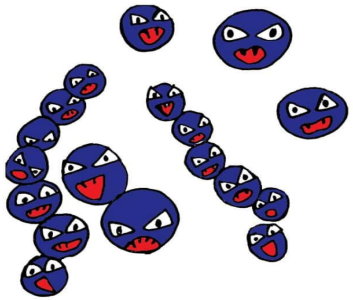
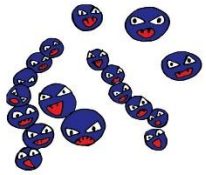


Bacterial infection of the skin

❖ *Streptococci*

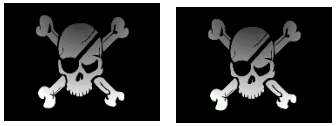
Presented by

Associate Professor Dina Abou Rayia



Streptococci commonly affecting the skin

Beta haemolytic *Streptococci*



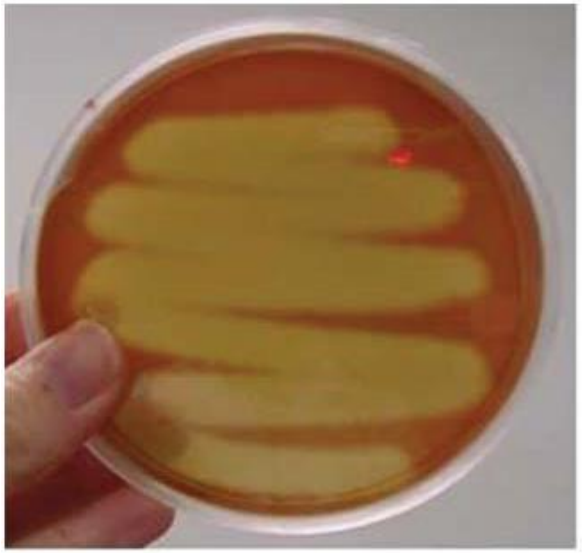
- **Group A**
  Streptococcus pyogens
  The most common
  The most serious

- **Group B**
  Streptococcus agalactiae

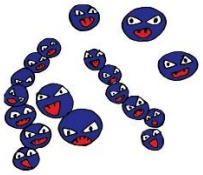
- **Group C and G**

- **Beta haemolytic** means causing **complete haemolysis on blood agar** with complete destruction of RBCs and haemoglobin release

