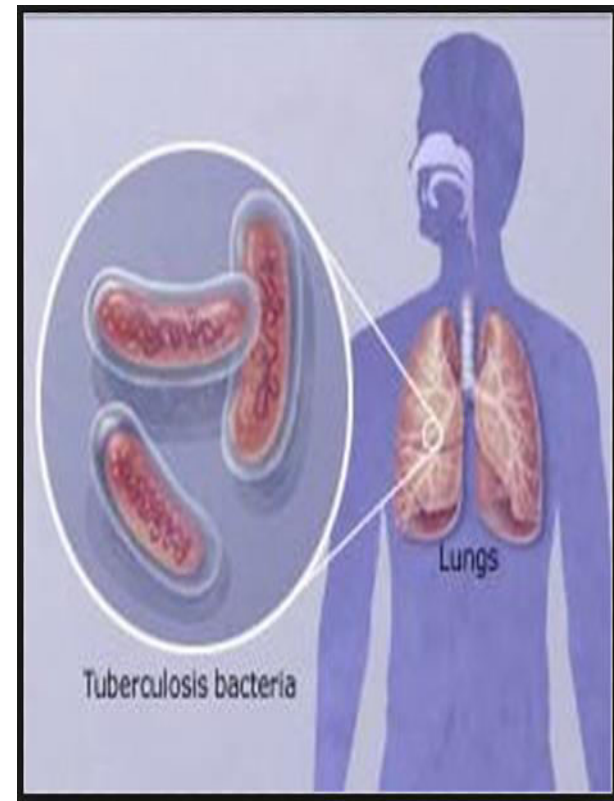


Mycobacterium



Characteristics of Mycobacterium

- Very thin , rod shape.
- Culture:
 - ✓ Aerobic, need high levels of oxygen to grow.
 - ✓ Very slow in grow compared to other bacteria (colonies may be visible in up to 60 days).
- **Acid-fast bacilli** → it has unusual thick cell wall, rich in lipids; which makes it:
 - Difficult to stain with gram stain (The gram stain can not penetrate this layer).
 - Resist de-colorization by the acid used in gram stain.
 - Hence **Ziehl-Neelsen (ZN) staining technique** is used instead (acid-fast staining technique).

- The acid fastness of this organism enable us to distinguish them from other genera.
- Non-motile, non-spore forming and non- capsulated.
- It can withstand weak disinfectants, and survive in dry state for weeks.
- It can be killed by heat or ultraviolet radiation.

Mycobacterium

There are two clinical significance spp. (obligate pathogens):

1. *M. tuberculosis* (cause TB)
2. *M. leprae*

➤ Most other Mycobacterial spp. are environmental saprophytes.

M. tuberculosis

- It is the cause of tuberculosis.
- *M.tuberculosis* can survive and grow in macrophages and remain viable for decades (virulence factor).

Tuberculosis (TB):

- It is a chronic intracellular infection
- Characterized by granuloma formation
- The lung is the usual site of this disease, but non-pulmonary forms occur
- Tuberculosis is divided into primary TB and post-primary TB

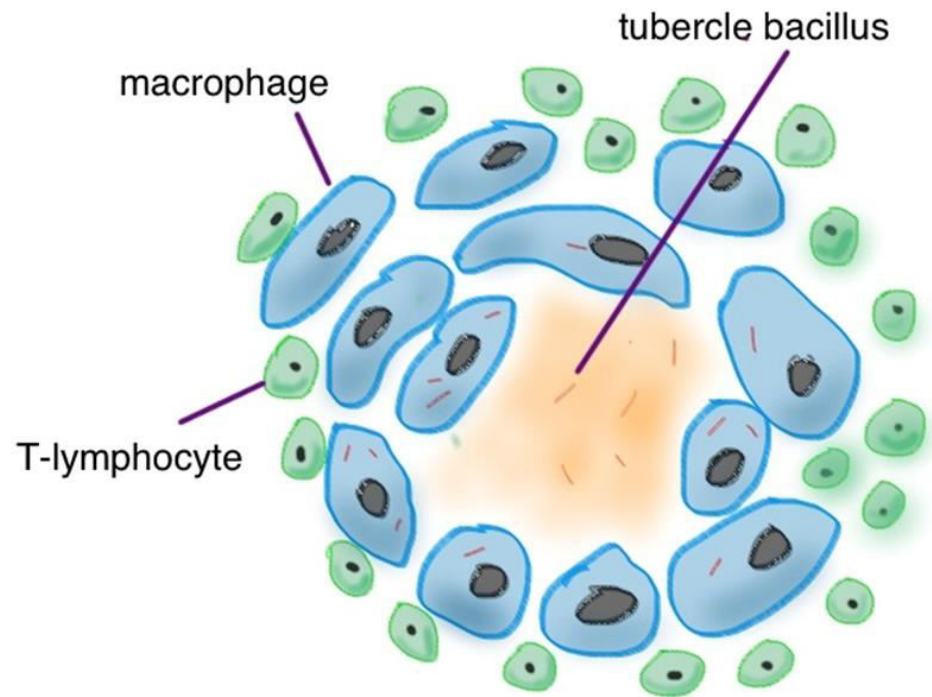
Primary Tuberculosis (Initial Infection)

