Transmission and Pathogenesis of TB

Presented by: Marybel Monreal

Marybel Monreal, BSN, RN has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity

Objectives

- ✓ What is TB?
- ✓ How is TB transmitted?
- ✓ Latent TB vs. TB Disease
- ✓ Risk factors for TB
- ✓ TB Classification System

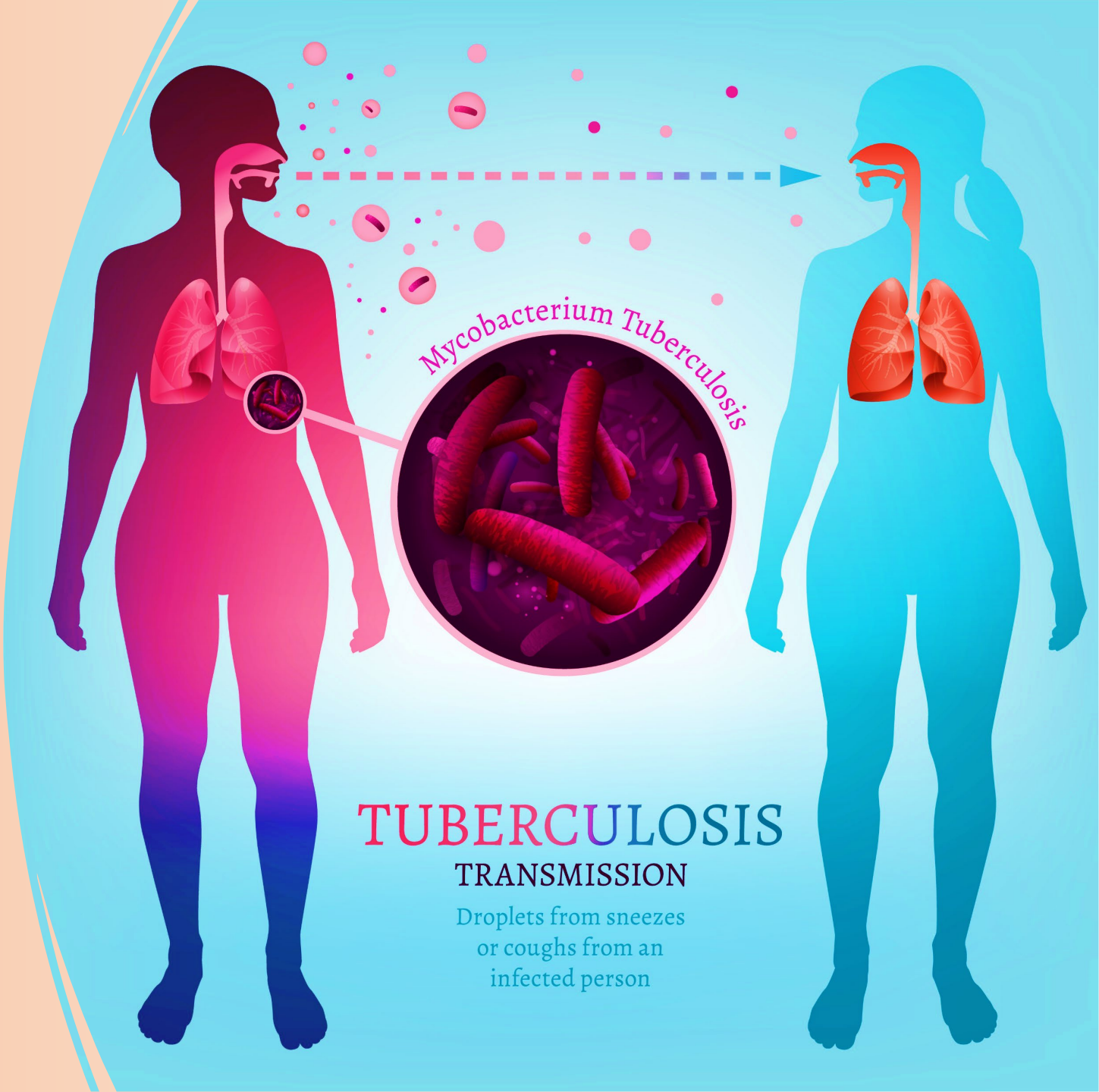
What is Tuberculosis

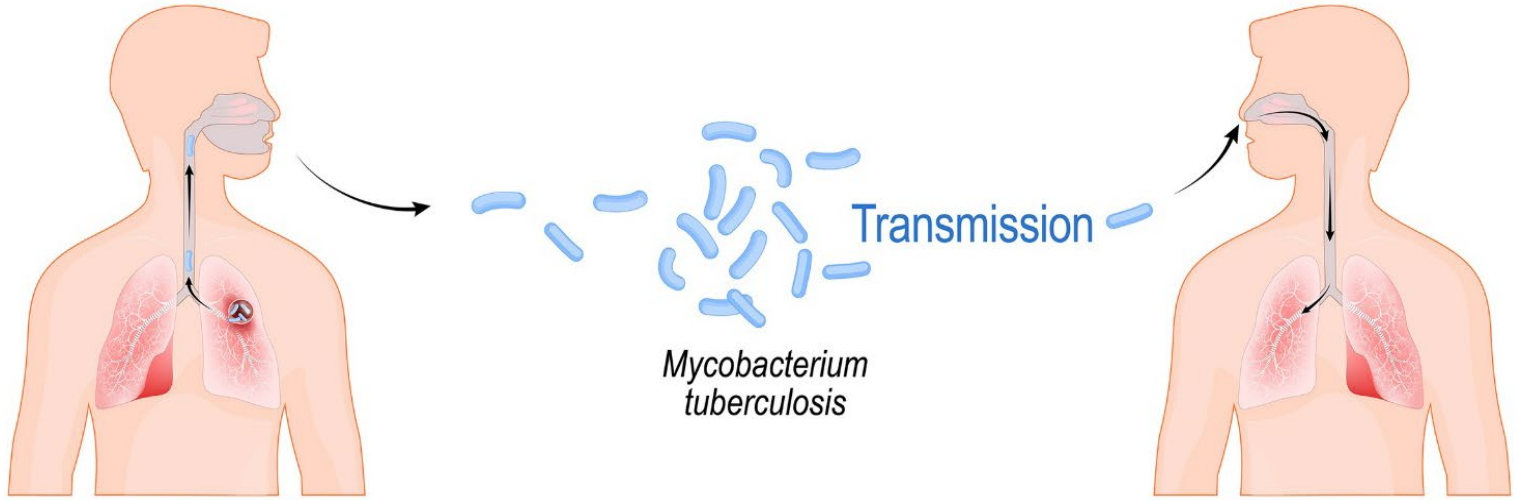
- TB is an airborne disease caused by the bacterium *Mycobacterium tuberculosis (M.tuberculosis)*
- Discovered March 24, 1882 by Dr. Robert Koch as a bacterial disease that mainly affects the lungs
- Although TB most commonly affects the lungs it can also affect: lymph nodes, pleura, bone and joints, urogenital tract, and meninges, this is known as extrapulmonary TB.

Transmission

TB spreads through the air from one person to another when a person with pulmonary or laryngeal TB disease:

- Coughs
- Speaks
- Sings
- Sneezes



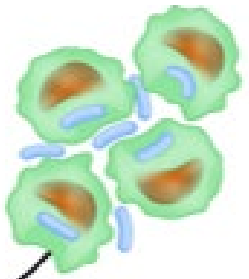


Tubercle bacilli multiply in the alveoli.
Some tubercle bacilli enter the bloodstream and spread through the body

Macrophage

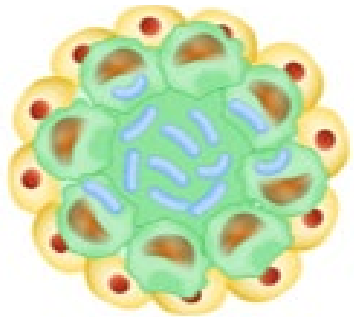
~ 2 to 8 weeks macrophages ingest tubercle bacilli

