following primary HSV infection by transporting viral particles to the neural sensory ganglia.
- During reactivation, HSV particles rely on anterograde axonal transport to reach the skin and oral mucosa. Anterograde axonal transport is mediated by kinesin, a motor protein that moves intracellular cargo (eg, organelles, viral particles) away from the nucleus, down the axon, and toward the nerve terminal.



Herpes Simplex Viruses
Clinical Presentation

- HSV infections typically manifest with painful vesicles on an erythematous base that progress to ulcerations.
- Oral infection
  - Herpetic gingivostomatitis, Labial herpes
- Genital herpes
- Cutaneous herpes
  - Eczema herpeticum, Herpetic whitlow
- Eye infection
- CNS infection

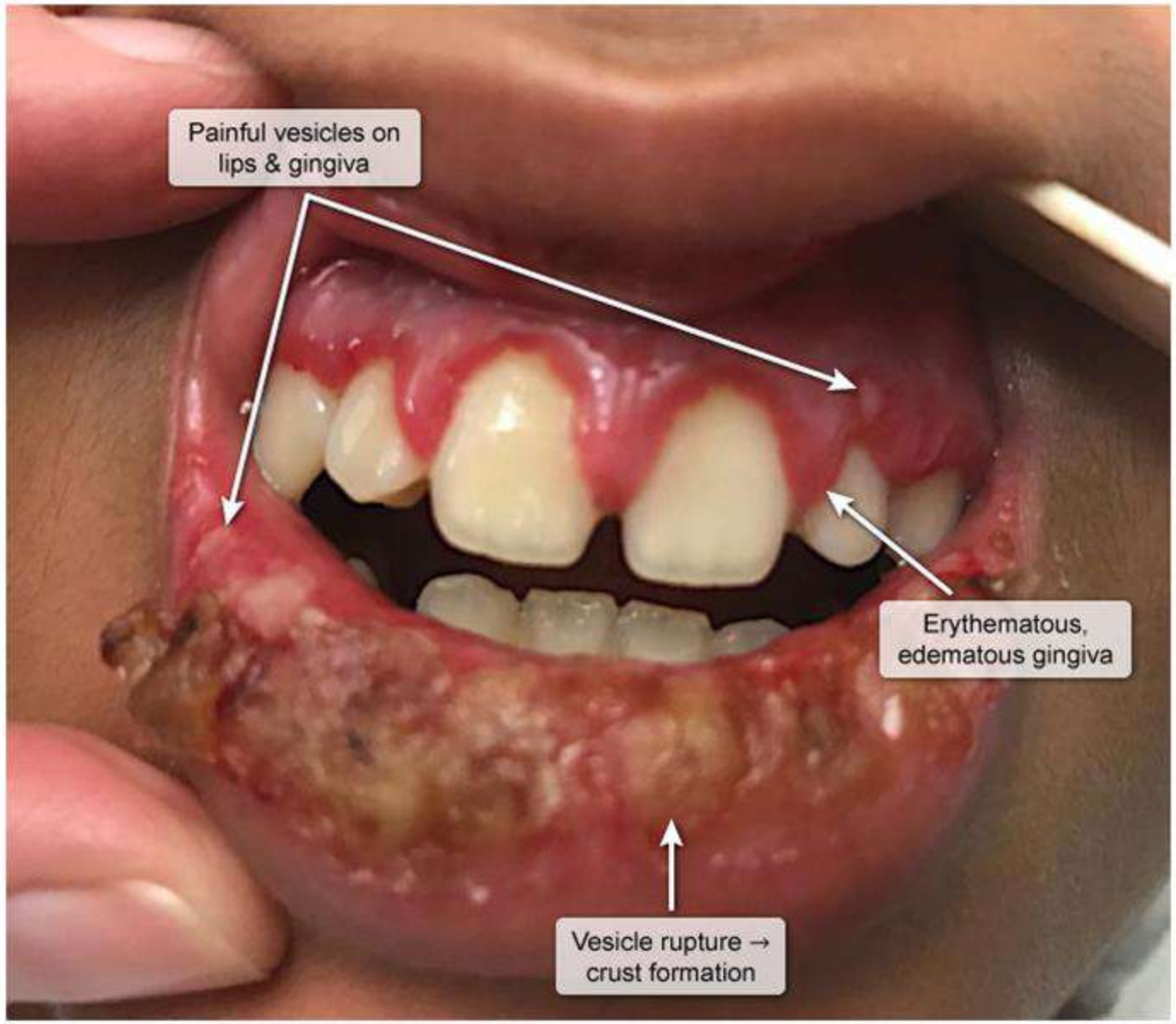
Herpetic gingivostomatitis

Herpes labialis

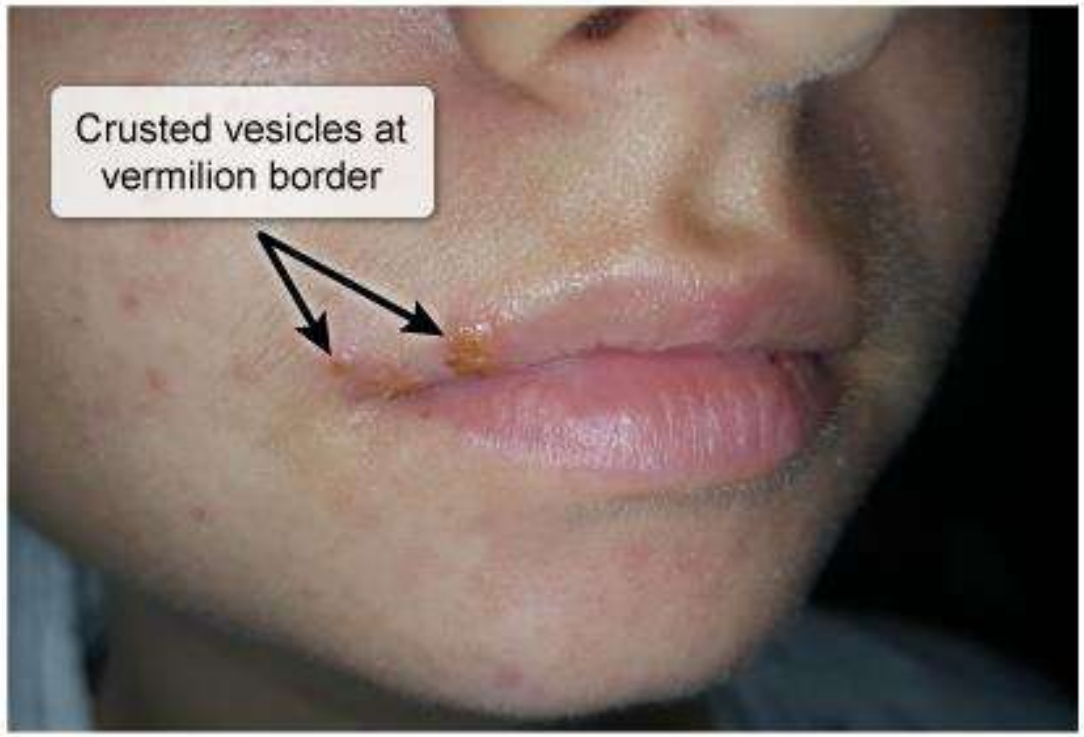
Eczema herpeticum

Herpetic whitlow

Herpetic gingivostomatitis



Herpes labialis

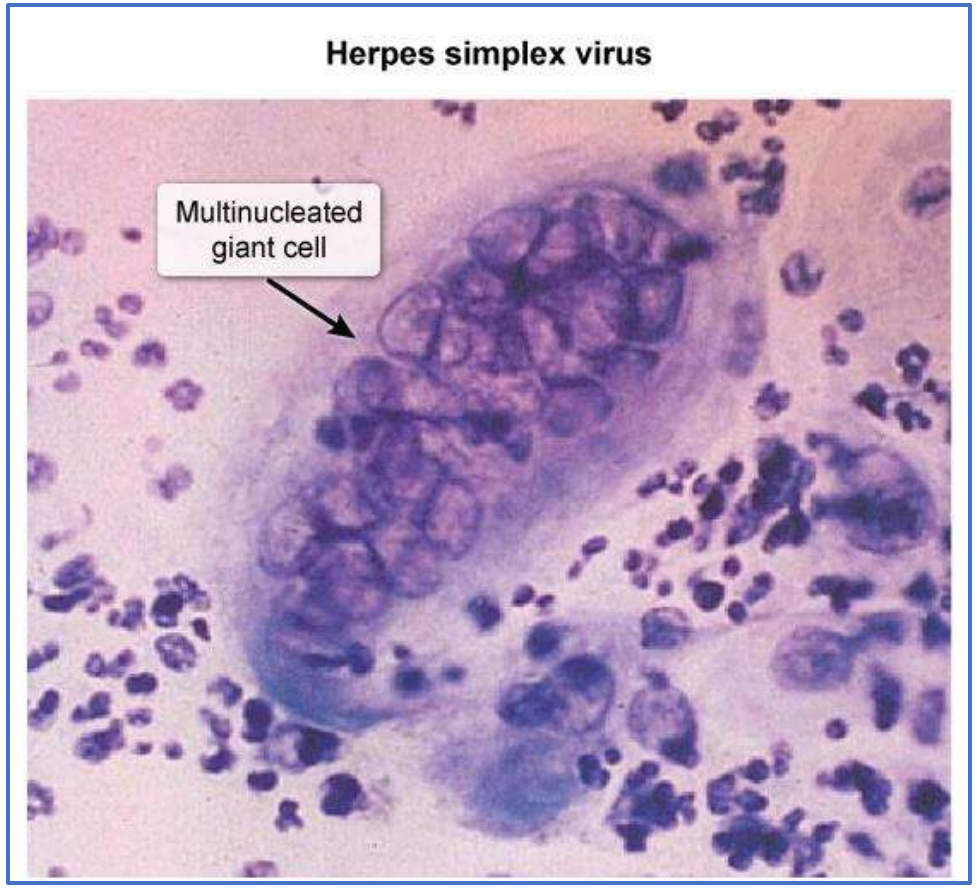


Herpes Simplex Viruses
Diagnosis

- Make a **clinical diagnosis** of HSV infection or reactivation.
- Confirm diagnosis with PCR and/or viral culture
- Serologic testing
- Microscopy
  - Tzanck test
    - Multinucleated giant cells
