

## 2- Gram positive rods, non spore forming rods:-

### 1-Genus: Listeria

#### Species: Listeria monocytogenes

##### + Distinguishing Features:

Small gram (+) bacilli, Facultative intracellular Parasite  
Cause foodborne disease

##### + Reservoir: Widespread

- ✓ Animals (GI and genital tracts)
- ✓ unpasteurized milk products
- ✓ plants, and soil
- ✓ contaminated food,
- ✓ soft cheese
- ✓ meat,
- ✓ fruit, ice cream

##### + Transmission: foodborne or vertical

##### + Pathogenesis: Listeriolysin O Toxin,

##### + Disease(s)

- Listeriosis
- Neonatal disease
- Transplacental
- Neonatal septicemia and meningitis (third most common cause)
- Meningitis in renal transplant or cancer patients (most common cause)

##### + Treatment: ampicillin with gentamicin added for immunocompromised patients

+ Prevention: pregnant and immunocompromised patients should avoid cold contamination food

## 2-Genus: Corynebacterium

### Species: Corynebacterium diphtheriae

##### + Distinguishing Features:

Gram (+) rods , aerobic, non-spore forming rods arranged in V or L shapes on Gram stain

Toxin-producing and thus cause diphtheria.

##### + Reservoir: throat and nasopharynx

##### + Transmission: bacterium or phage via respiratory droplets

##### + Pathogenes:

- Is Organism not invasive; colonizes epithelium of oropharynx or skin in cutaneous diphtheria

- Diphtheria toxin (A-B component)—inhibits protein synthesis
- Effect on oropharynx: Dirty gray pseudomembrane (made up of dead cells and fibrin exudate, bacterial pigment)
- Extension into larynx/trachea → obstruction
- Effect of systemic circulation → heart and nerve damage

✚ **Diseases:**

1. diphtheria (sore throat with pseudomembrane, bull neck, potential respiratory obstruction, myocarditis, cardiac dysfunction, nerve palsy.
2. renal failure

✚ **Diagnosis:**ELISA for toxin

✚ **Treatment:**Erythromycin and antitoxin for endocarditis, intravenous penicillin

✚ **Prevention:** toxoid vaccine

### 3- GENUS: Mycobacterium spp.

✚ **Genus Features**

Acid fast rods with waxy cell wall, Obligate aerobe

✚ **Cell wall**

High concentration of lipids called mycolic acids ,Wall makes mycobacteria highly resistant to desiccation and many chemicals (including NaOH used to kill other bacteria in sputa before neutralizing and culturing Sensitive to UV

✓ **Species of Medical Importance**

- 1) *M. tuberculosis*
- 2) *M. leprae*
- 3) *M. avium-intracellulare*
- 4) *M. kansasii*
- 5) *M. marinum*
- 6) *M. ulcerans*

### **Species: Mycobacterium tuberculosis**

✚ **Distinguishing Features**

Rods acid fast, Aerobic, slow growing on its culture medium;  
Produces niacin ( Bactericin) intracellular organism (most important)

✚ **Reservoir**: human lungs

✚ **Transmission**: respiratory droplets

✚ **Pathogenes**

- Facultative intracellular organism (most important)

- Sulfatides (sulfolipids in cell envelope): inhibit phagosome-lysosome fusion, allowing intracellular survival (if fusion occurs, waxy nature of cell envelope reduces killing effect)
- Cord factor (trehalose dimycolate): causes serpentine growth in vitro; inhibits leukocyte migration; disrupts mitochondrial respiration and oxidative phosphorylation
- Tuberculin (surface protein) along with mycolic acid delayed hypersensitivity and cell-mediated immunity (CMI): granulomas and caseation mediated by CMI; no exotoxins or endotoxin; damage done by immune system

### **Disease(s)**

#### ✓ **Primary pulmonary TB:**

- Symptoms can include fever, dry cough
- Organisms replicate in naive alveolar macrophages, killing the macrophages until CMI is set up (Ghon focus)
- Macrophages transport the bacilli to the regional lymph node (Ghon complex) and most people heal without disease
- Organisms that are walled off within the Ghon complex remain viable unless treated

#### ✓ **Reactivational TB:**

- Symptoms can include fever, hemoptysis, night sweats, weight loss
- Erosion of granulomas into airways (high oxygen) later in life under conditions of reduced T-cell immunity can lead to mycobacterial replication and disease symptoms
- Complex disease with the potential of infecting any organ system
- May disseminate (miliary TB): kidneys, GI tract, brain, spine (Pott disease)

### **Diagnosis**

- Microscopy of sputum: screen with auramine-rhodamine stain (fluorescent apple-green); no antibody involved; very sensitive; if positive, confirm with acid fast stain
  - PPD skin test (Mantoux)
  - Quantiferon-TB Gold Test
  - Symptoms can include fever, hemoptysis, night sweats, weight loss
  - Erosion of granulomas into airways (high oxygen) later in life under conditions of reduced T-cell immunity can lead to mycobacterial replication and disease symptoms

- Complex disease with the potential of infecting any organ system
- May disseminate (miliary TB): kidneys, GI tract, brain, spine (Pott disease)
- No serodiagnosis

#### ✚ **Treatment:**

-Multiple drugs critical to treat infection standard observed short-term therapy for uncomplicated pulmonary TB (rate where acquired resistance <4%): Streptomycin added for possible drug-resistant cases until susceptibility tests are back (if area acquired has >4% drug-resistant mycobacteria)

-For MDR TB, use 3–5 previously unused drugs: aminoglycosides, fluoroquinolones, thioamide, cycloserine, bedaquiline

#### ✚ **Prevention:**

- Isoniazid taken for 9 months can prevent TB in persons with infection but no clinical symptoms
- Bacille Calmette-Guérin (BCG) vaccine containing live, attenuated organisms may prevent disseminated disease; (not used in U.S.)
- UV light or HEPA filter used to treat potentially contaminated air.

### ✚ **OTHER NON-SPORE-FORMING, GRAM-POSITIVE RODS**

*Propionibacterium* is a genus of anaerobic or microaerophilic rods of diphtheroid-like morphology. They are common inhabitants of the normal skin and, in rare instances, have been reported as causes of endocarditis and infections of plastic implants. *P. acnes*, often a strict anaerobe, has been implicated as a contributing cause of acne. Various species of *Lactobacillus* are part of the commensal flora of human mucous membranes. They produce large quantities of lactic acid during fermentation and have been thought to assist in maintaining the acid pH of normal mucous epithelia. Acid production by oral lactobacilli may play a role in the progression of dental caries, especially in dentine. *Erysipelothrix rhusiopathiae* is a filamentous, gram-positive rod that causes disease in animals and, rarely, a skin infection called erysipeloid in people who commonly handle animal products (eg, butchers, veterinarians, and fishermen).

#### ➤ References :

- USMLE® STEP 1: IMMUNOLOGY AND MICROBIOLOGY, Lecture Notes, 2019, KAPLAN, Publishing NEY YORK .

- Lippincott® Illustrated Reviews: Microbiology, **Fourth Edition, Cynthia Nau Cornelissen, PhD** Department of Microbiology and Immunology School of Medicine Virginia Commonwealth University Richmond, Virginia  
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