TB Basics

Accelerating advocacy on TB/HIV

15th July, Vienna
How long has TB been infecting humans?

- TB disease has been found in the mummies of ancient Egyptians and Andean Indians.
- Global problem for thousands of years.
- Consumption, white plague, Captain of the men of death!
- Cause of TB identified on 24 March 1882 by Dr. Robert Koch.
A potted history of TB

- 1882 TB bacilli identified by Koch
- 1907 TST - tuberculin skin test (von Pirquet)
- 1919 BCG – Bacille Calmette & Guerin vaccine
- 1943 Schatz & Waksman discover streptomycin
- 1948 BMRC trial of streptomycin vs bed rest
- 1952 Development of isoniazid
- 1966 Development of rifampicin
- 1978 Short course chemotherapy (DOTS)
What is TB?

- TB is a bacteria (single-cell organism)

- More specifically, it is a type of mycobacteria
  - “myco” means waxy in latin and refers to TB’s waxy cell wall
  - There are 70 different types of mycobacteria
What is TB?

• The scientific name for the TB microbe is *Mycobacterium tuberculosis* or M.tb
What is TB?

- Beneath a microscope, it has a long rod-like shape or ‘bacillus’

- The thick waxy cell wall allows the germ to spread through the air in water droplets

*TB bacilli stained bright red using the Ziehl-Neelson stain (image copyright Dennis Kunkel Microscopy, Inc.)*
How is TB transmitted?

- TB is transmitted through the air

- TB bacteria are coughed up from the lungs of an infected person into the air

- Once the TB bacteria are inhaled, they push their way into the lungs
TB Infection and Disease
Transmission of TB

• Droplet nuclei containing mycobacteria inhaled
Not all TB infections lead to TB disease

- **Latent TB infection** (aka LTBI) occurs when the immune system has contains TB and prevents disease.
- **Active TB disease** refers to the time when TB breaks out and causes disease.
TB Definitions

- Latent TB infection (LTBI)
  - TB bacilli live dormant inside the lung, but do not cause destruction of organs
  - No signs or symptoms of disease
  - Not infectious

- TB disease
  - TB bacilli progressively invade and damage a part(s) of the body
  - Signs and symptoms of disease appear
  - Can be infectious
What is the risk of LBTI progressing to active disease?

In HIV-negative persons, the body’s immune system usually keeps TB infection under control.

Only 5-10% of LTBI cases progress to active TB during their lifetime.

People living with HIV with LTBI have a 5-10% risk of developing TB disease each year.
TB Disease

• The TB germ can "wake up" at any time (usually within 1-2 years) and make a person sick

• More likely to get TB disease when a person's body is weakened from:
  
  HIV
  Diabetes
  Poor Nutrition
  Cancer medications
  Steroids
  Drug use
  Smoking
  Old Age
What happens during active TB disease?

- Active TB disease may occur in the lungs (pulmonary TB) and/or in other parts of the body (extrapulmonary TB).
- **Pulmonary TB** is the most common form of TB disease and is the infectious form.
- The damage caused by pulmonary TB sends pus containing TB bacilli into the lungs, which a person with TB may cough up in spit or sputum.
- **Extrapulmonary TB** is normally rare but occurs in up to 40% of TB cases among people living with HIV.
Definitions: Patients with TB

- **Pulmonary TB (PTB)**
  - Disease involves the lung tissue
  - Smear-positive: visible TB bacilli in sputum, very infectious
  - Smear-negative: no visible TB bacilli in sputum, less infectious

- **Extra-pulmonary TB (EPTB)**
  - Disease involving an organ other than the lung, includes pleural TB
  - Not infectious unless also have pulmonary TB
What are symptoms of TB disease?

• Due to general infection and immune response
  – Fever
  – Night sweats
  – Weight loss

• Due to direct damage
  – Pulmonary TB
    • Cough
    • Sputum – white, grey, green, red
  – Extrapulmonary
    • Just about anything…..depending on site

• People living with HIV develop symptoms late and are less likely to present with coughing.
TB Basics Summary

- Caused by *Mycobacterium tuberculosis*
- Transmitted through the air
- Infection can cause latent TB or progress to active TB
- Active TB can be pulmonary or extra-pulmonary
- Pulmonary TB can be smear positive or smear negative
- People living with HIV are more likely to progress to active TB and often develop symptoms late