

Orientation to Gram Positive Bacteria of Medical Importance

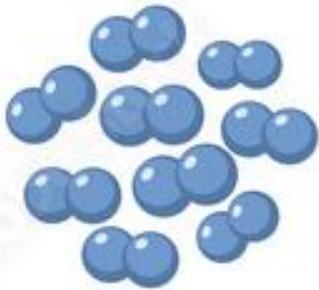
By

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Medically Important Gram-Positive Cocci

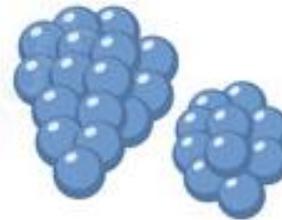
- ***Staphylococcus***
 - S. aureus*
 - S. epidermidis*
 - S. saprophyticus*
- ***Streptococcus* :**
 - Group A: *pyogenes*
 - Group B: *agalactiae*
- ***Streptococcus pneumoniae* (diplococci)**



Pneumococci



Streptococci

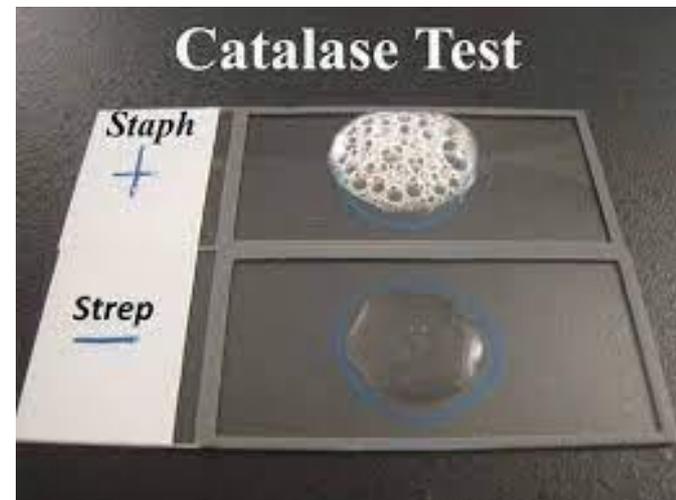
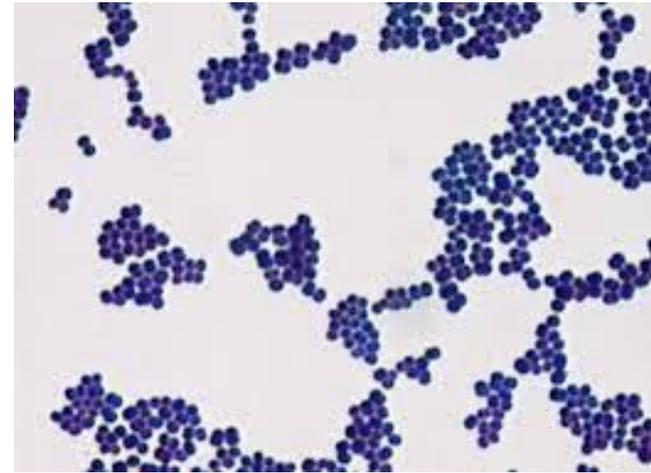


Staphylococci

Medically Important Gram-Positive Cocci

Staphylococci General Characteristics

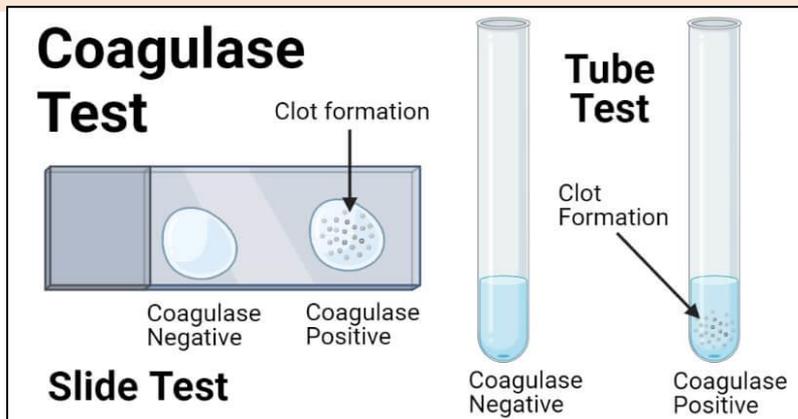
- Some are common inhabitants of the skin and mucous membranes.
- Spherical cells arranged in irregular clusters (grape-like clusters).
- Produces many virulence factors
- They are catalase positive