- **Groups** classified according to **carbohydrate cell wall antigen**

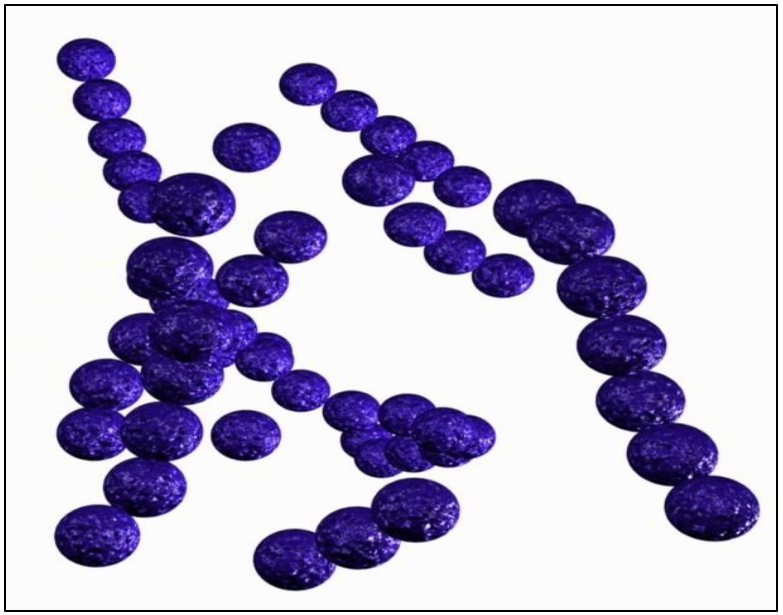


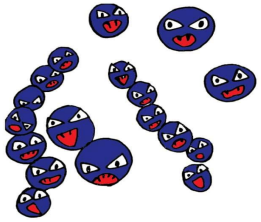
Beta Hemolysis



Streptococcus pyogens

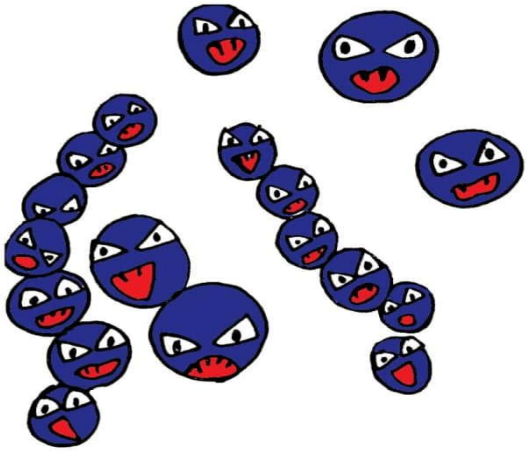
Group A beta haemolytic *Streptococci*

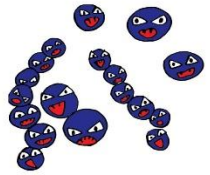




Name

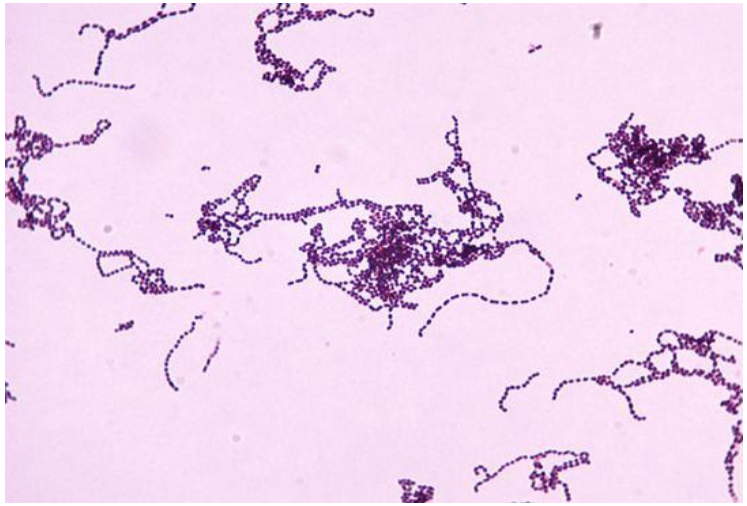
- ***Strept.*** → Means chain
- ***pyogens*** → Means pus forming



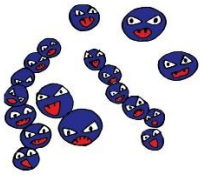


Morphology and Culture

- Gram positive spherical cocci
- Arranged in chain
- Non motile
- Non spore forming
- Some strains are capsulated



- Facultative anaerobe
- Cultured on blood agar
- Surrounded by beta haemolysis
- Catalase negative
- Grow best at 37◦ C
- Sensitive to penicillin



Structure

1. Capsule: hyaluronic acid

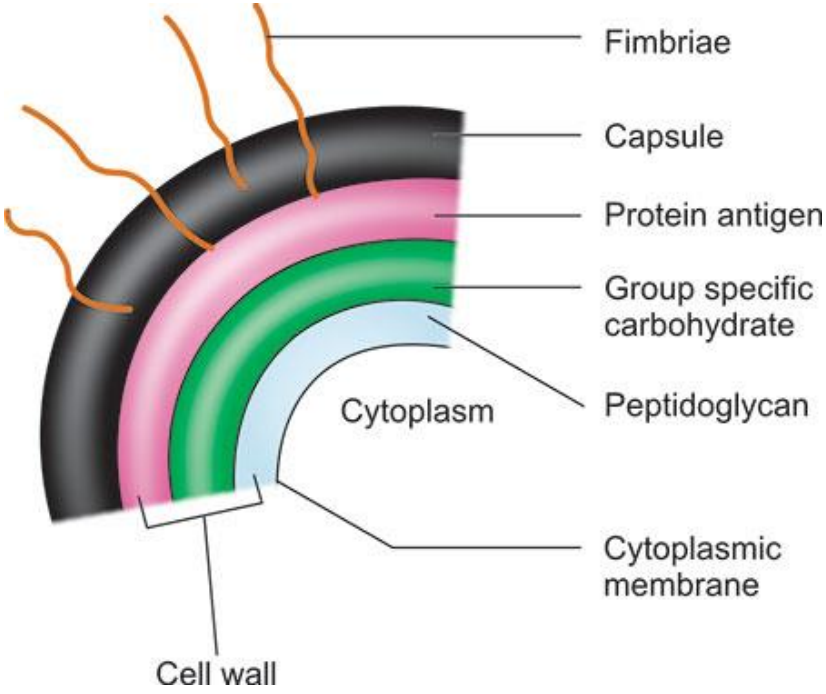
2. Cell wall :