    - Cannot be used to differentiate between HSV-1 and HSV-2; also commonly positive in VZV infection
  - Direct fluorescent antibody test
    - Detects HSV antigens
    - Can distinguish between HSV-1 and HSV-2

Herpes Simplex Viruses
Tzanck smear

- Inoculation occurs on mucosa or skin where the virus replicates rapidly in the host cell nucleus and causes abnormal cell division, resulting in intranuclear inclusion bodies and **multinucleated giant cells** visible on Tzanck smear.
- The image depicts a **Tzanck smear**, in which epithelial cells are scraped from an ulcer base and stained. The presence of **multinucleated giant cells** is suggestive of **herpes simplex virus** (HSV) infection. Tzanck smears are insensitive and do not differentiate between HSV and varicella-zoster virus infection. Therefore, Tzanck smears largely have been replaced by polymerase chain reaction testing.



Herpes Simplex Viruses
Treatment

- Acyclovir
- Valacyclovir
- Early treatment of herpes infections is essential to prevent complications because antiviral drugs only inhibit the virus during its replication phase.
- Neonatal infection can be prevented by cesarean section.
- No vaccine is available.

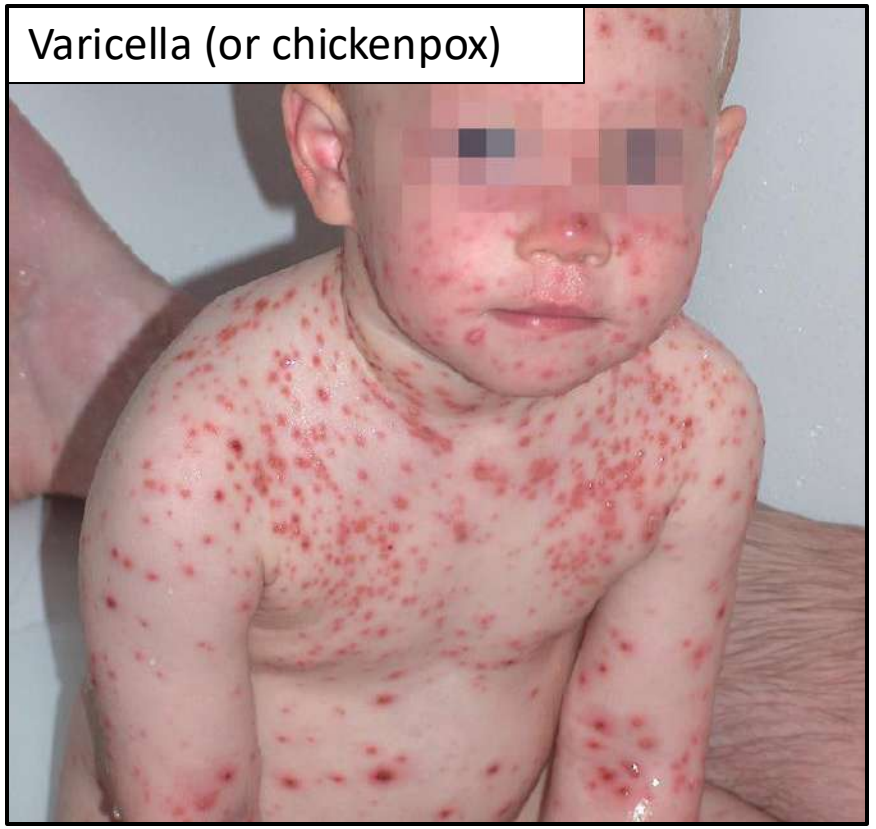
Herpes Simplex Viruses – **USMLE** Questions IDs