Medically Important Gram-Positive Cocci

Staphylococcus aureus

- Coagulase positive
- Diseases:
 - Food poisoning.
 - Localized infections (Abscess formation).
 - Spreading infections.
 - Necrotizing infections.
 - Systemic infections (ex. Osteomyelitis).



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Coagulase-negative Staphylococci

- Frequently involved in nosocomial and opportunistic infections.
- *S. epidermidis* – lives on skin and mucous membranes; and cause endocarditis, bacteremia, UTI.
- *S. saprophyticus* – infrequently lives on skin, intestine, vagina; UTI.

Medically Important Gram-Positive Cocci

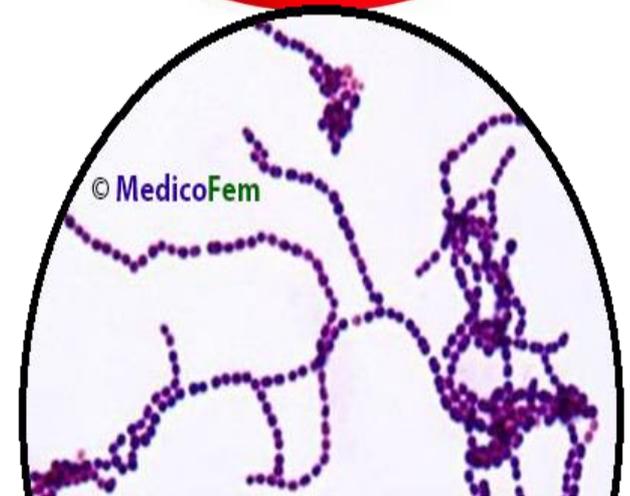
Streptococci

- Gram-positive cocci arranged in chain
- Catalase & Coagulase negative
- Classification

α -hemolytic: partial hemolysis of RBCs

β -hemolytic: complete hemolysis of RBCs

γ -hemolytic: no hemolysis of RBCs

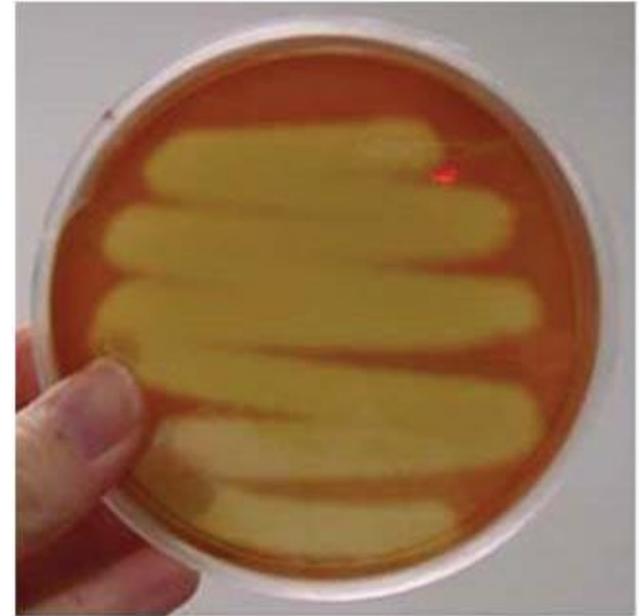


Medically Important Gram-Positive Cocci

β -hemolytic Streptococci

S. pyogenes (Group A strep):

- Group-A streptococci (GAS).
- β - hemolytic.
- Most serious streptococcal pathogen.
- Inhabits throat, nasopharynx, occasionally skin.
- Diseases:
 - Pharyngitis.
 - Skin infections.
 - Necrotizing infections.
 - Systemic infections

