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 virulence factors
  - major nosocomial disease agent
    - “staff” infections?
  - hemolytic on blood agar
    - destroys RBCs, leukocytes, etc.
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 \textit{S. aureus (MDRSA)}
    – surgery, catheterization etc.
Diseases of Staphylococcus

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

- Stye, infected eyelash
- Impetigo
- Surgical wound infection
- Staph mastitis
Systemic & Superantigens

- Scalded skin syndrome
  - Exfoliation, 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

Fatal TSS
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.