- **Step 1**
  - 907, 908, 1409, 1499, 1549, 1550, 6547, 11604, 15565
- **Step 2**
  - 3003, 4011, 4104, 4139, 4806, 10068, 12200, 12201, 12296, 15409

Varicella Zoster

- It causes two disease
  - Primary infection → Varicella (or chickenpox) → الجدري المائي
  - Reactivation → Herpes zoster (or shingles)
- Characteristics:
  - Enveloped virus with icosahedral nucleocapsid and linear double-stranded DNA.
- One serotype → so there is vaccine (live attenuated)
- Transmission:
  - Respiratory secretions
  - Direct skin contact with VZV-infected vesicle fluid
  - Transplacental

Varicella (or chickenpox)

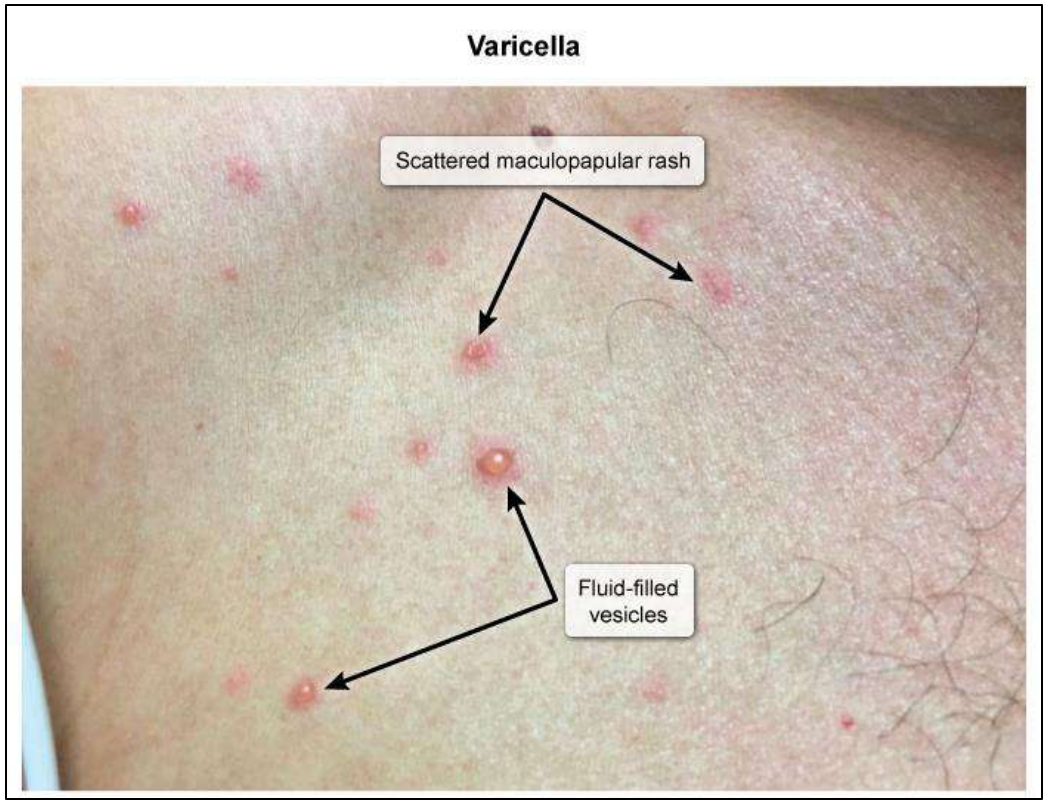


Herpes zoster (or shingles)

Varicella Zoster

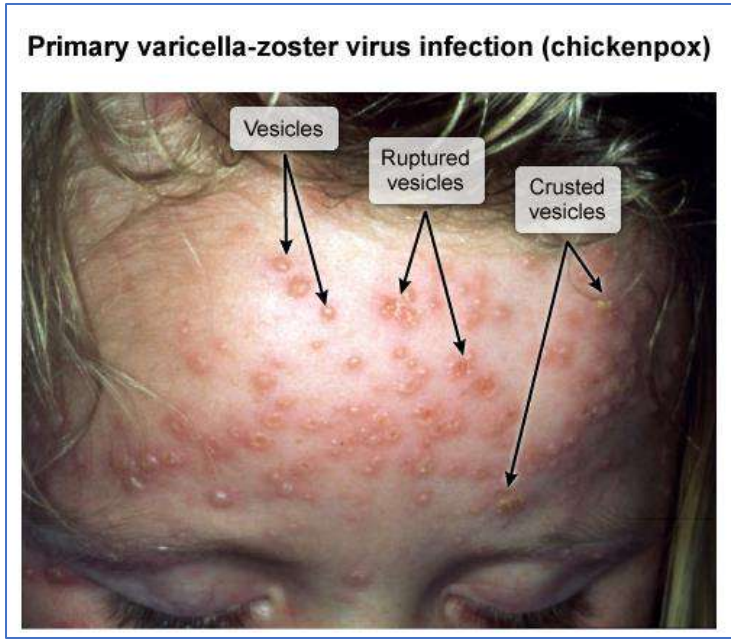
Varicella (or chickenpox)

- The condition predominantly affects children.
- Transmission occurs via inhalation of airborne droplets and direct contact with respiratory secretions or skin lesion fluids.