Phagocytosis

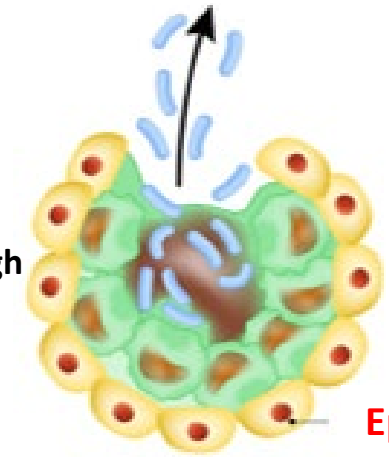


macrophages surround tubercle bacilli and form a granuloma that acts like a shell that contains the bacilli and keeps them under control (LTBI)

Granuloma Formation



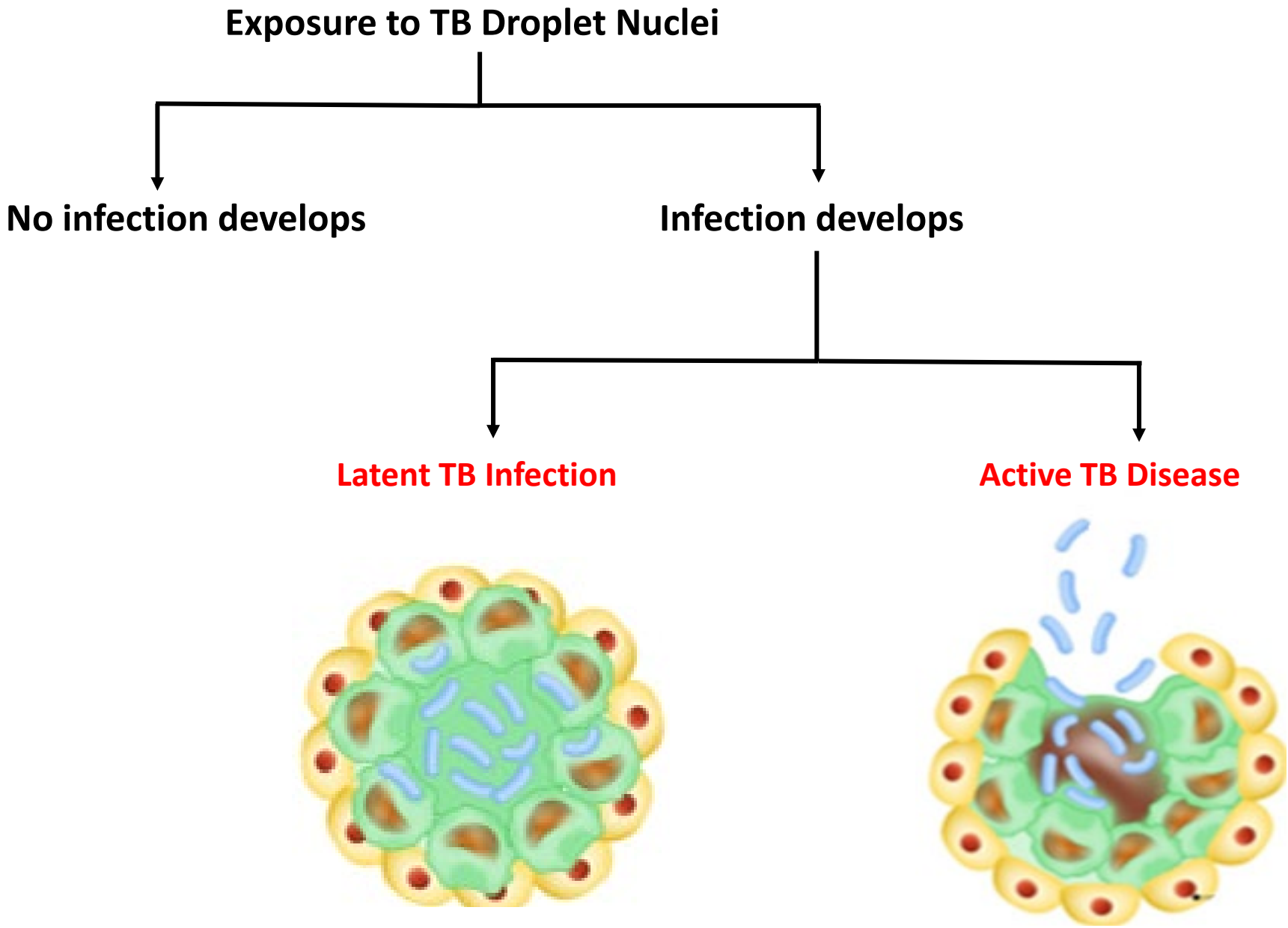
Epitheliod cell



If the immune system cannot keep bacilli under control they begin to multiply and breakthrough the shell – (TB Disease)