- Inner peptidoglycan
- Middle carbohydrate
- Outer lipoteichoic acid and proteins

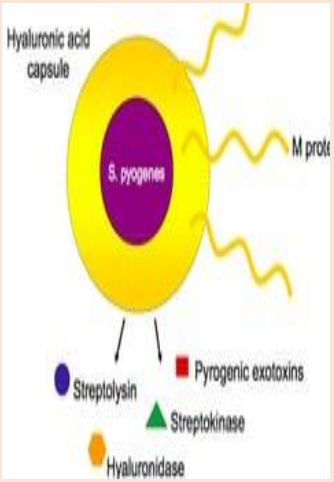
3. **Type specific antigenic proteins:**

- M protein
- R protein
- T protein

4. **Cytoplasmic membrane**



Virulence factors

Cell surface virulence factors		Secreted virulence factors	
Anti-phagocytic	- Hyaluronic acid capsule - M protein (strains lacking M protein are non virulent and antibodies against it are protective)	Enzymes	- Streptokinase (fibrinolysin) - Streptodornase (DNase) - Hyaluronidase
Adherence to host surfaces 	- Lipoteichoic acid - Fibronectin binding protein	Toxins	- Streptococcal pyrogenic exotoxins (superantigens - Streptolysin O {Antigenic stimulating antibody formation (ASO)} - Streptolysin S is a type of secreted streptolysins but it is Non antigenic and responsible for haemolysis on blood agar

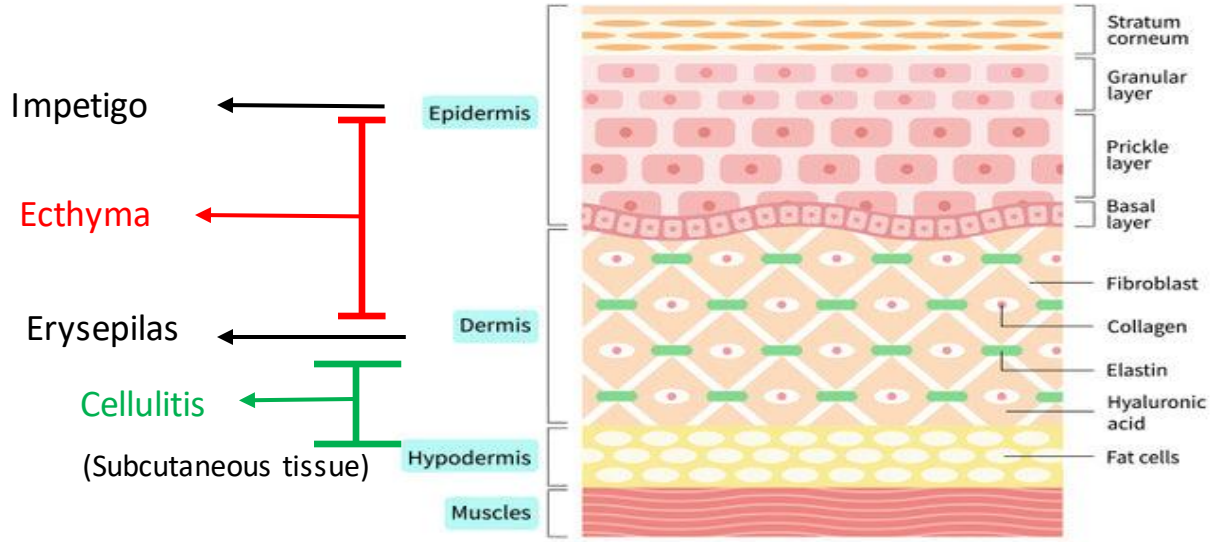
Skin diseases due to *streptococcal pyogenes* infection

➢ Direct skin infection

- Impetigo
- Ecthyma
- Erysepilas
- Cellulitis
- Necrotizing fasciitis

➢ Indirect skin affection through toxins

- Scarlet fever
- Toxic shock syndrome



Impetigo contagiosum

- It affects outer keratin layer of the skin
- *S. pyogenes* enter through minor skin abrasion , minor trauma or insect bite
- It is contagious (contact transmission)
- More common in summer, children (below 15 years with the peak from 2-5 years so called school sore) , bad hygiene and developing countries, and in the face.
- Types :
- **Non bullous** streptococcal causing impetigo
- **Bullous** (mainly caused by *Staph.aureus*)

