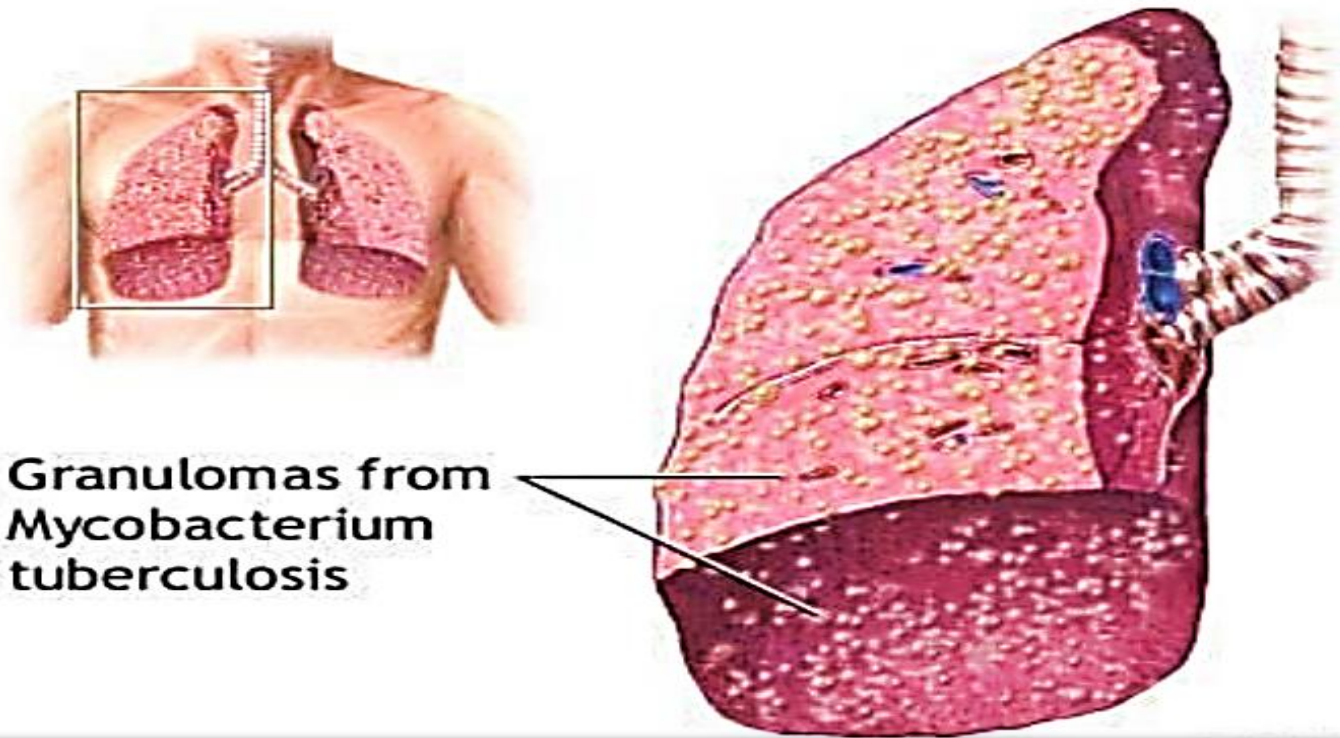


MYCOBACTERIA



Presented by:
Assist. Instructor:
Sulaiman A. Abdullah

Members of the Genus *Mycobacterium*

1. *Mycobacterium tuberculosis* Complex (MTC):
 - * *M. tuberculosis*, Human is the only reservoir
 - * *M. bovis*, Both cows and humans
extrapulmonary TB (hunched backs)
2. Non-tuberculous mycobacteria (NTM):
e.g. M. avium. TB-like disease especially in AIDS patients
3. *Mycobacterium leprae*: causes leprosy.

