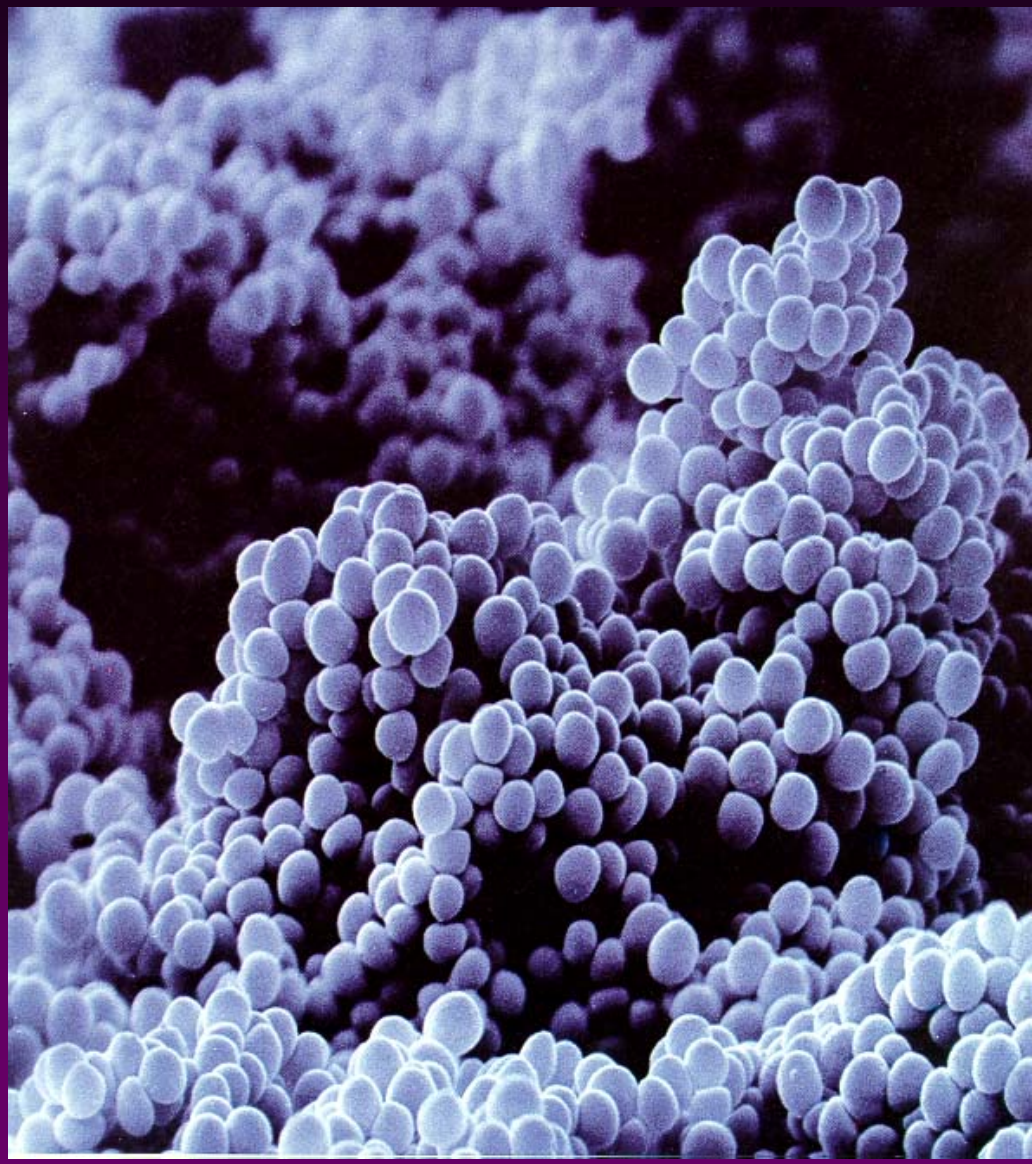
# Staphylococcus spp

One of the most common of all bacteria associated with humans and important pathogens

# *Microbiology of Staphylococcus*

- Gram + cocci
  - generally in grape-like clusters (Gr, *staphyle*)
    - also singly, pairs, etc.
- Important group**!!**
  - Normal on skin, upper respiratory tract, vagina, intestines, etc.
- Three pathogenic spp
  - *S. aureus*
    - produces coagulase
  - *S. epidermidis*
    - most common organism on skin
  - *S. saprophyticus*



# Microbiology continued

- Pyogenic cocci
  - invasive “pus-formers”
    - Staphylococci
    - Streptococci
    - Pneumococci
- numerous diseases
  - depending on virulenc factors
  - major nosocomial disease agent
    - “staff” infections?
  - hemolytic on blood agar
    - destroys RBCs, leukocytes, etc.