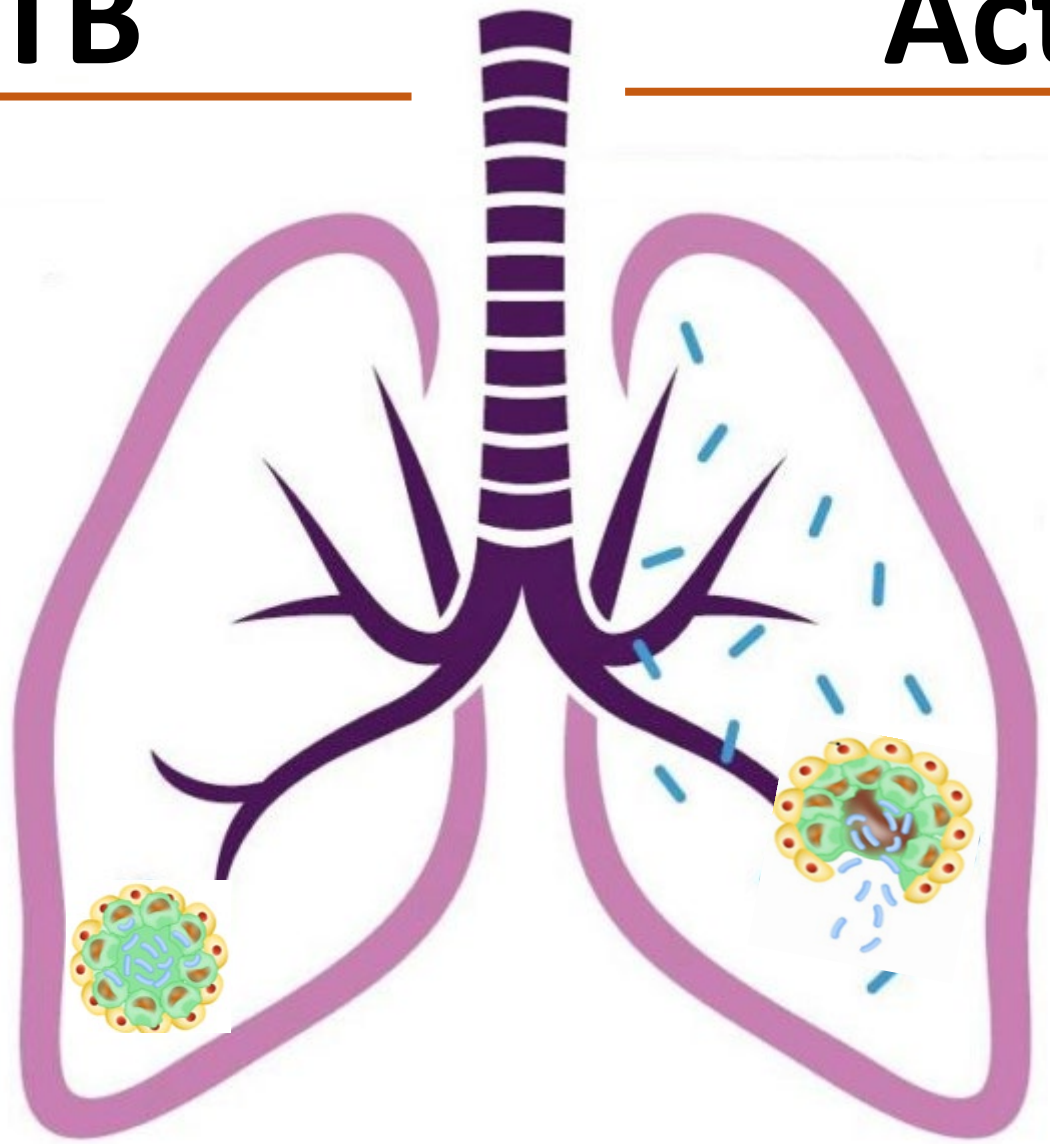
Dissemination

Latent TB vs. Active TB Disease



Latent TB

- TST or IGRA positive
- Chest radiograph normal
- No symptoms or physical findings suggestive of TB
- If done, respiratory specimens are smear and culture negative

