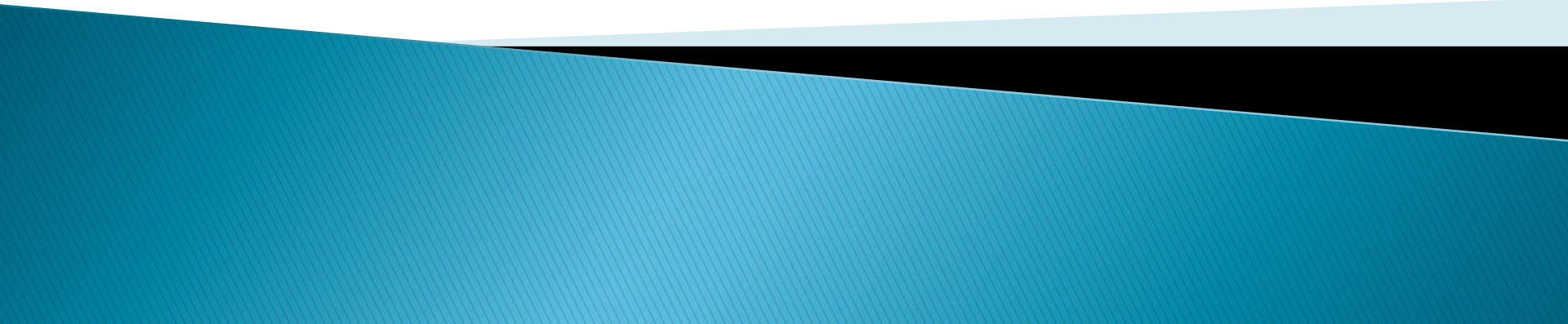


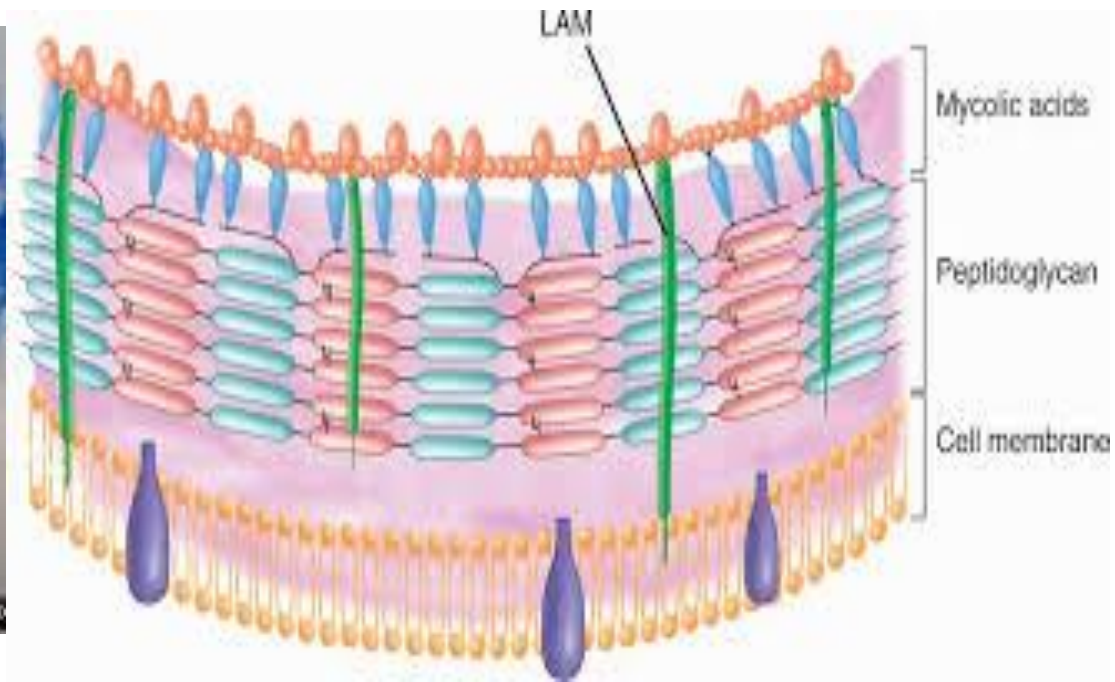
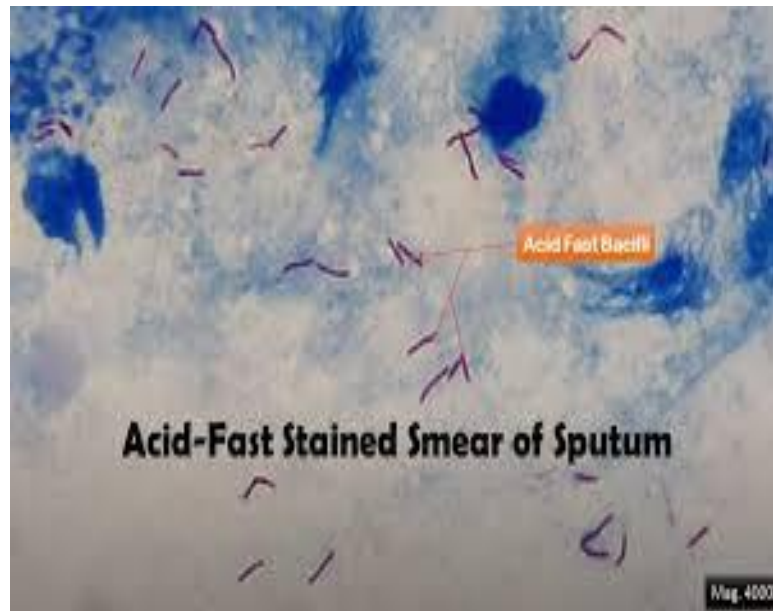
Tuberculosis



