Gram-Positive Cocci

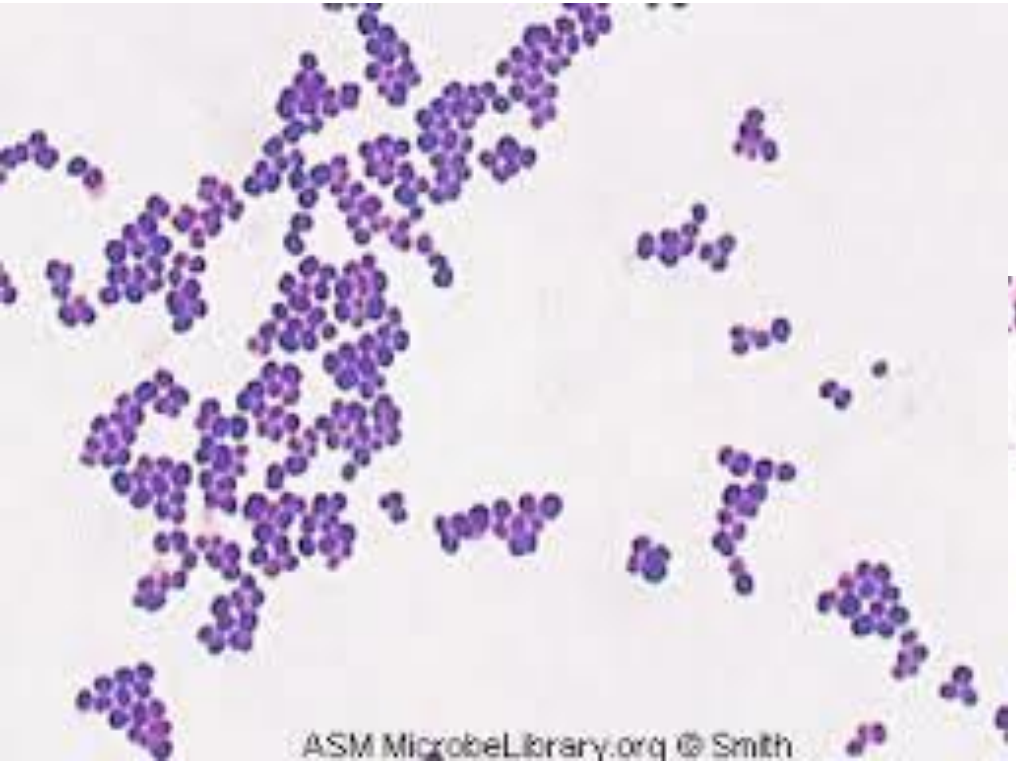
By

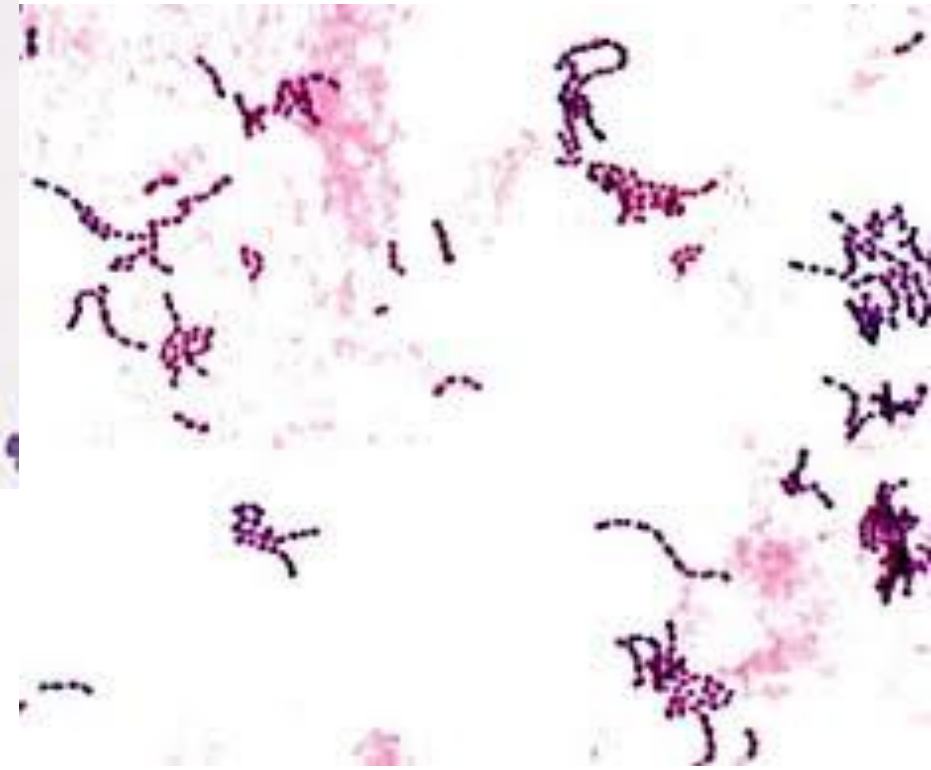
Prof. Dr. Asem Shehabi and Dr. Suzan Matar