Non bullous type

Begins as papules that form vesicles surrounded by erythema which enlarge and breakdown forming crusts (honey -coloured) and heal without scar

Bullous type

Ecthyma

- A deep form of impetigo that extends to dermis
- Characterized by thick crusted sores that form ulcers underneath and heal by scar formation
- More common in immunosuppressed individuals
- More common in the buttocks, thigh and legs

Impetigo and Ecthyma are treated by antibiotic and good hygiene is mandatory with crust removal by K permanganate, saline, hydrogen peroxide

Erysipelas

- Infection is usually restricted to dermis but with prominent lymphatic involvement and enter the skin through abrasion or minor trauma
- More common in children and on lower extremities and butter fly area of the face
- Accompanied by chills, fever, and vomiting
- Characterized by being:

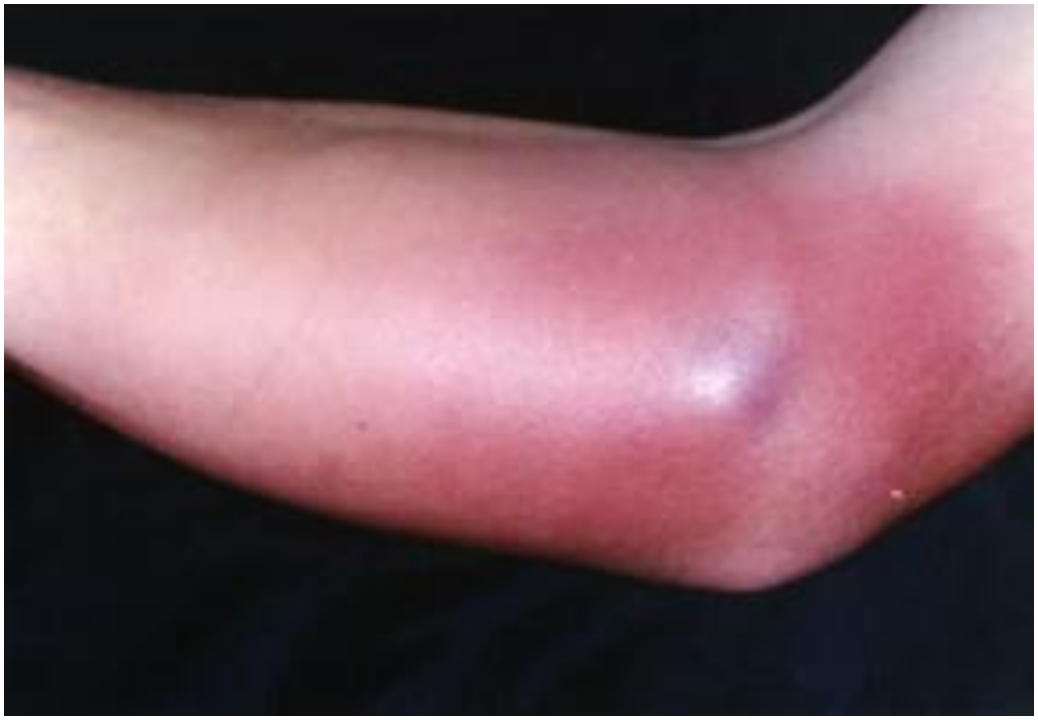
  - Raised above the surrounding skin

  - Clear line of demarcation between affected and non affected parts

  - Lesions are brilliant, salmon red in colour

Cellulitis

- It is like erysipelas but infection extends to the subcutaneous hypodermis layer of the skin
- Minor trauma or wound are predisposing factors
- Diffuse without line of demarcation
- Lesions are more pink than salmon red
- Erysipelas and cellulitis may be complicated with myositis , fasciitis, subcutaneous abscess and septicemia



