Streptococcaceae

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General Characteristics

- GPC in pairs and chains
- Catalase negative
- Nonmotile
- May be encapsulated
- Facultative anaerobes
- Nitrate negative

Classification

- Lancefield’s
  - C-substrate on cell wall
  - A, B, C, D, F, G
- Brown’s
  - Alpha hemolysis
  - Beta hemolysis
  - Gamma hemolysis (non-hemolytic)
  - Alpha-prime hemolysis

Beta-hemolytic streptococci

**Streptococcus pyogenes** (Grp. A)

- Colony morphology
  - Glossy, grayish-white, translucent, large zone beta hemolysis
- PYR positive
- Taxo A sensitive
- SXT resistant
- Sodium hippurate negative

Beta-hemolytic streptococci

**Streptococcus pyogenes** (Grp. A)

- Clinical significance – suppurative (pus)
  - Can be normal respiratory flora
  - Always consider as potential pathogen
  - Pharyngitis
  - Erysipelas, Impetigo, Scarlet fever
  - Puerperal fever (sepsis)
  - Necrotizing fasciitis
  - Streptococcal toxic shock syndrome

Beta-hemolytic streptococci

**Streptococcus pyogenes** (Grp. A)

- Clinical significance – non-suppurative
  - Post-streptococcal sequelae
    - Acute glomerulonephritis
    - Rheumatic fever
    - Hypersensitivity response
      - Cultures negative
**Streptococcus pyogenes (Grp. A)**

- **Virulence Factors**
  - Erythrogenic toxin
  - Streptolysin O, Streptolysin S
  - Hyaluronidase
  - DNase, NADase
  - Streptokinase
  - M Protein - endotoxin

- **Susceptibility testing**
  - Organism considered susceptible to penicillin
  - Susceptibility testing not routinely done

**Streptococcus agalactiae (Grp. B)**

- **Colony morphology**
  - Flat, glossy, grayish-white, translucent, narrow zone beta hemolysis
- **PYR negative**
- **Taxo A resistant**
- **Sodium hippurate positive**
- **CAMP positive**

**Clinical significance**
- Normal flora
- Neonate pneumonia, septicemia and meningitis
- Vaginitis, postpartum fever and sepsis
- Endocarditis
- UTI
- Others
Beta-hemolytic streptococci
Groups C, F, G *Streptococcus*
- Colony morphology
  - Small, grayish white, translucent, varying zone sizes of beta hemolysis
- ID by serological typing for C-substrate
- Clinical significance
  - Normal flora
  - Sepsis, endocarditis, wounds, meningitis, pneumonia, pharyngitis (Grp. C), others

What are the key identification characteristic for *Streptococcus agalactiae*?
GPC, catalase negative, beta-hemolytic, PYR negative, bacitracin resistant, sodium hippurate positive and CAMP positive.

What disease states is *Streptococcus agalactiae* commonly the etiologic agent for?
Neonate pneumonia, septicemia and meningitis; vaginitis, postpartum fever, sepsis, endocarditis, and UTI.

Gamma-hemolytic streptococci
Group D *Streptococcus*
- Colony morphology
  - Small, cream/white, smooth
- PYR negative
- Bile esculin positive
- No growth in 6.5% NaCl
- Clinical significance
  - Normal flora
  - Bacteremia associated with colon malignancy

Gamma-hemolytic streptococci
*Enterococcus species*
- Colony morphology
  - Small, cream/white, smooth
- PYR positive
- Bile esculin positive
- Growth in 6.5% NaCl

Gamma-hemolytic streptococci
*Enterococcus species*
- Clinical significance
  - Normal flora GI and mucous membranes
  - Endocarditis
  - UTI
  - Wound and intra-abdominal abscesses
Enterococcus species

- Susceptibility testing
  - More resistant than Group D Streptococcus
  - Now seeing Vancomycin resistant strains
- Susceptibility testing must be performed.

How would you differentiate Group D Streptococcus and Enterococcus?

PYR, bile esculin and growth in 6.5% NaCl.
Enterococcus is positive for all three and Group D Streptococcus is positive for just bile esculin.

Streptococcus pneumoniae

- Gram stain: GPC in pairs, lancet-shaped (can have capsules)
- Colony morphology
  - Small, gray, glistening, alpha hemolysis
  - Autolysis of cells upon extended incubation so center of colony begins to disappear
  - If encapsulated, colonies are mucoid

Streptococcus pneumoniae

- Optochin/Taxo P sensitive
- Bile solubility positive

Streptococcus pneumoniae

- Virulence factors
  - Polysaccharide capsule – able to resist phagocytosis

Streptococcus pneumoniae

- Clinical significance
  - Normal respiratory flora in rare to few amounts
  - Predisposing conditions for infection
  - Community acquired bacterial pneumonia
  - Sinusitis, otitis media, mastoiditis, meningitis, peritonitis, arthritis, conjunctivitis
Streptococcus pneumoniae

- Susceptibility testing
  - Seeing resistance to penicillin so must do susceptibility testing on clinically significant isolates
  - Oxacillin KB disk to screen for penicillin susceptibility

What disease is *Streptococcus pneumoniae* the most common cause?