Gram-psitive cocci

- **Micrococcaceae** family.. Facultative Anaerobic Gram-positive cocci .. includes the following Genera/Groups:
- Staphylococcus.. Arranged in irregular clusters of cocci .. Catalase +ve
- The Two Common ***Staphylococcus*** species: *S. aureus* & *S. epidermidis* are common in skin, nose, oral cavity. other body sites.. Opportunistic Pathogens.
- Streptococci.. Arranged in diplococci or chain of cocci.. Catalase –ve.. Many important group & species
- Enterococci.. Arranged in diplococci & short chain.. Catalase -ve

Stapylococci-Streptococci





Pathogenicity of *S. aureus*

- More invasive & opportunistic pathogenic than all other *Staph. Species..* Contains capsule..Biofilm formation on medical devices..catheters.
- Cell wall antigenic structure polysaccharides
- Protein A: antiphagocytic
- Various enterotoxins.. Common Food poisoning
- α-toxin causes septic shock.
- Toxic shock syndrome toxin-1: causes toxic shock & death.
- Coagulase & Clumping factor +ve.. Both converted prothrombin into fibrin & fibrinogen .. Deposit fibrin on Staph. Protect it.
- **Hyaluronidase:** Spreading factor during tissue infection
- Leukocidin.. destroy WBCs.. formation of pus and acne
- A common cause of skin abscess ..wounds, sepsis/ bacteremia, sinusitis, conjunctivitis, pneumonia, meningitis, osteomyelitis & any body sites.

S. epidermidis

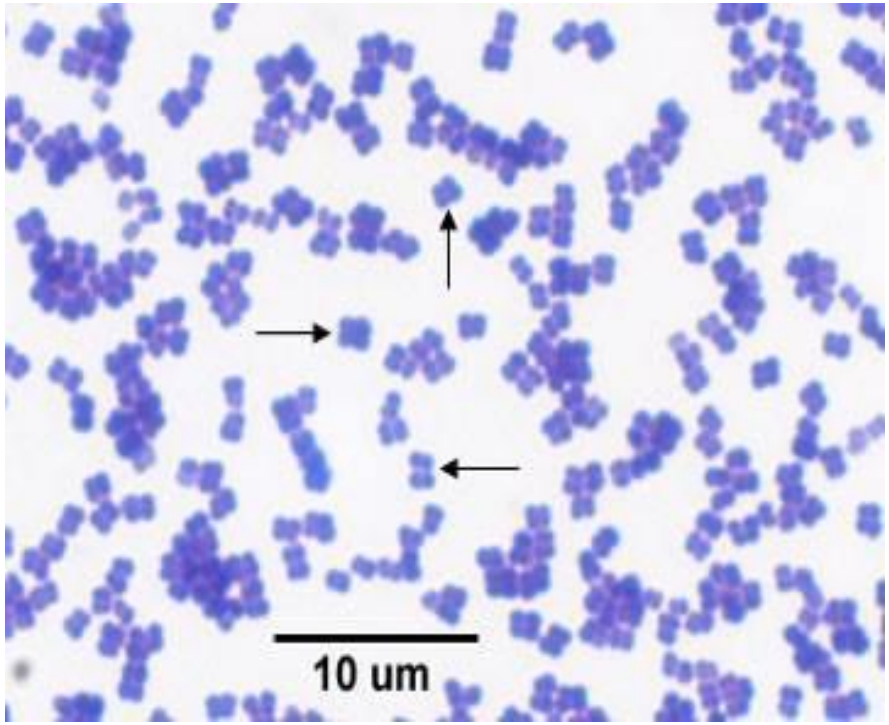
- Less pathogenic, part body normal flora, Skin , Nose

