Introduction of Tuberculosis, History and Transmission
Learning outcomes

• Identify the historical landmarks in the development of TB as a communicable disease.
• Explain how TB can be transmitted
• Describe how an infection with the TB bacilli can progress to TB the disease
• Discuss the risk factors that can influence the natural occurrence of TB
Why do we need to stop TB

3000 bacilli hang in the air - for up to 5 hours
Why we need to stop TB

• 1/3 of the worlds population is infected
• 3 million deaths annually
• 5 deaths per minute
• 8-10 million new cases per year
• SA one of the highest TB rates per 100 000 of the population.
• TB in SA currently a health crisis
Why is TB/DR-TB increasing in South Africa

- Increase in population
- Socio-economic conditions (poverty, overcrowding, unemployment, migration, alcoholism)
- Poorly managed TB control programs
- Stigma associated with TB and HIV
- Intersectoral collaboration?
Discovery of the TB germ

Discovery of the TB organism in 1882

Robert Koch
Discovery of the TB germ

- Koch’ postulate
- Culture
- Staining methods: Ehrlich, Ziehl & Neelson
- Proof of airborne spread
- BCG- Calmette & Guerin
- PPD/Tuberculin test
- Anti-TB drugs developed
What’s the current situation?

HIV and AIDS, TB, & DR-TB
SA Tuberculosis epidemic

- Global rank (no of cases): 4
- Incidence (per 100000/yr): 900
- Prevalence (per 100000/yr): 511
- TB Mortality (per 100000/yr): 71
- TB cases HIV+ (15-49 yrs): 58%
- New cases Drug Resistant: 1.8%

WHO Report 2007
Why DR-TB is Increasing in SA

Poorly managed TB Control Programs

- poor adherence to protocols (diagnosis, drugs)
- poor patient follow up
- poor treatment adherence by patients
• TB spread by someone with disease in their lungs who is coughing; i.e. patient with active disease
• Risk of infection depends on degree of contact, infectiousness, and ventilation
• Susceptibility of the exposed person
What may enhance transmission?

Patient with active disease
- Disease involving the lungs
- Duration of infectiousness (presence of cavitations, extensive disease)
- Presence of a cough
- Undergoing a procedure that can induce coughing or aerosolization of tubercle bacilli (sputum induction, bronchoscopy)
TB Transmission

4 steps in TB pathogenesis:

1. Exposure
2. Infection
3. Disease
4. Death
TB Transmission cont...
MODEL TB

Exposure → Infection (Sub-clinical) → Disease (Infectious tuberculosis) → Death

Risk factors

Exposure → Infection (Sub-clinical) → Disease (Non-infectious tuberculosis) → Death

Risk factors

Risk factors

Risk factors
The environment

- Presence of someone with active TB disease who is not on effective therapy (undiagnosed, untreated, non-compliant, unrecognized drug resistance)
- Exposure of susceptible individuals to an infectious person in small enclosed settings
- Inadequate ventilation that results in insufficient dilution or removal of infectious droplet nuclei
- Re-circulation of air containing infectious droplet nuclei
- Duration of exposure
The susceptible individual

Compromised immune system

- HIV
- Diabetic
- steroid therapy
- chemotherapy (cancer)
- children <5 years
- poor nutrition
Disease following TB infection

- Time since infection (length of exposure)
- HIV co-infection
- Age
- Strain virulence
- Genetic factors
- Medical conditions (silicosis, diabetes mellitus, malignancies, renal failure, steroid therapy)
Post-primary TB

- Occurs after a latent period of months or years
- Reactivation occurs when dormant bacilli start to multiply due to a weakened immune system
- It can result from re-infection by resistant strains of TB bacilli