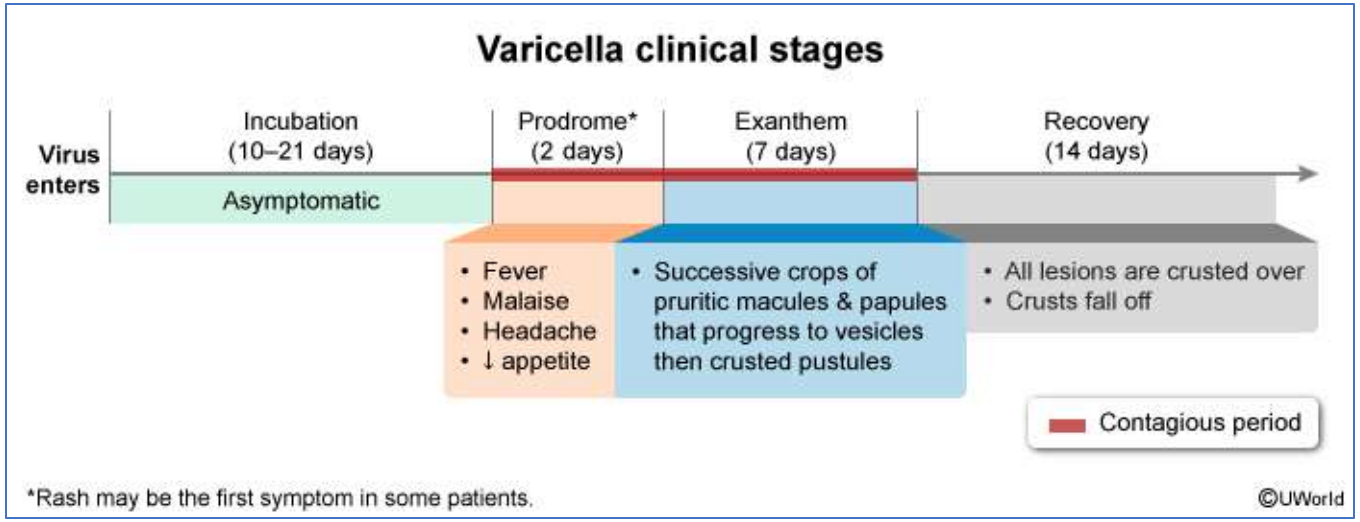
Varicella Zoster
Varicella (or chickenpox)–Clinical presentation

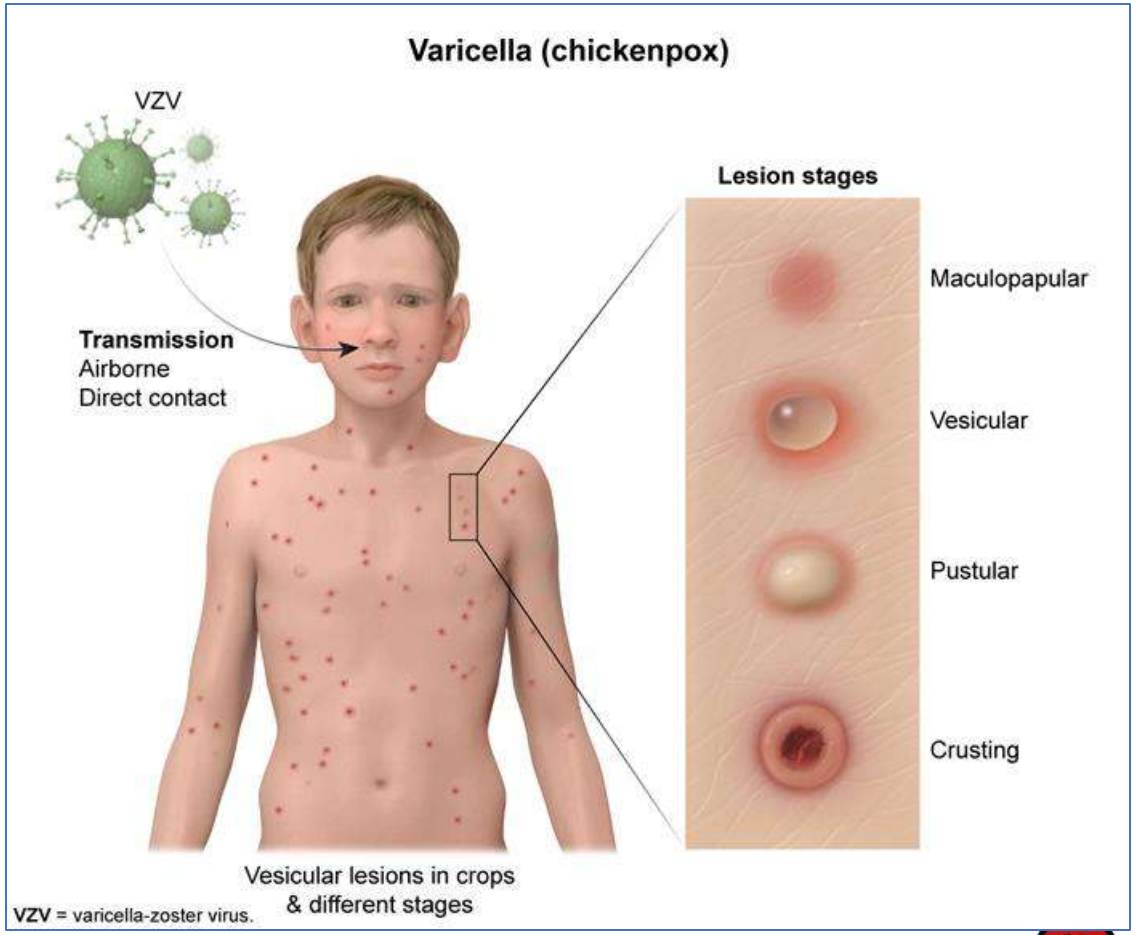
- **Incubation period:** ~ 2 weeks
- **Prodrome phase** (rare in children)
  - Constitutional symptoms (e.g., fever, malaise, headache, muscle or joint pain)
  - 2–3 days prior to the onset of exanthem
- **Exanthem phase:** characterized by approx. 250–500 severely pruritic lesions in varying stages of development.
  - Lesions first manifest centrally (i.e., face, scalp, and trunk) and spread to the extremities.
  - Palms and soles are typically spared.
- **Latent phase:** Following resolution of active skin infection, VZV remains latent in the sensory root ganglia; it can later reactivate (**see "Shingles" next slide**).