D.D with erysipelas

Treatment of erysipelas and cellulitis by systemic antibiotic for 10-14 days

Necrotizing fasciitis

- Necrotizing = death of tissue

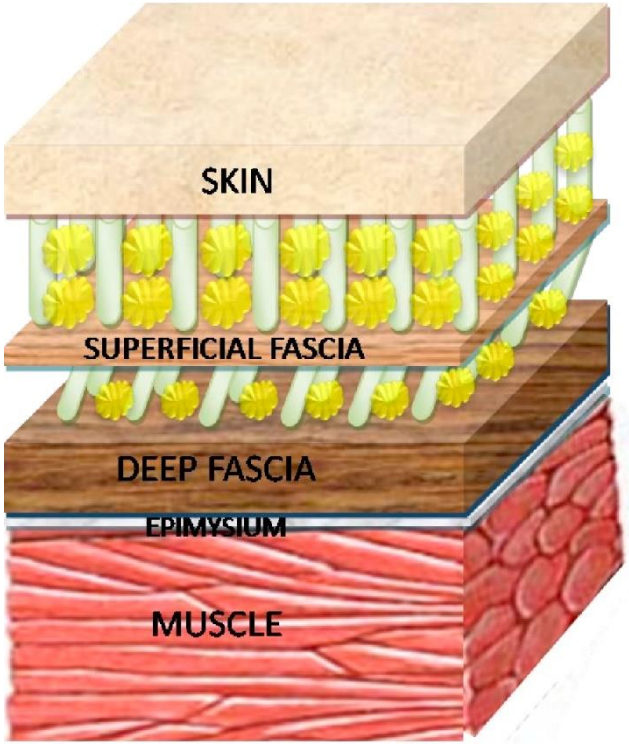
- Sever bacterial infection that spread rapidly through superficial and deep fascia and characterized by:

❖ Rapid spreading of redness area (≥ ½ inch per hour) this may be "Necrotizing Fasciitis" (draw a line around the red area with a pen, then watch for spreading beyond the line)

❖ The area is extremely painful over the skin and underlying muscles

❖ The person shows signs of bacteremia (fever, change in mental function such as delirium, profound weakness)

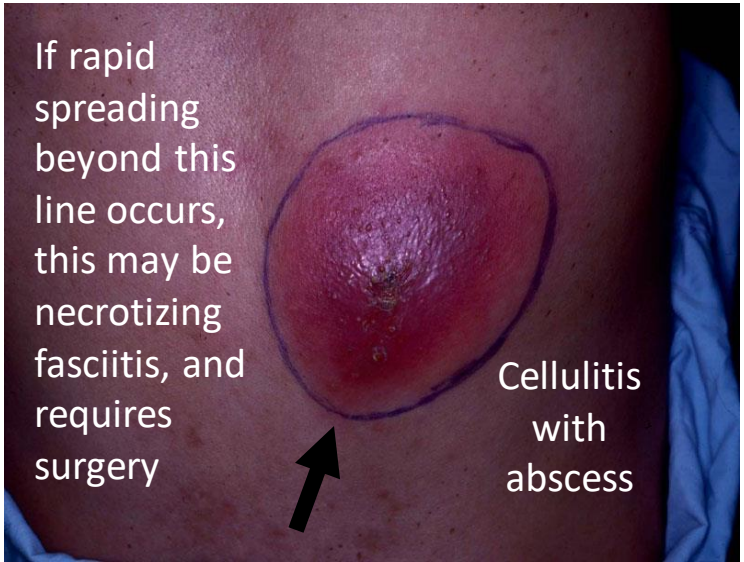
❖ It may end in gangrene and tissue necrosis



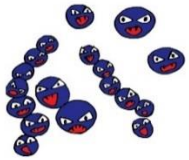
Mortality rate from 30-70%

Necrotizing fasciitis

- **Treatment by intravenous antibiotics**
- **Surgery like debridement or amputation may be needed**