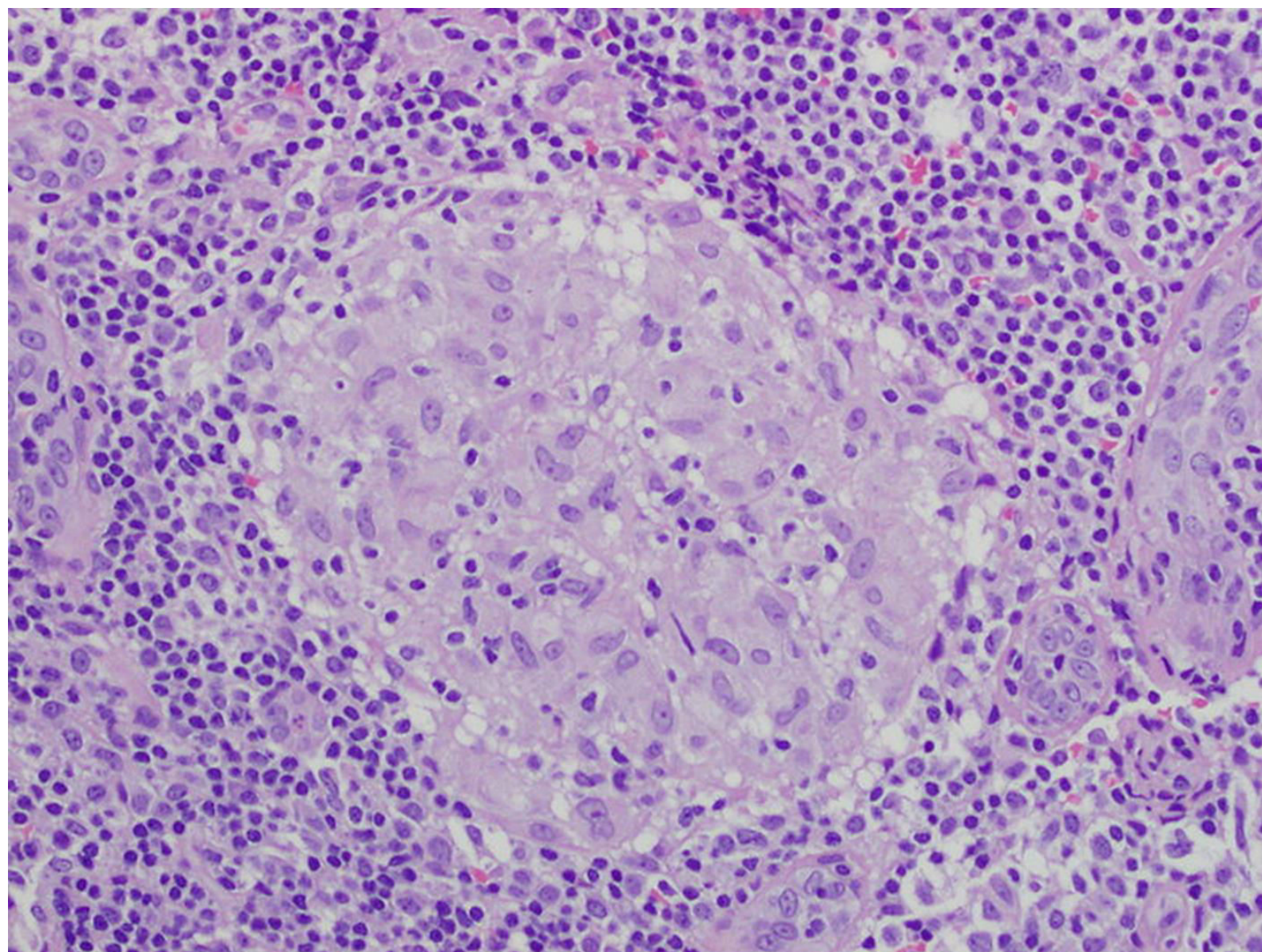
- Spread through the air by inhalation of bacteria (when the infected person coughing, sneezing, or laughing).
- Usually mild or asymptomatic.
- The site of initial infection is >> lung.
- Host macrophages will activate and form cluster (granuloma) around the infection.