  Coagulase-ve.. Rarely opportunistic pathogen,Common Bacteremia in immuno-deficient patients.. Skin abscess, Biofilm on human implants devices
- Diagnosis: Collect specimens ..Culture & identification of isolates by gram-stain, catalase & coagulase test, susceptibility test.
- Most *S. aureus* strains.. Less *S. epidermidis* are resistant to all B-lactams.. Increase rate of isolation Methicillin/Oxacillin-resistant *S. aureus* (MRSA).. All still susceptible to Vancomycin

Micrococcus species:

Common on skin ..similar in biological characters to Coagulase –ve ***S. epidermidis ..*** Mixed infection

Opportunistic pathogen in immuno-compromised patients.. Mostly susceptible to β-Lactam drugs.

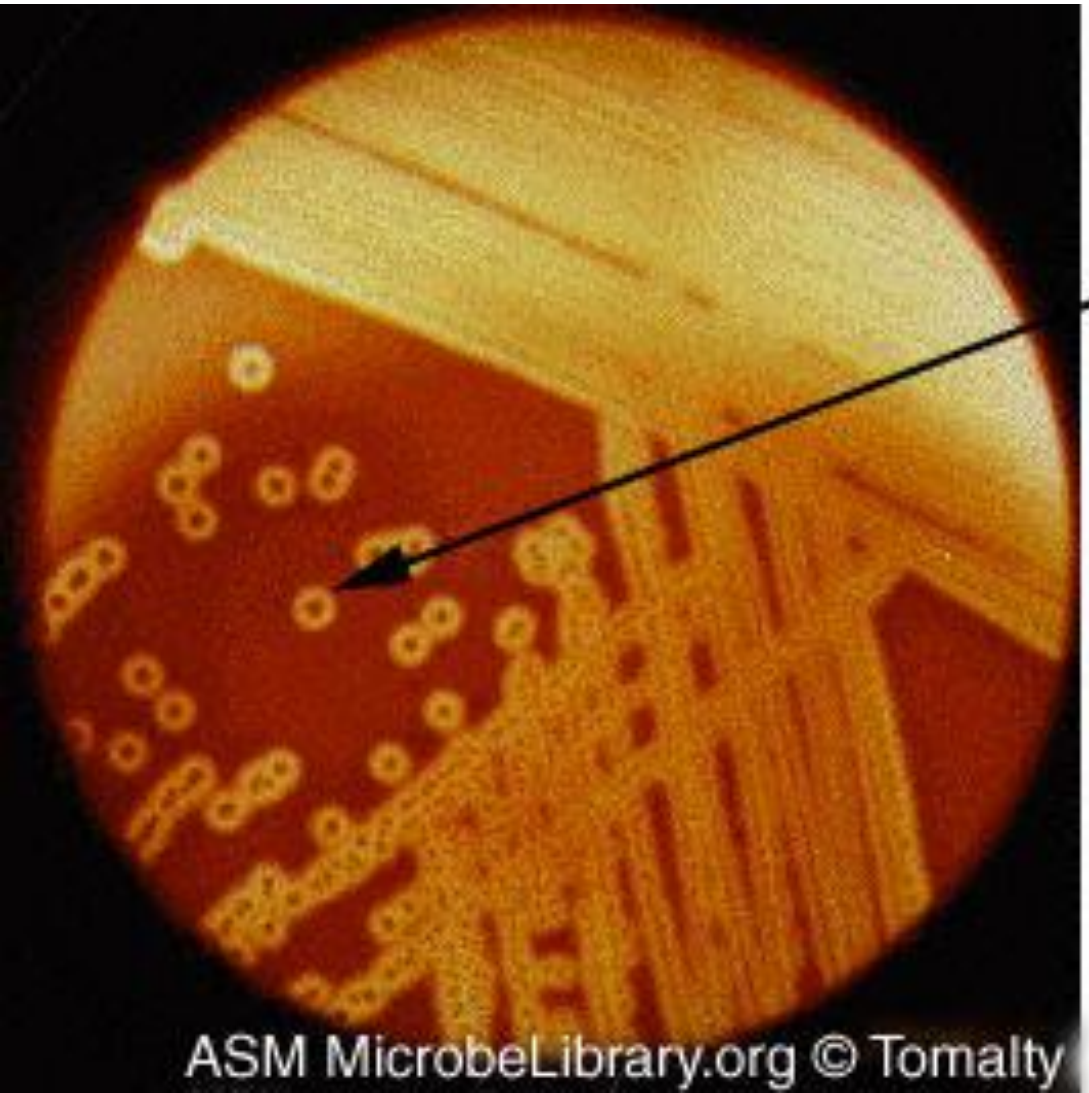


Streptococci-1