BE CAREFUL



Indirect skin affection by toxigenic strains of *Streptococcus pyogenes*

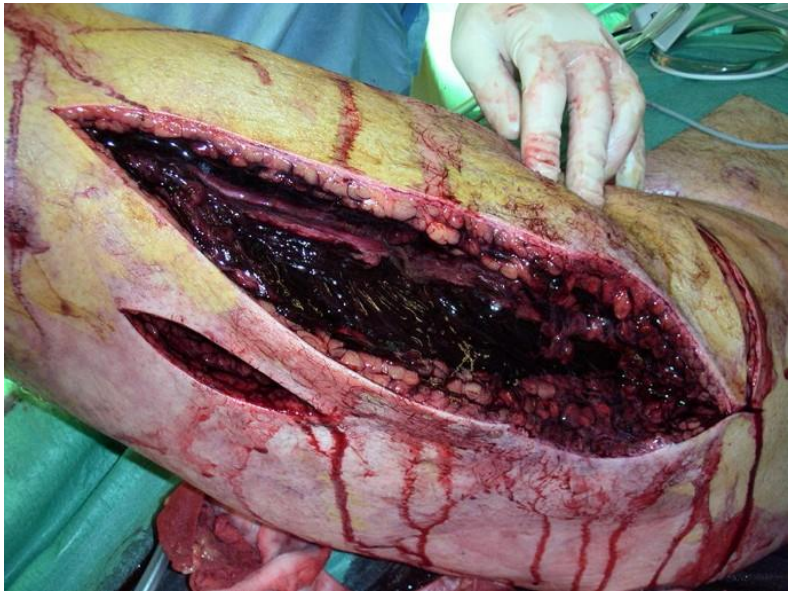
❖ **Scarlet fever:**

- **It is a droplet infection by strains capable of producing erythrogenic toxin and the patient usually has high fever, sore throat and macular rash**
- **It has a specific diagnostic test called Shultz-Charlton test in which intradermal injection of anti-erythrogenic toxin causes blanching of the erythematous areas**

Indirect skin affection by toxigenic strains of *Streptococcus pyogenes*

❖**Toxic shock syndrome**

- **It could affect the skin in the form of necrotizing fasciitis, myositis or gangrene with toxic shock and multisystem organ failure**

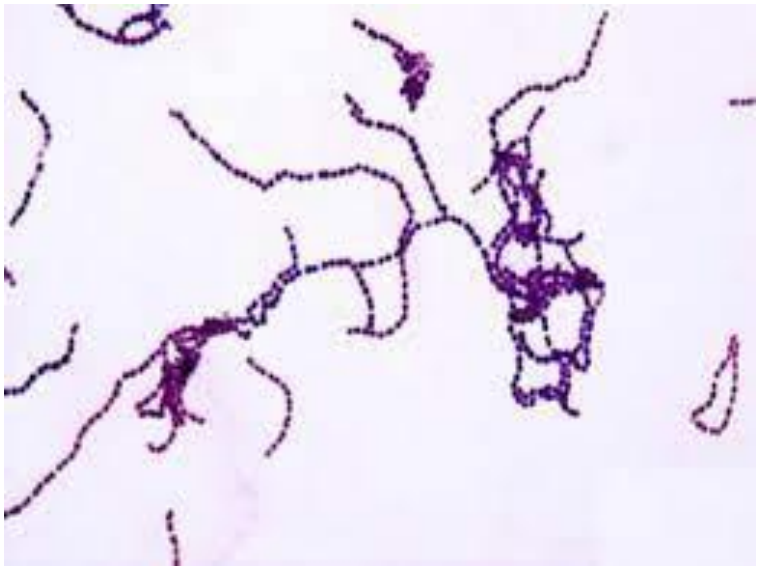


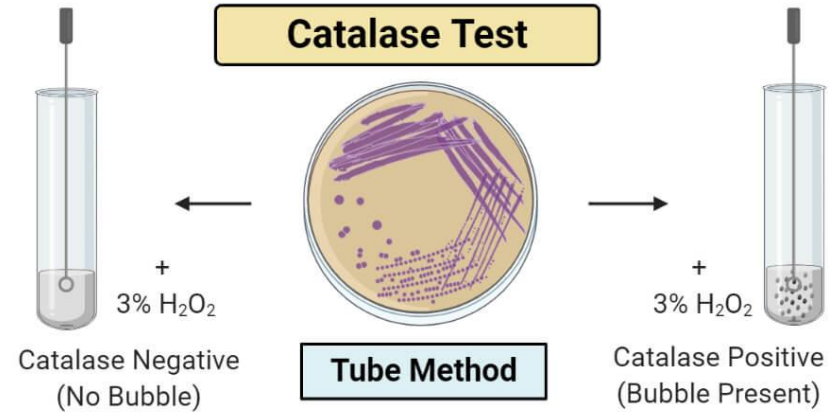
Diagnosis of skin infections caused by *Streptococcus pyogenes*

❖**Clinical:**

❖**Laboratory:**

- Specimen from skin lesion
- Smear stained with Gram stain
- Culture on blood agar
- Biochemical reaction
- Antibiotic sensitivity





