

Tuberculosis-3

A comprehensive overview of TB pathogenesis, transmission, and clinical manifestations

General Characteristics

- Weakly Gram-positive bacilli, **nonmotile obligate aerobes**
- Mycolic acids comprise >60% of cell wall mass
- Facultative intracellular pathogens infecting macrophages

Transmission

- **Inhalation:** Airborne droplet nuclei (<5 µm) from coughing/sneezing
- **Sources:** Human (pulmonary TB) or bovine (unpasteurized milk)
- **Infection dose:** Only 10 organisms needed

Risk Factors

- Immunocompromised patients (AIDS, post-transplant)
- Diabetes, smoking, IV drug abuse
- Chronic renal failure

Global Epidemiology

Second-most common cause of death from infectious diseases after AIDS. Epidemic sources include school children/teachers, homeless shelters, nursing homes, and healthcare workers exposed to unrecognized TB. 📌

Primary Tuberculosis: Initial Infection

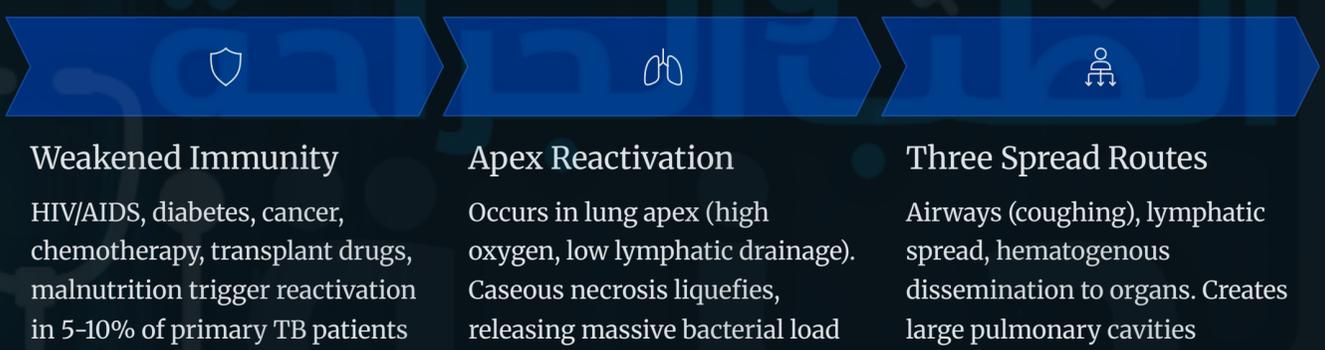
Primary TB represents the body's response to **initial infection in previously unexposed individuals**. Tubercle bacilli deposited in peripheral alveoli are engulfed by macrophages. Most individuals contain the infection through activated macrophages forming characteristic granulomas called tubercles.

Ghon Complex Formation

- **Ghon Focus:** Primary infection site in lung
- **Hilar lymph nodes:** TB spreads via lymph or direct extension
- **Outcome:** Granuloma with caseous necrosis, fibrosis, calcification

Healing occurs within ~3 weeks as cell-mediated immunity walls off bacteria. Most cases are asymptomatic or present flu-like symptoms.

Secondary (Reactivation) Tuberculosis



Disease Outcomes & Manifestations

01	02	03
Local Progressive Pulmonary TB	Disseminated (Miliary) TB	Clinical Presentation
Extension to entire lobe or segment after primary or secondary TB	Miliary pulmonary disease, laryngeal TB (tracheal spread), intestinal TB (swallowed sputum), systemic miliary TB (hematogenous)	Cough, fever, night sweats, weight loss. Primary TB may be asymptomatic or flu-like

"Any person who presents with symptoms or signs suggestive of TB, in particular **cough of long duration (>2 weeks) + hemoptysis + night sweats**"

Diagnosis of Active TB

Diagnostic Tests

- **Acid-fast bacilli smear:** Ziehl-Neelsen or auramine-rhodamine stain
- **PCR:** Confirmation of AFB-positive smears
- **Culture:** Gold standard (2-6 weeks for results)
- **Imaging:** Chest X-ray or CT scan

Sample Collection

Pulmonary TB:

- Sputum (≥3 samples, 8-24hr intervals, including early morning)
- Gastric lavage (children unable to expectorate)
- Bronchoalveolar lavage (if insufficient samples)

Extrapulmonary TB: Lymph node aspirate, pleural fluid, urine, synovial fluid, CSF

Tuberculin Skin Test (Mantoux Test)

1	2	3
Principle	Procedure	Reading
Demonstrates type IV delayed hypersensitivity reaction against tubercle bacilli antigens in latent TB	0.1 mL PPD (purified protein derivative) injected intradermally on volar forearm surface	Measure transverse diameter of induration (not erythema) at 48-72 hours post-injection

Key Limitations: False positives from BCG vaccination or nontuberculous mycobacteria. False negatives in immunosuppressed, very young (<6 months), or recent/very old infections. Does not differentiate active from latent TB. 📌