Varicella Zoster

Varicella (or chickenpox)–Clinical and lesion stages

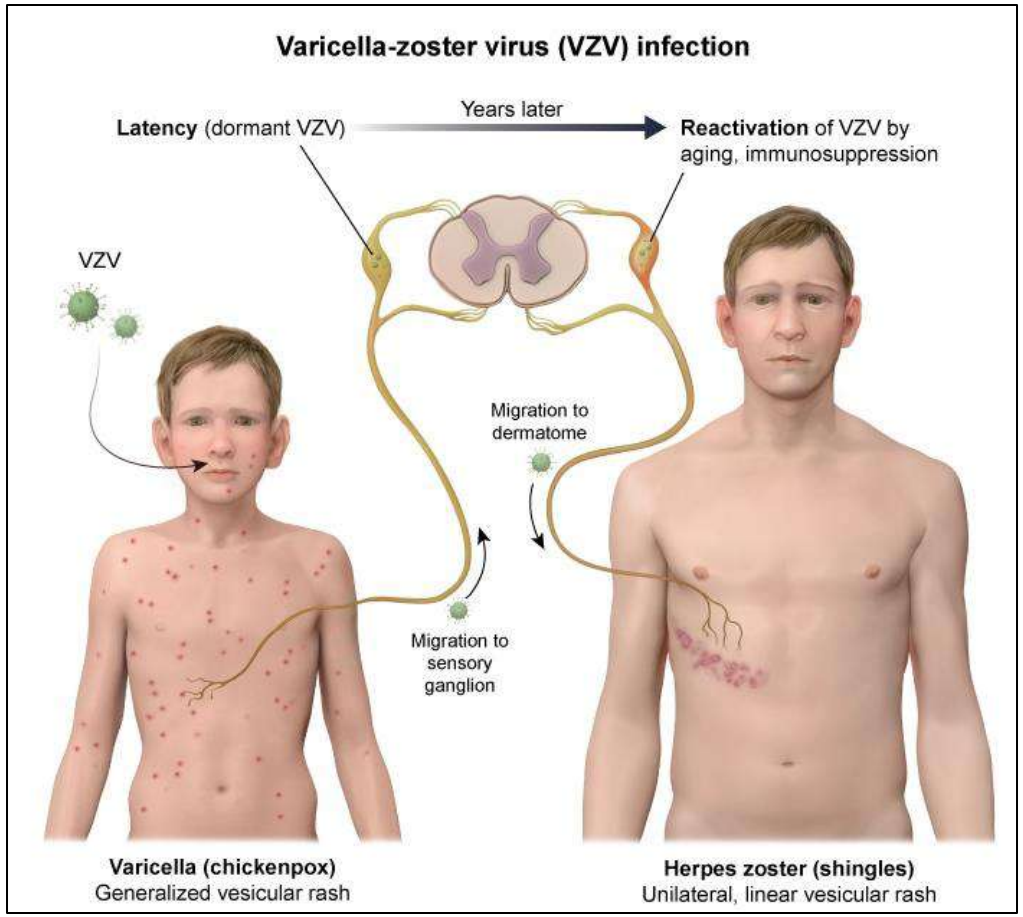




Varicella Zoster

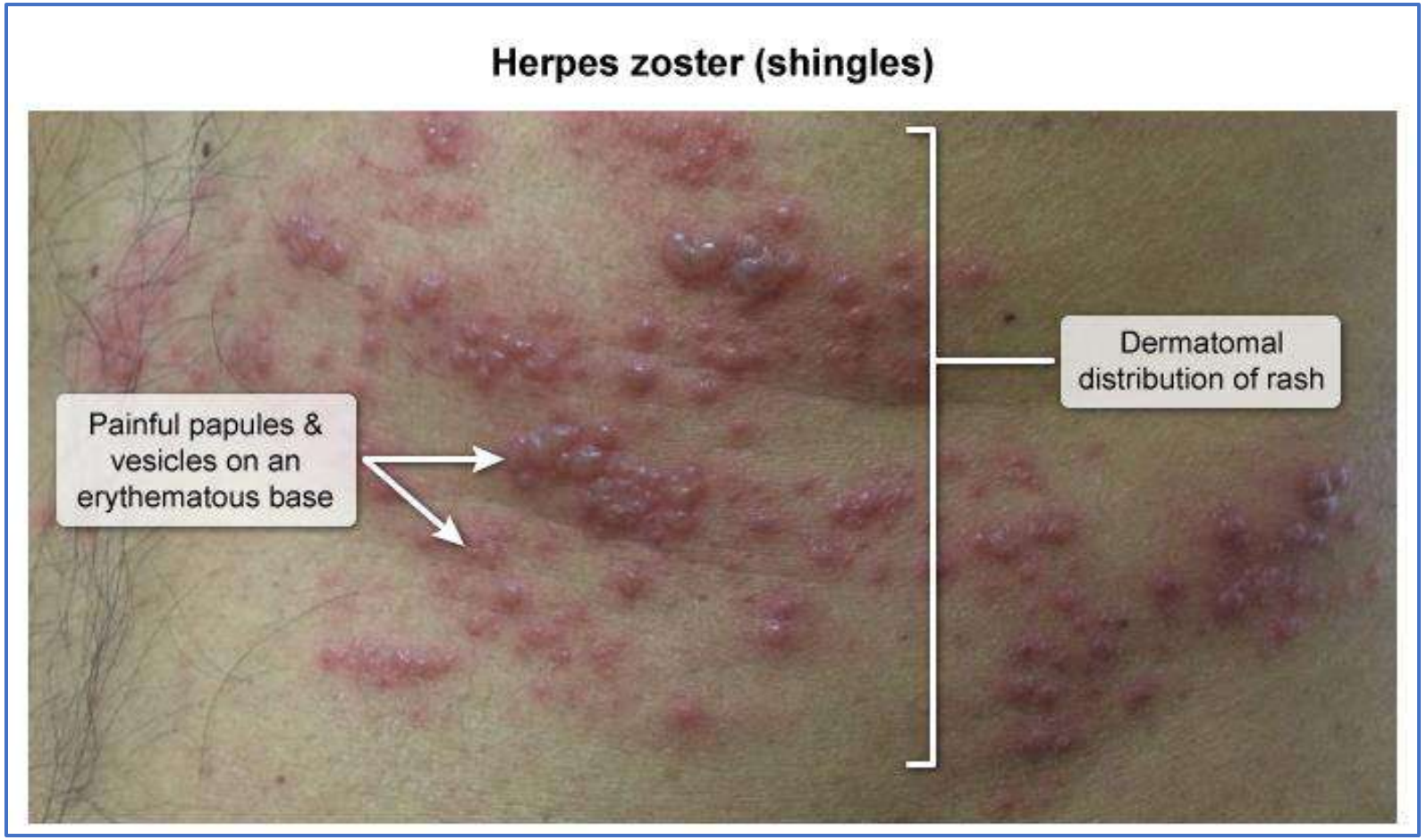
Herpes zoster (or shingles) → Latency and Reactivation

- Initial infection typically occurs in childhood and causes varicella (chicken pox), which is characterized by fever and a self-limited, diffuse vesicular rash.
- VZV then travels via sensory fibers to the dorsal root ganglia (or trigeminal ganglia), where it remains dormant for years.
- Weakening of cellular immunity leads to reactivation of the virus, which manifests as herpes zoster (shingles).
- Shingles is characterized by unilateral burning pain and a papular or vesicular rash in a **dermatomal distribution**.