- ▶ **Tuberculosis** is one of the most prevalent infections of human beings and contributes considerably to illness and death around the world.
 - ▶ It spreads by inhalation tiny droplets of saliva from the coughs or sneezes of an infected person.
 - ▶ It's a slowly spreading, chronic, granulomatous bacterial infection, characterized by gradual weight loss.
 - ▶ Tuberculosis is the second most common cause of death from infectious disease after HIV/AIDS.
- 

CAUSATIVE ORGANISM:

- Tubercle bacillus or Koch's bacillus called *Mycobacterium tuberculosis* causes tuberculosis in the lungs and other tissues of the human body.
- **Strict aerobe** and thrives best in tissues with high oxygen tension such as in the apex of the lung,
- **Non motile** bacteria,
- **Fastidious**,
- **Acid-fast bacilli** (not stained by the Gram stain because of the high lipid component of the cell wall),
- Can withstand weak **disinfectants** and can survive in a **dry** state for weeks.
- It has unusual cell wall, rich in lipids (e.g., **mycolic acid**), is likely responsible for this resistance and is a key virulence factor.
- The genus includes pathogens known to cause serious diseases in mammals, including:
 - ✓ tuberculosis (*Mycobacterium tuberculosis*)
 - ✓ leprosy (*Mycobacterium leprae*).



Colonies of *Mycobacterium tuberculosis* on Lowenstein-Jensen (LJ) Medium



Clinical manifestation:

Constitutional symptoms:

- ❖ Anorexia
- ❖ Low grade fever
- ❖ Night sweats
- ❖ Fatigue
- ❖ Weight loss

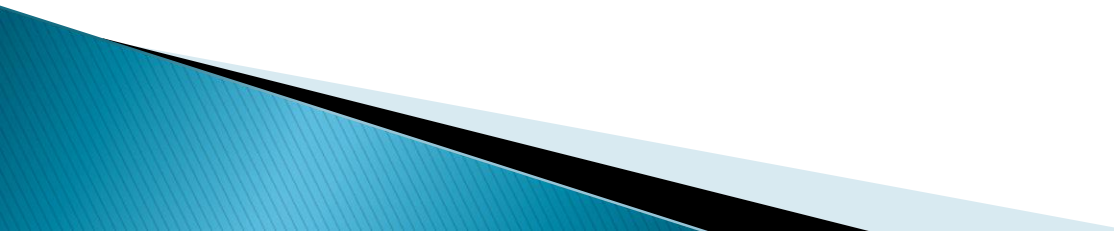
Pulmonary symptoms:

- ❖ Dyspnea
- ❖ Non resolving bronchopneumonia
- ❖ Chest tightness
- ❖ Mucopurulent sputum with hemoptysis
- ❖ Chest pain

Extrapulmonary symptoms:

- ❖ Pain
 - ❖ inflammation
- 

Virulence factors:

1. Waxy cell wall.
 2. Major factor is ability to invade and survive within macrophages as surface protein called “exported repetitive protein” prevents phagosome from joining with lysosome.
 3. It produces no exotoxins or no LPS.
- 

Mode of Transmission

Human beings acquire infection with tubercle bacilli by one of the following routes:

1. **Inhalation** of organisms present in fresh cough droplets or in dried sputum from an open case of pulmonary tuberculosis.
 2. **Ingestion** of the organisms leads to development of tonsillar or intestinal tuberculosis.
 3. **Inoculation** of the organisms into the skin may rarely occur from infected postmortem tissue.
 4. **Transplacental** route results in development of congenital tuberculosis in foetus from infected mother and is a rare mode of transmission.
- 

- PULMONARY REGION : 85 %
- EXTRA-PULMONARY SITES- 15 %
 - Lymph Nodes (most common)
 - Bones & Joints
 - Intestine
 - Meninges
 - Skin

Pathogenesis

Initial infection



Entry of bacteria through droplet nuclei



Bacteria transmitted to alveoli through airways



Deposition and multiplication of bacteria



Bacilli are also transported to other parts of the body via blood stream and phagocytosis by neutrophil and macrophages

Mycobacterium



Pulmonary alveoli



Immune system had lodged in (alveolar macrophage)



Detect present of pathogen and engulf the bacteria



Mycobacterium bacteria inhibits the macrophages (phagosome+lysosome) to form phagolysosome and remains protected inside the macrophages

Start replication inside macrophages



Primary infection occurs



Cell mediated immunity gets activated, surround the cell to form granuloma (3 weeks)



Leads to necrosis of tissues at infection site (terminus gone focus)



Involve nearby lymph nodes (cone complex)



Calcification of cone complex (latent T.B.)

GRANULOMA

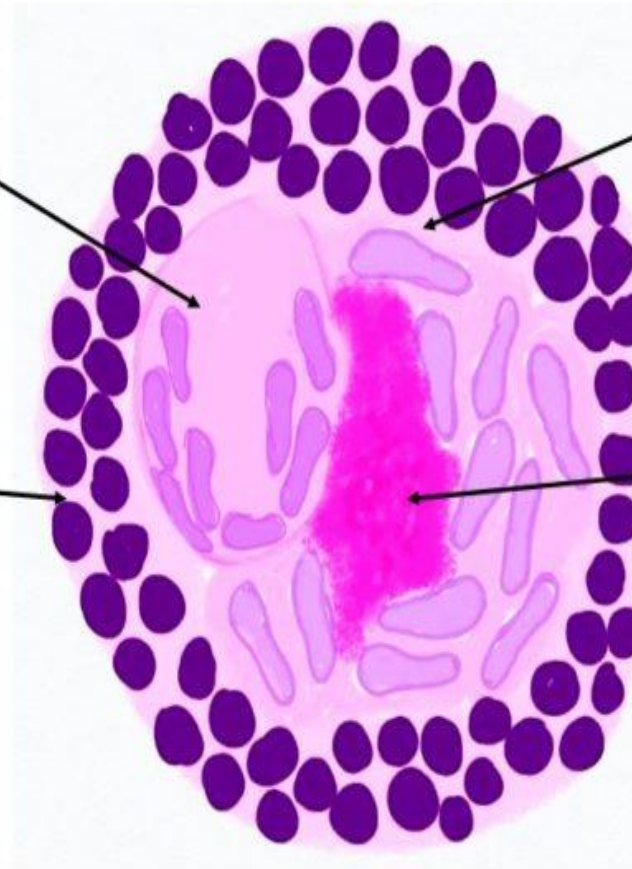
Langhans Giant cell

Epithelioid cells with pale elongated nuclei

Clusters of epithelioid cells surrounded by lymphocytes

Amorphous, eosinophilic granular debris material with complete loss of cellular details