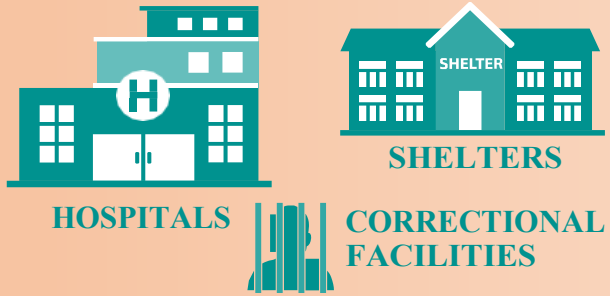


Active TB

- TST or IGRA usually positive
- Chest radiograph usually abnormal
- Symptoms may include: -
  - Fever
  - cough
  - night sweats
  - weight loss
  - fatigue
  - hemoptysis
  - decreased appetite
- Specimens usually smear and culture positive

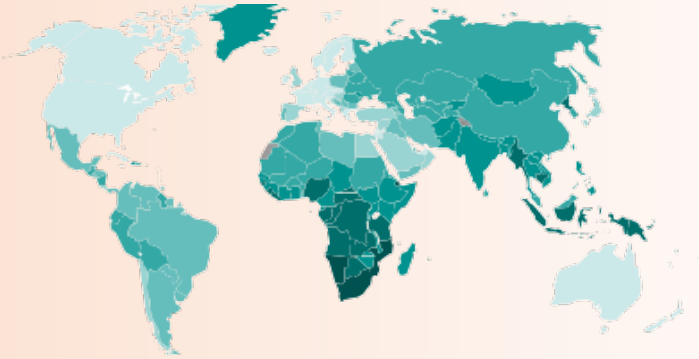
Who is at risk of TB exposure?

Close **contacts** to persons with infectious TB



Residents and employees of high-risk **congregate** settings

People with health problems that make it hard to fight TB disease



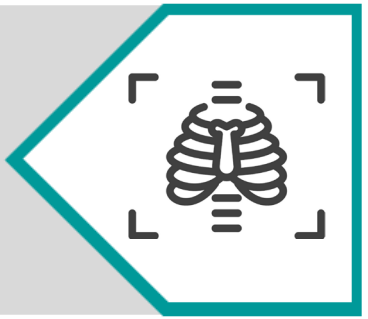
Recent immigrants from TB-endemic regions of the world (within 5 years of arrival to the U.S.)

Individuals at Increased Risk for Progression to TB Disease

Persons with HIV

Underweight or malnourished persons

Those with a history of prior, untreated TB or fibrotic lesions on chest radiograph



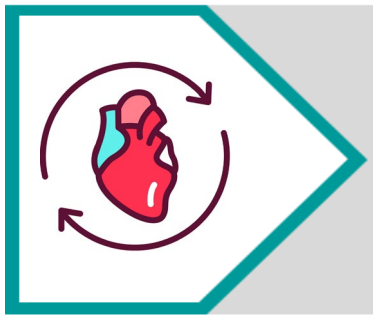
Substance users

Children 5 years old with a positive TST

Those receiving TNF alpha antagonist for treatment of rheumatoid arthritis or Crohn's disease.