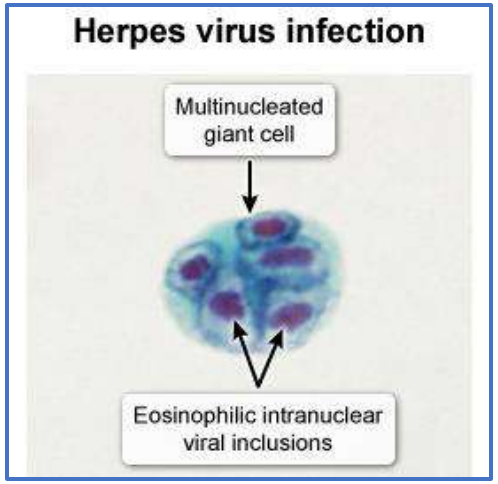
Varicella Zoster

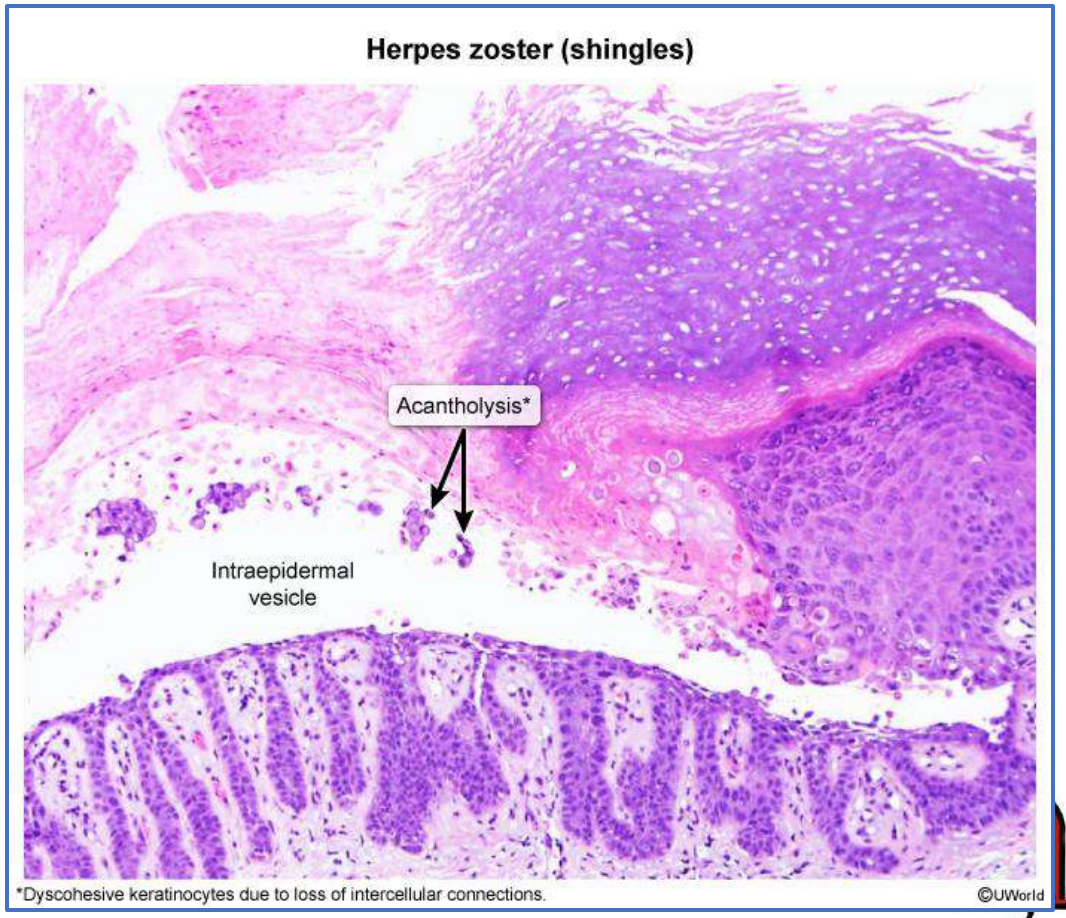
Herpes zoster (or shingles) → Latency and Reactivation



Varicella Zoster
Skin biopsy

Light microscopy of a sample from a vesicle base reveals intranuclear inclusions in keratinocytes and multinucleated giant cells (positive Tzanck smear). Skin biopsy would show acantholysis (loss of intercellular connections between keratinocytes) and intraepidermal vesicles.





Varicella Zoster

Herpes zoster (or shingles) → summary

Herpes zoster (shingles)	
Pathogenesis	• Reactivation of varicella-zoster virus from sensory nerve ganglion • Risk factors: increasing age, immunosuppression
Clinical features	• Prodrome: itching, tingling, burning in dermatomal distribution • Rash: grouped papules & vesicles on erythematous base; ulceration & crusting; acute neuritic pain
Treatment	• Antiviral therapy (eg, valacyclovir)
Complications	• Postherpetic neuralgia (most common) • Herpes zoster ophthalmicus • Herpes zoster oticus (Ramsay Hunt syndrome)

Herpes zoster ophthalmicus

Herpes zoster oticus

Varicella Zoster – **USMLE** Questions IDs

- **Step 1**
  - 15375, 1042, 1552, 1553, 18606, 107365
- **Step 2**
  - 2854, 3422, 4186, 4431, 4693, 14828, 16204, 18582, 2768, 12341, 14198, 108785, 108890

