

Medical Bacteriology- Lecture 10

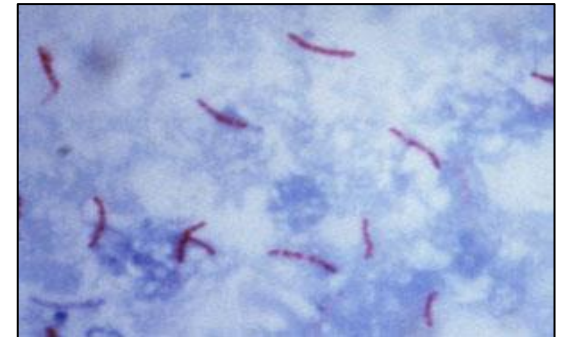
Mycobacterium

Actinomycetes

Nocardia

Mycobacterium

- **Characteristics**
- Large rods
- Gram (not straight/ correct)
- Acid fast stain
- Culture grows slowly- slow generation time
- Obligate aerobes
- Acid fast bacteria
- facultative intracellular pathogen
- Rich in lipids (resistant to chemical agents)
- Many non-pathogenic mycobacteria are parts of human normal flora



M. tuberculosis acid fast stain.



Colonies of *M. tuberculosis* on Lowenstein-Jensen medium

Mycobacterium

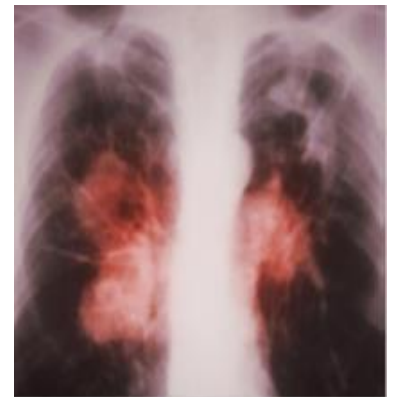
- **Medically important species**
- *M. tuberculosis* (tuberculosis in humans)
- *M. bovis* (TB in cows and rarely in humans)
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- *M. leprae* (leprosy).

Human Tuberculosis

- **Tuberculosis (TB)** is the leading cause of death in the world.
- TB infected people have a positive reaction to the **tuberculin skin test**
- **Symptoms:** (low fever, cough, night sweating, weight loss, weakness).
- **Contagious**
- **Transmission; Respiratory TB;** spread through air from cough.
- **Extra-pulmonary TB;** contaminated milk
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- *Bacille Calmette-Guerin (BCG- vaccine)*

