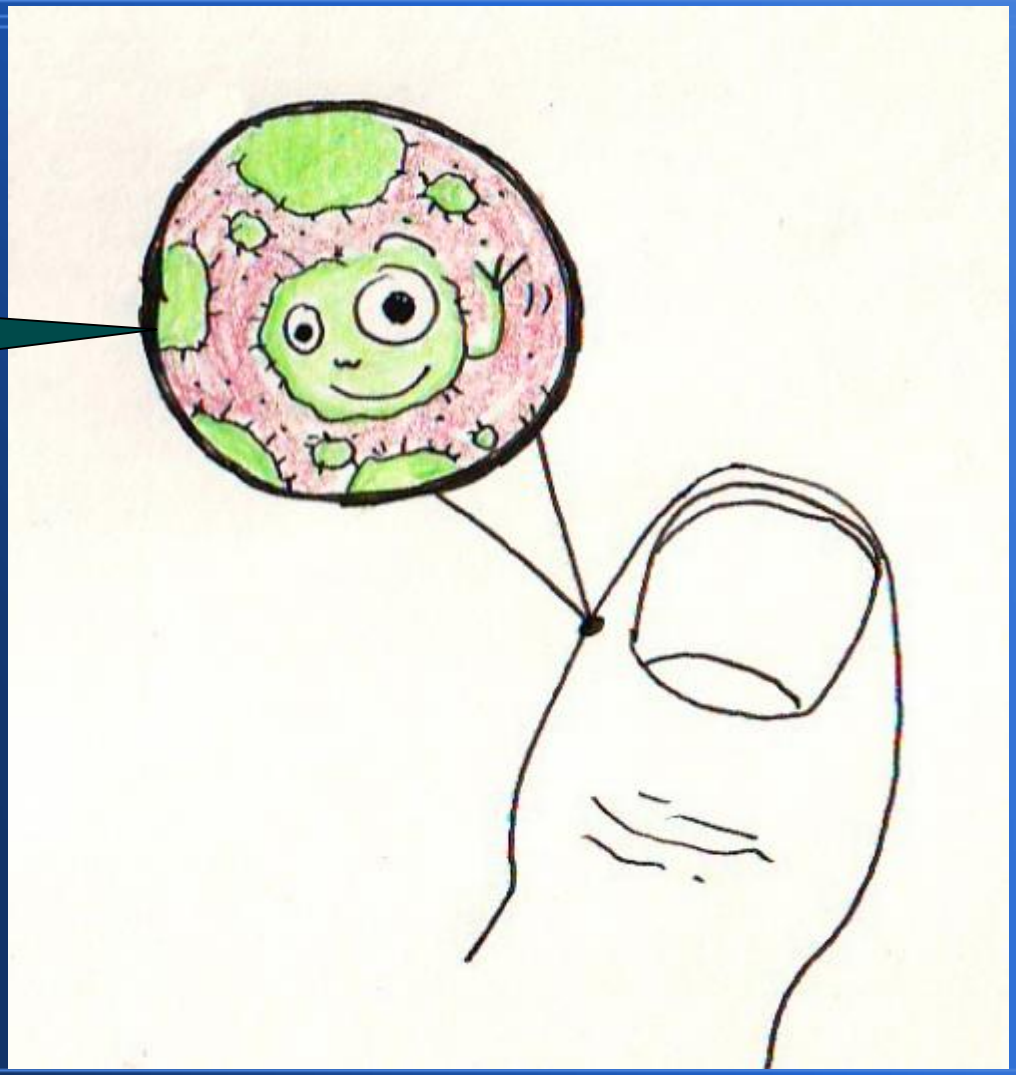
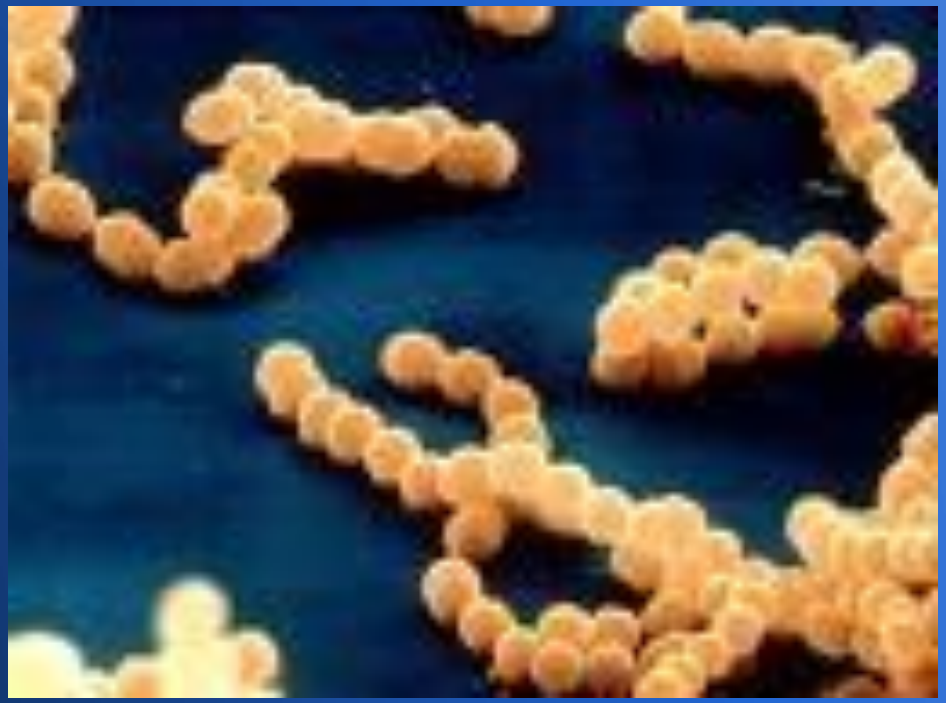
STREPTOCOCCUS



General Characteristics of Streptococci

Gram-positive spherical/ovoid cocci arranged in long chains; commonly in pairs

- Non-spore-forming, nonmotile
- Can form capsules and slime layers
- Facultative anaerobes



Classification of Streptococci

Lancefield classification system based on cell wall C carbohydrates Ag – 21 groups (A, B, C,….)

Type of Haemolysis:

1– ***α- hemolytic***

{S.pneumoniae & Viridans}

2– ***β-hemolytic***

{ Streptococcus group A, B, C, G, D & F}

3– ***(γ) non- hemolytic***

{ Enterococcus}

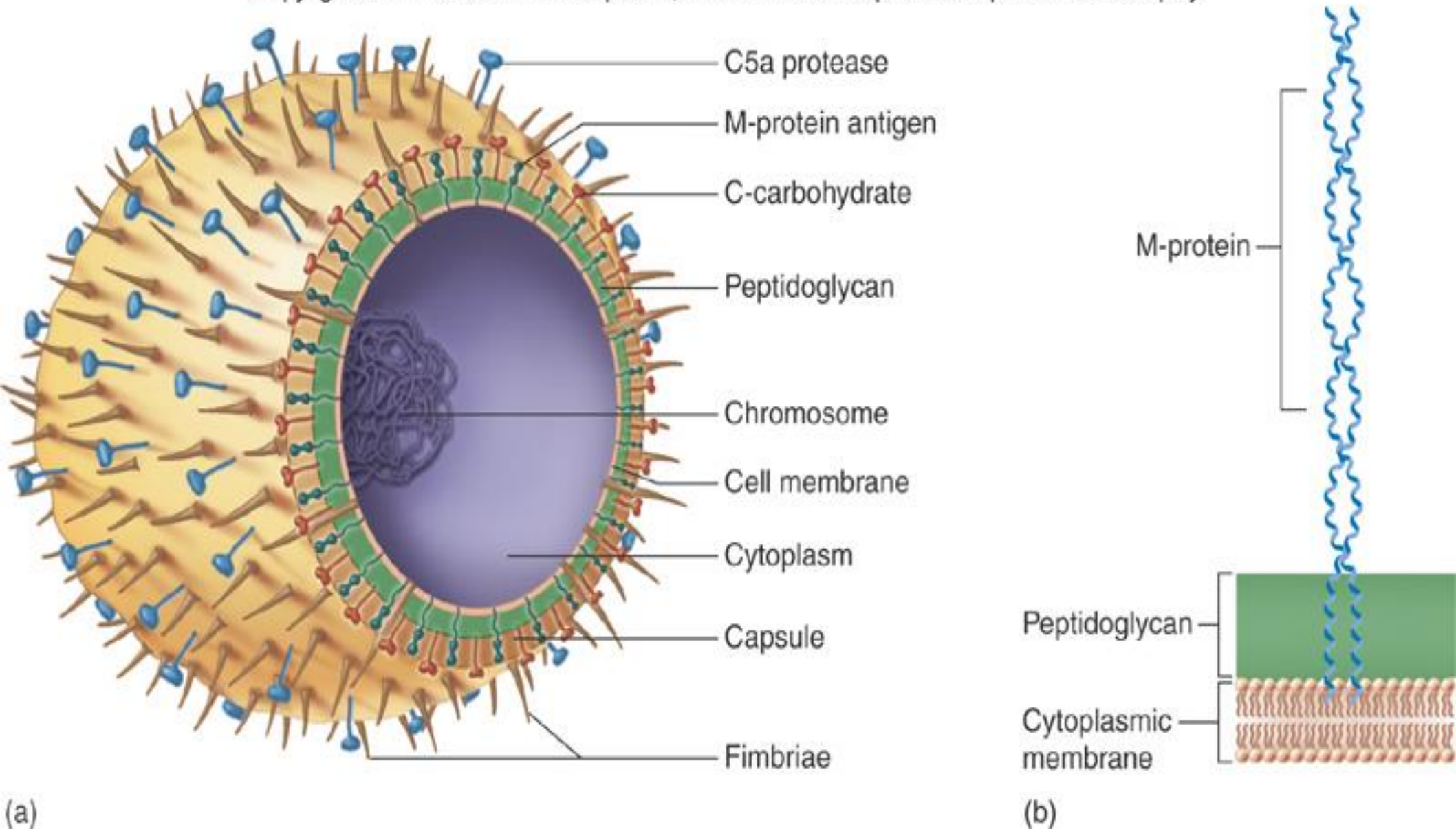
Human Streptococcal Pathogens

- *S. pyogenes*
- *S. agalactiae*
- Viridans streptococci
- *S. pneumoniae*
- *Enterococcus faecalis*

β-hemolytic *S. pyogenes*

- Most serious streptococcal pathogen
- Inhabits throat, nasopharynx, occasionally skin

View of group A *Streptococcus*

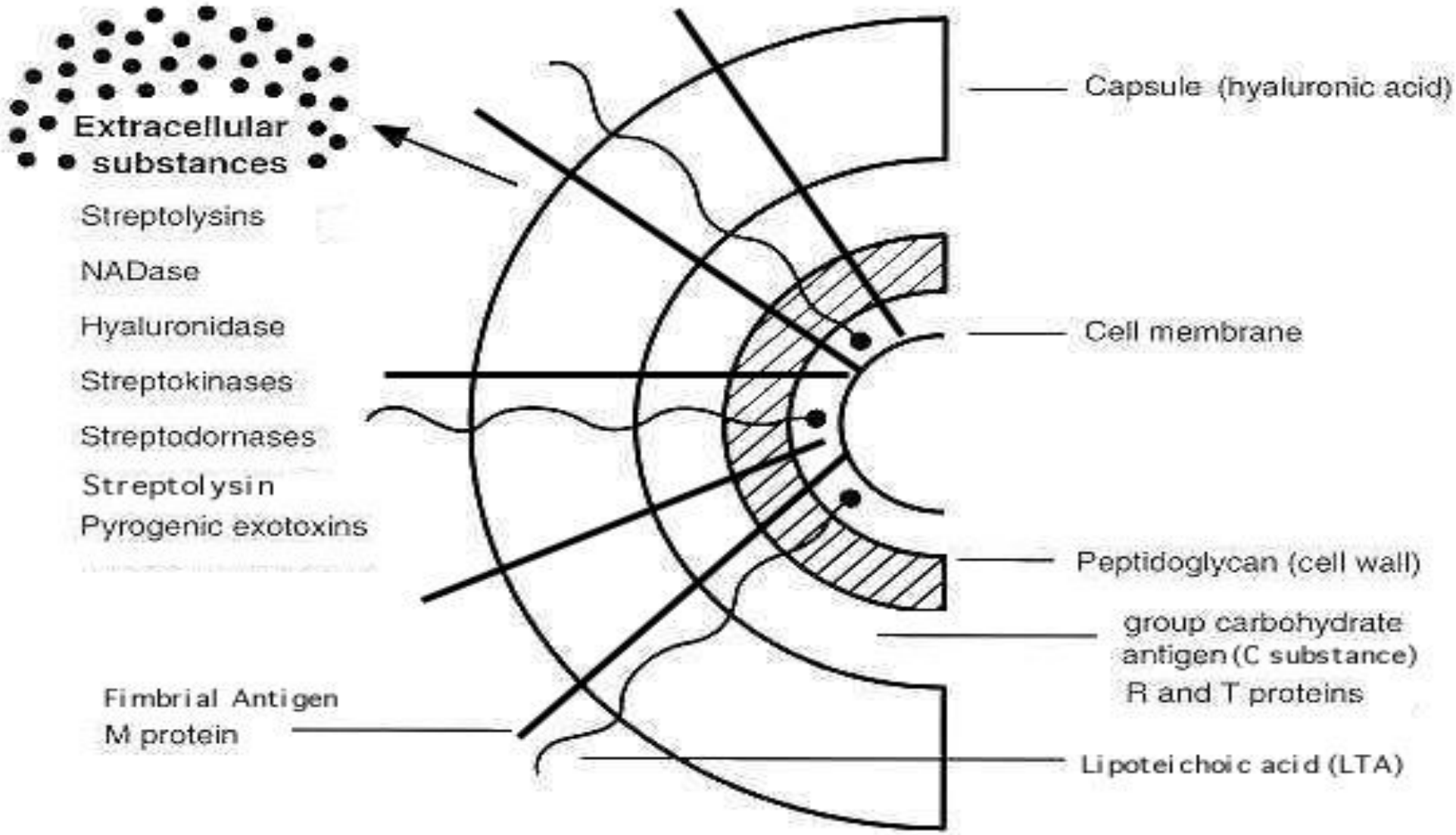


Virulence Factors of β-Hemolytic *S. Pyogenes*

Produces surface antigens:

- **C-carbohydrates** – protect against lysozyme
- **Fimbriae** – adherence
- **M-protein** – contributes to resistance to phagocytosis
- Hyaluronic acid **capsule** – provokes no immune response
- C5a protease hinders complement and neutrophil response

Virulence Factors of β-Hemolytic *S. Pyogenes*



Virulence Factors of β-Hemolytic *S. Pyogenes*

Extracellular toxins:

Streptolysins – hemolysins; streptolysin O (SLO) and streptolysin S (SLS) – both cause cell and tissue injury

Erythrogenic toxin (pyrogenic) – induces fever and typical red rash

Superantigens – strong monocyte and lymphocyte stimulants; cause the release of tissue necrotic factor

Virulence Factors of β-Hemolytic *S. Pyogenes*

Extracellular enzymes

Streptokinase – digests fibrin clots

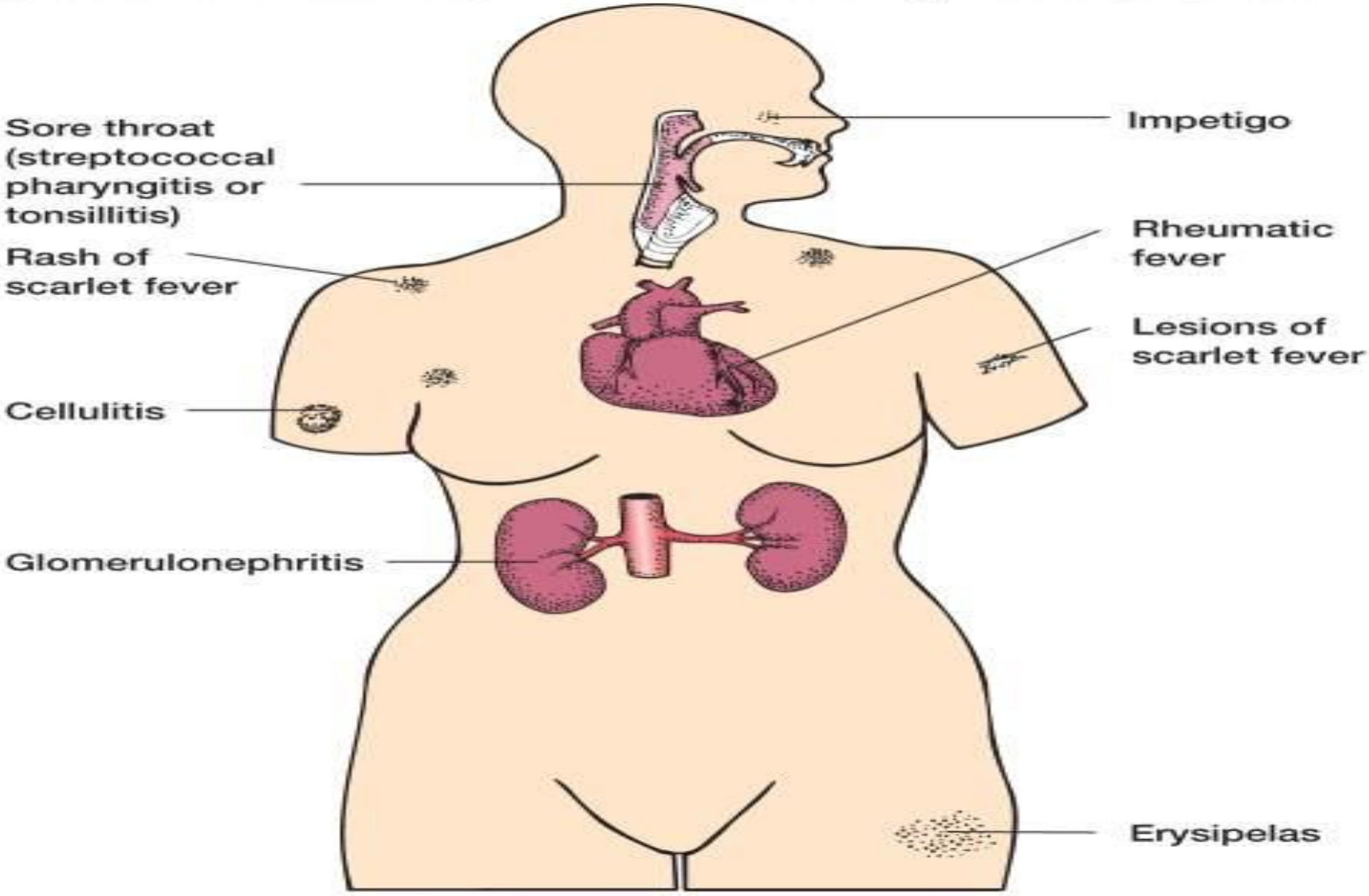
Hyaluronidase – breaks down connective tissue

DNase – hydrolyzes DNA

Epidemiology and Pathogenesis

- Humans only reservoir
- Inapparent carriers
- Transmission – contact, droplets, food
- Portal of entry generally skin or pharynx
- Children predominant group affected for cutaneous and throat infections
- Systemic infections and progressive sequelae possible if untreated

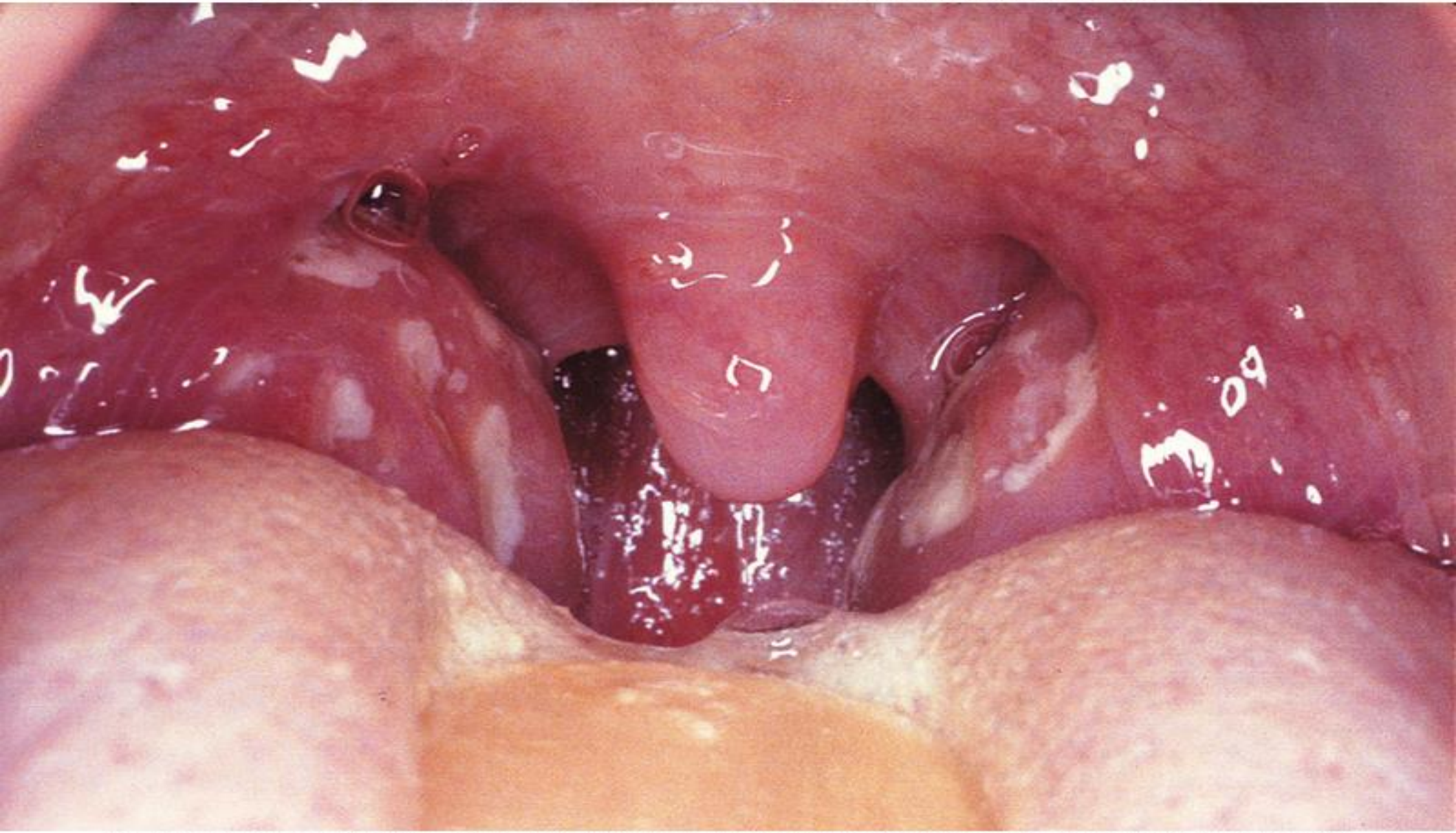
Streptococcus Pyogenes Clinical Infections