CASEOUS NECROSIS
on gross examination



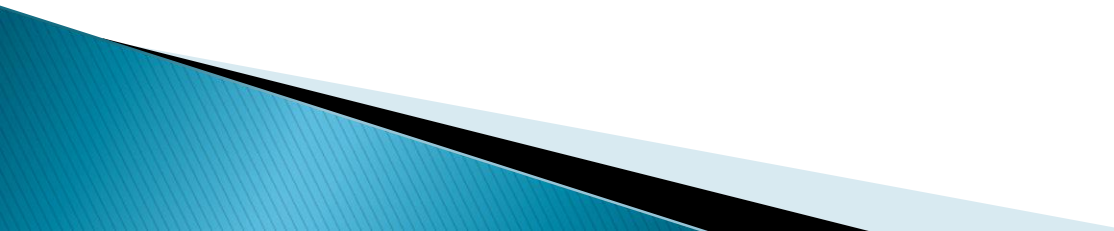
Diagnosis:

- ✓ History collection
- ✓ Physical examination
- ✓ Clubbing of the fingers or toes (in people with advanced disease)
- ✓ Swollen or tender lymph nodes in the neck or other areas.
- ✓ Fluid around a lung (pleural effusion)
- ✓ Unusual breath sounds (crackles)

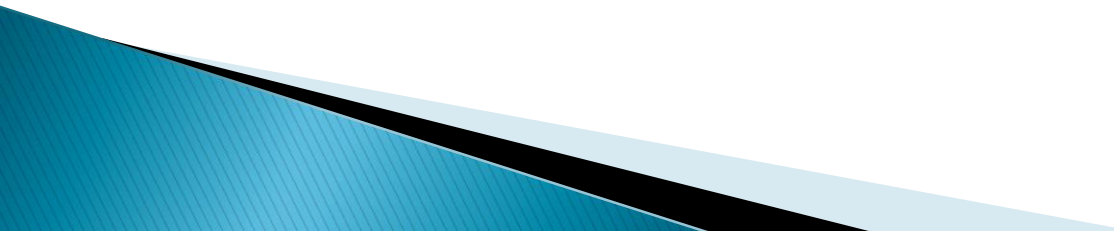
If Miliary T.B.:

- ✓ Physical examine may show:
- ✓ Swollen liver
- ✓ Swollen lymph node
- ✓ Swollen spleen

Tests include:

- Biopsy of affected tissue (rare)
 - Bronchoscopy
 - Chest C.T scan
 - Chest X-ray
 - Sputum examination and cultures (The Löwenstein–Jensen medium, is a growth medium specially used for culture of *Mycobacterium species*, notably *M. tuberculosis*.)
 - Thoracentesis
 - Tuberculin skin test (PPT test): Purified protein derivative (PPD), part of cell wall is injected under the skin, 24 – 48 hours measure the size of the welt that forms. Cells have been primed and recognize the PPD.
 - Interferon- γ release blood test like (QFT-gold test)
- 

Complication:

- ❑ Bones, spinal pain and joints destruction.
 - ❑ Brain (meningitis)
 - ❑ Liver, kidney
 - ❑ Heart (cardiac tamponade)
 - ❑ Pleural effusion
 - ❑ T.B pneumonia
 - ❑ Serious reactions to drug therapy (hypersensitivity, hepato toxicity)
- 

Treatment:

Antibiotic sensitivity and control:

- The **4-month TB treatment** regimen (high-dose daily rifapentine with moxifloxacin, isoniazid, and pyrazinamide)
- **Long-term therapy (6–9 months)** with antituberculous drugs RIPE (rifampicin, isoniazid, pyrazinamide, and ethambutol). As drug resistance is growing and a persistent problem, combination therapy should always be given.
- **Prevention** is by Bacillus Calmette–Guérin (**BCG**) vaccination containing live attenuated organisms, in childhood.