Respiratory Tuberculosis stages

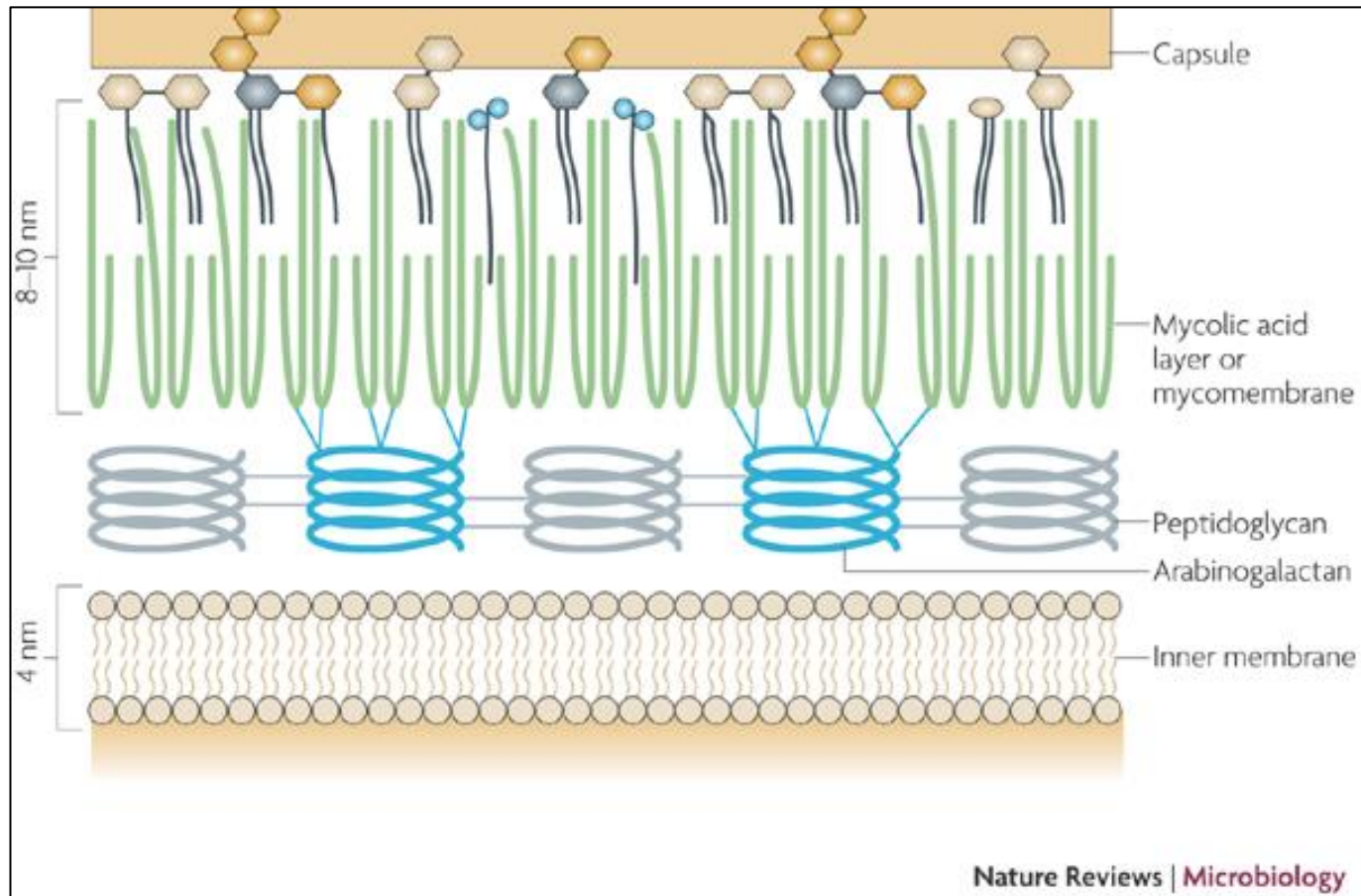
- **1) Droplet nuclei (Primary nodule)** Inhalation droplet nuclei .
- **2) (Tissue necrosis):** Begins 7-21 days after initial infection. **MTB multiplies within macrophages.**
- **3) (Consolidation):** tuberculin-positive, tubercle formation, semi-solid or "cheesy" necrosis", **(most contagious).**
- **4) (Calcification):** the tubercle grows, may invade a bronchus and other parts of the lung. **(X-rays positive).**



Cell Wall Structure of *M. tuberculosis*

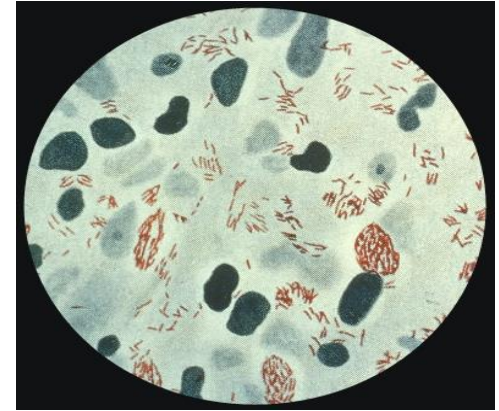
- The cell wall complex contains
 - Peptidoglycan
 - Complex lipids (mycolic acids, cord factor & wax-D)
- **Mycolic acids:** *Mycobacterium*, *Corynebacterium* and *Nocardia*
(a significant determinant of virulence)
- **Cord Factor:** virulent strains of MTB.
- **Wax-D:** immune booster
- **Properties of cell wall lipid in *M. tuberculosis***
- **Resistant to;** antibiotics, dyes, acidic & alkaline compounds, complement, macrophages