Streptococcal pharyngitis

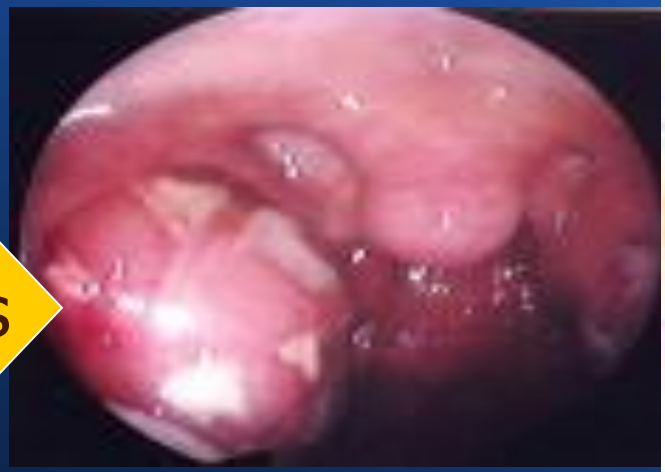
- red pharynx with exudate on tonsils and petechiae on soft palate
- bilateral tender anterior cervical adenopathy

Pharyngitis and tonsillitis

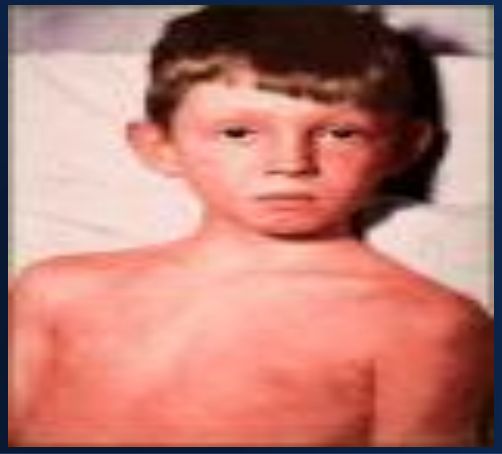


Streptococcus Pyogenes Clinical Infections

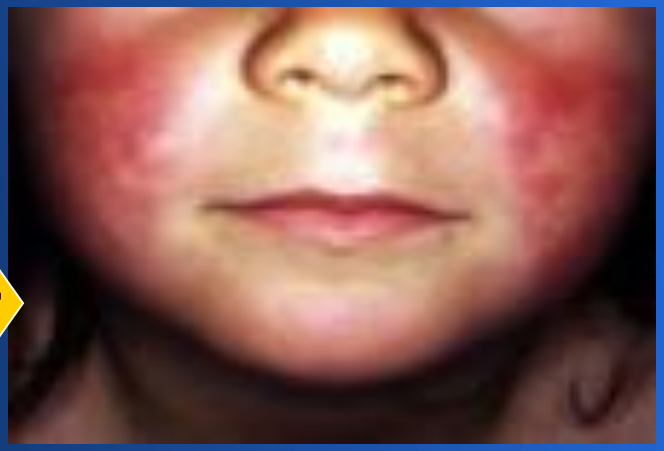
tonsillitis



Otitis media



Scarlet fever



Streptococcal Skin Infection

Suspected organisms

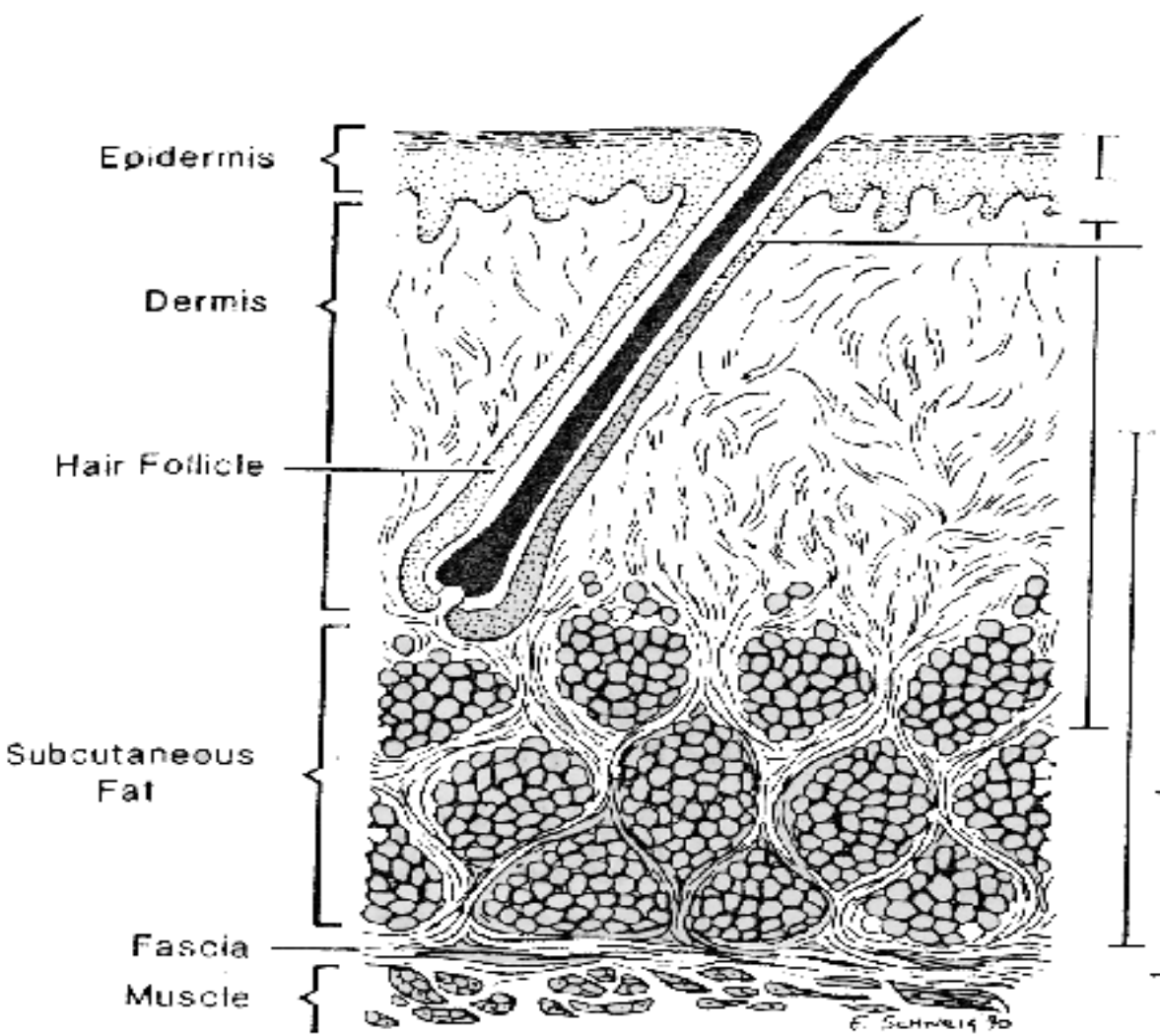
Impetigo: Group A *Streptococcus*, *Staphylococcus aureus*

Cellulitis: Group A *Streptococcus*, *Staphylococcus aureus*, *Haemophilus influenzae*

Erysipelas: Group A Streptococcus

Necrotizing fasciitis: Group A Streptococcus, *Clostridium perfrigens*, *Bacteroides fragilis*, *Enterobacteriaceae*, *Pseudomonas aeruginosa*

IMPETIGO



Infection Site	Etiologic Organisms
Impetigo	*S. aureus, Strep. pyogenes*
Folliculitis	*S. aureus*
Erysipelas	*Strep. pyogenes*
Cellulitis	*Strep. pyogenes* (common) *S. aureus* (uncommon) *H. influenzae* } (rare) Other } (rare)
Necrotizing fasciitis	*Strep. pyogenes* or Mixed bowel flora

Impetigo (contagious superficial infection)

Non-bullous	Bullous
• Cause	
- Streptococcal (Group A)	Staph. aureus
- Staph. aureus (Phage Groups II)	
• Pre-school and young school age	All ages
• Very thin walled vesicle on an erythematus base	Bullae of 1-2cm
• Transient	Persist for 2-3 day
• Yellowish-brain crusts (thick)	Thin, flat,
• Regional adenitis	Rare
• Constitutional symptoms present	Absent
• Face (around the nose, mouth & limbs)	occur anywhere
• Palms & sole spared	May involved

…

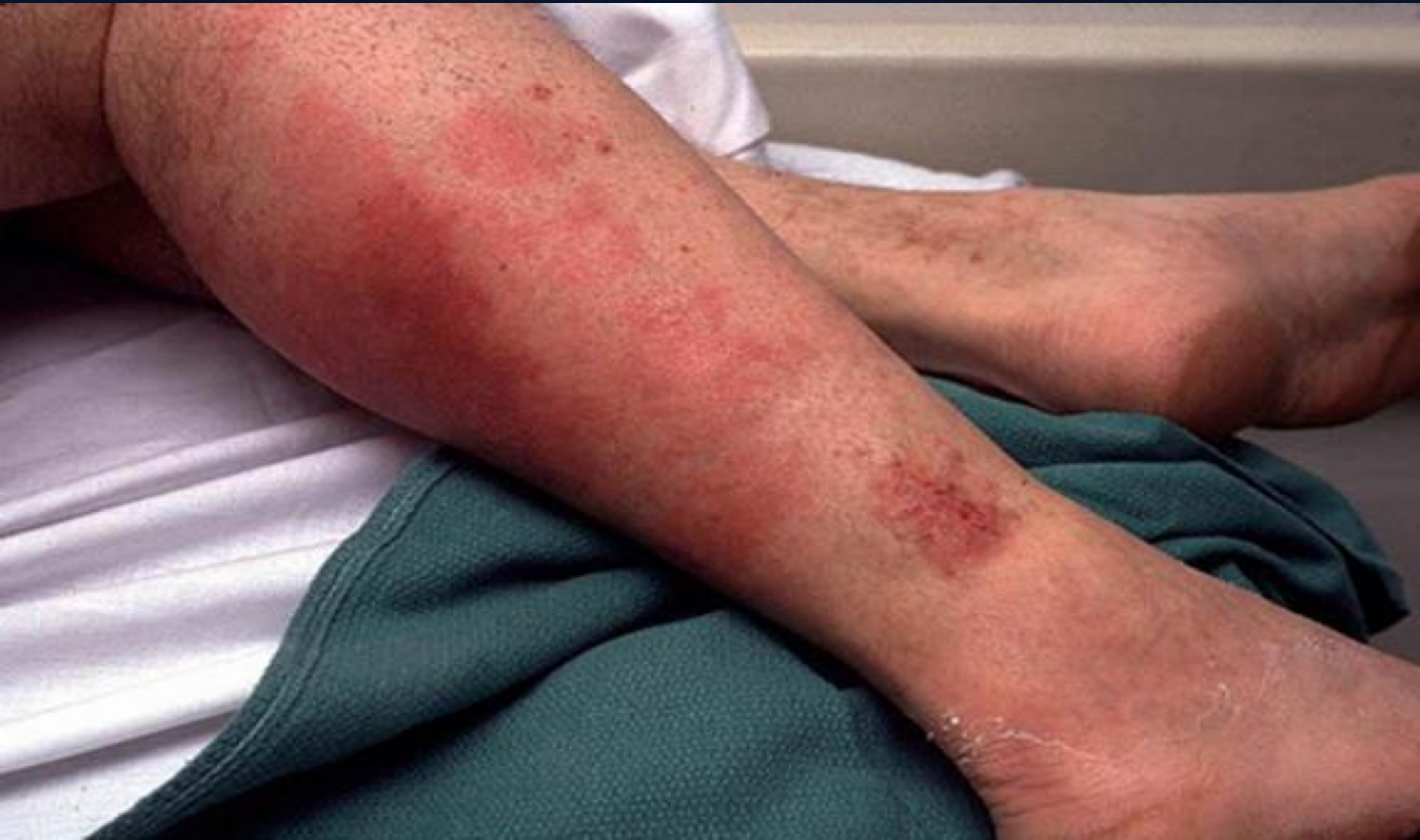
Impetigo (pyoderma)

- superficial lesions that break and form highly contagious crust; often occurs in epidemics in school children; also associated with insect bites, poor hygiene, and crowded living conditions

Primary bullous skin lesion (purulent honey-colored crusted skin lesions) in children

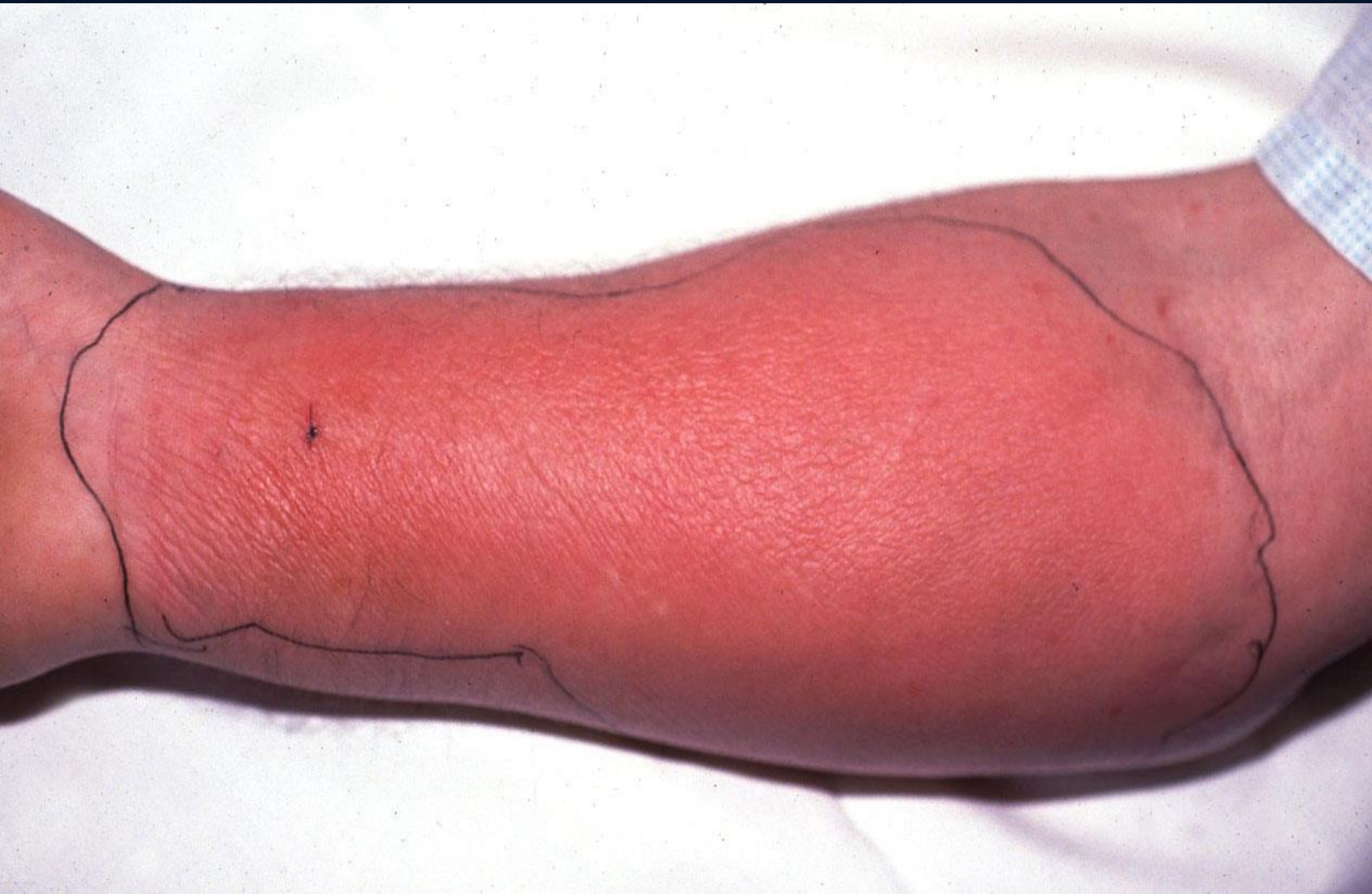
Erysipelas

- Acute infection and imflammation limited to dermis and upper part of subcutaneous tissue.
  - caused most often by group A streptococci
  - rarely cased by ß-hemolytic streptococci of the B, C, or G serologic group
- Painful red patches which enlarge and thicken more frequent in legs
- Facial erysipelas,



Cellulitis

- -group A streptococci
typically follows an innocuous or unrecognized injury; inflammation is diffuse, spreading along tissue planes
- -staphylococcus aureus
usually associated with wound or penetrating trauma; localized abscess become surrounded by cellulitis



CELLULITIS / ERYSIPELAS

„Flu-like symptoms”

- Fever
- Headache
- Shivers
- Diarrhea
- Pain

EARLY SIGNS

- Redness
- Local heat
- Swelling
- Tenderness

Cellulitis and Erysipelas diagnosis

- physical exam
  - cellulitis has an ill-defined border that merge smoothly with adjacent skin; usually pinkish to redish
  - erysipelas has an elevated and sharply demarcated border with a fiery-red appearance

Cellulitis and Erysipelas laboratory diagnosis

- laboratory exam
  - elevated antistreptolysin O titer supports diagnosis of streptococcal infection
  - blood cultures for patients with symptoms of toxicity or temp > 102^0F

Cellulitis and Erysipelas management

- Local care
  - immobilization
  - elevation to reduce swelling
- 2 weeks of antibiotic therapy
  - penicillin and dicloxacillin for most pts
  - many new, potent and expensive antibiotics offer no advantage

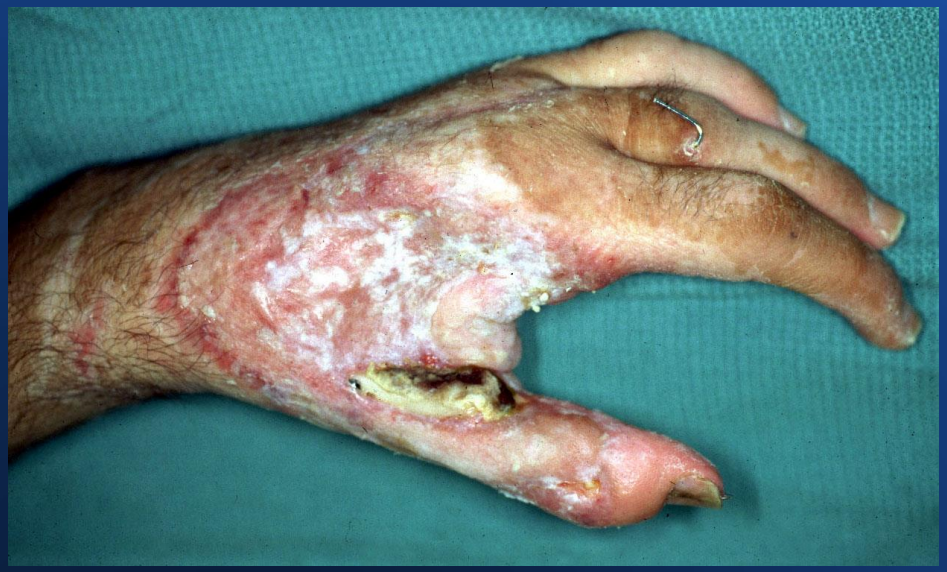
OUTPACIENT TREATMENT

Infection	Most patients	Pencillin allergic patients
Cellulitis		
mild-mod	Dicloxacillin (500 mg po q6h)	Cephalexin 500mg po q6h Clindamycin 450mg po q6h
severe	Nafcillin 1-2g iv q4h Vancomycin 1g iv q12h	Cefazolin 1g iv q8h
Erysipelas		
mild-mod	Penicillin V (500 mg po q6h)	Cephalexin 500mg po q6h Erythromycin 500mg po q6h Clindamycin 450mg po q6h
severe	Pen G 1-2 million U q6h	Cefazolin 1g iv q8h Clindamycin 900mg iv q8h

Adittional treatment

- Elevation
- Wound care/ Compression
- Treat portal of entry
- Post healing – compression stockings to prevent recurrence
- Lifestyle advice- exercise /weight reduction

Necrotizing fasciitis



- Extensive and rapidly spreading infection of the subcutaneous tissue and fascia accompanied by necrosis and gangrene of the skin and underlying structures
- Destroy fascia
- Systemic shock
- Young healthy & immunocompromised

STREP- sistemic infection

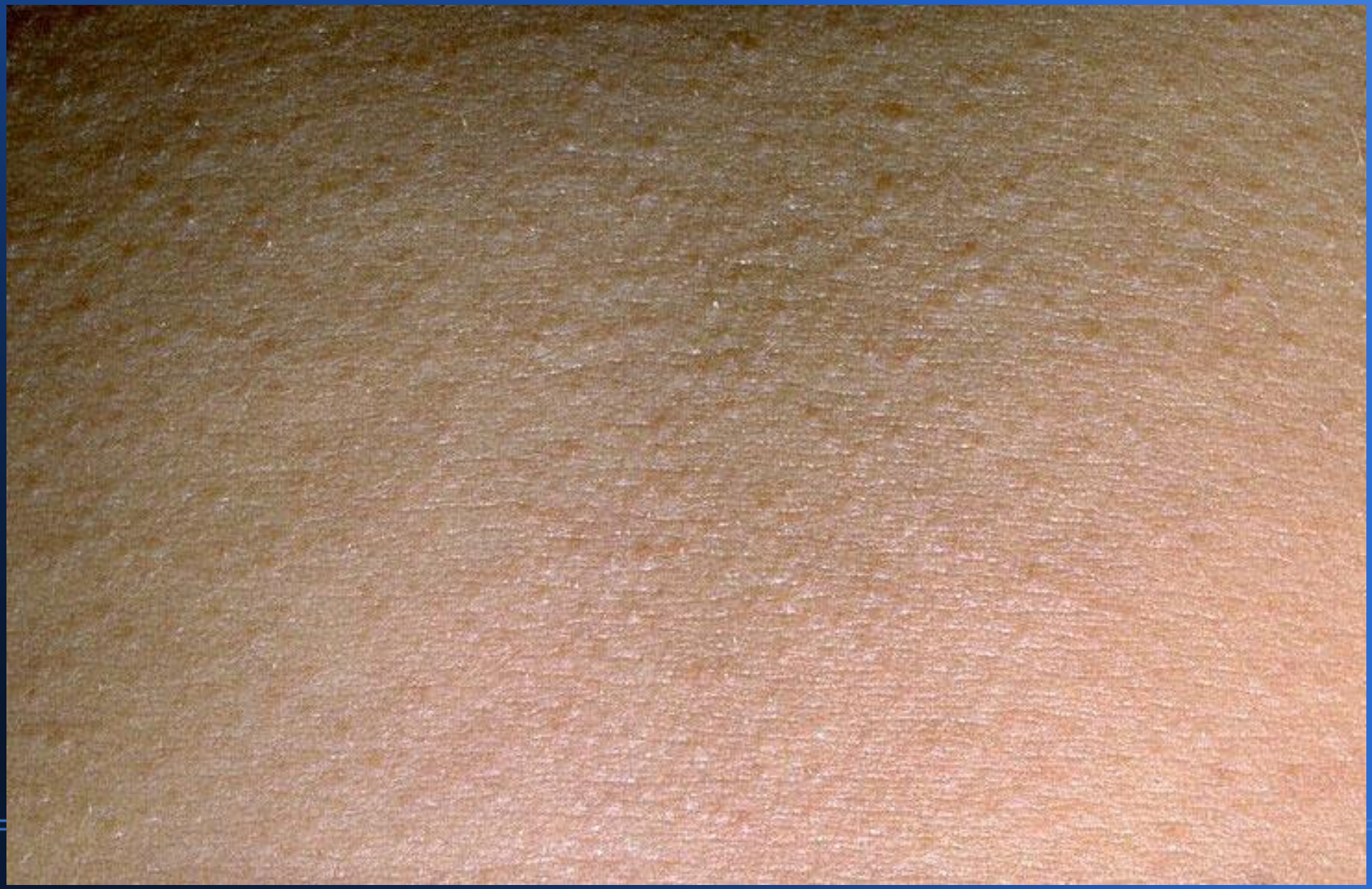
Systemic infections

- **Scarlet fever** – strain of *S. pyogenes* carrying a prophage that codes for erythrogenic toxin; can lead to sequelae
- Septicemia
- Pneumonia
- Streptococcal toxic shock syndrome

Scarlet fever

- Scarlet fever (scarlatina) is an exotoxin-mediated disease arising from group A beta-hemolytic streptococcal infection. Ordinarily, scarlet fever evolves from a tonsillar/pharyngeal focus, although the rash develops in fewer than 10% of cases of "strep throat."