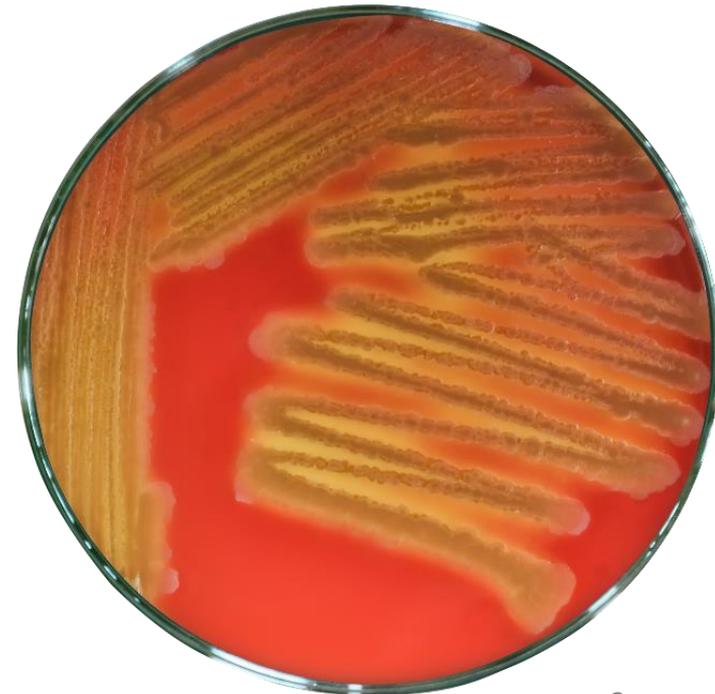
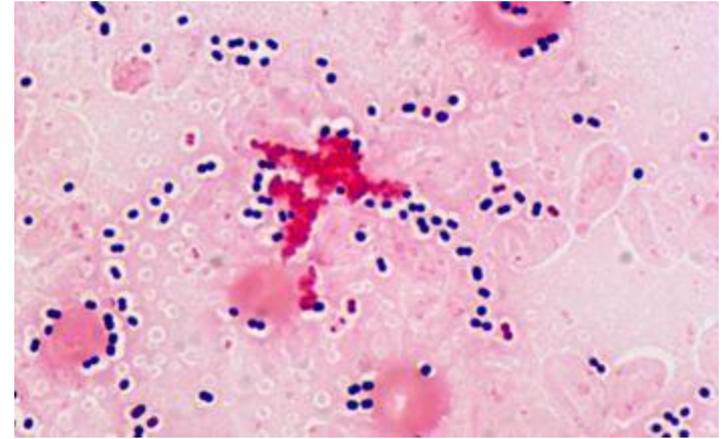


S. agalactiae (group B) normal flora of female genital system may cause neonatal pneumonia if inhaled during labour

Medically Important Gram-Positive Cocci

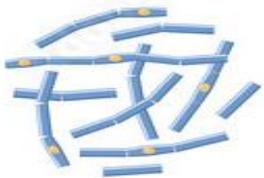
Streptococcus pneumoniae

- ✓ Pneumonia-inflammatory condition of the lung.
- ✓ Inhabits nasopharynx of healthy people.
- ✓ May also infect brain: (pneumococcal meningitis) and blood stream (pneumococcus septicemia).

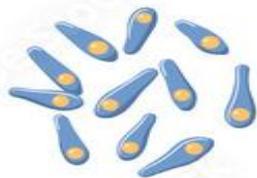


Medically Important Gram-Positive Bacilli

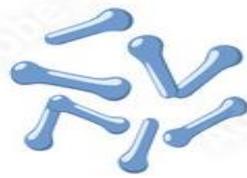
- ***Bacillus*** :
 - *B. anthracis* (anthrax)
 - *B. cereus*
- ***Clostridium***:
 - *C. botulinum*
 - *C. difficile*
 - *C. perfringens*
 - *C. tetani*
- **Non-spore forming**
 - *Listeria monocytogenes*
 - *Corynebacterium diphtheriae*
 - *Mycobacterium*