Medical Conditions that Increase the Risk for Progression to TB Disease

Silicosis

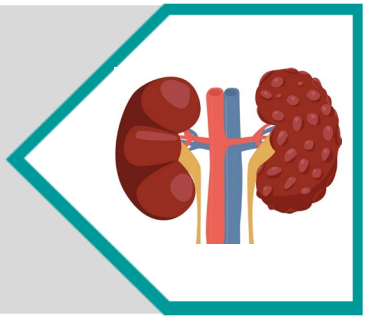


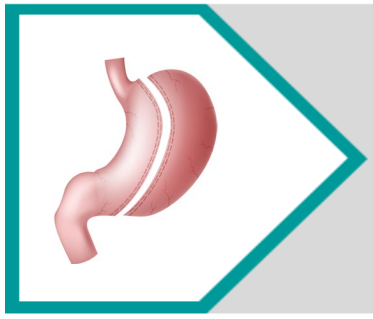
Solid organ transplantation

Diabetes Mellitus

Cancer of the head or neck

Chronic renal failure or on hemodialysis





Gastrectomy or jejunal bypass

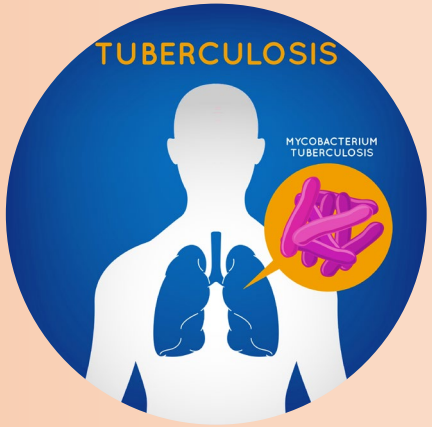
TB Classification System

0	No TB exposure- Not infected	• No history of TB exposure and no evidence of *M. tuberculosis* infection or disease • Negative reaction to TST or IGRA
1	TB exposure- No evidence of infection	• History of exposure to *M. tuberculosis* • Negative reaction to TST or IGRA (test given at least 8 to 10 weeks after exposure)
2	TB infection- No TB disease	• Positive reaction to TST or IGRA • Negative bacteriological studies (smear and cultures) • No clinical or radiographic evidence of active TB disease
3	TB disease clinically active	• Positive culture for *M. tuberculosis* OR • Positive reaction to TST or IGRA, plus clinical bacteriological, or radiographic evidence of current active TB disease
4	Previous TB disease (not) clinically active	• May have past medical history of TB disease • Abnormal but stable radiographic findings • Positive reaction to the TST or IGRA • Negative bacteriologic studies (smear and cultures) • No clinical or radiographic evidence of current active TB disease
5	TB disease suspected	• Signs and symptoms of active TB disease, but medical evaluation not complete

HEARTLAND

Tuberculosis is an airborne disease caused by the bacterium *M. tuberculosis*

TB Clinical Classification System is used in the U.S. ; based on pathogenesis of the disease



TRANSMITTED through air from one person to another when the infected person coughs, speaks, sings or sneezes

Certain medical conditions place you at risk of progression to TB disease: silicosis, DM, chronic renal failure, organ transplant, CA of head or neck, GI surgery

At risk of TB exposure: contacts, individuals in congregate settings, recent immigrants

Once Transmission occurs a patient either develops infection or not and may be diagnosed with Latent TB infection or active TB disease.

Latent TB Infection:

- Immune system contains bacilli
- TST/IGRA +
- CXR normal
- Asymptomatic
- Usually smear & culture negative

TB Disease:

- Immune system unable to contain bacilli
- TST/IGRA +
- CXR usually abnormal
- May be symptomatic
- Usually smear & culture positive

References

- David M. Lewinsohn,1,a Michael K. Leonard,2,a Philip A. LoBue,3,a David L. Cohn,4 Charles L. Daley,5 Ed Desmond,6 Joseph Keane,7 Deborah A. Lewinsohn,1 Ann M. Loeffler,8 Gerald H. Mazurek,3 Richard J. O'Brien,9 Madhukar Pai,10 Luca Richeldi,11 Max Salfinger,12 Thomas M. Shinnick,3 Timothy R. Sterling,13 David M. Warshauer,14 and Gail L. Woods15. ***Official American Thoracic Society/Infectious Diseases Society of America/Centers for Disease Control and Prevention Clinical Practice Guidelines: Diagnosis of Tuberculosis in Adults and Children***

- https://www.cdc.gov/tb/publications/guidelines/default.htm

- Diagnostic Standards / Classification of TB in Adults and Childrenexternal icon
  Am J Respir Crit Care Med 2000; 161


THANK YOU