Granuloma:

- ✓ It is s inflammation composed of macrophages.
- ✓ The center of granuloma contain necrotic tissue, tubercle bacilli and dead macrophages.
- ✓ This central called caseation (cheese-like appearance)

- Granuloma formation usually sufficient to limit the primary infection
- The bacilli that are not destroyed by the immune system will spread to extra-pulmonary sites.





Latent Tuberculosis

- After primary infection, some tubercle bacilli enter a latency stage.
- Immune system keeps bacilli contained and under control.
- Person is not infectious and has no symptoms.

Post-primary Tuberculosis

- Caused by reactivation of tubercle bacilli (reactivation TB), or by reinfection with *M. tuberculosis*
- Mostly in pulmonary sites (lung).
- Granuloma formation occurs and cause extensive tissue destruction.
- Large caseation will formed and called (tuberculomas)
- Usually due to impairment in immune status (malnutrition, alcoholism, advanced age or severe stress).

Latent TB vs. TB Disease

LTBI	TB Disease
Tubercle bacilli in the body	
Chest x-ray usually normal	Chest x-ray usually abnormal
Sputum smears and cultures negative	Symptoms smears and cultures positive
No symptoms	Symptoms such as cough, fever, weight, loss
Not infectious	Often infectious before treatment
Not a case of TB	A case of TB

Sites of TB Disease

- Pulmonary TB occurs in the lungs
 - ✓ 85% of all TB cases are pulmonary
- Extrapulmonary TB occurs in places other than the lungs, including the:
 - ✓ Larynx
 - ✓ Lymph nodes
 - ✓ Brain and spine
 - ✓ Kidneys
 - ✓ Bones and joints
- Disseminated TB occurs when tubercle bacilli enter the bloodstream and are carried to all parts of the body

Tuberculosis of the Conjunctiva

- It is uncommon.
- Usually in young people.
- It **may or may not be associated** with systemic tuberculosis.
- Usually there is lymph glands involvement.

Treatment:

- ✓ Streptomycin drops.
- ✓ Systemic anti-tuberculous therapy (minimum of 6 month).
- ✓ Excision and cauterization.