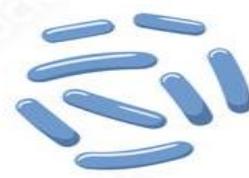
Bacilli



Clostridia



Corynebacteria

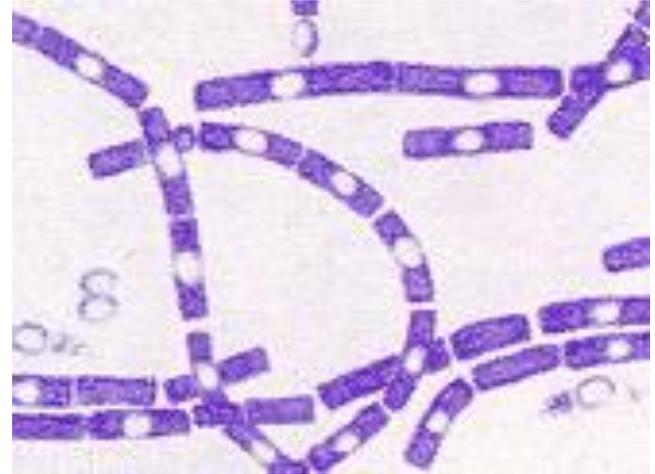


Listeria

Medically Important Gram-Positive Bacilli

Bacillus anthracis

- Large, block-shaped rods
- Central spores
- Virulence factors –polypeptide capsule/exotoxins
- 3 types of anthrax:
 - ✓ Cutaneous–spores enter through skin, black sore; least dangerous.
 - ✓ Pulmonary–inhalation of spores.
 - ✓ Gastrointestinal–ingested spores.



Medically Important Gram-Positive Bacilli

Bacillus cereus

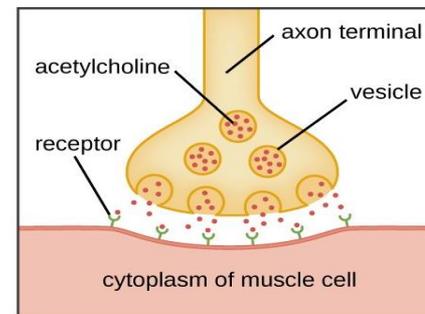
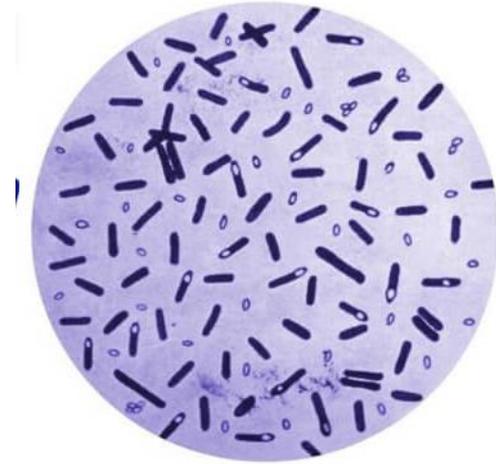
- Grows in foods, spores survive cooking/ reheating (rice dishes).
- Ingestion of toxin-containing food causes nausea, vomiting, abdominal cramps, diarrhea; 24-hour duration.
- No treatment.
- Increasingly reported in immunosuppressed.



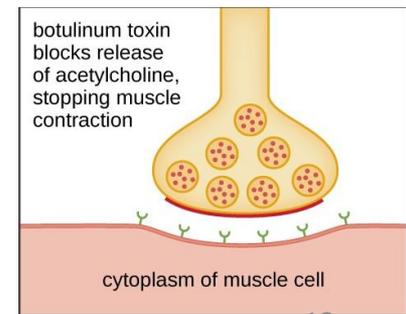
Medically Important Gram-Positive Bacilli

Clostridium Botulinum: Flaccid paralysis

- Botulism—intoxication associated with inadequate food preservation
- Toxin carried to neuromuscular junctions: blocks the release of acetylcholine: necessary for muscle contraction to occur.
- Clinically
 - Double or blurred vision
 - Difficulty swallowing
 - Neuromuscular symptoms



normal mechanism



abnormal mechanism

Medically Important Gram-Positive Bacilli

Clostridium difficile

- Normal flora colon, in low numbers.
- Causes antibiotic-associated colitis
- Due to treatment with broad-spectrum antibiotics that kill other bacteria: *C. difficile* overgrowth
- Enterotoxins that damage intestines.
- Major cause of diarrhea in hospitals.

