

**Microbiology**

**Lec -4-**

**Staphylococcus bacteria**

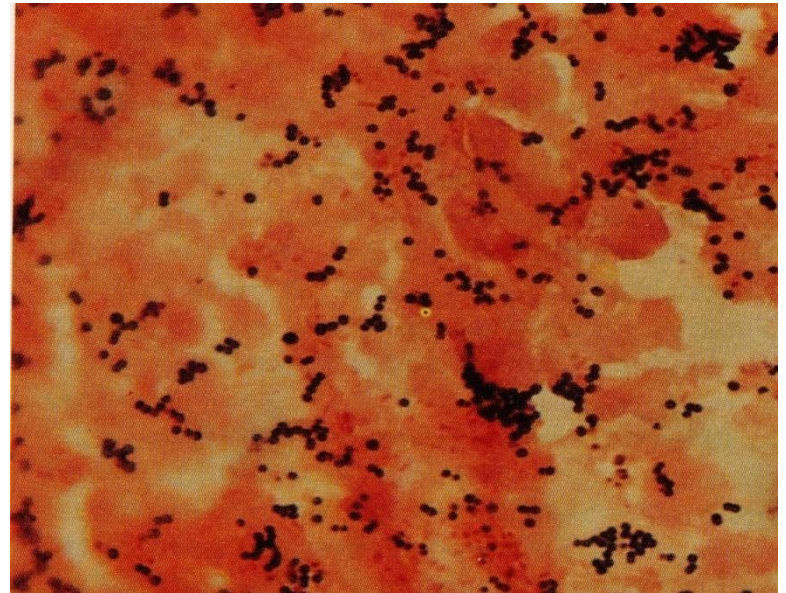
**By**

**Dr.Rawaa M. Mohammed**

- Family: Micrococcaceae
- Genus:
  - *Staphylococcus*- derived from Greek “stapyle” (bunch of grapes)
  - Include major human pathogen and skin infection

# *Staphylococcus*: General Characteristics

- Gram-positive spherical cells (0.5-1.5  $\mu\text{m}$ ) in singles, pairs, and clusters
- Appear as “bunches of grapes”



**Gram-stained smear of staphylococci from colony**

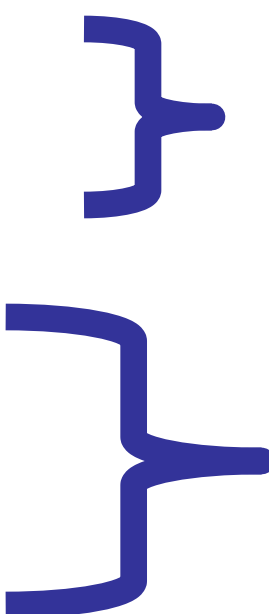
# *Staphylococcus*: General Characteristics

- Non motile
- Non–spore-forming
- Nonencapsulated
- Catalase-producing
- Glucose fermenters
- Primarily aerobic, some facultatively anaerobic

## *Staphylococcus*: General Characteristics

- Approximately 33 species
- ~15 species associated with humans
- *Staphylococcus* divided into **coagulase positive & coagulase negative** categories
- Inhibited by high bile salt concentration
- Colony morphology: cream or white colored

# Coagulase Positive Staphylococci

- ***S. aureus***
  - *S. intermedius*
  - *S. hyicus*
  - *S. delphini*
  - *S. schleiferi*
- 
- Human pathogens
- Animal-associated species

# *Staphylococcus aureus*

- Primary pathogen
- **Colonization:** axilla, perineum, pharynx
- Produce superficial to systemic infections
- **Pus formation**

# Natural history of disease

- Usual sites - skin, nasopharynx, perineum
- Breach in mucosal barriers - can enter underlying tissue
- Characteristic abscesses with Pus
- Bacteria secretes toxins



# DISEASES

- **Due to direct effect of organism**
  - Local - skin
  - Deep abscesses
  - Systemic infections
- **Toxin mediated**
  - Food poisoning
  - toxic shock syndrome
  - Scalded skin syndrome

# Virulence Factors of *S. aureus*

## \* **Pathogen Factors**

### **ENZYMES**

- Catalase
- Coagulase
- Hyaluronidase
- Lipases
- B lactasamase (antibiotic resistance)

\* **TOXINS-** enterotoxin, epidermolytic toxin

# SKIN LESIONS- superficial

- Boils
- Furuncles
- Wound infections

# DEEP ABSCESSSES

- Eg. - Breast abscess kidney, brain,  
Osteomyelitis, septic arthritis

# TOXIN MEDIATED DISEASES

## **1. Staphylococcal food poisoning**

- Due to production of enterotoxins**
- preformed toxin, heat stable**
- short incubation period**

## 2. Toxic shock syndrome

- High fever, diarrhoea, shock ,  
skin rash
- Mediated via 'toxic shock  
syndrome toxin'
- 10% mortality rate

# 3. Scalded skin syndrome

- Disease of young children
- Mediated through minor Staphylococcal infection by 'epidermolytic toxin' producing strains

# Virulence Factors: Extracellular enzymes

- Cytolytic Toxins

- Alpha hemolysin: lyses rbc, damages plts, causes severe tissue damage

- $\beta$  hemolysin: damage plasma membrane of rbc



# Virulence Factors: Extracellular enzymes

- Hyaluronidase: Hydrolyzes hyaluronic acid in connective tissue allowing spread of infection
- Staphylokinase: fibrinolysin which allows spread of infection
- Coagulase: virulence marker
- Lipase: allows colonization

# Virulence Factors: Extracellular enzymes

- Beta-lactamase or Penicillinase: confers resistance
- DNase: degrades DNA

# Coagulase-Negative Staphylococci

- Habitat: skin and mucous membranes
- Common human isolates
  - *S. epidermidis*
  - *S. saprophyticus*

# Coagulase-Negative Staphylococci: *Staphylococcus epidermidis*

- Mode of infection: colonization of medical implants
- Infections are acquired
- Serious infections among immunosuppressed patients or neonates may occur

# Coagulase-Negative Staphylococci: *Staphylococcus saprophyticus*

- Habitat: skin and mucosal membranes of the genitourinary tract
- Common cause of urinary tract infections in young, sexually active females

**Thank You**