Classification:

- **Viridans Streptococci Group:** Alpha-hemolytic/ Non-Hemolytic.. Normal respiratory flora.. Oral cavity.. opportunistic pathogen, Dental caries, Sepsis, Localized oral abscesses.. Common Endocarditis
- **Beta-hemolytic Streptococci Group:** Serogroups A, B, C, D, F, G.. Cell wall specific carbohydrates.. Respiratory flora.. 2-30 %Healthy Carries..Children
- **Group A Hemolytic Streptococci (S. pyogens):** Most invasive & Pathogenic.. Virulence Factors.. Cell Wall antigens/ M Proteins.. Many Extracellular Enzymes.. Hemolysins, 80 Specific subtypes, Pyrogenic /Erythrogenic Toxin.. Superficial skin infection.. Scarlet fever.. Children..No Vaccine

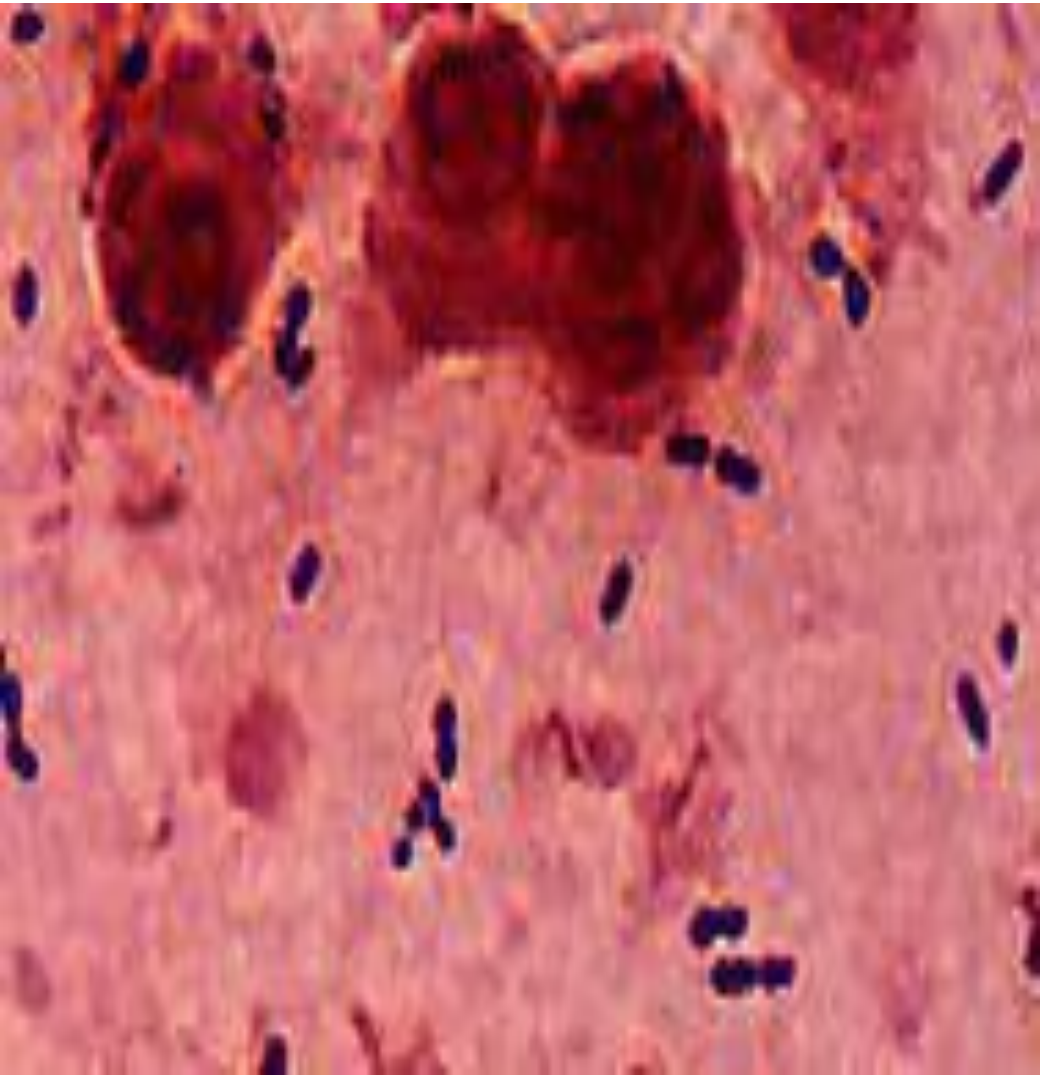
Beta-Hemolytic Streptococcis-Susceptible for Bacitracin



