Klebsiella – Enterobacter – Serratia Group

Sunday, August 3, 2025 3:35 PM

KLEBSIELLA – ENTEROBACTER – SERRATIA GROUP – Overview

◈ Diseases

- Opportunistic pathogens.
- Cause nosocomial infections, especially:
  - Pneumonia
  - Urinary tract infections (UTIs)
- Klebsiella pneumoniae can also cause community-acquired pneumonia.

◈ Important Properties

- Most commonly involved species:
  - Klebsiella pneumoniae
  - Enterobacter cloacae
  - Serratia marcescens
- Natural habitats:
  - Normal flora of large intestine.
  - Also found in soil and water.

- Distinguishing features:
    - Similar biochemical profiles.
    - Differ in motility and specific test results.
- Capsule:
    - *K. pneumoniae* has a large polysaccharide capsule ⟶ colonies appear mucoid.
- Pigment:
    - *S. marcescens* forms red-pigmented colonies (seen on agar plates).

◈ Pathogenesis & Epidemiology

- Klebsiella pneumoniae:
    - More likely to be a primary (non-opportunistic) pathogen.
    - Capsule provides antiphagocytic protection.
    - Carried in respiratory tract of ~10% healthy people.
    - Infection risk increases in:
        - Elderly
        - Chronic lung disease
        - Diabetics

        - Alcoholics

- Enterobacter & Serratia:

    - Strongly associated with hospital-acquired infections.
    - Common after invasive procedures:
        - IV catheterization
        - Respiratory intubation
        - Urinary catheterization
    - Serratia outbreaks linked to:
        - Contaminated respiratory devices (e.g., humidifiers)
    - Before modern procedures, Serratia was largely environmental.

- Injection drug users:

    - Serratia may cause endocarditis.

- Septic shock:

    - Like other gram-negative rods, can result from endotoxins in the cell wall (LPS).

◈ Clinical Findings

- Most common presentations:

- UTIs
- Pneumonia

- Other complications:

  - Bacteremia
  - Spread to meninges, liver, etc.

- Klebsiella pneumonia hallmark:

  - Thick, mucoid, bloody sputum = "currant-jelly sputum"
  - Can cause lung necrosis and abscesses

- Less common Klebsiella species:

  - K. ozaenae ⟶ Atrophic rhinitis
  - K. rhinoscleromatis ⟶ Granulomatous disease of nose/pharynx

◈ Laboratory Diagnosis

- Grow on MacConkey's or EMB agar:

  - Lactose fermenters ⟶ pink colonies
  - *Serratia* may give a false-negative (late fermenter)

- Differentiation:

- Based on biochemical tests and motility.

Treatment

- Drug resistance is common, especially in hospital-acquired strains.
- Many produce ESBLs (Extended-Spectrum β-Lactamases):
  - Resistant to most β-lactam antibiotics.
- Empiric therapy (before sensitivity known):
  - Aminoglycoside (e.g., gentamicin) +
  - 3rd-gen cephalosporin (e.g., cefotaxime)
- Severe Enterobacter infections:
  - May require imipenem + gentamicin

Prevention

- No vaccine available.
- Hospital infection control:
  - Replace IV catheter sites regularly.

- Remove urinary catheters promptly.
- Proper maintenance of respiratory devices.