**Zones of hemolysis due to different toxins**

# Virulence Factors of Staph:

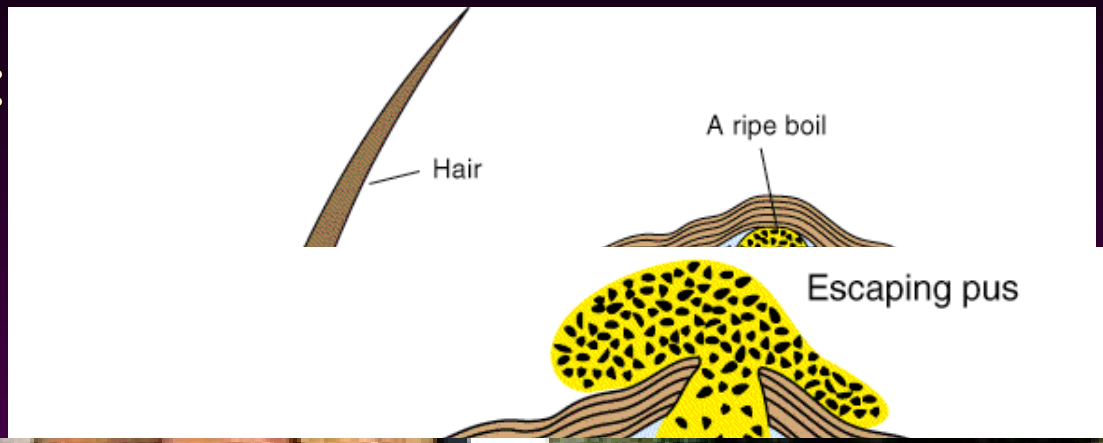
- **Enzymes:**
  - Catalase
    - interferes with phagocytic lysis
  - Coagulase
    - forms clots
  - Hyaluronidase
    - allows tissue penetration
  - DNAases
  - lipases
  - penicillinases
  - Protein A
    - binds IgG Fc receptors
  - **Staph Toxins:**
  - Cytotoxic toxins
    - 5 cytolysins: RBC, WBC, tissue necrosis
  - Toxic Shock Syndrome
    - TSST-1
    - fever, hypotension, rash
  - Exfoliative Toxin
    - Exfoliatin, A & B
    - splitting intracellular bridges
  - Enterotoxins
    - 5 distinct
    - heat resistant

# Transmission of Staph

- Common in healthy persons
- Some strains more pathogenic:
  - 30-50% carriers
  - anterior nares & skin
  - endogenous infections
  - Impetigo is highly contagious
    - poor personal hygiene
    - fomite transmitted
- Nosocomial Infections
  - health workers have high carrier rates
    - nasosecretions on hands
  - hospitalized patients are often immuno-compromised
  - Neonatal infections
  - Serious problem of antibiotic resistant *S. aureus (MDRSA)*
  - surgery, catheterization etc.

# Diseases of Staphylococcus

- Superficial infections:
  - Furuncles (boils)
  - Carbuncles
    - spread sub-cutaneously
    fevers, etc.
    far more serious
  - Impetigo
    - maybe Strept also
  - wound and burn infections