Scarlet fever



Age:

- Peak incidence of scarlet fever occurs in persons aged 4-8 years.
- By the time children are 10-years-old, 80% have developed lifelong protective antibodies against streptococcal pyrogenic exotoxins.
- Scarlet fever is rare in children younger than 2 years, because of the presence of maternal antiexotoxin antibodies and lack of prior sensitization.

History:

- The incubation period of streptococcal pharyngitis is usually 2-4 days.
- Prodrome
  - Sore throat
  - Headache
  - Vomiting
  - Abdominal pain
- Fever
- The rash appears 12- 48 hours after onset of illness, first on the trunk and then extending rapidly over the entire body to finally involve the extremities.
- Fever abates within 12-24 hours after initiation of antibiotic therapy.

Physical:

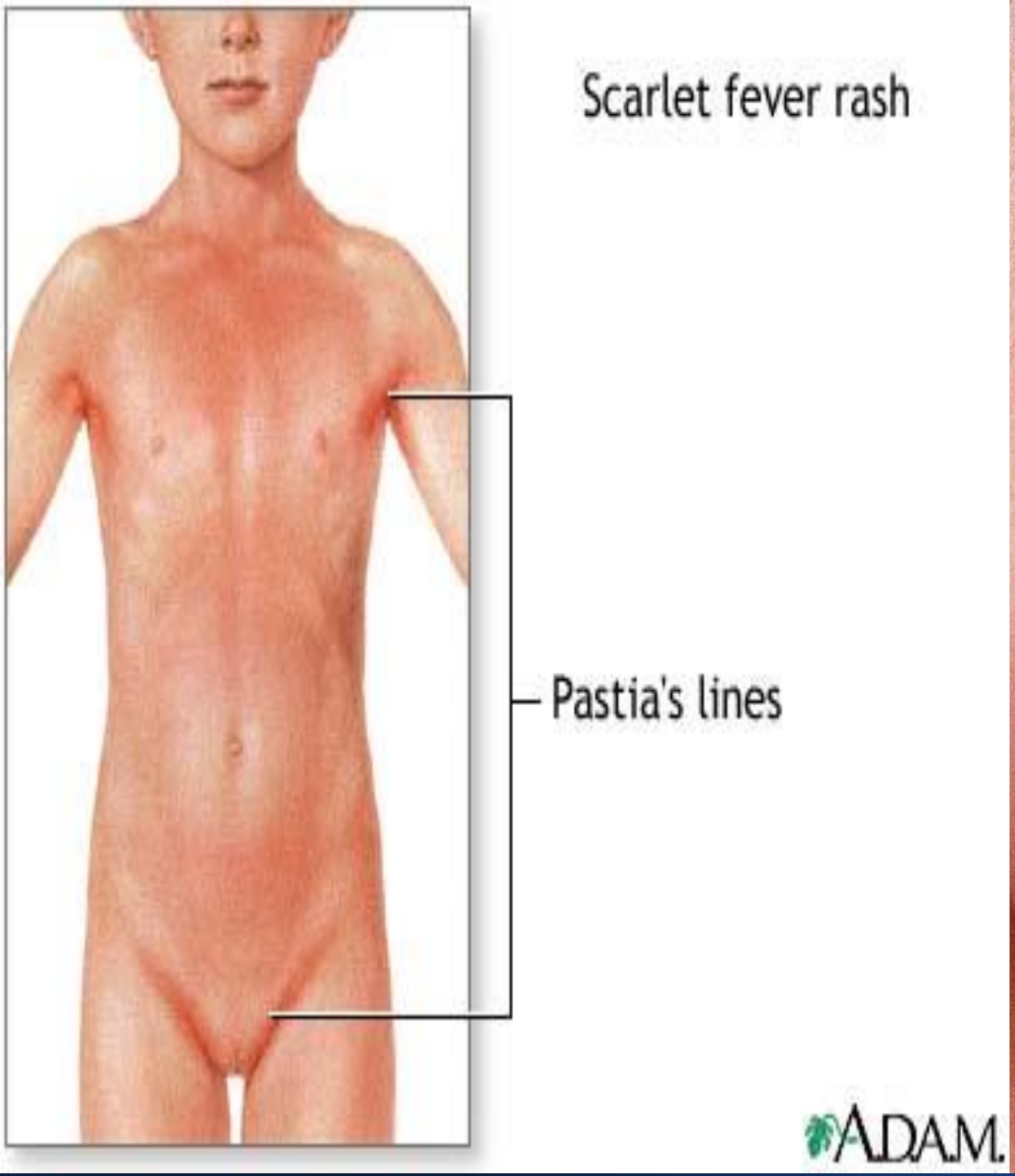
- The patient usually appears moderately ill.
- Fever
- Tachycardia
- Tonsils - Edematous, erythematous, and covered with a yellow, grey, or white exudate
- Petechiae on the soft palate
- Tender anterior cervical lymphadenopathy
- Face - Flushed with perioral pallor (Filatov Mask)

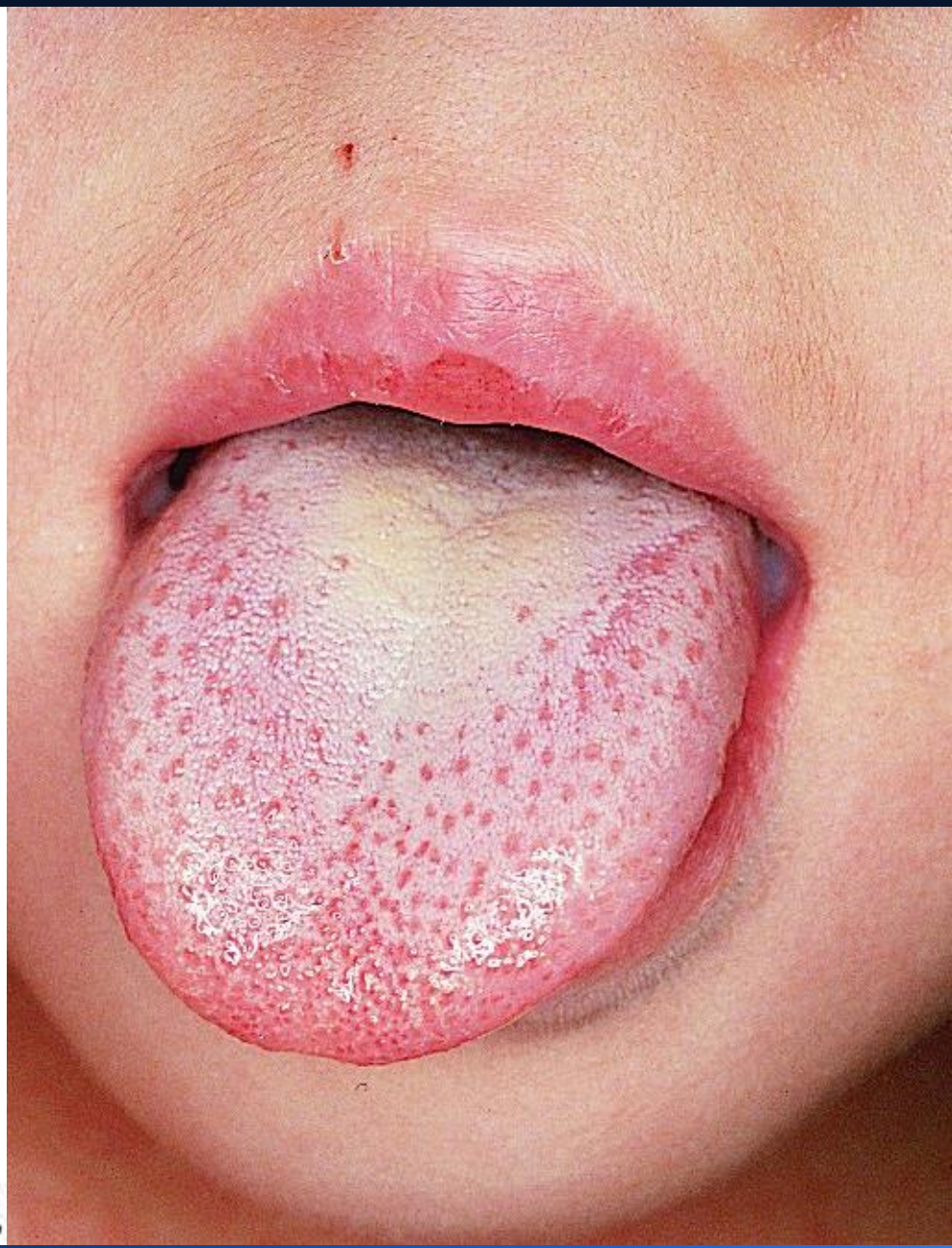
Exanthem

- The exanthem is diffusely erythematous; but, in some patients, it is more palpable than visible.
  - Exanthem usually has the texture of coarse sandpaper, and the erythema blanches with pressure.
  - The skin can be pruritic but usually is not painful.
  - A few days following generalization of the rash, it becomes more intense along skin folds and produces lines of confluent petechiae known as the Pastia sign. These lines are caused by increased capillary fragility.
  - The rash begins to fade 3-4 days after onset, and the desquamation phase begins. This phase begins with flakes peeling from the face. Peeling from the palms and around the fingers occurs about a week later and lasts for about a month after onset of the disease.

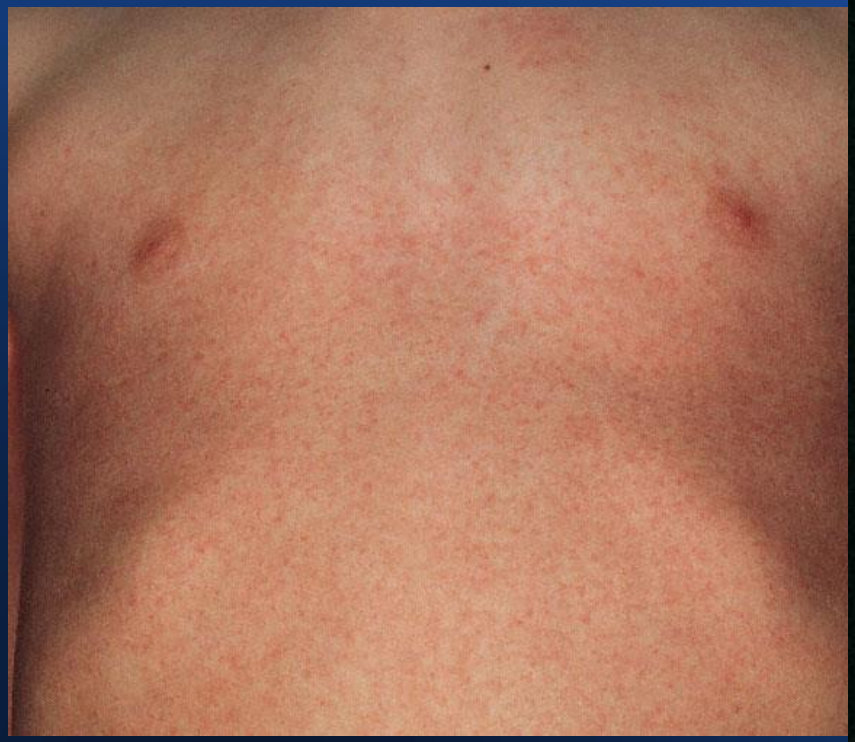
TONGUE CYCLE

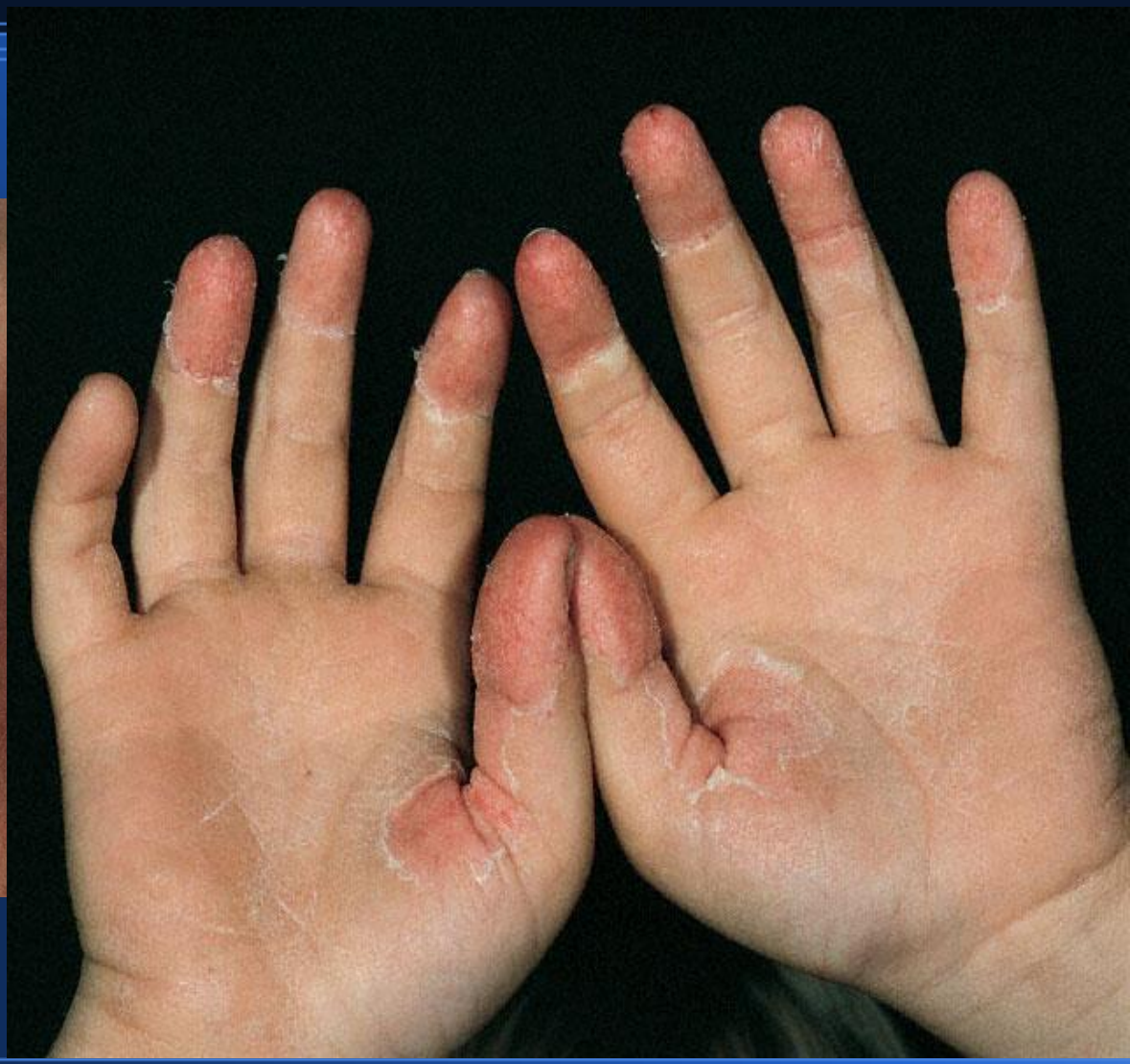
- During the first 2 days of the disease, the tongue has a white coat through which the red and edematous papillae project. This is referred to as a white strawberry tongue.
- After 2 days, the tongue also desquamates, resulting in a red tongue with prominent papillae called the red strawberry tongue.


Scarlet fever rash
Pastia's lines
A.D.A.M.



Scarlet fever





Lab Studies

- Throat culture remains the criterion standard for confirmation of group A streptococcal upper respiratory infection.
  - 10-15% carriage rate exists among healthy individuals, the presence of group A beta-hemolytic streptococci is not proof of disease.

Lab Studies

Streptococcal antibody tests are used to confirm previous group A streptococcal infection.

- The most commonly available streptococcal antibody test is the antistreptolysin O test (ASLO test: antibodies to streptococcal extracellular products) .
- Currently, streptococcal antibody tests during acute illness are not indicated.
- These tests can provide confirmatory evidence of recent infection but have no value in acute infection.
- They may be of value in patients suspected of having acute renal failure or acute glomerulonephritis.

Lab Studies

- Complete blood count
  - White blood cell (WBC) count in scarlet fever may increase to 12,000-16,000 per mm3, with a differential of up to 95% polymorphonuclear.
  - During the second week, eosinophilia, as high as 20%, can develop.

Treatment

- The goals when treating scarlet fever are to
  (1) prevent acute rheumatic fever
  (2) reduce the spread of infection
  (3) prevent suppurative complications
  (4) shorten the course of illness.

- Penicillin remains the drug of choice (there are still no documented cases of penicillin-resistant group A streptococci infections). A first-generation cephalosporin may be an effective alternative, as long as the patient does not have any documented anaphylactic reactions to penicillin. If this is the case, erythromycin can be considered as an alternative.

Table 1. Treatment of Group A Streptococcal Pharyngitis (*Primary Prevention* of Rheumatic Fever).

Antibiotic	Route	Dose	Duration of Rx
<u>For non penicillin allergic patients</u>: Benzathine benzylpenicillin	IM	< 30 kg 600,000 IU > 30 kg 1,200,000 IU	A single injection
Phenoxymethylpenicillin	Oral	< 30 kg 250 mg 2 or 3 times daily > 30 kg, 500 mg 2 or 3 times daily	10 days
<u>For penicillin allergic patients</u>: Erythromycin ethylsuccinate Erythromycin estolate	Oral Oral	40 mg/kg/day (max. 1.5 g/day) 3 times daily 20-40 mg/kg/day (max. 1.5 g/day) 3 times daily	10 days 10 days

Complications

- Suppurative complications
  - Cervical adenitis
  - Otitis media/mastoiditis
  - Ethmoiditis
  - Sinusitis
  - Peritonsillar abscess
  - Pneumonia
  - Septicemia, meningitis, osteomyelitis, and septic arthritis
- Rheumatic fever
- Acute renal failure from poststreptococcal glomerulonephritis

Streptococcus Pyogenes Clinical Infections

Streptococcal toxic shock syndrome (STSS)

- severe systemic immune response mediated by superantigens
- acute fulminating disease associated with Shock with multi-organ failure
- bacteraemia with toxaemia
- mortality 20-30%
- streptococcal pyrogenic exotoxins

Group B: *Streptococcus Agalactiae*

- Regularly resides in human vagina, pharynx, and large intestine
- Can be transferred to infant during delivery and cause severe infection
  - Most prevalent cause of neonatal pneumonia, sepsis, and meningitis
  - Pregnant women should be screened and treated
- Wound and skin infections and endocarditis in debilitated people

Group D Enterococci and Groups C and G Streptococci

- Group D:
  - *Enterococcus faecalis, E. faecium, E. durans*
  - Normal colonists of human large intestine
  - Cause opportunistic urinary, wound, and skin infections, particularly in debilitated persons
- Groups C and G:
  - Common animal flora, frequently isolated from upper respiratory; pharyngitis, glomerulonephritis, bacteremia

Treatment and Prevention

- Groups A and B are treated with penicillin
- Long-term penicillin prophylaxis for people with a history of rheumatic fever or recurrent strep throat
- Enterococcal treatment usually requires combined therapy

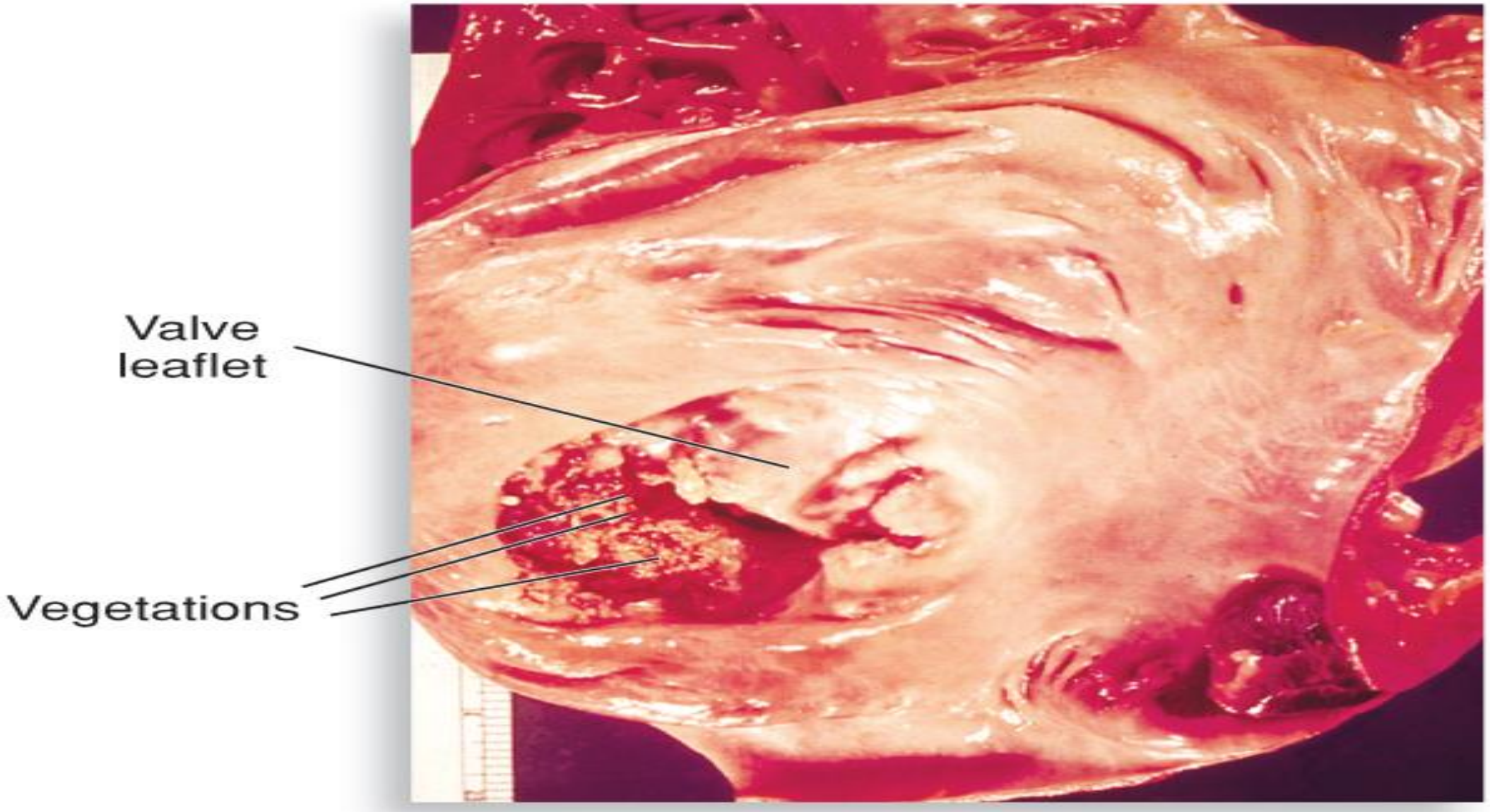
α-Hemolytic Streptococci: Viridans Group