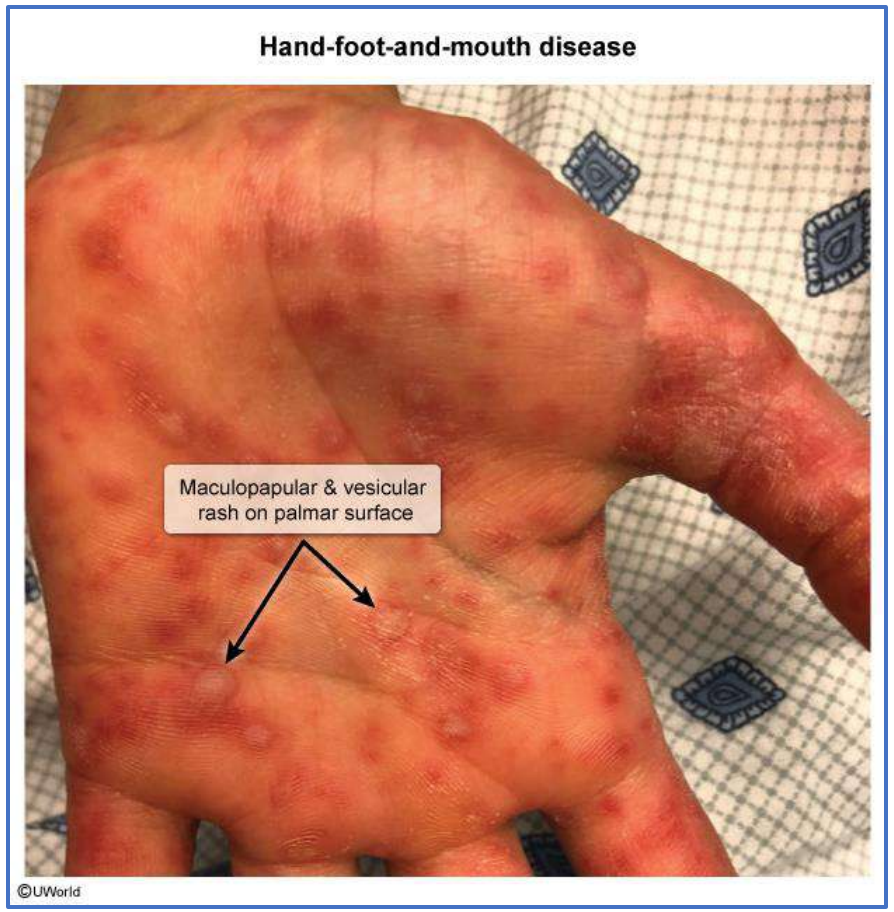
Smallpox

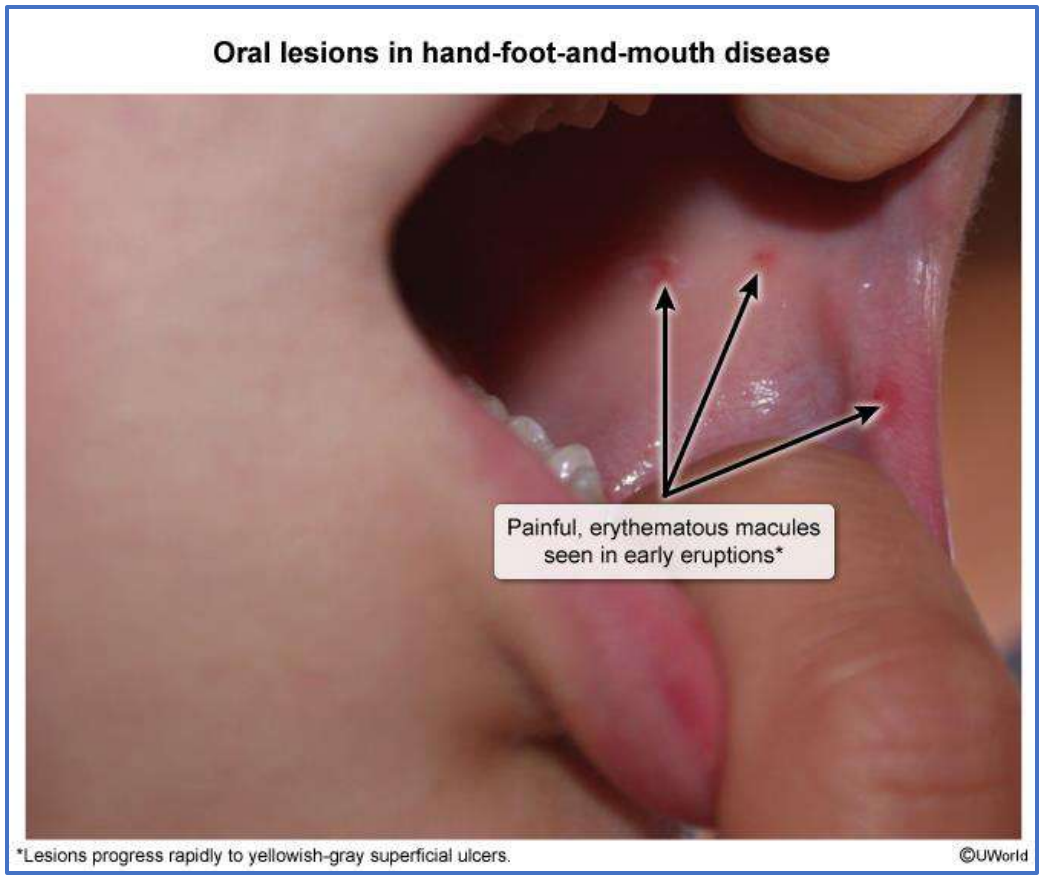
- An enveloped, linear, double-stranded DNA virus
- The disease has been **eradicated** with global vaccination
- Mortality was very high, with an overall fatality of 30%
- Prevention: vaccine contains live attenuated vaccinia virus.

Coxsackieviruses
Hand-foot-and-mouth disease

- **Definition:** highly contagious infection that manifests with a characteristic maculopapular/partially vesicular rash on hands and feet
- **Caused by** Coxsackie A virus infection
- **Clinical features**
  - Fever, malaise
  - Maculopapular and partially vesicular rash on the hands and feet (can also involve the buttocks)
  - Oral ulcers
  - Anorexia, oral pain
- **Diagnosis:** based on clinical features
- **Treatment:** symptomatic
- **Prognosis:** almost always self-limiting

Coxsackieviruses
Hand-foot-and-mouth disease





Skin lesions in hand, foot, and mouth disease

Coxsackieviruses
Hand-foot-and-mouth disease

Hand-foot-and-mouth disease	
Pathogenesis & epidemiology	• Coxsackievirus infection • Any age, usually age <7 • Transmission: direct contact with respiratory, oral, vesicular secretions or fecal-oral spread • Peaks during summer/fall
Clinical features	• Painful vesicles/ulcers on anterior oral mucosa • Macules/papules/vesicles on palms, soles, buttocks • ± Systemic symptoms (eg, fever, malaise)
Complications	• Myopericarditis • Aseptic meningitis • Nail dystrophy (1-2 months later)
Management	• Supportive (eg, pain control, hydration)

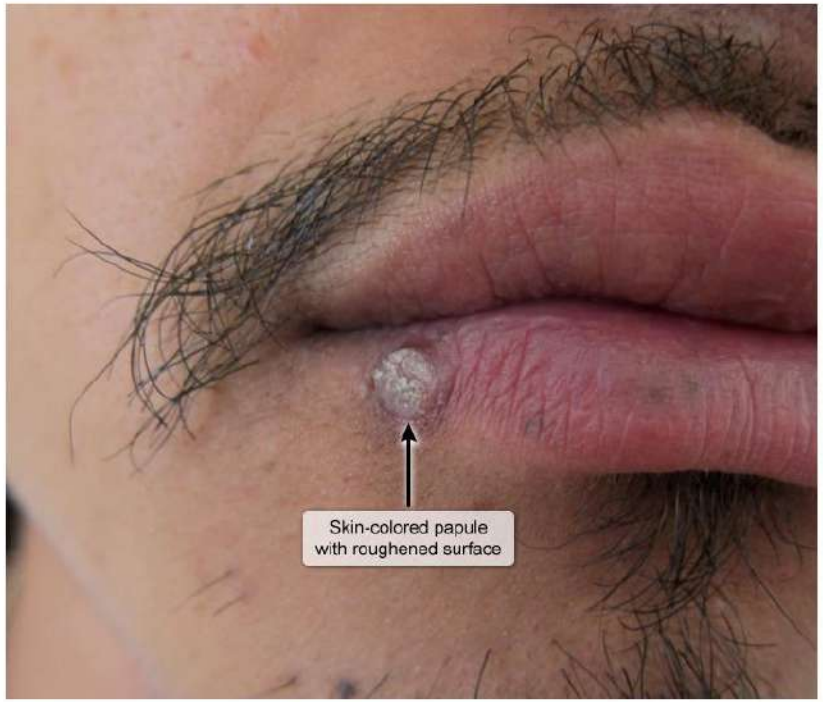
Hand-foot-and-mouth disease – USMLE Questions IDs