S. pyogenes

Note the clear zone of beta-hemolysis surrounding the *Streptococcus* colonies when grown on blood agar.

S. pneumoniae - Susceptible to Optochin in Lab test



Streptococci-2

- **Group A streptococcal** : Infections affect all ages with peak incidence at 5-15 years of age.. Acute Sore throat/ Pharyngitis, Skin infection, Sepsis, Otitis media, Sinusitis, Meningitis.

- Infection less common in Adults
- Few Healthy carriers through the year.

- Post streptococcal complications:

- A) Rheumatic Fever.. inflammatory disease affecting primarily heart and joints after repeat infection.
- B) Glomerulonephritis.. immune complex disease affects the kidney.. Bloody urine..fatal disease

- **Group B Streptococci: (*S. agalactiae*)**

Common in vaginal tract (5-20%).. Puerperal sepsis, Neonatal meningitis, Fatal ..Urinary Tract Infection.

Streptococci-3

- ***Streptococci pneumoniae*: G+ve Diplococcus**

- Capsule polysaccharides, 85 capsular serotypes..highly invasive, Antiphagocytic activity.. Common colonise human nasopharynx.. Opportunistic pathogen
- Common cause of bacterial pneumonia (Community acquired), more pathogenic in very young & old persons after RT viral infections
- Common cause of meningitis, Sinusitis, Otitis Media, Bacteremia, Young children, Immunocompromised persons.. up 50-90% *S. pneumonia* R-Penicillin in Jordan.. Specific vaccine for Adults & Children.. Protective 1-2-year.

- ***S. pneumoniae*** can be differentiated from V*iridans* streptococci Group.. Both alpha hemolytic using an G-Stain & Optochin test.
- **Group D/ Enterococcus:** *E. faecalis*, *E. faecium*.. Common in intestines Human-Animal.. opportunistic pathogen.. Urinary Tract Infect., Wound, Rare Sepsis, Endocarditis..

Culture and Identification

- All **Streptococci & Enterococci** can be easily cultured and grown on blood agar.
- Hemolytic activity is helpful for detection of each group..All **gram+ve cocci & catalase-negative**.
- Group A strept: **Bacitracin+ve**..others -ve
- Strept.pneumoniae :**Optochin+ve**, Viridans strept.-ve
- Entercocci: **Bile-esculin+ve**.. others -ve
- Final confirmation of **Group A** is by serological agglutination test using few colonies of streptococci culture and one drop of specific antisera..mixed together and observe agglutination reaction.