- Large complex group
  - *Streptococcus mutans, S. oralis, S. salivarus, S. sanguis, S. milleri, S. mitis*
- Most numerous and widespread residents of the gums and teeth, oral cavity, and also found in nasopharynx, genital tract, skin
- Not very invasive; dental or surgical procedures facilitate entrance

Viridans Group

- Bacteremia, meningitis, abdominal infection, tooth abscesses
- Most serious infection – **subacute endocarditis** – Blood-borne bacteria settle and grow on heart lining or valves
- Persons with preexisting heart disease are at high risk
- Colonization of heart by forming biofilms

Two effects of streptococcal colonization



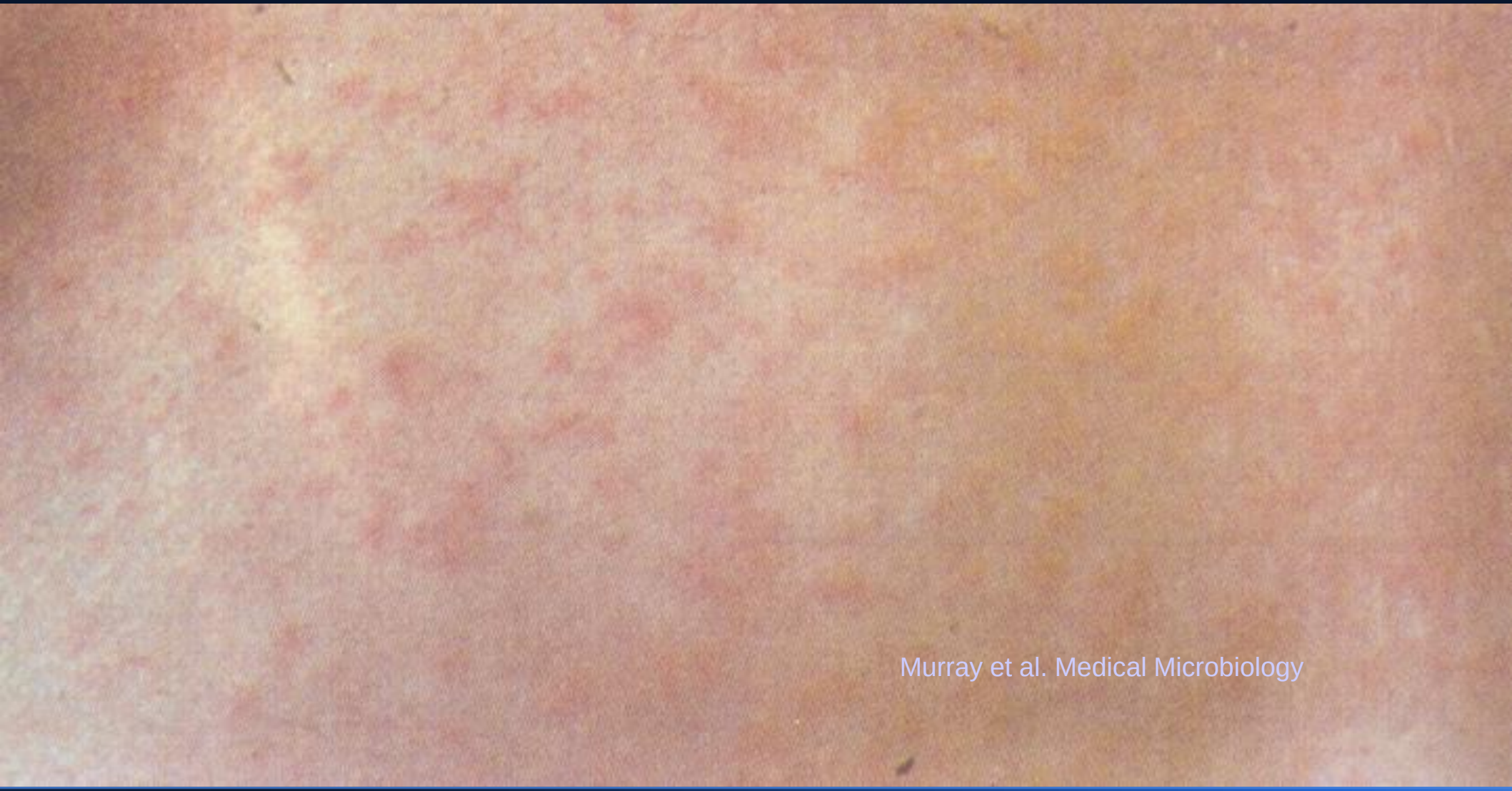
Viridans Group
S. MUTANS

- *S. mutans* produce slime layers that adhere to teeth, basis for plaque
- Involved in dental caries
- Persons with preexisting heart conditions should receive prophylactic antibiotics before surgery or dental procedures

Streptococcus Pneumoniae: The Pneumococcus

- Causes 60-70% of all bacterial pneumonias
- Small, lancet-shaped cells arranged in pairs and short chains
- All pathogenic strains form large capsules – major virulence factors
- Causes pneumonia and otitis media

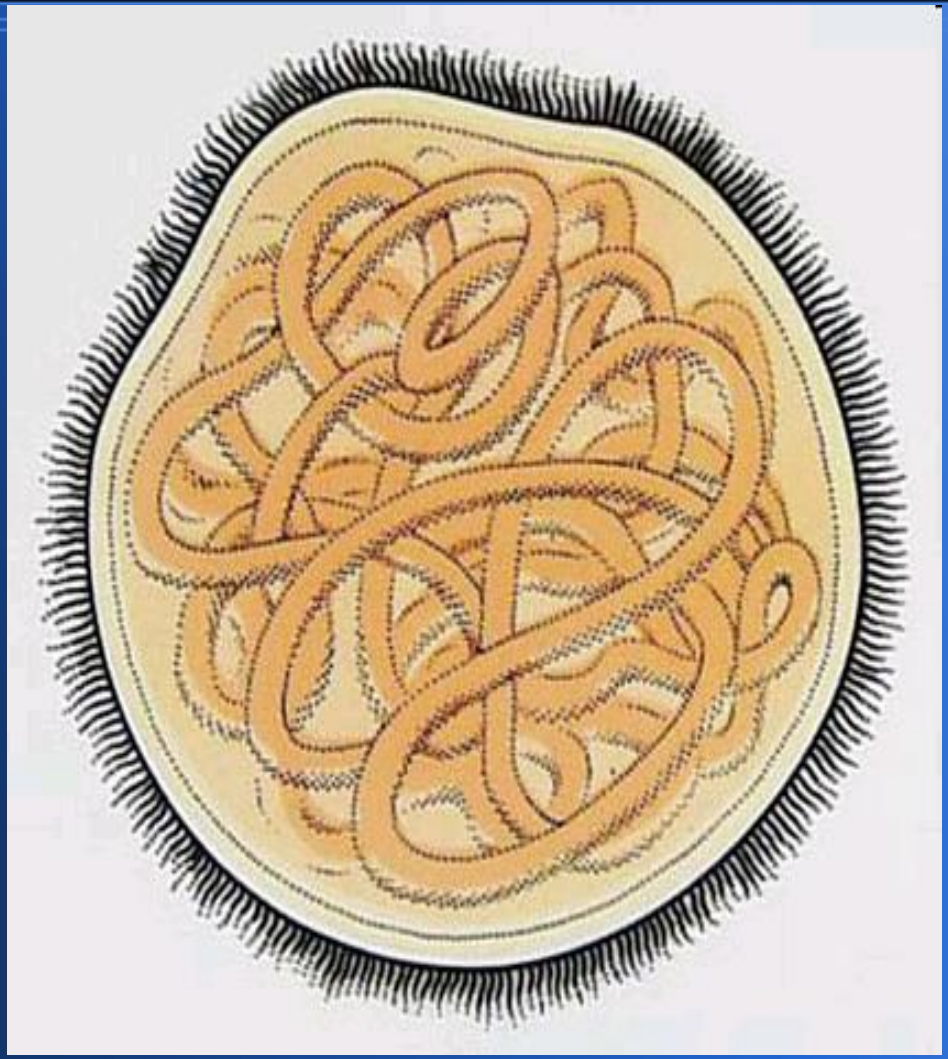
RUBELLA



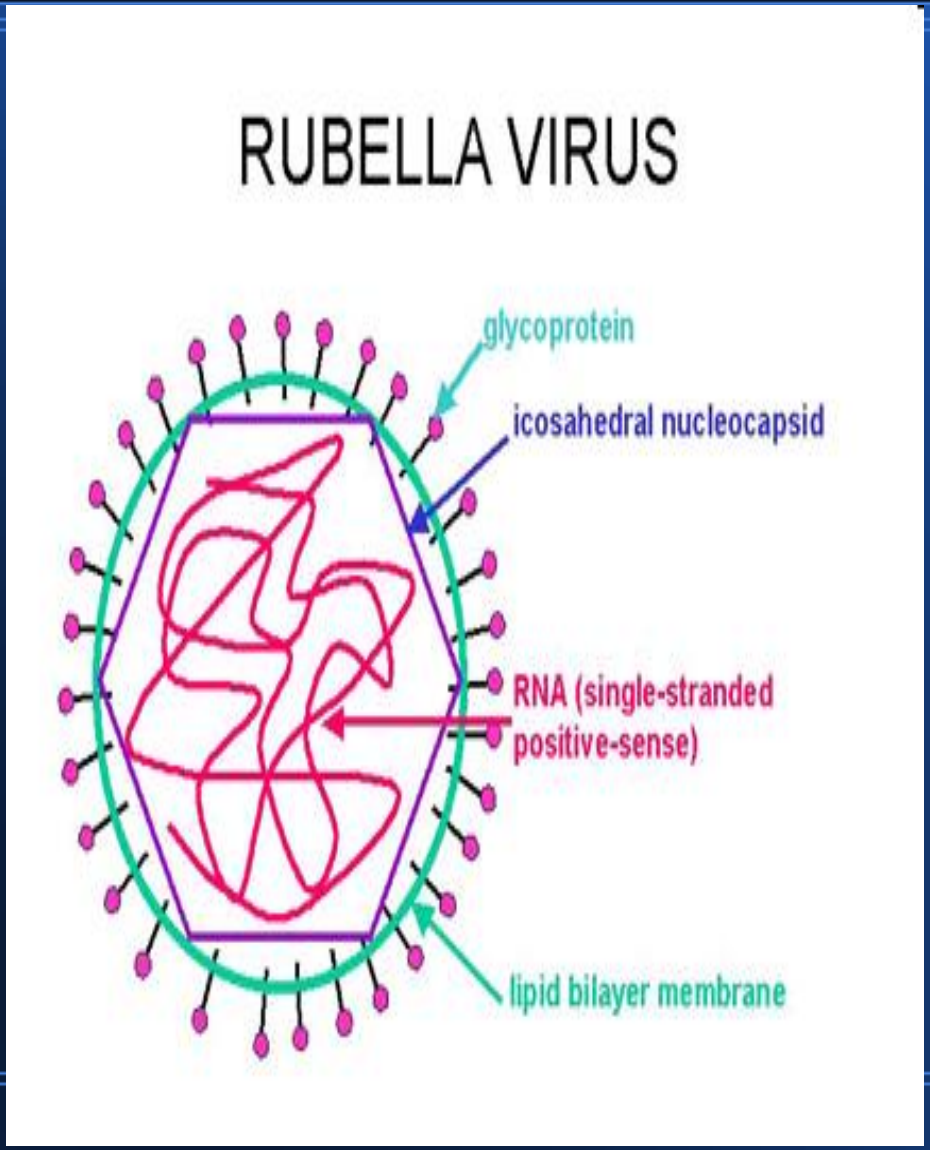
Murray et al. Medical Microbiology

Rubella
(German Measles)

- Rubella is also called as 3 day Measles or German Measles.
- Family – **Togaviridae**
- Genus - **Rubivirus**
- In general belong to Togavirus group



Rubella Virus

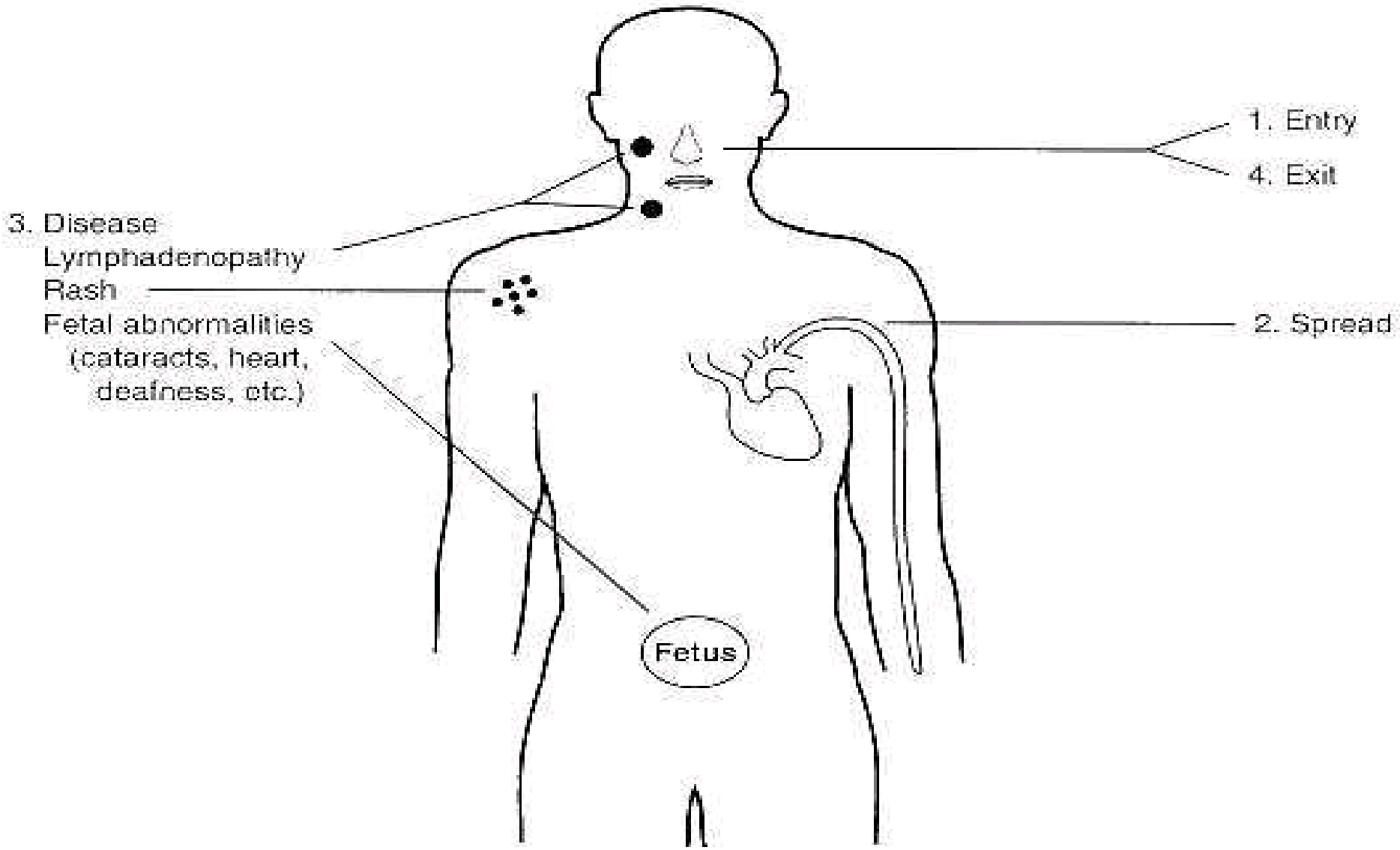


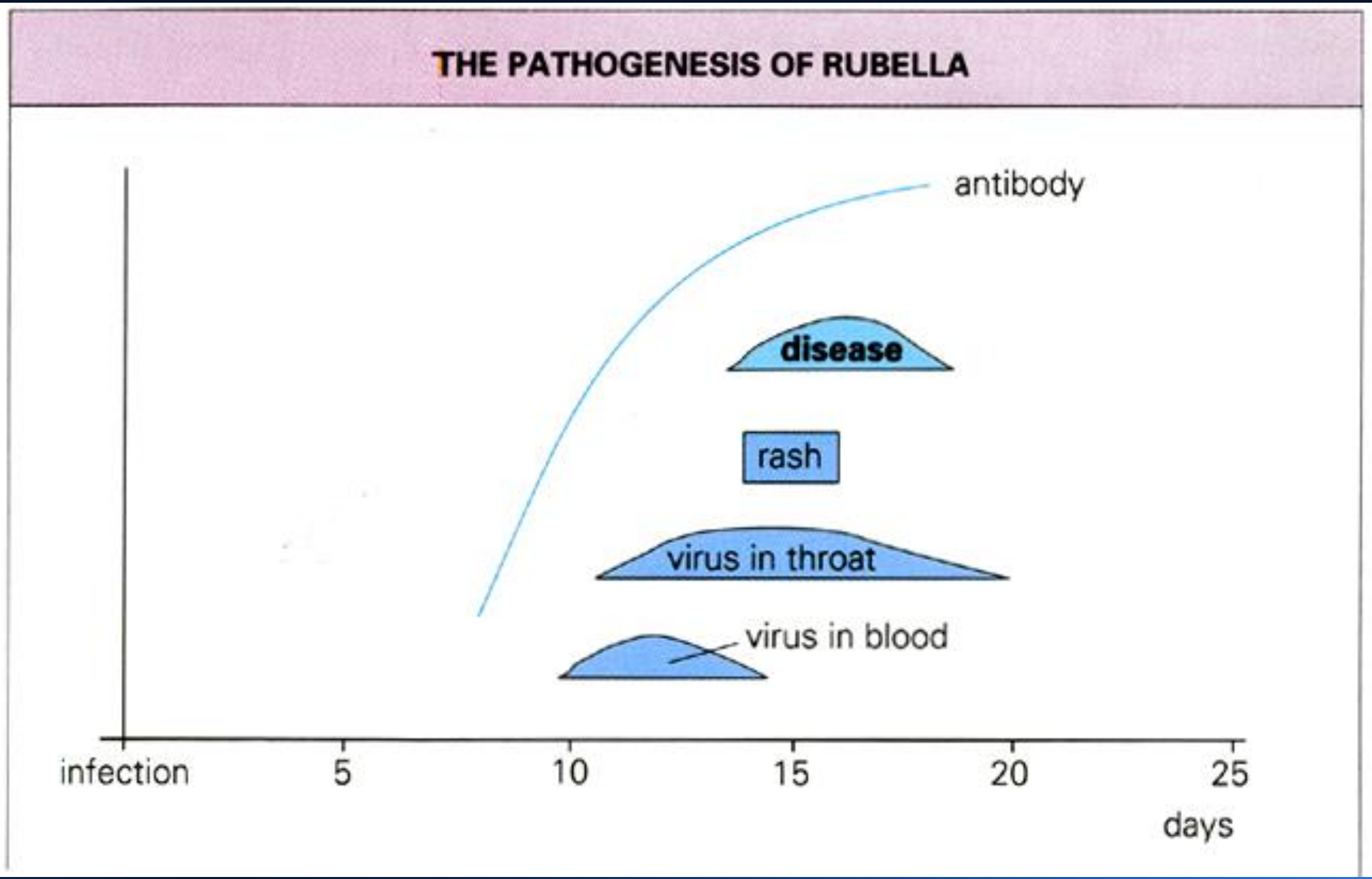
- Rubella virus are
  ss – RNA virus
  Diameter 50 – 70 nm
  Enveloped Spherical
  Virus carry hemagglutinin
  Virus multiply in the cytoplasam of infected cell.
  Only one antigenic type

Rubella Pathogenesis

- **Respiratory transmission**
- **Highly infectious**
- **Replication** in **nasopharynx** and **regional lymph nodes**
- **Viraemia 5-7 days** after exposure
- **Placenta** and **fetus infected during viraemia** (transplancental barrier crossed)

Systemic events of Rubella Infection




THE PATHOGENESIS OF RUBELLA
antibody
disease
rash
virus in throat
virus in blood
infection
5
10
15
20
25
days

EPIDEMIOLOGY

- Natural infection protects for life
- World wide distribution
- Epidemics of cyclic pattern every 6-8 years.

Source of infection:

- Clinical /subclinical cases [50 - 65 %].
- No carriers in postnatally acquired rubella
- Infants with congenital rubella: Shed virus for months .

Communicability: Less communicable

1 week – RASH -1 week.