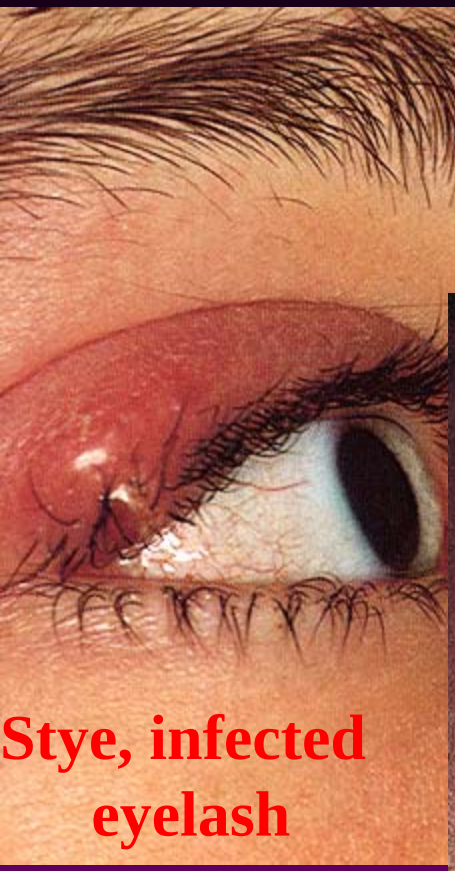




Furuncle


Carbuncle on neck

# Superficial Staph Infections



Stye, infected eyelash

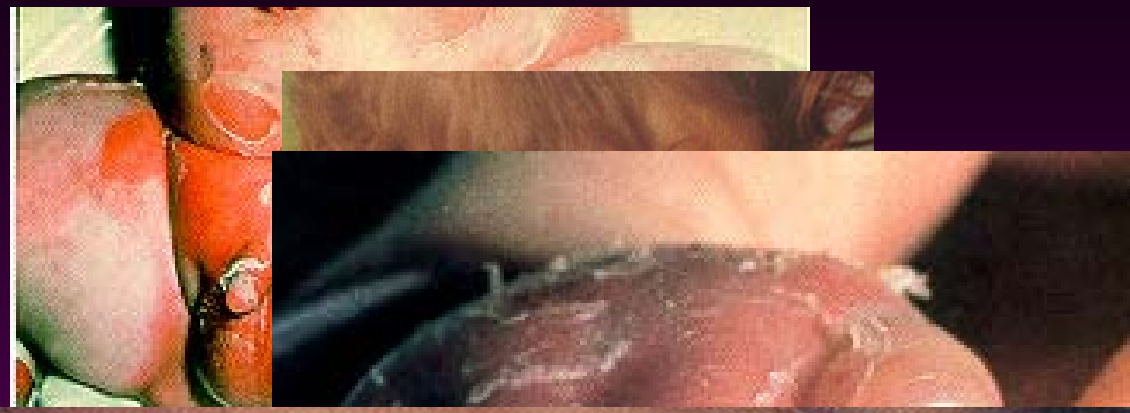
Impetigo

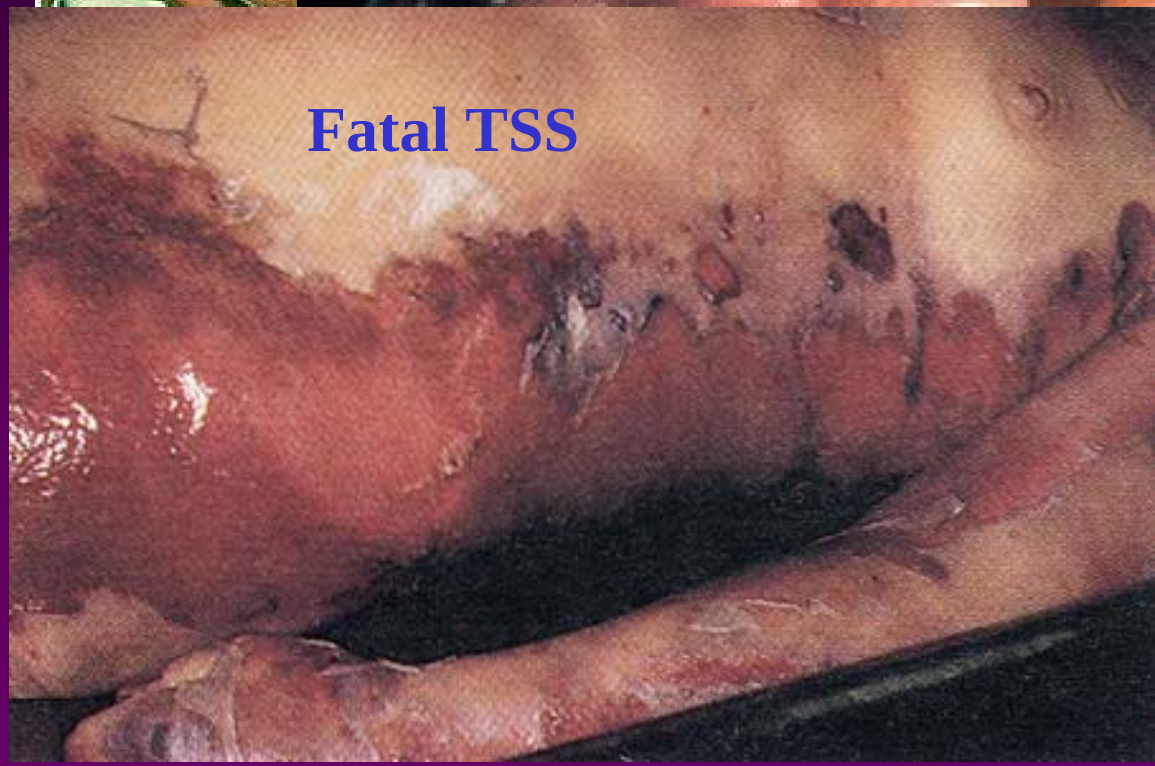
Surgical wound infection

Staph mastitis

# Systemic & Superantigens

- **Scalded skin syndrome**
  - Exfoliatin, separation of epidermis from dermal layers
- **Toxic Shock Syndrome**
  - TSST-1
  - fevers, rash, diarrhea marked desquamation
- Food poisoning
  - *S. aureus*, **# 1**
  - Enterotoxin (toxemia)
  - Highly heat resistant
    - creamy foods, potato salad, ham, etc.
    - nausea & vomiting






**Toxic Shock Syndrome**

# Other Staph Infections

- Nearly any tissue may be infected with *S. aureus*-hematogenous spread
- *S. epidermidis*
  - skin flora
  - contaminate catheters, surgery, etc.
  - slime producers
    - biofilms on prosthetics
    - heart valves
    - artificial joints
    - endocarditis
- *S. saprophyticus*
  - less pathogenic
  - common cause of UTI in young women
    - dysuria, what is that?
  - also forms biofilms on prosthetics
    - but less often!
    - heart valves
    - joints, etc.

# Treatment of Staph Infections

- Penicillin resistance, plasmid coded penicillinase
- vancomycin only drug still useful
  - recent drug resistance reported
- Cephalosporins, rifampin, etc.