- **Step 1**
  - 15419, 15550
- **Step 2**
  - 105618

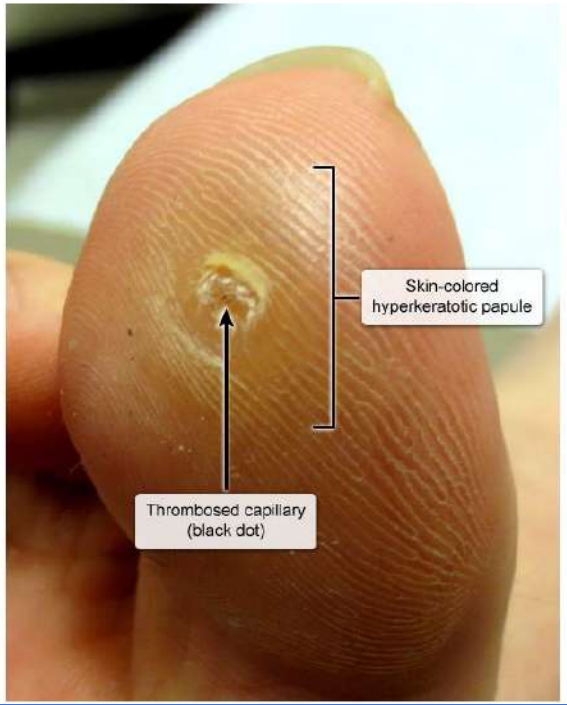
Warts and Papillomas

- Mostly a benign viral infection
- Nearly everyone is infected!
- Contact transmission; fomite transmission
- Different virus types
  - Plantar warts (HPV 1)
  - Flat warts (HPV 3,10,28,49)
  - Genital Warts (HPV 6,16,18,31)

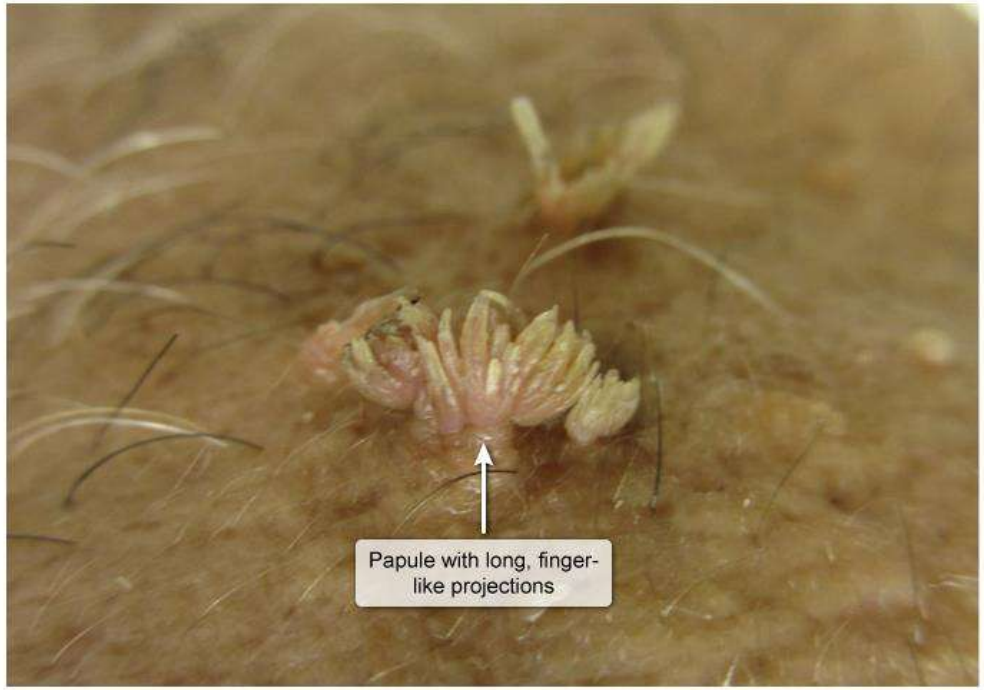
Cutaneous wart (verruca vulgaris)



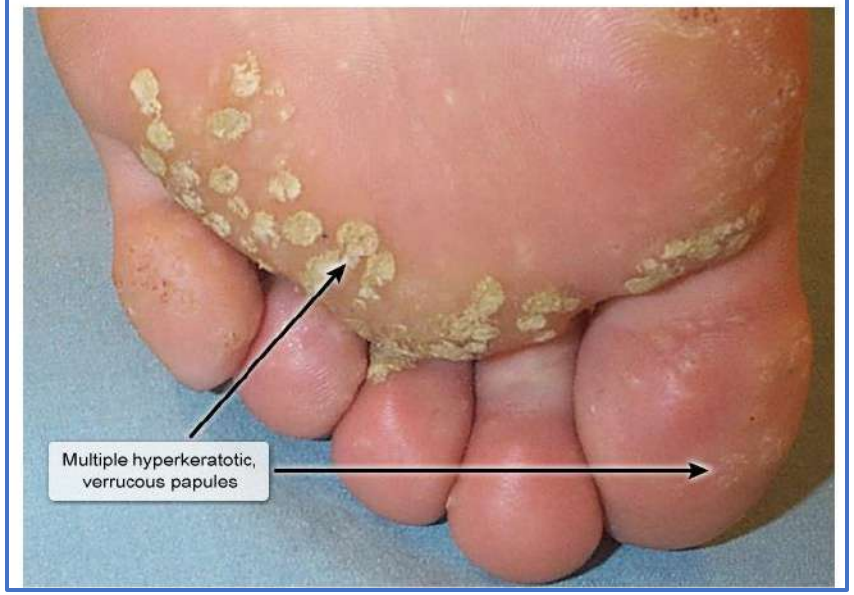
Plantar wart



Filiform cutaneous wart (verruca vulgaris)



Plantar warts



Common wart (verruca vulgaris)

Condyloma acuminata