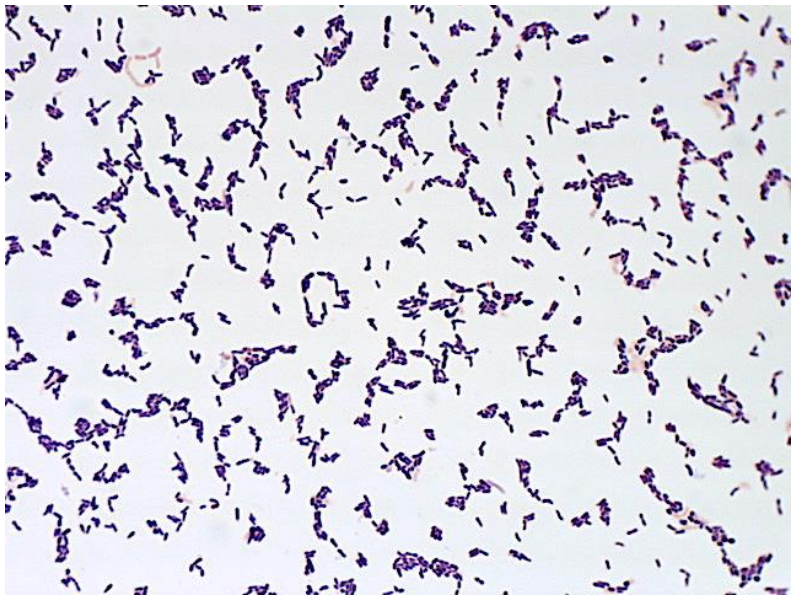
Bacterial infection of the skin

- *Cutibacterium acnes*

(Formarly *Propionibacterium acnes*)

Morphology and Culture

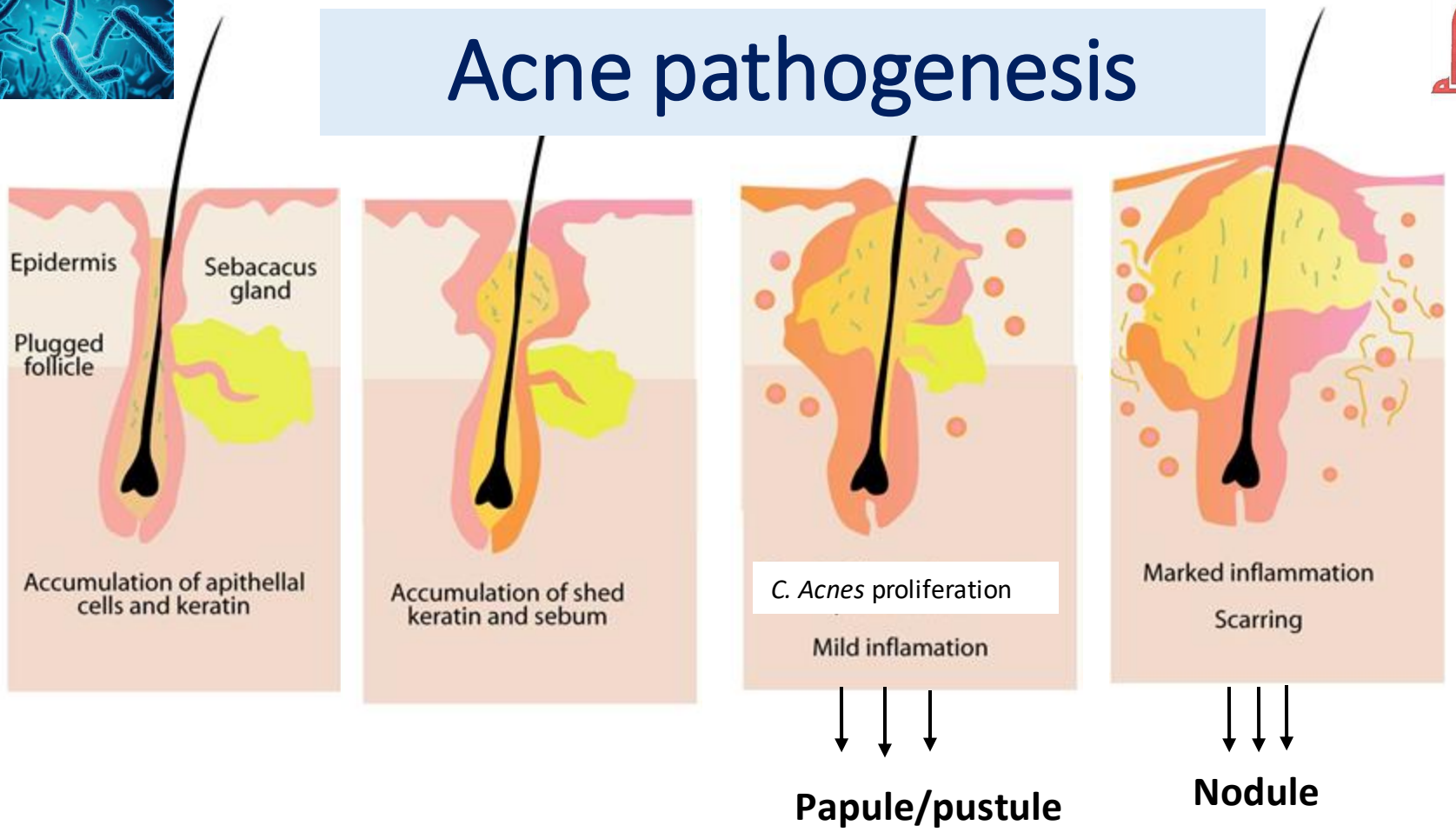
- Gram positive bacilli pleomorphic in shape (branched, Chinese letter arrangement) may be slightly curved so described as diphteroids , non motile and non spore forming.
- Prefer the anaerobic growth condition (aerotolerant anaerobe) and characterized by slow growth
- It is catalase positive
- Produce lipases and proteases
- They are considered as a part of normal skin flora