EPIDEMIOLOGY

Age: 3-10 years, Developed countries > 15 years

Immunity:

- 1 attack - life long immunity
- Maternal antibodies protect infant during first 6 months
- 40% of childbearing women susceptible

ENVIRONMENTAL FACTORS:

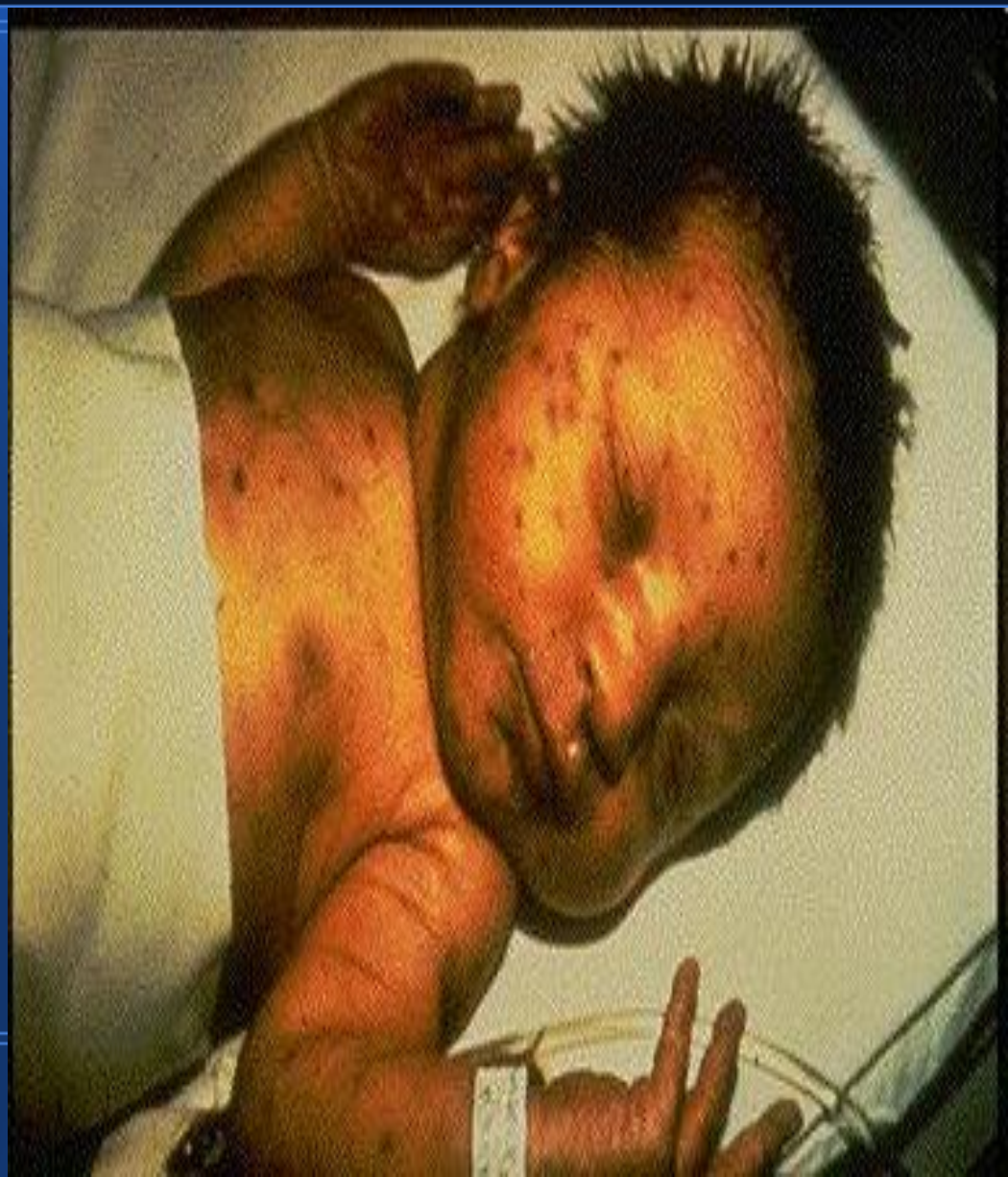
- Seasonal pattern– late winter & early spring
- Poor housing, over crowding

Transmission:

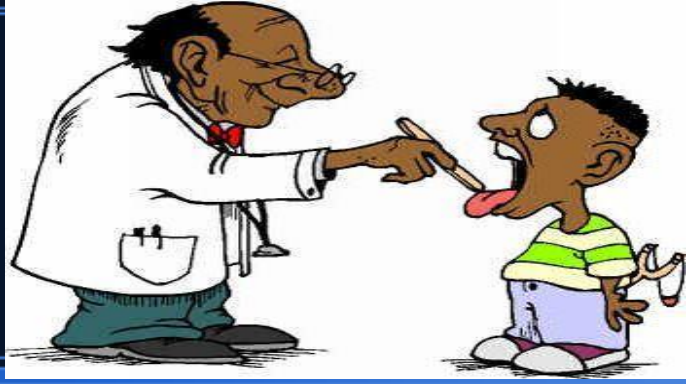
- **Directly** from person-to-person by droplets from nose & throat, droplet nuclei
- **Portal of entry:** Respiratory route
- VERTICAL TRANSMISSION

Post natal Rubella

- Occurs in Neonates and Childhood
- Adult infection occurs through mucosa of the upper respiratory tract spread to cervical lymphnodes
- Viremia devlops after 5 – 9 day
- Lasts for 13 – 15 days
- Leads to development of antibodies
- The appearance of antibodies coincides the appearance of suggestive immulogic basis for the rash
- In 20 – 50 % cases of primary infections are subclinical



Rubella Clinical Features



Incubation period: 2-3 weeks (18 days)

Duration – 3 days

- 50-60% Asymptomatic
- Mild and variable symptoms

CLINICAL FEATURES:

1) PRODROMAL STAGE:

- Coryza, sore throat, low grade fever (mild)
- Within 24 hours RASH starts.

Rubella Clinical Features

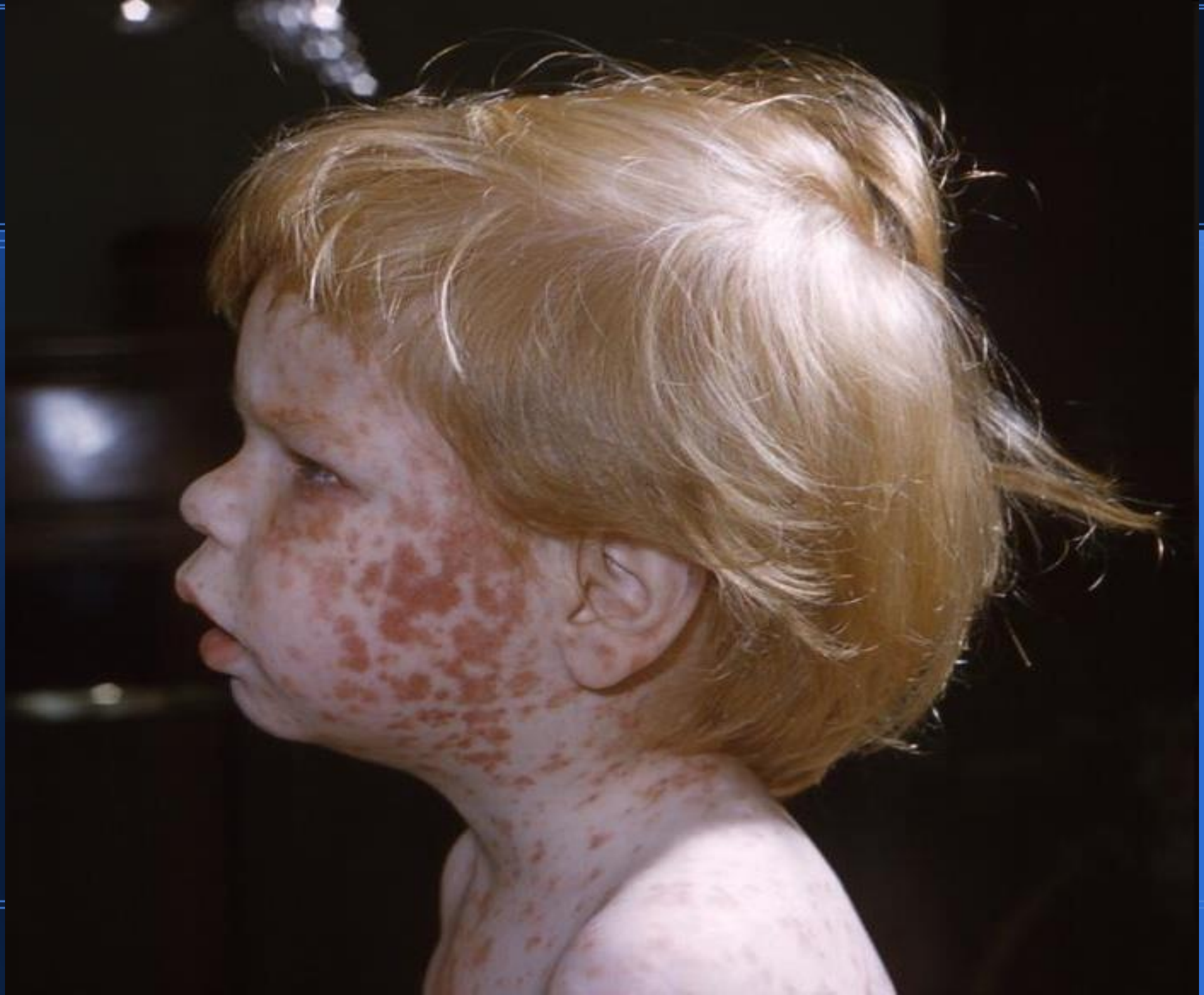
2) LYMPHADENOPATHY

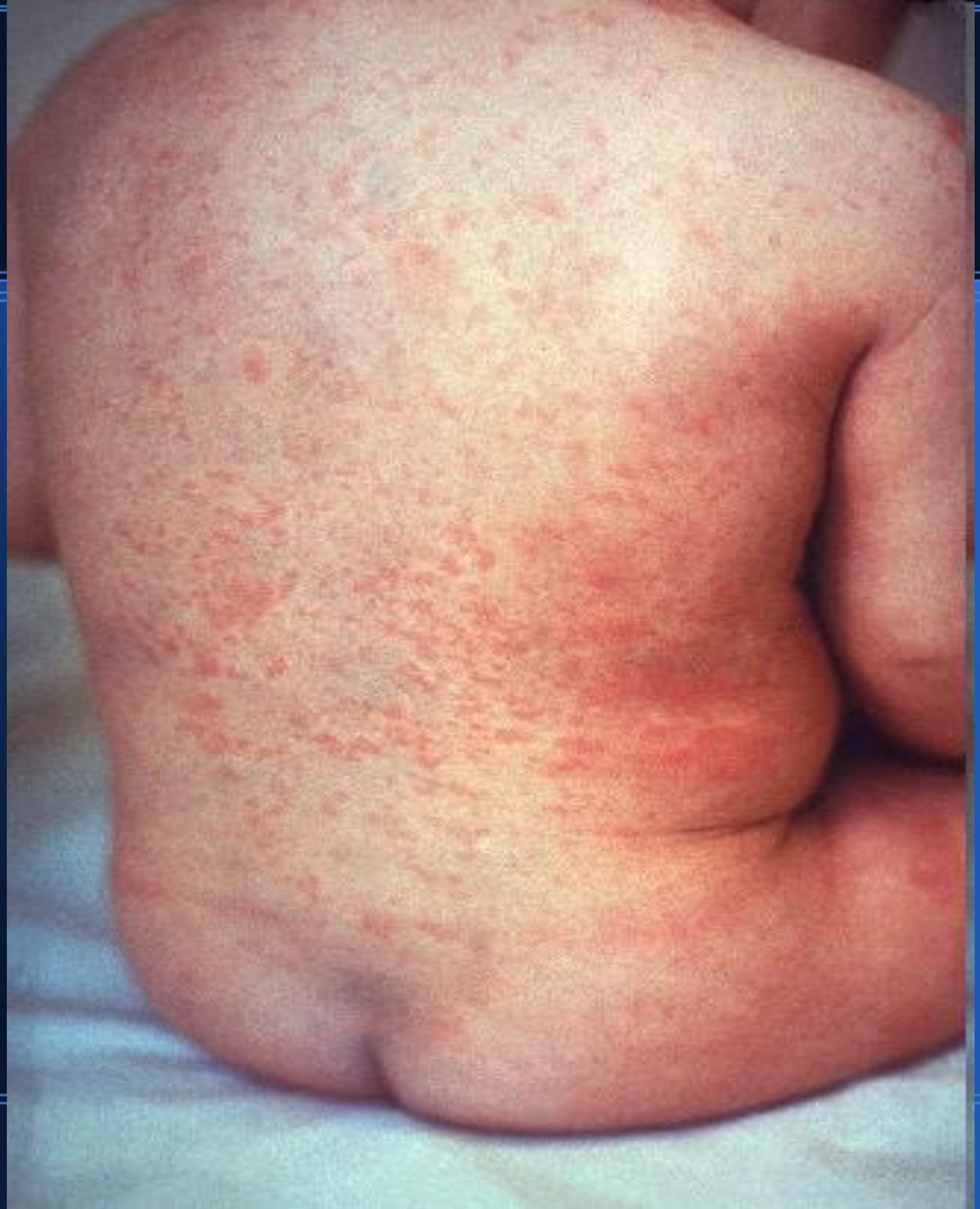
Post-auricular and posterior cervical

7 days ------ RASH--------10 -14 days

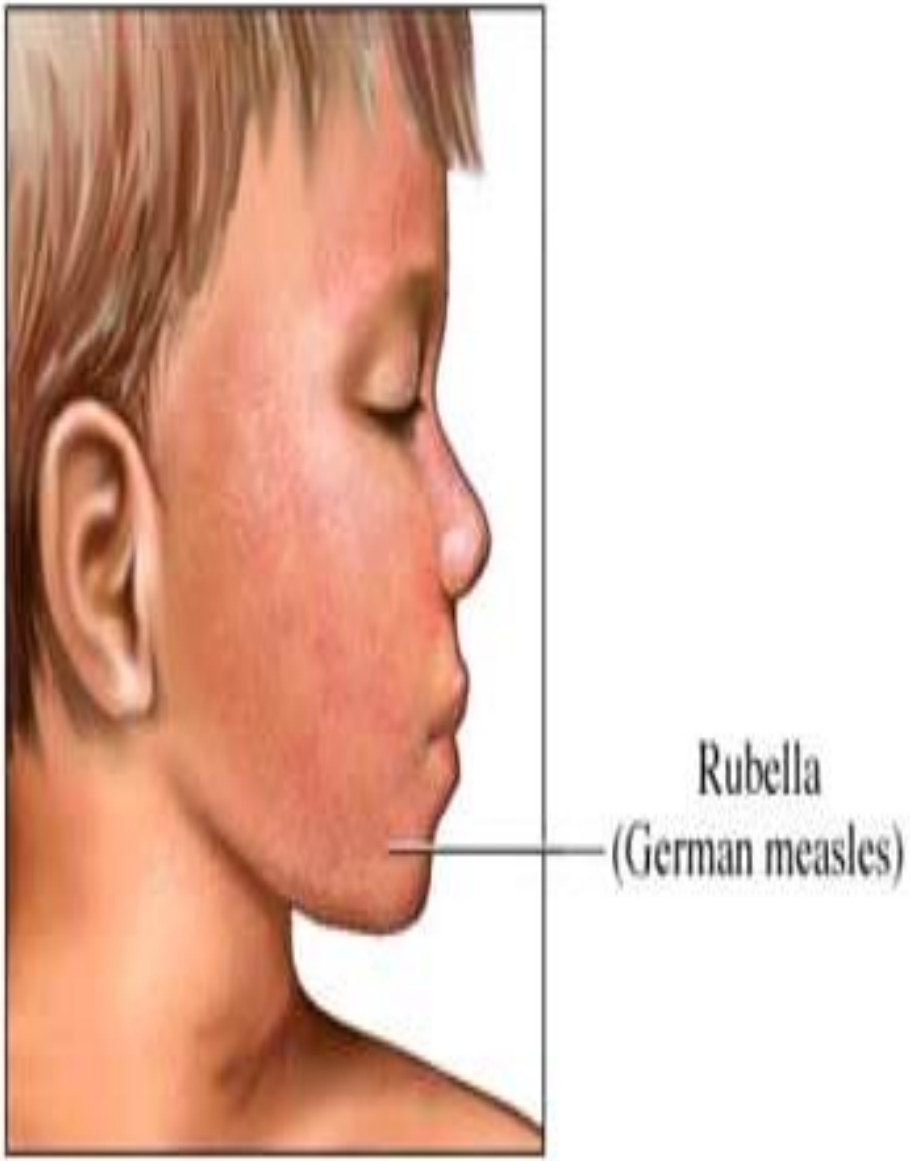
3) RASH

- Minute, discrete, pinkish, macular, not confluent like measles
- Face----Trunk-----Extremities
- Spreads and clears fast
- Disappears 3 rd day





Immunity - Rubella



DIAGNOSIS

- **Virus isolation:** Nasopharyngeal or throat swabs taken 6 days prior or after appearance of rash is a good source of Rubella virus

  Throat swab culture.

  Virus antigens can be detected by Immunofluresecentet methods

- **Serology**

  HAI (Hemagglutination inhibition test) developed in 1966.

- Two blood samples collected – 1st within 5 days of onset, 2nd after 2 weeks.

  Four fold rise in antibody titre in paired sera

  ELISA & Radio-immune assay.

  Presence of IgM antibody- 2 weeks after RASH

Other manifestations and complications

- May produce transient Arthritis, in women in particular.
- Serious complications are

Thrombocytopenia

Purpura

Encephalits

RUBELLA-LIKE SYMPTOMS

OTHER CAUSES INCLUDE:

- HUMAN PARVOVIRUS
- SOME ALPHAVIRUSES
- SOME ENTEROVIRUSES
- SOME ADENOVIRUSES
- EPSTEIN-BARR VIRUS
- SCARLET FEVER
- TOXIC DRUG REACTIONS

Congenital Rubella Syndrome

- Maternal viremia with Rubella infection during pregnancy may result in infection of placenta and fetus.
- The growth rate of fetal cells are reduced.
- Results in fewer number of cells after the birth.
- Lead to deranged and hypo plastic organ development.
- Results in structural damage and abnormalities

Rubella infection – At various trimesters

- Ist trimester infections lead to abnormalities in 85 % of cases. and greater damage to organs
- 2nd trimester infections lead to defects in 16 %
- > 20 weeks of pregnancy fetal defects are uncommon

  However Rubella infection can also lead to fetal deaths, and spontaneous abortion.
- The intrauterine infections before birth lead to viral excretion in various secretion in newborn up to 12-18 months.

Clinical Findings
(Congenital Rubella Syndrome)

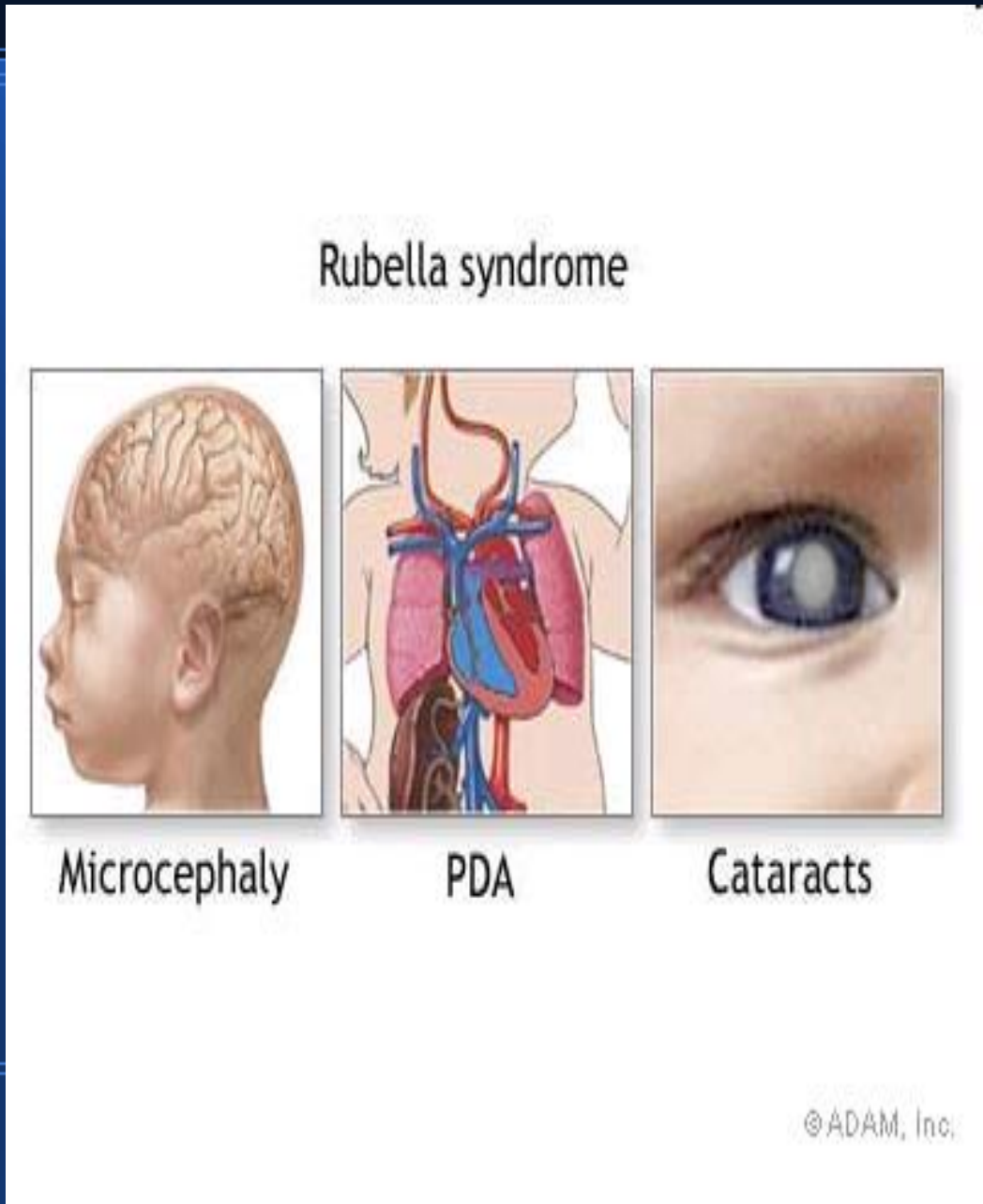
- May be transient effects in infants.
- Permanent manifestations may be apparent at birth, become recognized during the first year.
- Developmental abnormalities appear during childhood and adolescents.