Cell wall of *M. tuberculosis*



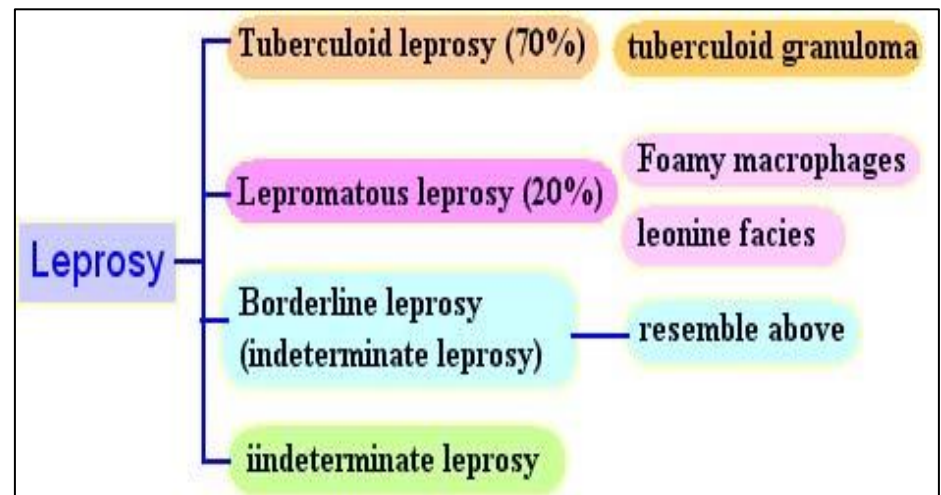
M. leprae

- Gram positive
- **Acid fast bacilli**
- **Causes leprosy**
- Mostly found in warm tropical countries
- **Obligate intracellular parasite- Cannot be cultivated in-vitro**
- **Characteristic lesions are grown in laboratory animals.**
 - **e.g. Foot pads of mice**
 - **Armadillos**
- Incubation period is months to years.
- Route of infection is through nasal mucus secretion
- Severe and permanent nerve damage



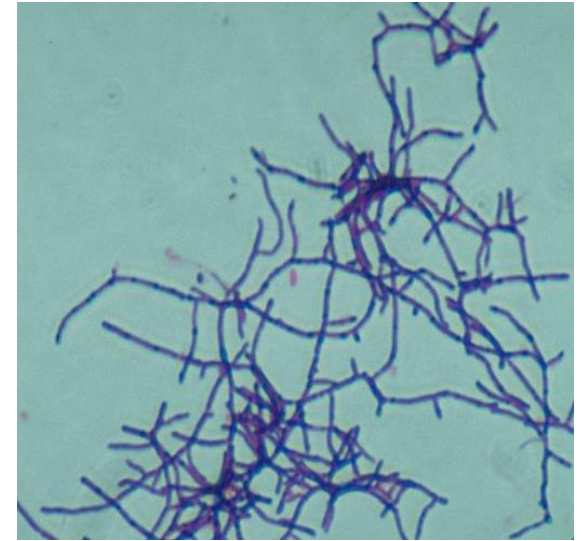
Leprosy types

- **1- Tuberculoid**
 - host is highly resistant
 - few peripheral nerves and adjacent skin areas
 - tuberculoid granuloma.
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- **2- Lepromatous**
 - host lacks resistance
 - all tissue affected
 - foam cell granuloma.
- **3- Intermediate.**



Actinomycetes

- Gram positive bacilli
- **Branching filaments**
- facultative or strictly anaerobic- aerobic
- **not acid-fast**
- **Grow slowly in culture** (up to two weeks or more)
- Normal flora of the upper respiratory, gastrointestinal and female genital tracts
- **Human actinomyosis**
- Chronic infections , opportunistic diseases, abscesses, dental caries
- Low virulence potential
- Aerobic actinomycetes whose cell walls lack mycolic acid: Streptomyces species



Nocardia

- Weakly gram positive bacilli
- **Branching long filamentous cells**
- **Acid fast**
- soil, aquatic environment, humans (oral flora) and animals
- **Cutaneous, sub- cutaneous, systemic lesions.**
- Transmission (inhalation, skin).
- 50% of patients are immunocompromised
- Treatment (long term antibiotics therapy)
- ***Nocardia madurae*; causes Madura foot**