Medically Important Gram-Positive Bacilli

Clostridium perfringens (Gas Gangrene)

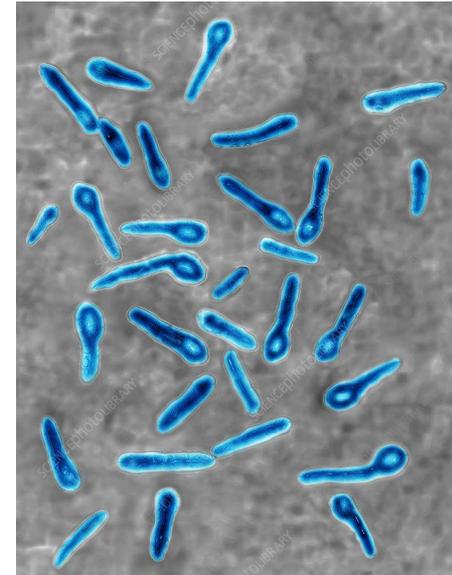
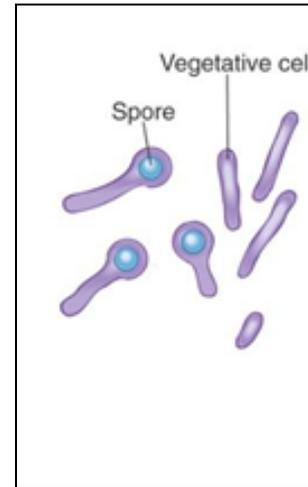
- Soft tissue :wound infections: myonecrosis
- Predisposing factors: infection of all types of wounds.
- Virulence factors (lytic enzymes)



Medically Important Gram-Positive Bacilli

Clostridium tetani: Tetanus

- Common resident of soil and GI tracts of animals.
- Causes tetanus or lockjaw, a neuromuscular disease.
- Most commonly among IV drug abusers and neonates in developing countries.



Medically Important Gram-Positive Bacilli

Gram Positive Non-Spore-Formers

Listeria monocytogenes:

- Found in soil, water, luncheon meats, hot dogs, cheese.
- Resistant to long storage and refrigeration, heat, salt, pH extremes and bile.
- Neonatal listeriosis may cause meningitis
- Adult listeriosis may cause gastroenteritis or meningitis



Muller Hinton agar

Medically Important Gram-Positive Bacilli

Gram Positive Non-Spore-Formers

Corynebacterium diphtheriae:

- Virulence factors: diphtherotoxin.
- Vaccine (DPT).
- Causes a pseudomembrane which can cause asphyxiation.
- Acquired via respiratory droplets from carriers or actively infected individuals.