Classical Triad of Rubella

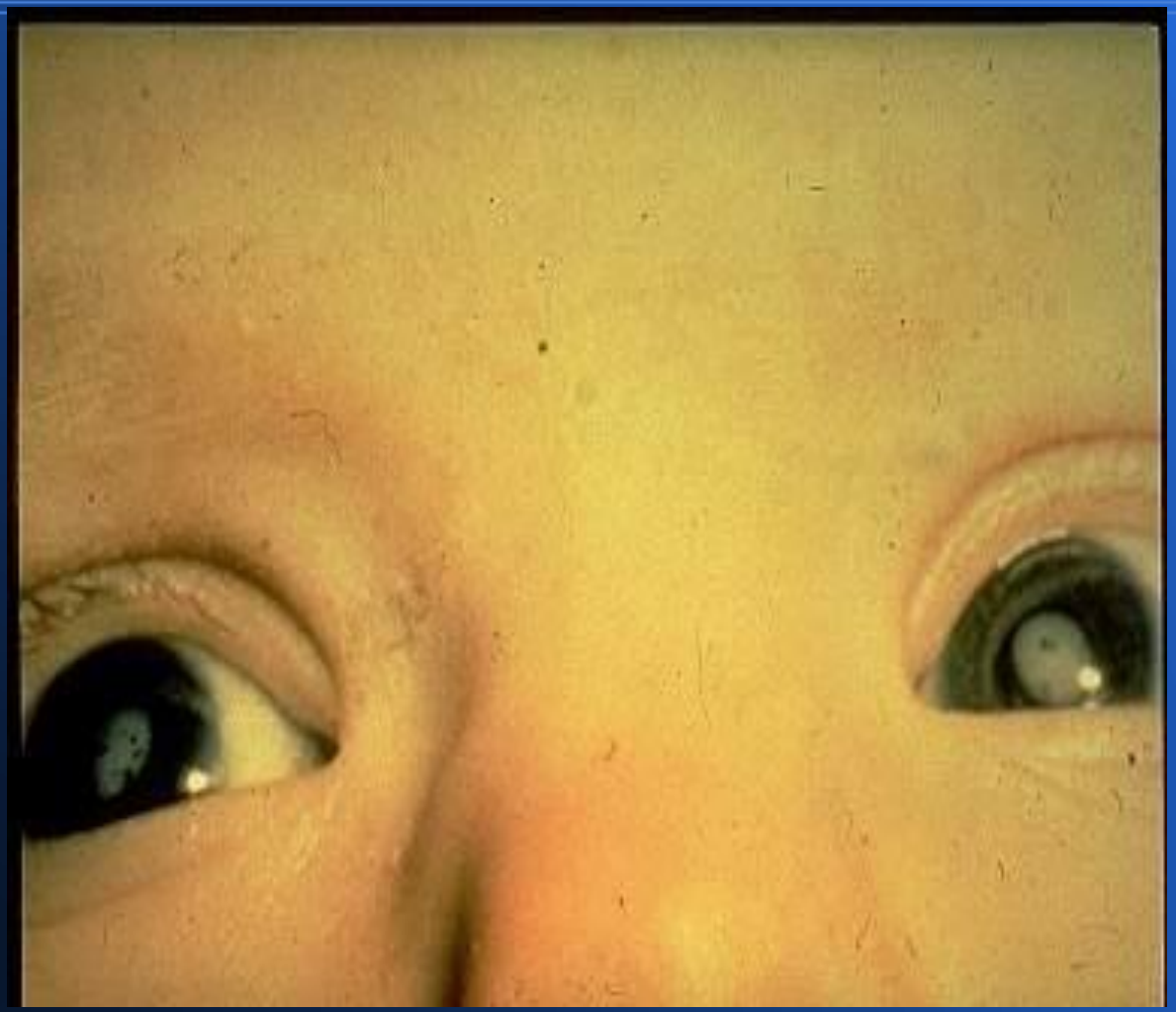
Classical Triad

- **Cataract**
- **Cardiac abnormalities**
- **Deafness**

- **Other manifestations**
- **Growth retardation**
- **Rash**
- **Hepatosplenomegaly**
- **Jaundice**
- **Meingoencephalitis**
- **CNS defects lead to moderate to profound mental retardation**



Congenital Rubella Cataract



Other Neurological manifestions

- Problems in balance
- Motor skills in preschool children altered.
- A rare complication of Pan encephalitis can occur in second decade with Congenital rubella syndrome may progress to death.

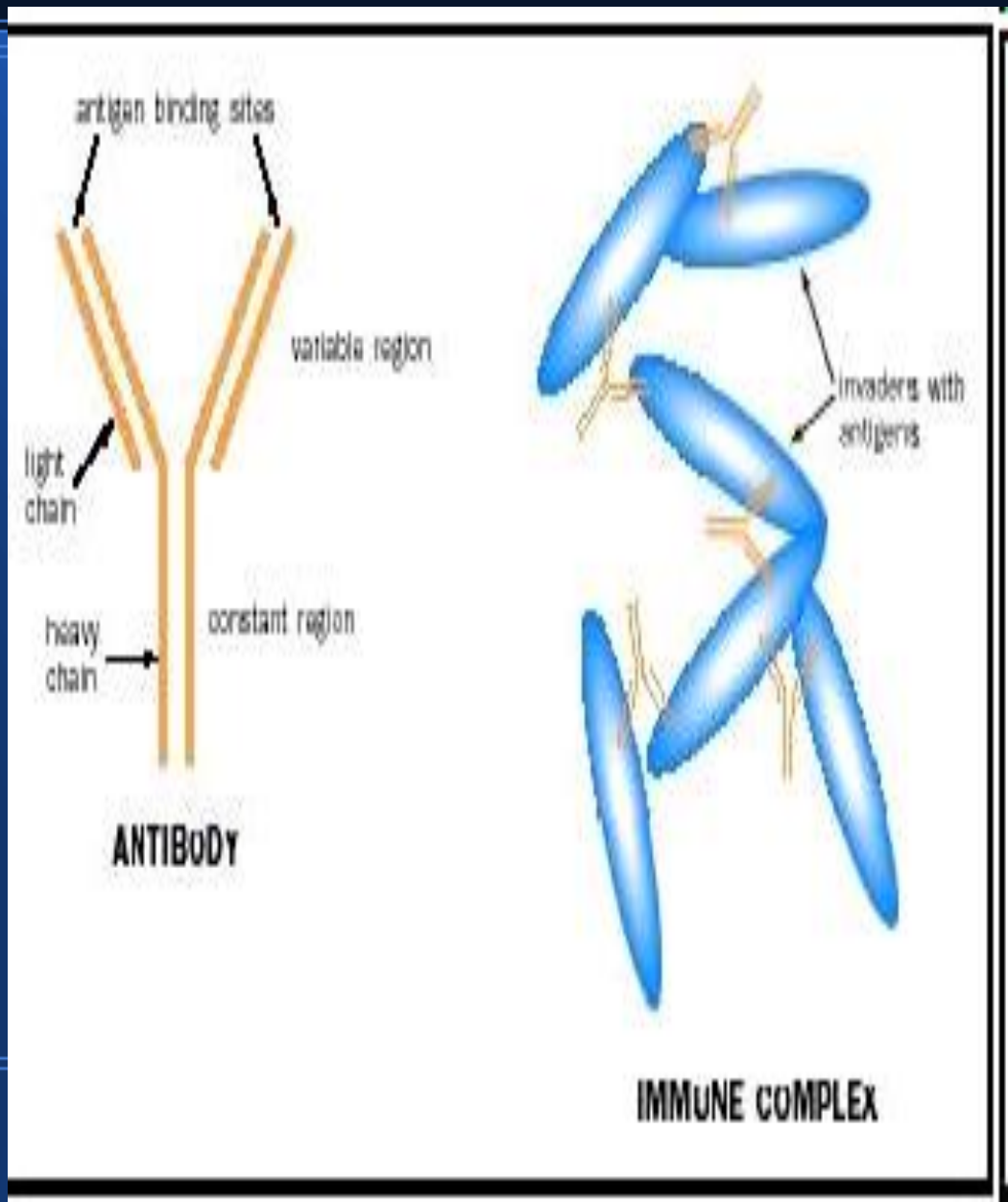
Active infection at birth

1. Hemolytic anemia
2. Thrombocytopenic purpura
3. Petechial rash
4. Pneumonia.
5. Hepatitis
6. Encephalitis

Newborn sheds virus up to 18 months

Diagnosis of Congenital Rubella Syndrome

- Demonstration of Rubella antibodies of IgM in a new born is diagnostic value. As IgM group do not cross the placenta and they are produce in the infected fetus,



Treatment and Prevention

- Rubella is a mild self limited illness.
- No specific treatment or Antiviral treatment is indicated.
- AINS, symptomatic, vitamins

Measles vaccine is given as MMR Vaccine

PREVENTION

GOAL: Prevent rubella infection during a future pregnancy

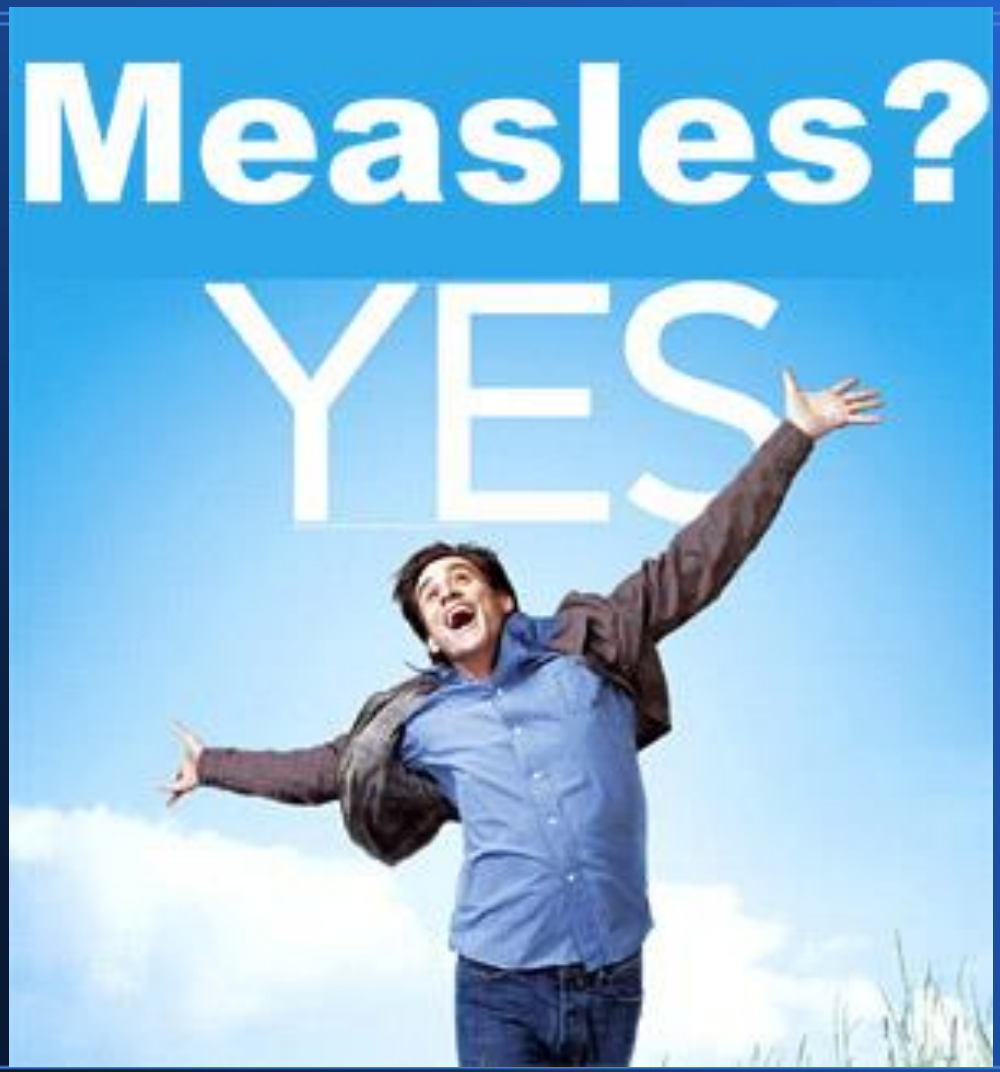
Active immunisation : Live attenuated vaccine

- **Dose:** 0.5 ml subcutaneously
- Sero-conversion rate **95%**
- Immunity persists life long / 14-16 years

Contraindication: Pregnancy.

Avoid pregnancy for 3 months after vaccination.


Thank You!

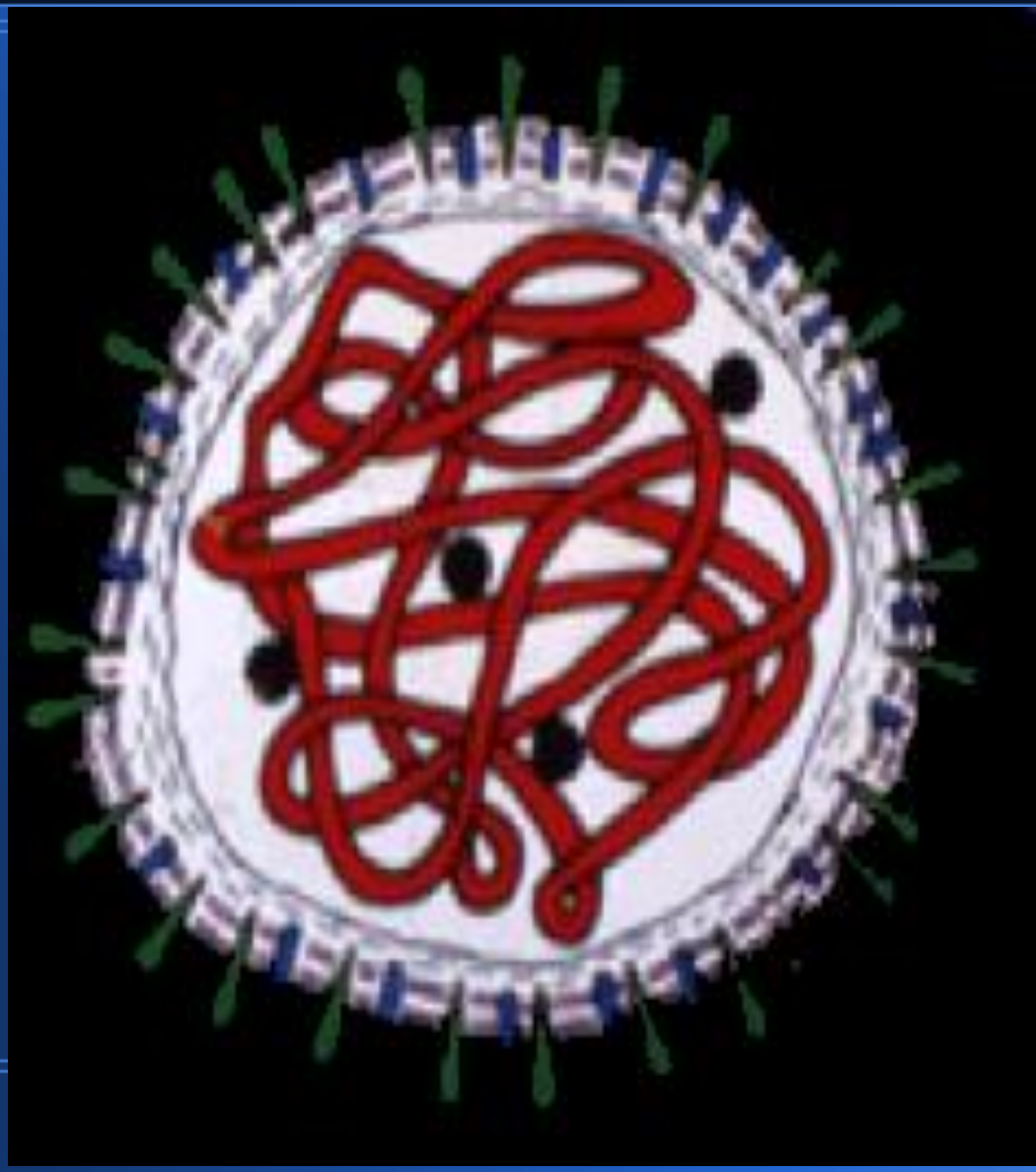

Measles?
YES

Measles: The Disease

- **Acute**, **highly contagious** viral illness
- Commonly causes **fever** with **rash**
- Near **universal infection of childhood** in pre-vaccination era
- Frequent and often **fatal** in **developing countries**

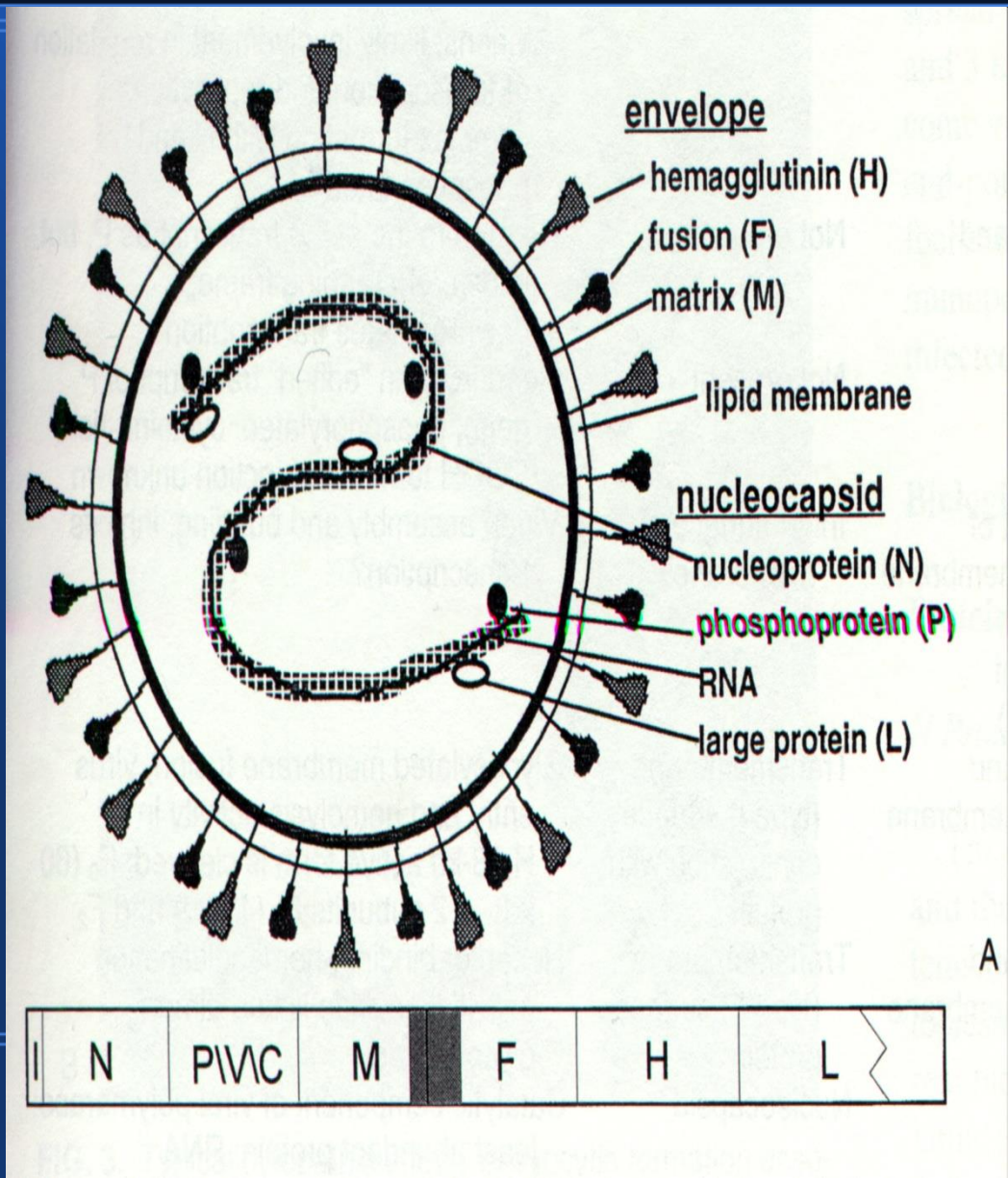
Measles - Parmyxoviridae

- **Measles** is an infection of the respiratory system caused by a virus, specifically a Paramyxoviruses of the genus *Morbillivirus* Morbilliviruses, like other paramyxoviruses, are enveloped, single-stranded, negative-sense RNA viruses.

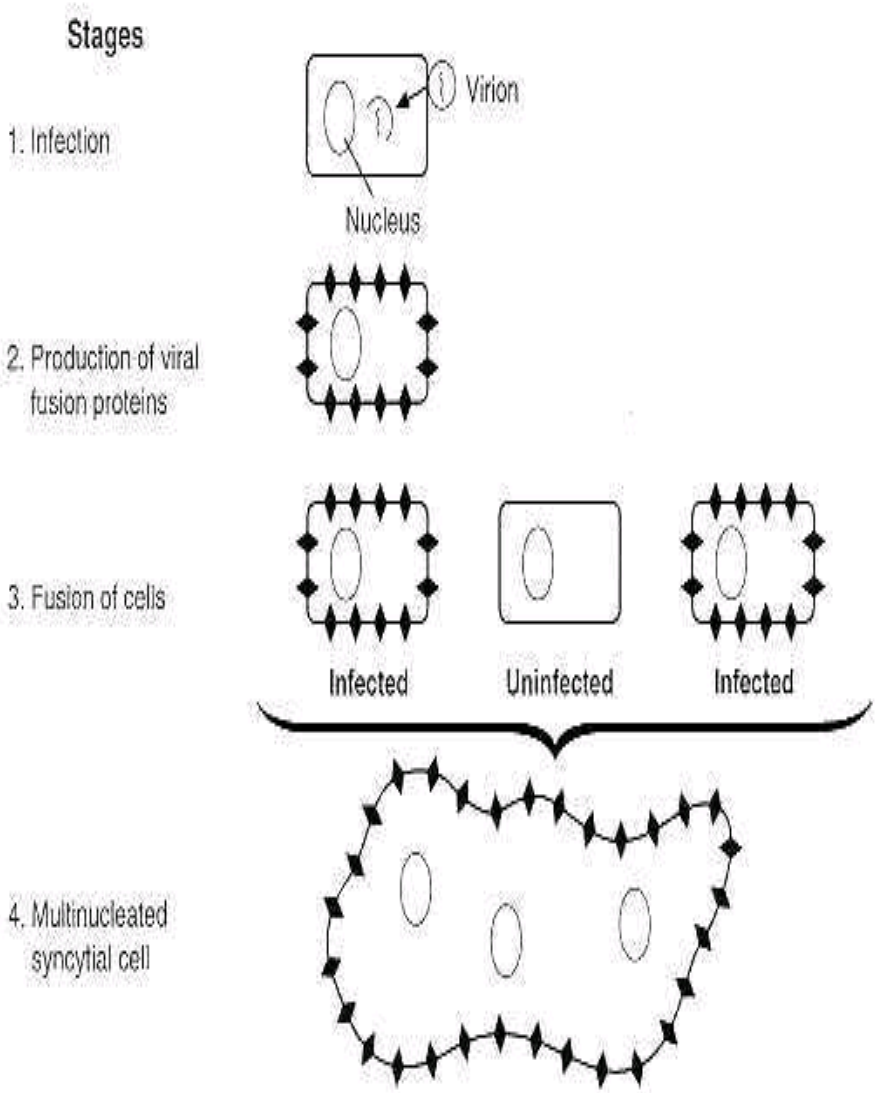


Measles Virus

- **contains six structural proteins, three that are complexed to the RNA and three that are associated with the viral membrane envelope.**



Fusion Protein



The F (fusion) protein is responsible for fusion of virus and host cell membranes, viral penetration and hemolysis. The H (hemagglutinin) protein is responsible for adsorption of the virus to cells.

Three kinds of antibodies are produced after infection:

- complement combining antibody;
- hemagglutinin inhibiting antibody
- neutralizing antibody

Only one antigenic type of measles virus is known.

EPIDEMIOLOGY

- **1.Source of infection**

  The patients are the only source of infection.