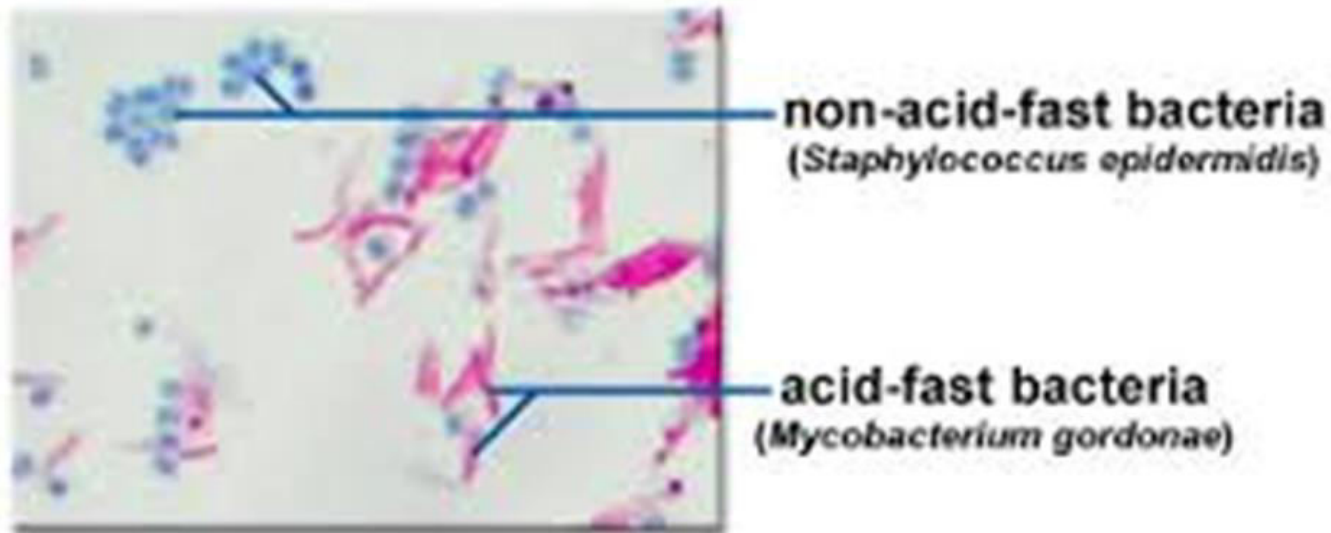
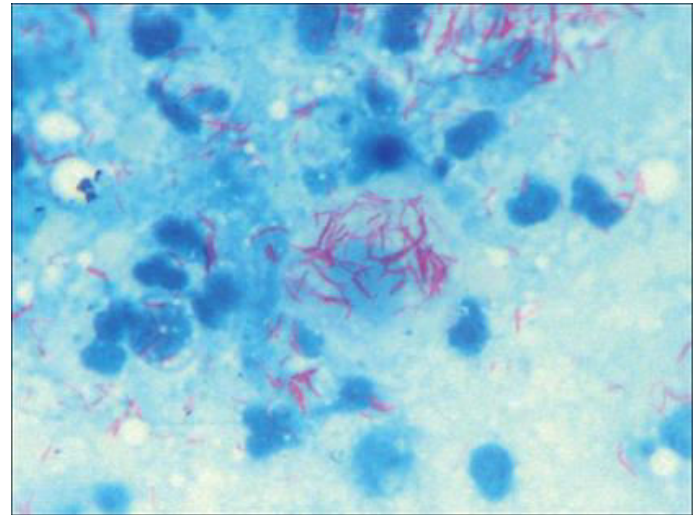
Laboratory Diagnosis of *M. tuberculosis*

Specimen:

- Sputum (should be from lung secretions, not saliva)
- Collect 3 specimens on 3 different days
- Collect sputum before treatment is initiated

Microscopy:

- Use ZN stain and looking for Acid Fast Bacilli.
- Smears containing acid-fast bacilli (AFB) Strongly consider TB



Culture:

- This is the definitive identification of *M.tuberculosis*.
- Culture all specimens, even if smear is negative.
- It usually grow after 6-8 weeks of cultivation on Lowenstein-Jensen medium (LJ)>> this media have malachite green which prevent growth of most other contaminant.

Mycobacterium tuberculosis on
Lowenstein Jensen medium





Prevention and Treatment

Prevention:

- BCG vaccine (80% protective).
- It is given to children in countries at risk and to individuals under heavy risk of infection, such as special groups of health-care workers.

Treatment:

- Combination of 4 antibiotics>>

Isoniazid (INH)

Rifampin (RIF)

Pyrazinamide (PZA)

Ethambutol (EMB)

Mycobacterium leprae

- Cause Leprosy, which is a chronic disease of the skin, mucous membranes and nerve tissue.
- It is very rare disease, found in tropical countries.
- Transmission occurs person to person through inhalation or contact with infected skin.
- Leprosy has low infectivity (prolonged close contact & host immunologic status play a role in infectivity).

Diagnosis

- Skin scraping will show the acid-fast bacilli.
- Bacteria difficult to culture.
- PCR techniques not very sensitive.
- Diagnosis is based on clinical manifestation of the disease.