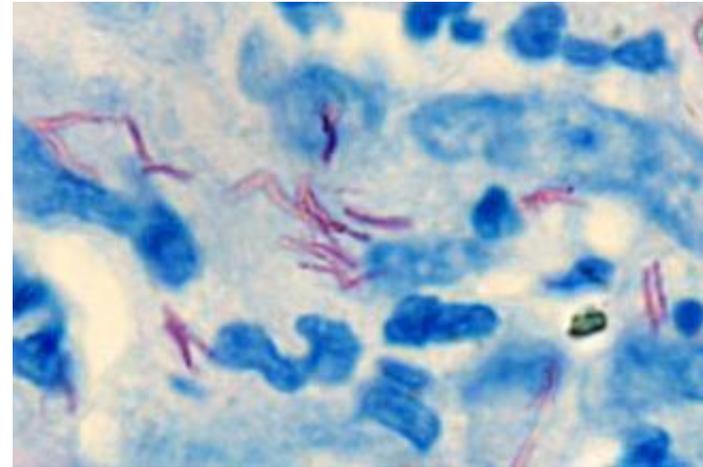


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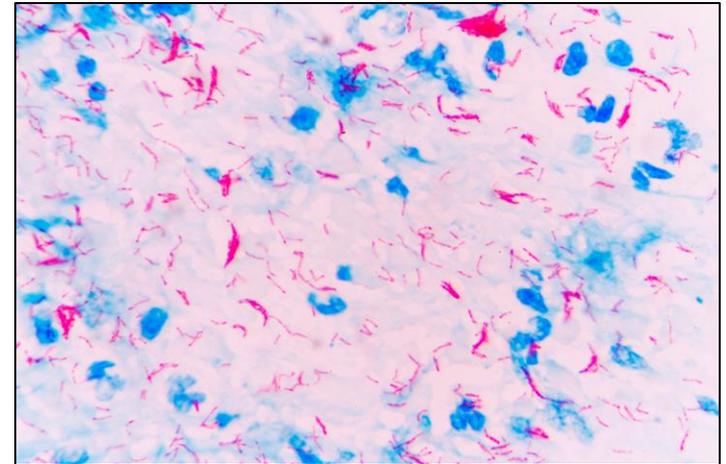
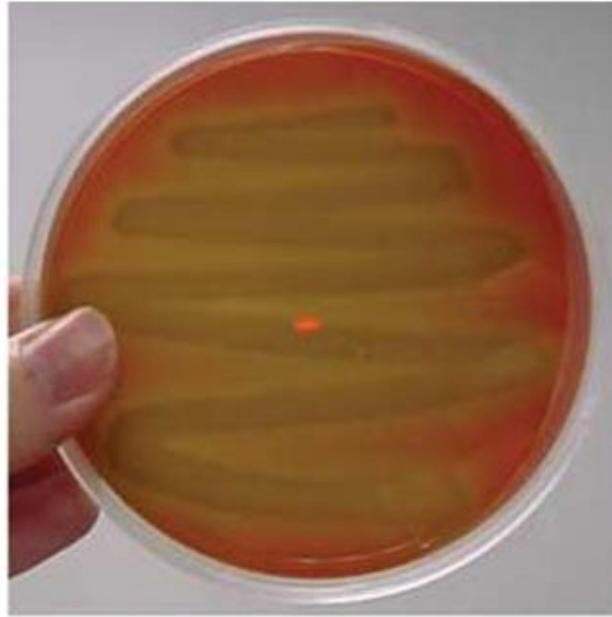
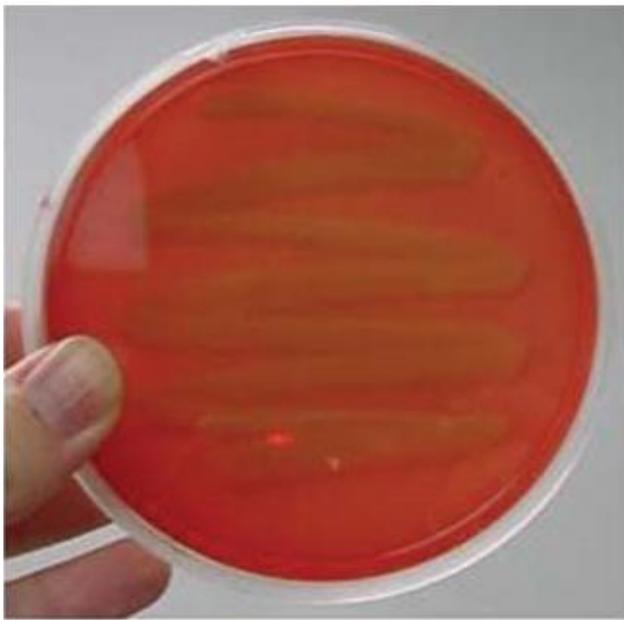
Gram Positive Non-Spore-Formers

Mycobacterium:

- Gram-positive irregular bacilli.
- Acid-fast staining: mycolic acids.
- Strict aerobes.
- Grow slowly.
- Virulence factors -contain complex waxes that prevent destruction by lysosomes or macrophages.







Thank
You