- **2 .Routes of transmission**

  Air-borne, contact with fluids from an infected person's nose and mouth, either directly or through aerosol transmission

- **3. Susceptibility of population**

  3.1 All age person is susceptible; 90% of contact people acquire the disease.

  3.2 The permanent immunity acquire after disease.

- **4. Epidemic features**

  season:winter and spiring

  age:6 months to 5 years old

EPIDEMIOLOGY

- **H**as a PRECISE incubation period of 10 days with average of 6-19 days
- Infectivity lasts from 4 days prior to 4 days following the onset of the rash.
- Age-specific attack rates may be highest in infants younger than 12 months school-aged children

Measles: Pathogenesis

- **Respiratory transmission** of virus
- **Replication** in **nasopharynx** and **regional lymph nodes**
- **Primary** viremia **2-3 days** after exposure
- **Secondary** viremia **days 5-7** after exposure with spread to tissues

measles virus

↓respiratory tract

epithelial cells(multiply)

↓lymphoid tissue

blood (first viremia)

↓

MPS(multiply)

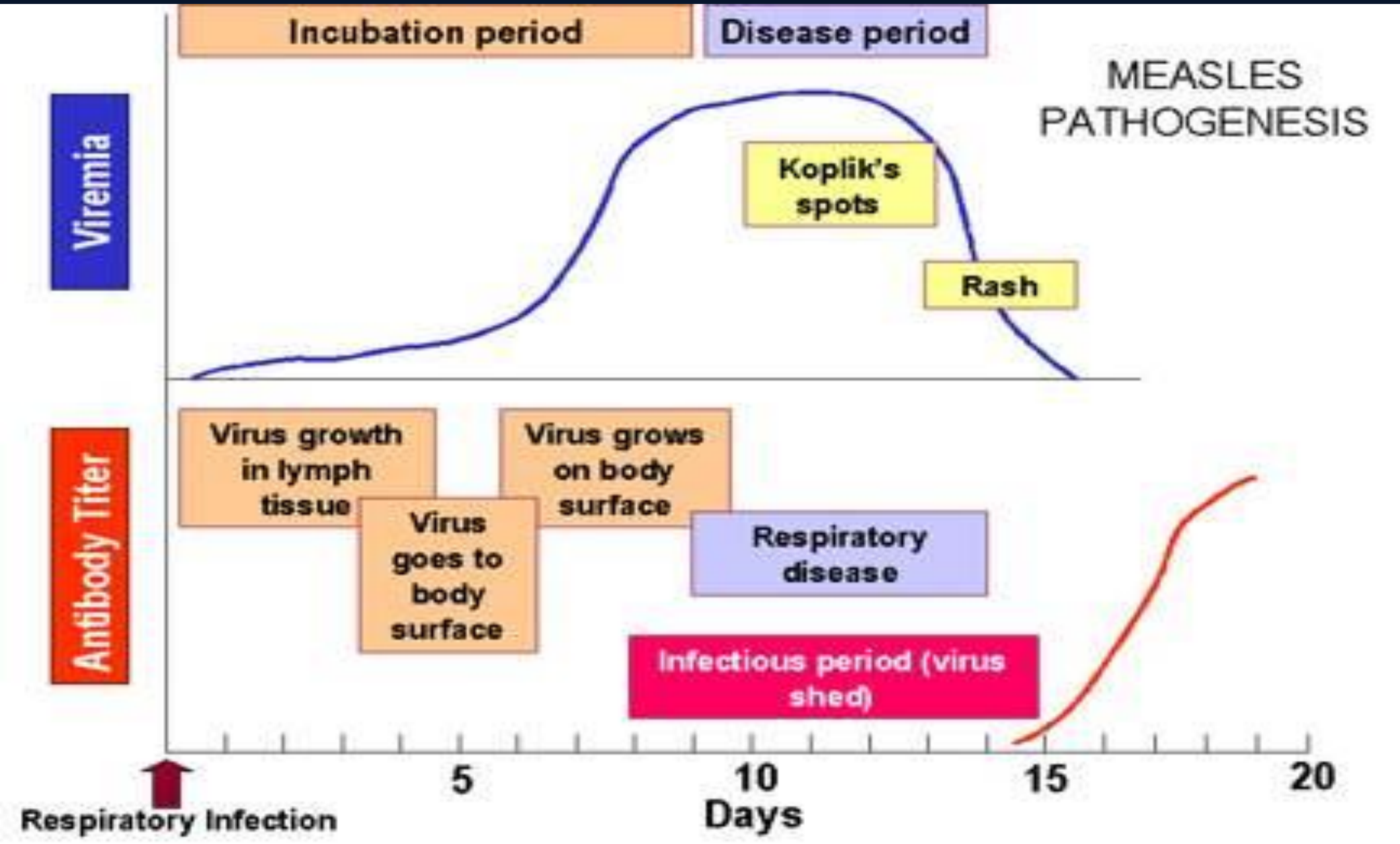
↓

blood (second viremia)

↓

general toxic symptoms

Pathogenesis

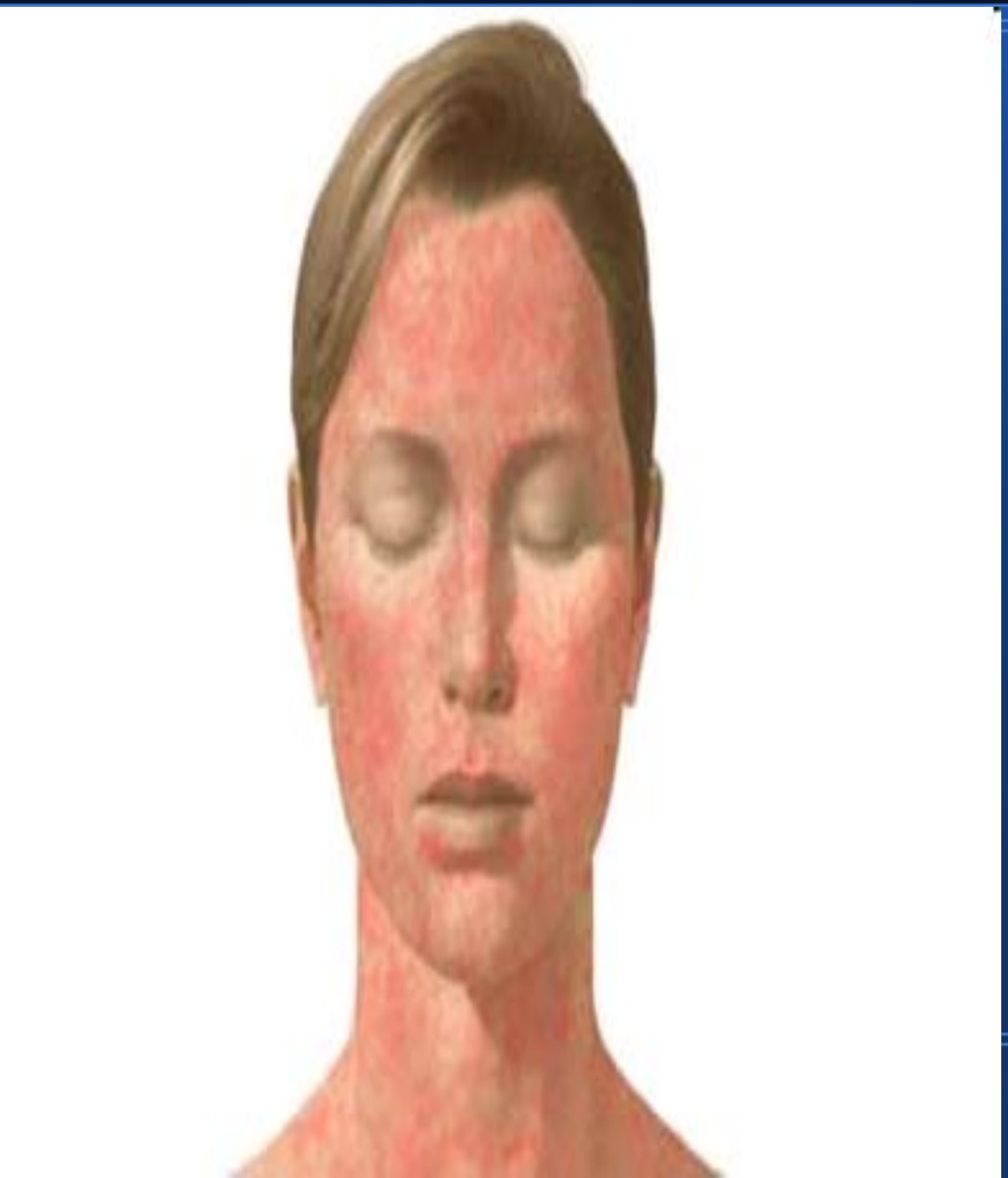


Physical examination

Typical type

- Incubation period is precise- 10 days with average of 6-19 days
- Prodromal phase 3~4 days- with viral prodromal symptoms Fever; Cough, coryza, conjunctivitis (the "3 Cs"). In 2-3 days, the Koplik spots appear as 1-2 mm, blue-gray macules, arising at the buccal, gingival and labial mucosa on an eythematous base.Additional prodromal symptoms may include malaise, myalgias, photophobia, and periorbital oedema
- The rash stage - Maculopapular eythematous rash that involves the palms and soles.

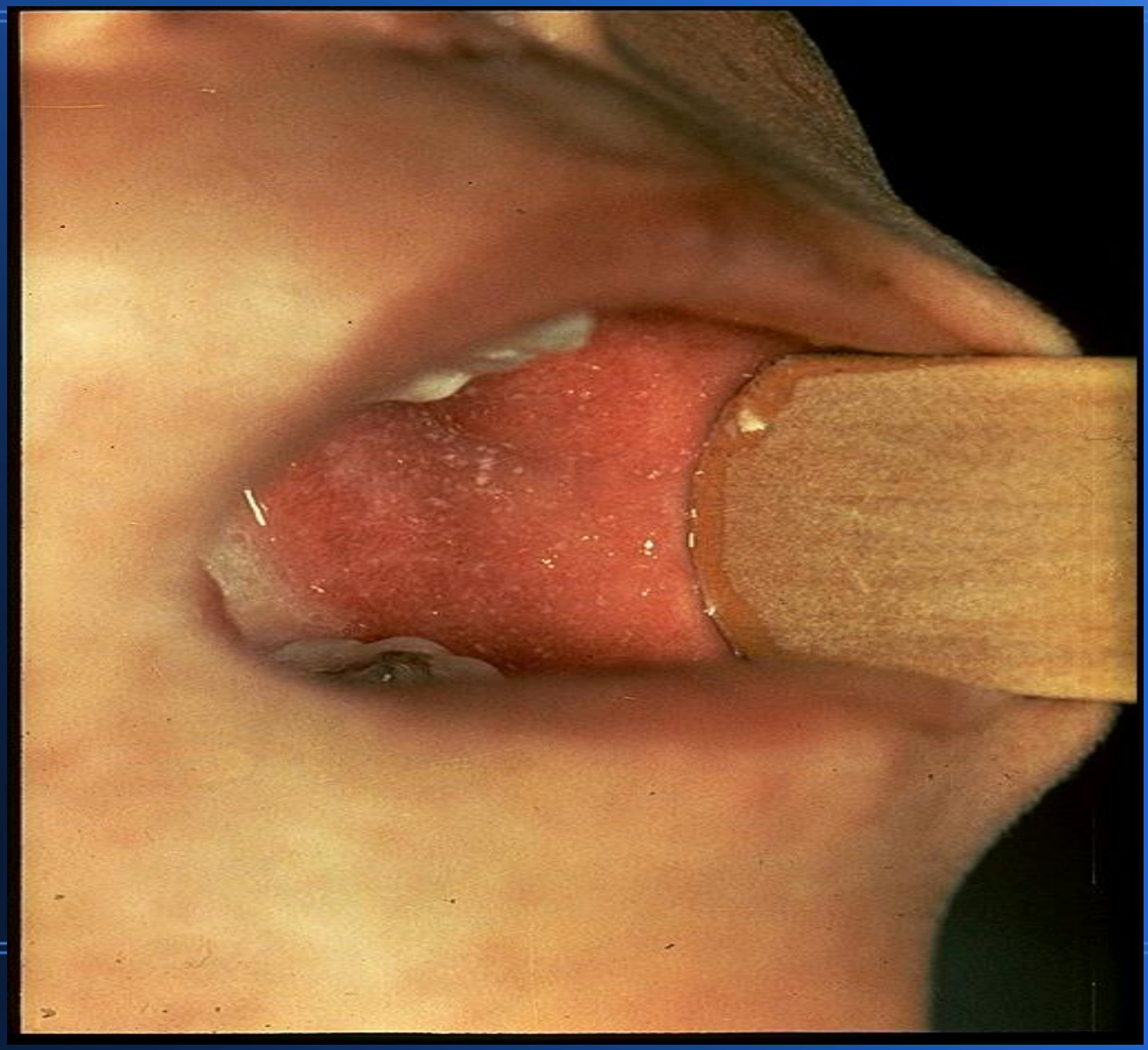
A rash is leading manifestations



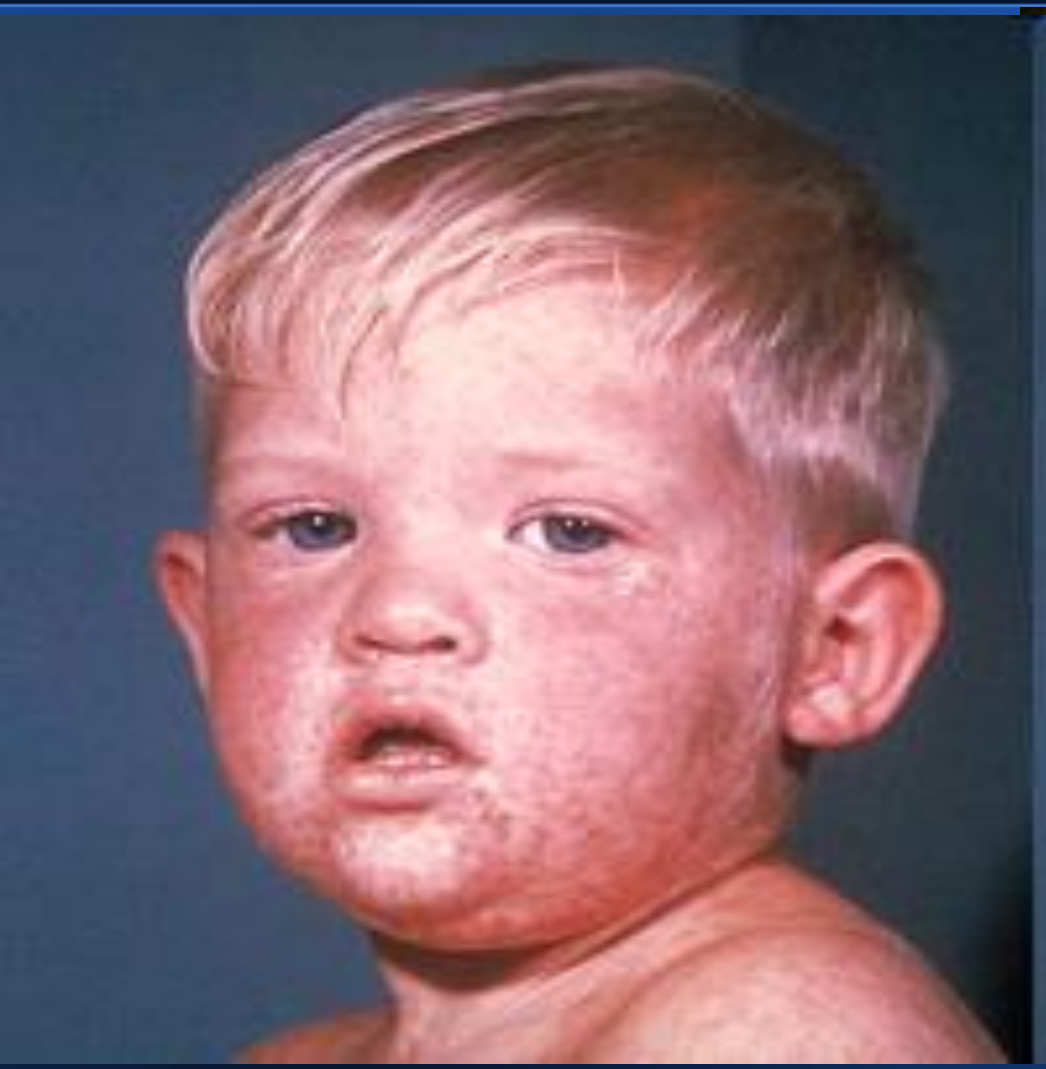
- Typically begins at the hairline and spreads caudally over the next 3 days as the prodromal symptoms resolve. **Centrifugal**: begins on face, head then spreads to trunk, arms, legs

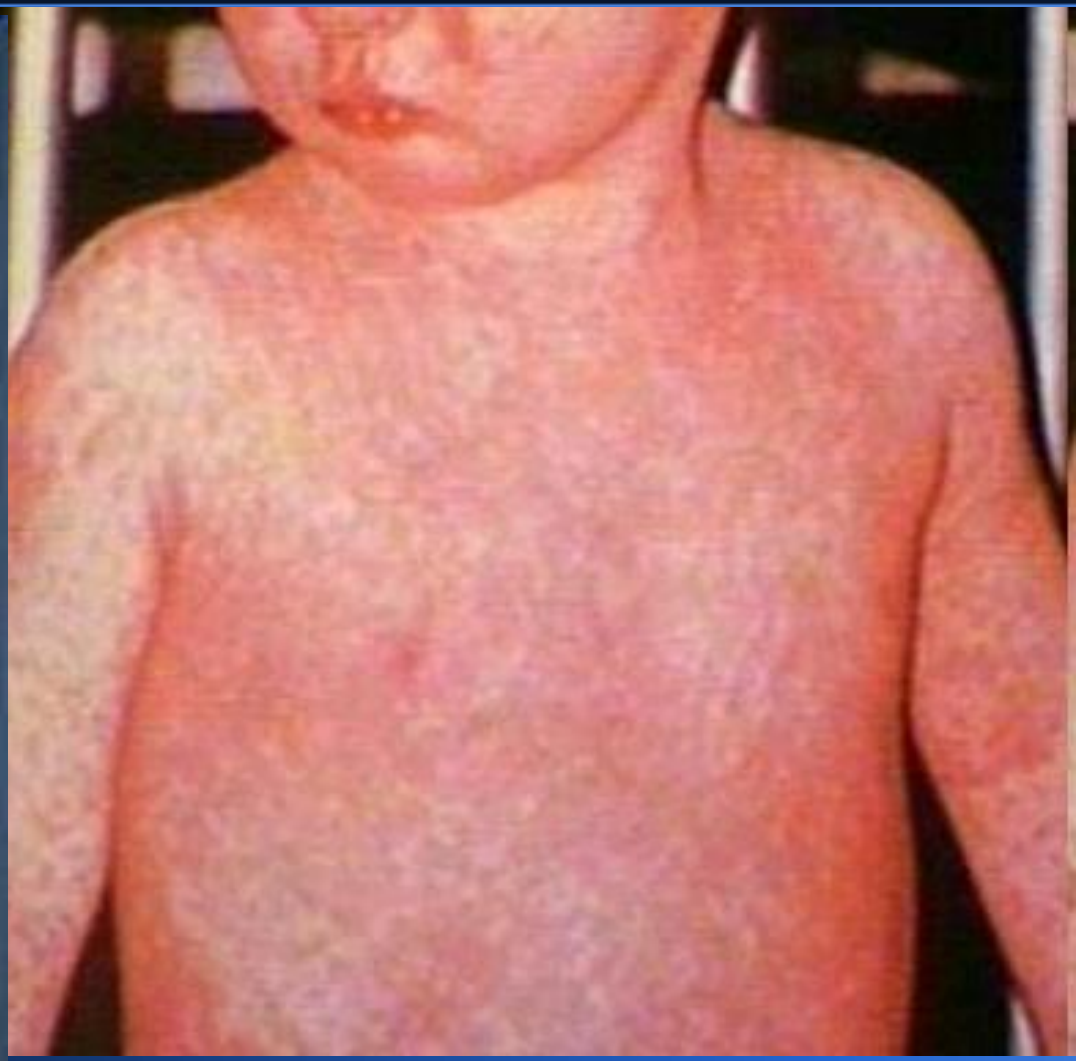
- The rash lasts 4-6 days and then fades from the head downward, in order of appearance.
- Desquamation may be present but is generally not severe.
- Complete recovery from the illness generally occurs within 7-10 days from the onset of the rash

KOPLICK SPOTS



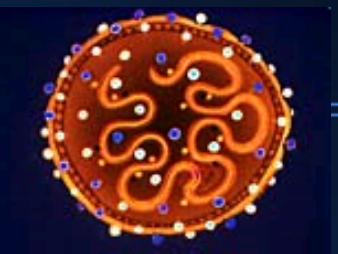
Rash is a Prominent Feature





Spread of Virus

- The highly contagious virus is spread by coughing and sneezing, close personal contact or direct contact with infected nasal or throat secretion



THE CLINICAL IMPACT OF MEASLES

site of virus growth	well nourished child good medical care	malnourished child poor medical care
Lung	temporary respiratory illness	life threatening pneumonia
Ear	otitis media quite common	otitis media commoner more severe
Oral mucosa	Koplik's spots	severe ulcerating lesions
Conjunctiva	conjunctivitis	severe corneal lesions secondary bacterial infection blindness may result
Skin	maculopapular rash	haemorrhagic rashes may occur ('black–measles')
Intestinal tract	no lesions	diarrhoea – exacerbates malnutrition, halts growth, impairs recovery
Urinary tract	virus detectable in urine	no known complications
Overall impact	**serious disease in a small proportion of those infected**	**major cause of death in childhood (estimated 1.5 million deaths/yr worldwide)**

Mims et al., Medical Microbiology 1993

IMMUNOSUPPRESSION AND MEASLES

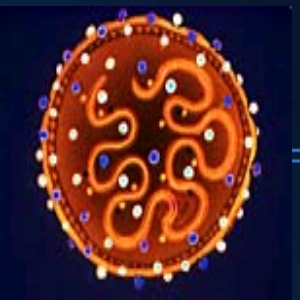
- TEMPORARY DEPRESSION OF IMMUNE RESPONSE
  - Tuberculin +ve individuals may temporarily become -ve
- MAY GET REACTIVATION OF HERPES, TUBERCULOSIS

COMPLICATIONS

- GIANT CELL PNEUMONIA
- SECONDARY BACTERIAL INFECTIONS
- MORE SEVERE IF MALNOURISHED AND/OR POOR ACCESS TO MEDICAL CARE
- MEASLES ENCEPHALITIS

Risk factors for severe measles

- Malnutrition- low protein, calories -> impaired immunity
- Underlying immunodeficiency
- Pregnancy
- Vitamin A deficiency-> low mucosal defense
- Lack of antibiotics for secondary infections
- lLack of vaccination
- Poor hygiene



Subacute sclerosing panencephalitis

- **Subacute sclerosing panencephalitis** (**SSPE**)

- rare chronic, progressive encephalitis that affects primarily children and young adults, caused by a persistent infection of immune resistant measles virus (which can be a result of a mutation of the virus itself).
- SSPE is 'incurable' but the condition can be managed by medication if treatment is started at an early stage.

