Microbiology

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ARKAN
ACADEMY

Non-Spore-Forming Gram-Positive Rods and Anaerobic Gram-Positive Cocci

- **Introduction**
  - **Non-Spore-Forming Gram-Positive Rods**:
    - ✓ Include aerobic and anaerobic types.
    - ✓ Colonize the skin and mucosal surfaces; can be facultatively anaerobic or strictly anaerobic.
    - ✓ Pathogenic genera include:
      - *Actinomyces, Mobiluncus, Lactobacillus, Propionibacterium.*
      - Other genera such as *Bifidobacterium* and *Eubacterium* are rarely associated with disease.
  - **Anaerobic Gram-Positive Cocci**:
    - ✓ Normally colonize the oral cavity, gastrointestinal tract, genitourinary tract, and skin.
    - ✓ Cause infections when they spread to normally sterile sites, often as part of polymicrobial infections.

- **Non-Spore-Forming Gram-Positive Rods**

1. ***Actinomyces***:
   - Facultatively anaerobic or strictly anaerobic, slow-growing gram-positive rods.
   - Common in the upper respiratory, gastrointestinal, and female genital tracts but absent on skin.
   - Clinical Features:
     - ✓ Chronic infections (actinomycosis) with granulomatous lesions, abscesses, and sinus tracts.
     - ✓ Most commonly affects cervicofacial regions (e.g., after dental trauma).
   - Treatment:
     - ✓ Surgical drainage and prolonged antibiotic therapy.

2. ***Nocardia***:
   - Strictly aerobic rods, weakly acid-fast, forming branched filaments.
   - Found in soil; infections are exogenous, primarily in immunocompromised individuals.
   - Clinical Features:
     - ✓ Bronchopulmonary infections, cutaneous nocardiosis, and brain abscesses.
   - Virulence:
     - ✓ Resists phagocytosis using catalase, superoxide dismutase, and cord factor.

3. ***Lactobacillus***:
   - Facultatively or strictly anaerobic rods, part of normal flora in the mouth, stomach, intestines, and genitourinary tract.
   - Rarely pathogenic but associated with transient bacteremia, endocarditis, or septicemia.
   - Widely used in probiotics and food fermentation.

4. ***Propionibacterium (Cutibacterium)***:
   - Small gram-positive rods found on the skin, conjunctiva, and mucosal surfaces.
   - Clinical Features:
     - ✓ Causes acne vulgaris and opportunistic infections (e.g., prosthetic devices).

5. ***Other Anaerobic Rods***:
   - *Mobiluncus*: Gram-variable rods associated with bacterial vaginosis.
   - *Bifidobacterium* and *Eubacterium*: Rarely cause disease; often contaminants.

- **Aerobic Non-Spore-Forming Gram-Positive Rods**

1. ***Listeria monocytogenes:***
   - Short, non-branching gram-positive rods, motile at room temperature.
   - Clinical Features:
     - ✓ Causes foodborne illnesses, neonatal infections, and severe disease in immunocompromised individuals.
   - Virulence:
     - ✓ Intracellular survival and replication via listeriolysin O and actin polymerization.

2. ***Corynebacterium diphtheriae:***
   - Pleomorphic rods, produces diphtheria toxin (classic A-B exotoxin).
   - Clinical Features:
     - ✓ Respiratory diphtheria with pseudomembrane formation.
   - Transmission:
     - ✓ Person-to-person via respiratory droplets or contact.

- **Anaerobic Gram-Positive Cocci**

  - General Features:
    - ✓ Colonize normal flora but cause infections when introduced to sterile sites.
    - ✓ *Peptostreptococcus* species are the most common pathogens.

  - Clinical Features:
    - ✓ Infections often polymicrobial, affecting soft tissues, abscesses, and chronic conditions like diabetic foot ulcers.

Questions

1. **Which of the following non-spore-forming Gram-positive rods is an important cause of neonatal meningitis?**
   - **A.** Listeria monocytogenes
   - **B.** Corynebacterium diphtheriae
   - **C.** Lactobacillus acidophilus
   - **D.** Propionibacterium acnes

2. **Which of the following characteristics helps differentiate Actinomyces from Nocardia?**
   - **A.** Gram-positive staining
   - **B.** Presence of branching filaments
   - **C.** Acid-fast staining (positive in Nocardia)
   - **D.** Obligate anaerobic growth

3. **Which of the following Gram-positive rods is often used in probiotics?**
   - **A.** Corynebacterium diphtheriae
   - **B.** Lactobacillus acidophilus
   - **C.** Listeria monocytogenes
   - **D.** Cutibacterium acnes

4. **What is the main mechanism of action of diphtheria toxin?**
   - **A.** Inhibition of protein synthesis by ADP-ribosylating elongation factor 2 (EF-2)
   - **B.** Damage to cell membranes by pore formation
   - **C.** Activation of macrophages to release cytokines
   - **D.** Destruction of DNA by nuclease activity

5. **A 45-year-old male presents with a hard, painless swelling on the lower jaw that has been slowly growing over the past few months. He reports a history of recent dental extractions. Physical examination reveals a draining sinus tract with yellowish granules.Question: What is the most likely causative agent of his condition?**
   - **A.** Clostridium tetani
   - **B.** Listeria monocytogenes
   - **C.** Actinomyces israelii
   - **D.** Bacillus anthracis

Answers

1. Which of the following non-spore-forming Gram-positive rods is an important cause of neonatal meningitis?
   - A. Listeria monocytogenes
2. Which of the following characteristics helps differentiate Actinomyces from Nocardia?
   - C. Acid-fast staining (positive in Nocardia)
3. Which of the following Gram-positive rods is often used in probiotics?
   - B. Lactobacillus acidophilus
4. What is the main mechanism of action of diphtheria toxin?
   - A. Inhibition of protein synthesis by ADP-ribosylating elongation factor 2 (EF-2)
5. What is the most likely causative agent of his condition?
   - C. Actinomyces israelii

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