Community acquired bacterial pneumonia. It can also cause meningitis, sinusitis, otitis media, peritonitis, and conjunctivitis.

Streptococcus viridans group

- Colony morphology
  - Tiny, gray, domed, alpha hemolysis
- Optochin/Taxo P resistant
- Bile solubility negative
- Bile esculin negative
- No growth in 6.5% NaCl

Streptococcus viridans group

- Clinical significance
  - Normal flora
  - Generally non-pathogenic
  - Subacute bacterial endocarditis (#1 cause)
  - Liver abscesses, bacteremia
- *Streptococcus anginosus/milleri* group
  - Deep wound infections

Abiotrophia species

- Nutritionally variant streptococci
- Requires Vitamin B6 / pyridoxal to grow
- Clinical significance
  - Normal flora
  - Endocarditis

How can you differentiate *Streptococcus pneumoniae* from *Streptococcus viridans* group?

Susceptibility to Optochin and bile solubility. *Streptococcus pneumoniae* is optochin sensitive and bile solubility positive. *Streptococcus viridans* group is optochin resistant and bile solubility negative.
**Streptococcus viridans group** are clinically significant for what disease?

Subacute bacterial endocarditis (#1 cause)

**Abiotrophia species** are clinically significant for what disease?

Subacute bacterial endocarditis

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**Streptococcus-like bacteria**

**Gemella species**

- Colony morphology
  - Resemble *Streptococcus viridans* group
  - Can be alpha or gamma hemolytic
- Gram stain: GPC in pairs and chains
  - Easily decolorized
  - Pairs may have adjacent sides flattened

**Streptococcus-like bacteria**

**Gemella species**

- Identification
  - PYR variable
  - Vancomycin sensitive
  - Glucose non “F”
  - Bile esculin negative
  - No growth in 6.5% NaCl

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**Streptococcus-like bacteria**

**Gemella species**

- Clinical significance
  - Normal flora of respiratory and GI tracts
  - Rarely isolated from humans
  - Opportunistic pathogen
    - Septicemia
    - Wounds, abscesses
    - Respiratory
    - UTI

**Streptococcus-like bacteria**

**Leuconostoc species**

- Colony morphology
  - Resemble *Streptococcus viridans* group
  - Can be alpha or gamma hemolytic
- Gram stain: GPC in pairs and chains
  - Can be coccobacilli in appearance
Leuconostoc species

- Identification
  - PYR negative
  - Vancomycin resistant
  - Glucose "F"
  - Bile esculin positive
  - Variable growth / no growth in 6.5% NaCl

Leuconostoc species

- Clinical significance
  - Normally found in environment
  - Opportunistic pathogen in immunosuppressed patients
    - Septicemia
    - Wounds
    - CSF

Pediococcus species

- Colony morphology
  - Resemble Streptococcus viridans group
  - Can be alpha or gamma hemolytic
- Gram stain: GPC in pairs, tetrads and clusters

Pediococcus species

- Identification
  - PYR negative
  - Vancomycin resistant
  - Glucose "F"
  - Bile esculin positive
  - Variable growth / no growth in 6.5% NaCl
  - Group D antigen positive

How can you differentiate Gemella, Leuconostoc and Pediococcus from each other?

<table>
<thead>
<tr>
<th>Biochem</th>
<th>Gemella</th>
<th>Leuconostoc</th>
<th>Pediococcus</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.S.</td>
<td>-Pair, chain</td>
<td>-Pair, chain</td>
<td>-Tetrad, cluster</td>
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<tr>
<td>PYR</td>
<td>-Variable</td>
<td>-Negative</td>
<td>-Negative</td>
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<tr>
<td>Van</td>
<td>-Sensitive</td>
<td>-Resistant</td>
<td>-Resistant</td>
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<tr>
<td>Gluc</td>
<td>-Non &quot;F&quot;</td>
<td>-&quot;F&quot;</td>
<td>-&quot;F&quot;</td>
</tr>
<tr>
<td>BE</td>
<td>-Negative</td>
<td>-Positive</td>
<td>-Positive</td>
</tr>
<tr>
<td>6.5NaCl</td>
<td>-No growth</td>
<td>-Variable</td>
<td>-Type Grp D</td>
</tr>
</tbody>
</table>
Summary…

- Classification – hemolysis, C-substrate
- Gram stain – GPC in pairs & chains
- Identification
  - Beta Strep (PYR, Taxo A, SXT, Na hipp)
  - Alpha Strep (Optochin, bile solubility)
  - Gamma Strep (PYR, BE, 6.5% NaCl)
  - Strep-like organisms
- Clinical significance of each organism

Who am I?

Enterococcus species

Gram stain BAP PYR

Streptococcus pyogenes

Gram stain BAP PYR

Streptococcus pneumoniae

Gram stain BAP with optochin

Streptococcus agalactiae

Gram stain BAP Na hippurate