Clinical Presentation of SSPE

- Characterized by a history of primary measles infection usually before the age of 2 years, followed by several asymptomatic years (6–15 on average), and then gradual, progressive psycho neurological deterioration

personality change, seizures, myoclonus, ataxia, photosensitivity, ocular abnormalities, spasticity and coma.

The Progress of SSPE

- The initial symptoms of SSPE - involve regressive changes in intellect and personality.

- Within several months, the psychological symptoms are compounded by neurological ones, most often consisting of myoclonic jerks. A relentless mental and motor deterioration then ensues, culminating in extreme neurologic dysfunction and death within several years of the onset of symptoms.

Modified Measles

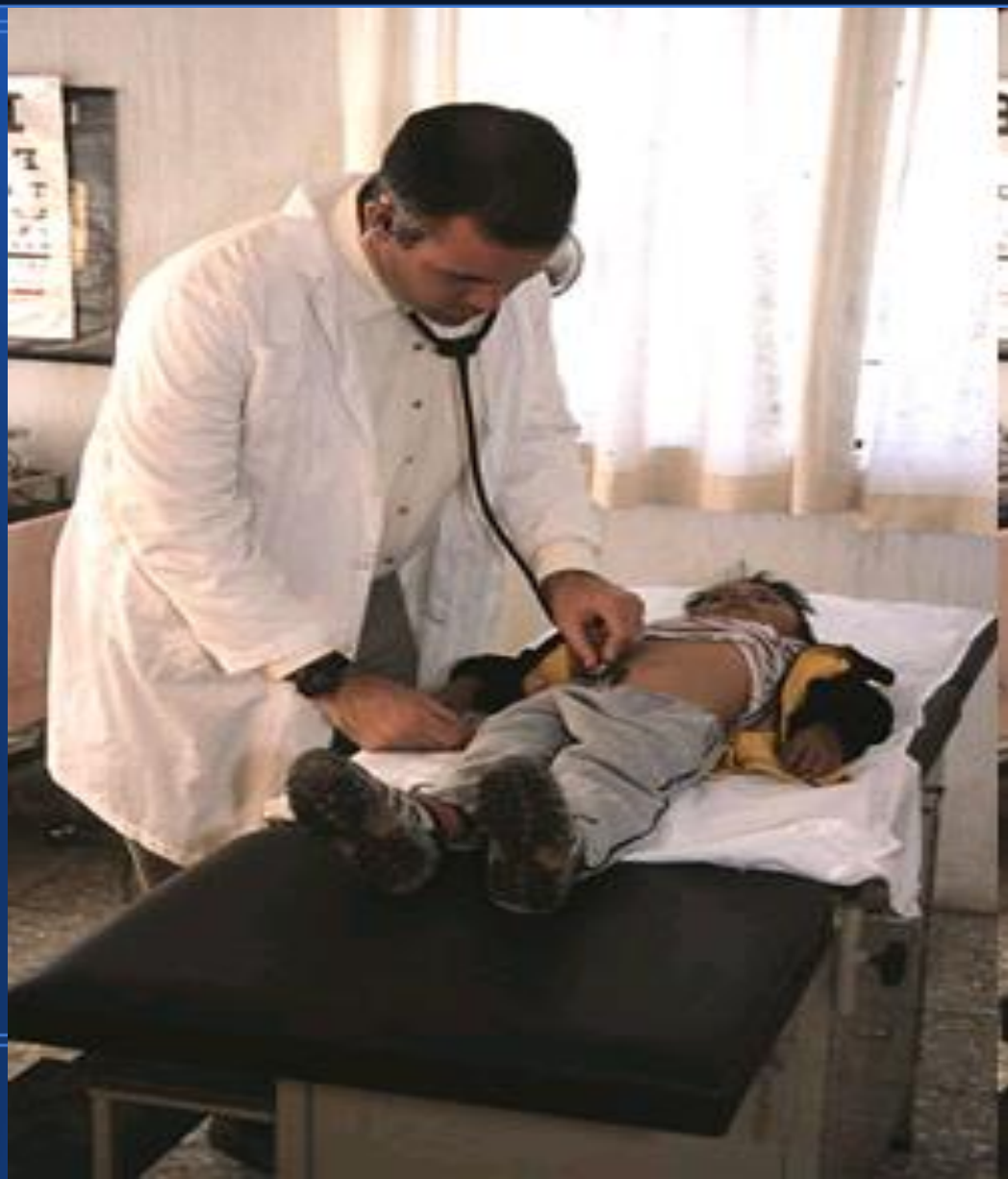
- Modified measles occurs in children who have received serum immunoglobulin after their exposure to measles. The measles symptom complex may still occur, but the incubation period is as long as 21 days, with the same symptoms as measles but milder.

Atypical Measles

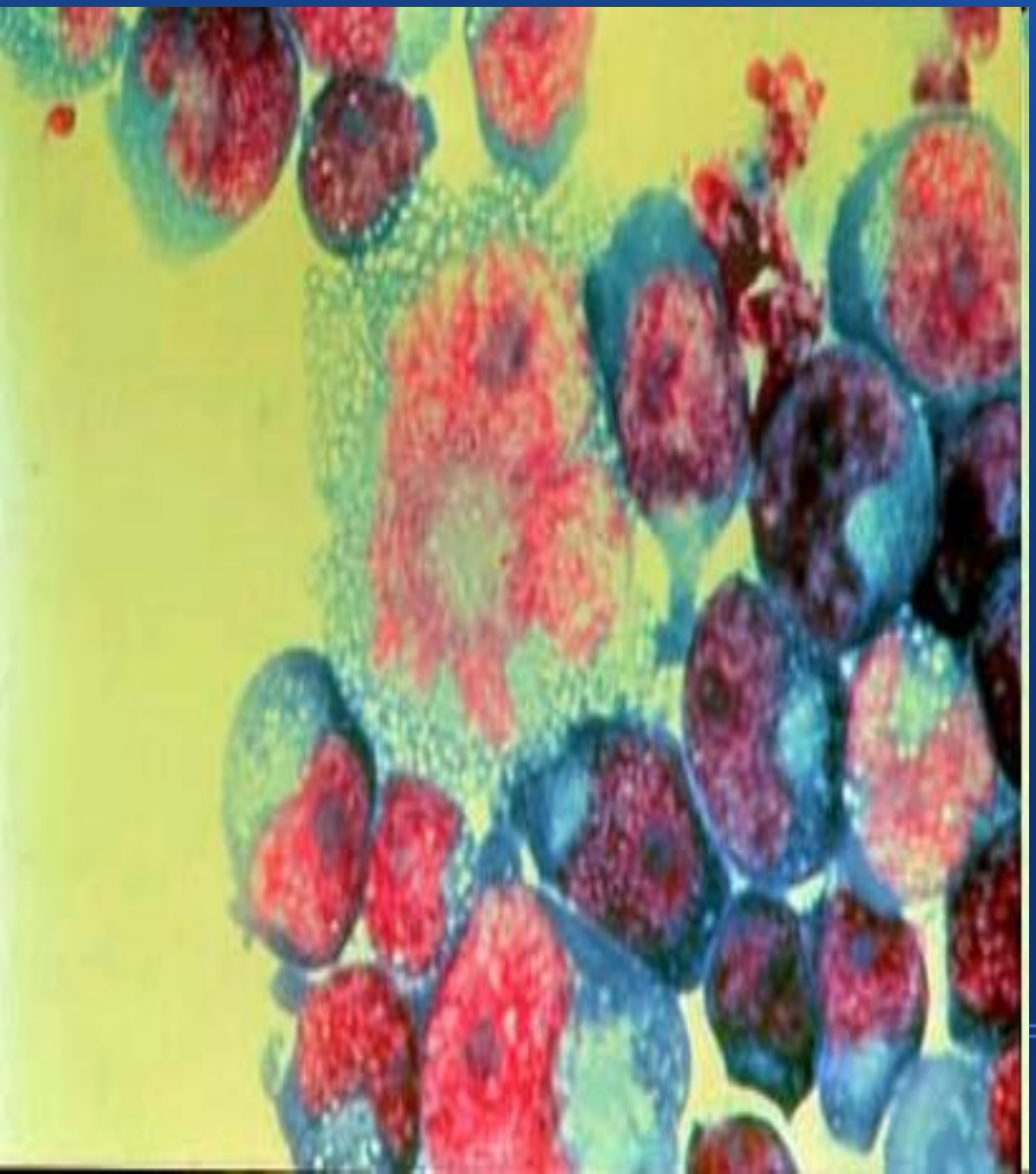
- When they are exposed to the measles virus, a mild or nonexistent prodrome of fever, headache, abdominal pain and myalgias precedes a rash that begins on the hands and feet and spreads centrally.
- The rash is most prominent in the body creases and may be macular, hemorrhagic vesicles, petechial, or urticarial.
- Complications may include pneumonia, pleural effusion, hilar lymphadenopathy, Hepatosplenomegaly, hyperesthesia, or paresthesia.
- **Atypical measles occurs in individuals who were previously immunized with the killed measles vaccine and who have incomplete immunity.**

Diagnosis of Measles

- Most cases are diagnosed clinically

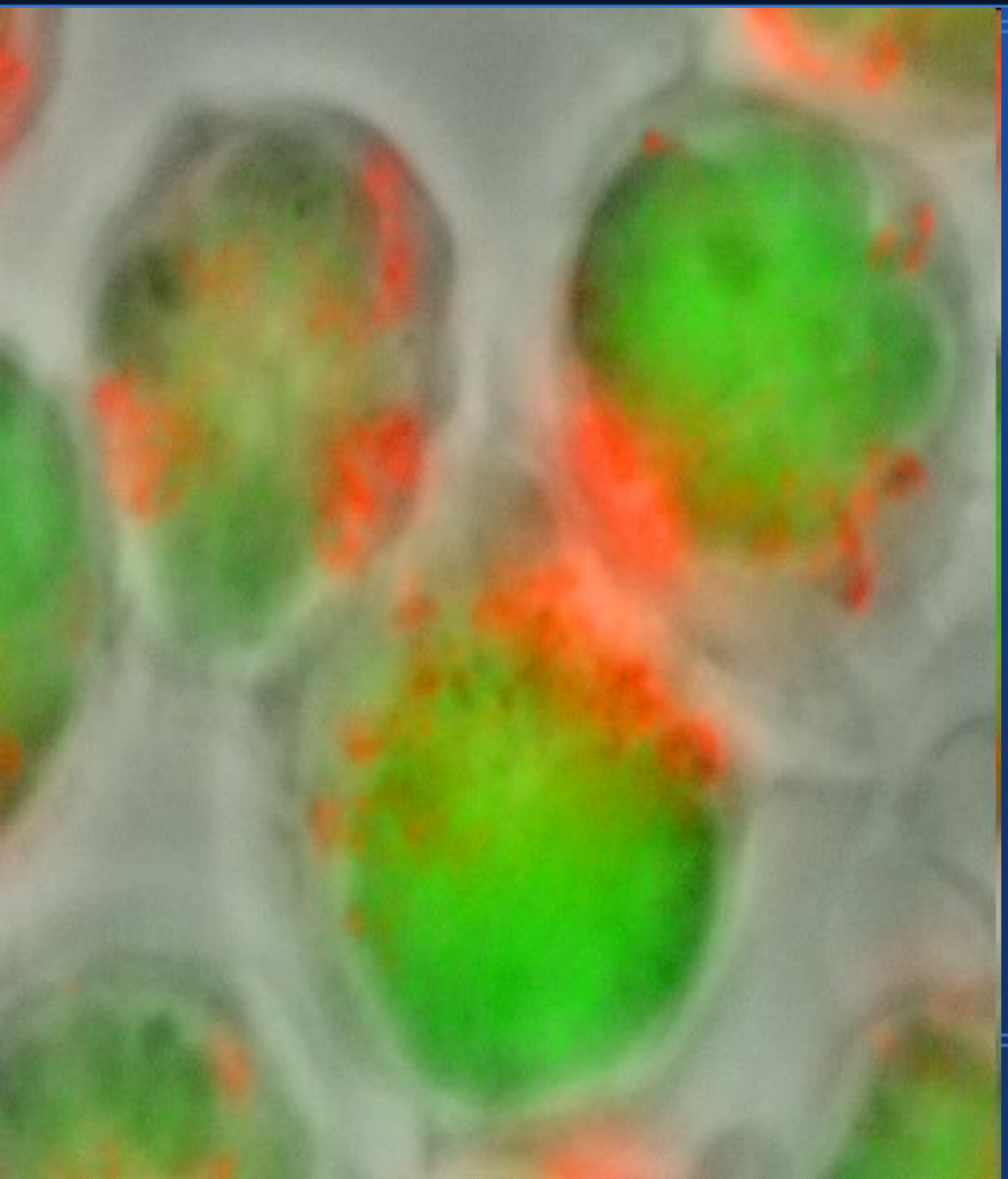


Diagnosis by Microscopy



- Production of multinucleate giant cells with inclusion bodies is pathognomonic for measles. During the prodromal phase, such cells are detectable in the NPS (nasopharyngeal secretions). This is more rapid and practical than virus isolation

Diagnosis with Immunofluorescence

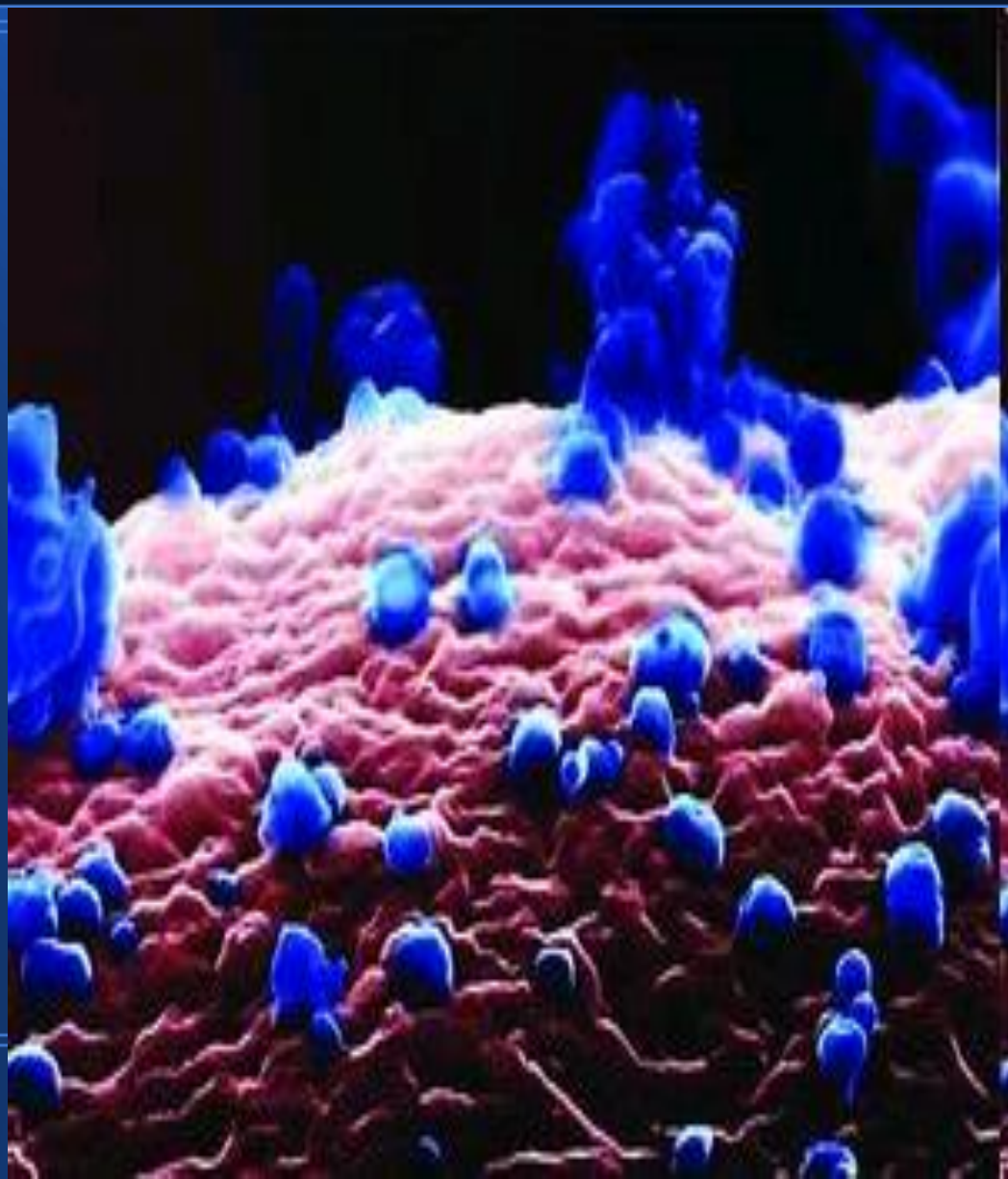


Direct and indirect immunofluorescence have been used to demonstrate MV antigens in cells from NPS specimens.

This technique can also be applied to the urine as such cells may be present in the urine 2 to 5 days after the appearance of the rash

Diagnosis by Viral Isolation

- **Measles virus can be isolated form throat or conjunctival washings, sputum, urinary sediment cells and lymphocytes.**



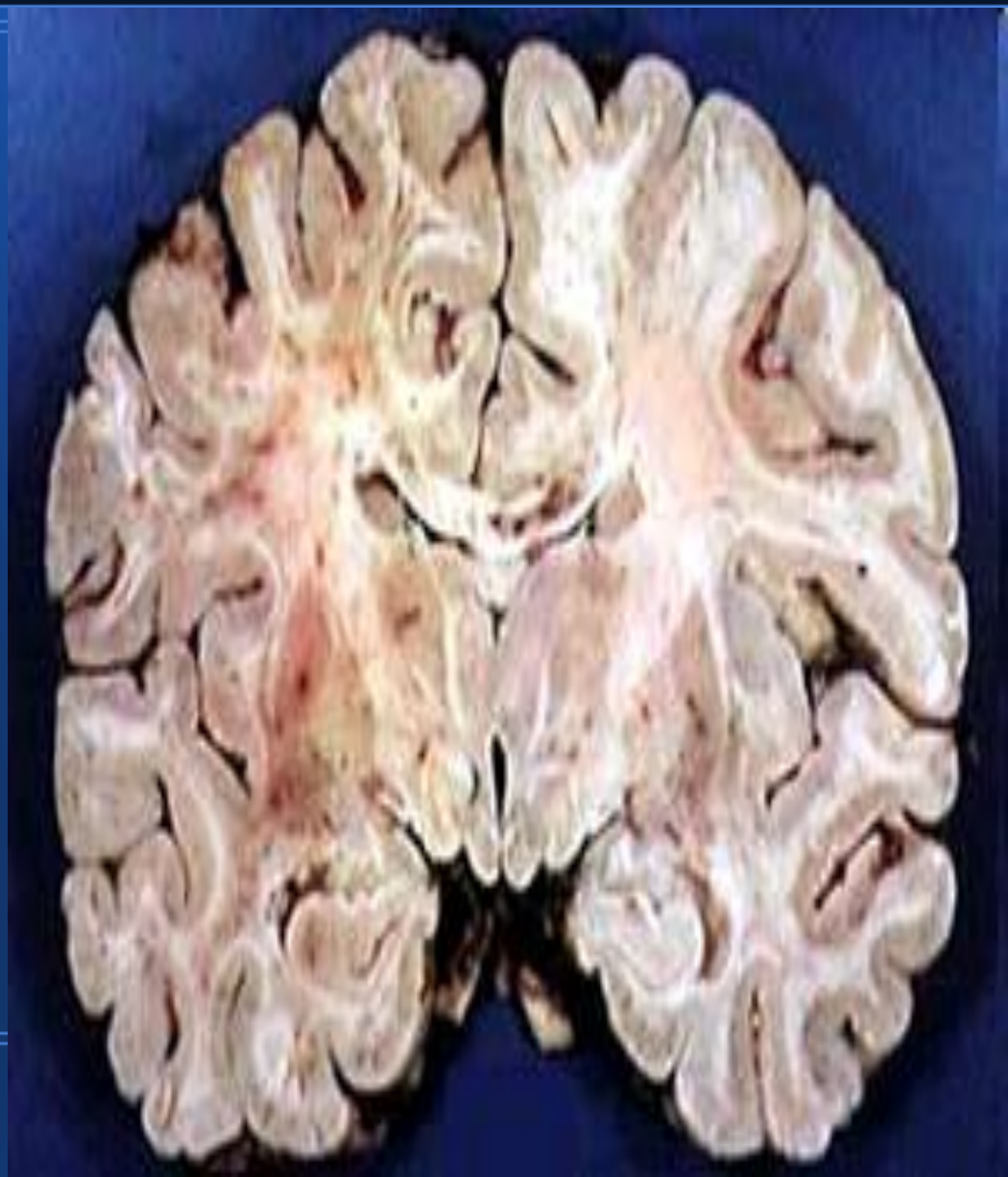
Diagnosis by Serology

- Diagnosis of measles infection can be made if the antibody titres IgG rise by 4 fold between the acute and the convalescent phase

or if measles-specific IgM is found in **acute phase serum.** The methods that can be used include HAI, CF, neutralization and ELISA tests.

Diagnosis of SSPE

- The presence of measles specific antibodies in the CSF is the most reliable means of laboratory diagnosis of SSPE.



Treatment

- Severe complications from measles can be avoided though supportive care that ensures good nutrition, adequate fluid intake and treatment of dehydration with WHO-recommended oral rehydration solution (to replace fluids and other essential elements lost from diarrhoea or vomiting).

Treatment options in Developing Countreis

- All children in developing countries diagnosed with measles should receive two doses of vitamin A supplements, given 24 hours apart. This can help prevent eye damage and blindness. Vitamin A supplements have been shown to reduce the number of deaths from measles by **50%.**

Measles vaccine is given as MMR Vaccine

- Contains **live**, **attenuated virus**
- **12 months** is recommended and minimum age for **MMR** (younger in some countries)
- If child younger than **9 months**, **maternal antibody may interfere**
- **Revaccinate in 6 months** to **5 years** (school entry age)

Microbes and humans

Disease can come about in several overlapping ways

- Some bacteria are entirely adapted to the pathogenic way of life in humans. They are never part of the normal flora but may cause subclinical infection, e.g. *M . tuberculosis*
- Some bacteria which are part of the normal flora acquire extra virulence factors making them pathogenic, e.g. *E. coli*
- Some bacteria which are part of the normal flora can cause disease if they gain access to deep tissues by trauma, surgery, lines, e.g. *S. epidermidis*
- In immunocompromised patients many free-living bacteria and components of the normal flora can cause disease, especially if introduced into deep tissues, e.g. *Acinetobacter*