Sensitive to tetracycline

Linked to acne and isolated from joint infections

Acne pathogenesis



The production of sebum is under the control of androgens. During puberty the androgens stimulate the production of sebum plus increased keratinization and desquamation in sebaceous duct. This causing blockage of ducts (anaerobic condition) and this turns the gland as a sac for the multiplication of *C. acnes* that degrade lipids forming free fatty acids that trigger the inflammatory cells

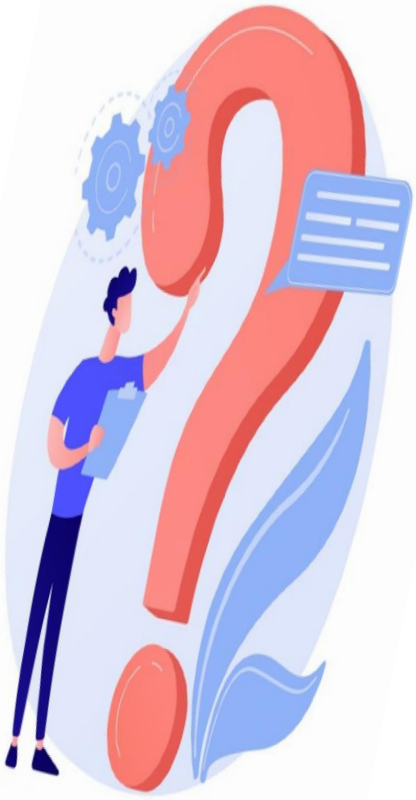
Clinical forms of acne

Acne papule

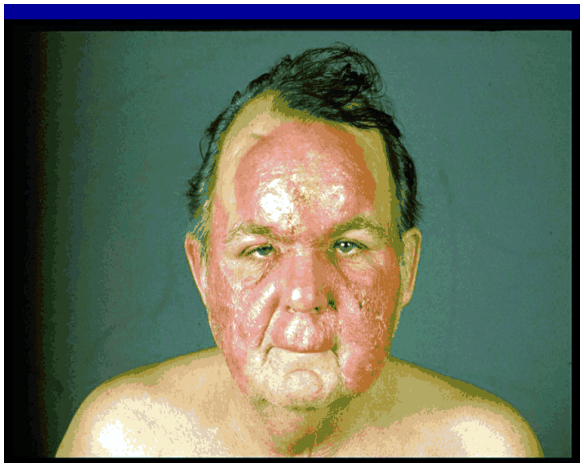
Acne pustule

Acne nodules

QUIZ TIME!



Identify ?????



Identify ?????

??????????????????

- **Compare between impetigo and ecthyma (1, 2, 3)**
- **Compare between erysipelas and cellulitis (1,2,3)**
- **Case**

A 27 years old man was seen for an infection around his toenail. The lesion was drained, and the pus cultured and gave beta-hemolytic *S. pyogenes*. The patient was not given antibiotic because the physician believed that the drainage was sufficient. Five days later the patient complained of fever and sever pain in his foot, which had become erythematous and swollen with no line of demarcation. His temperature was 40.2◦C, sweaty and hot.


Thank
You