Mycobacterium Tuberculosis

General Characteristics

- *Strictly aerobic,*
- *Non motile*
- *Non spore forming*
- *Facultative intracellular bacilli. macrophage*
- *Slow generation time (15-20) hours*
- *They are resistant to decolorization by acid alcohol, hence called 'acid-fast bacilli'.*

Mycobacterium Tuberculosis

Morphology:

- *Slender*
- *Straight or curved*
- *Arranged singly or in small groups*
- *Chains of cells in smears made from colonies called **serpentine cords***
- *Ziehl-Neelsen (Z-N) pink in a blue background*

Lipid-Rich Cell Wall

Mycobacterium tuberculosis is not classified as either Gram-positive or Gram-negative because it does not have the chemical characteristics of either, although the bacteria do contain peptidoglycan (murein) in their cell wall.

Over 60% of the mycobacterial cell wall is lipid, consists of Mycolic acid, Cord factor, and Wax-D



Laboratory Diagnosis

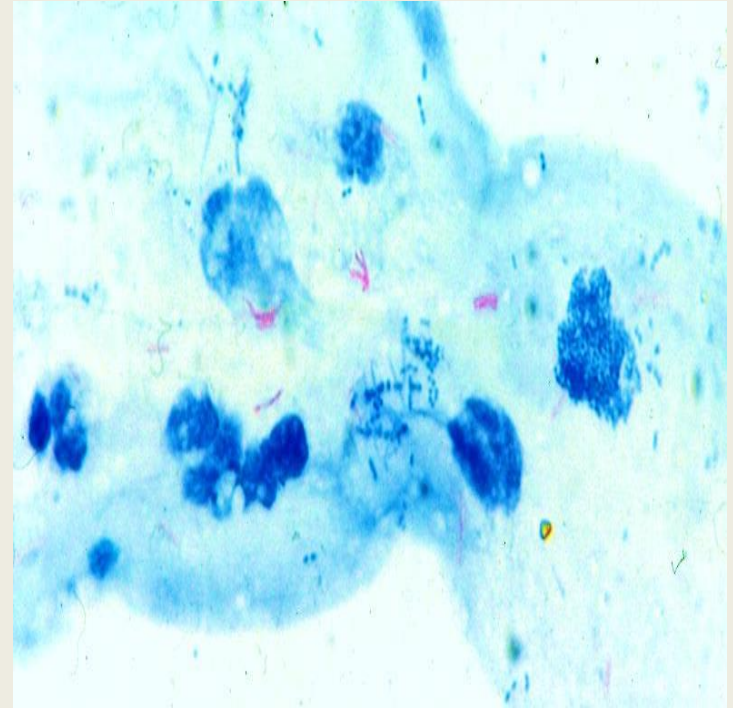
- *Specimens: include sputum,*
- *Early morning sputum specimens collected on 3 consecutive days, from a deep productive cough, give the best results*
- *an excess of 10,000 bacteria per ml of sputum are needed to visualize the bacilli with a 100X*



Laboratory Diagnosis

- **Direct Detection:**

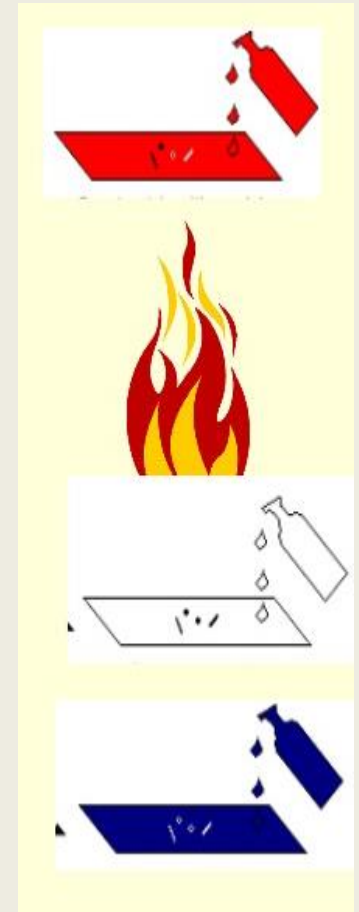
1. *Smears: Ziehl-Neelsen (Z-N). Under the ordinary light microscope, AFB appear pink in a blue background*



2. *Molecular tests: • For rapid detection.*

Ziehl-Neelsen (Z-N) Stain

- *Cover with carbol-fuchsin dye*
- *Heat gently for 5 minutes over direct flame*
- *Acid-alcohol (decolourization)*
- *Wash with water*
- *Counterstain for 10-30 seconds with Methylene blue*
- *Wash with water and let dry*



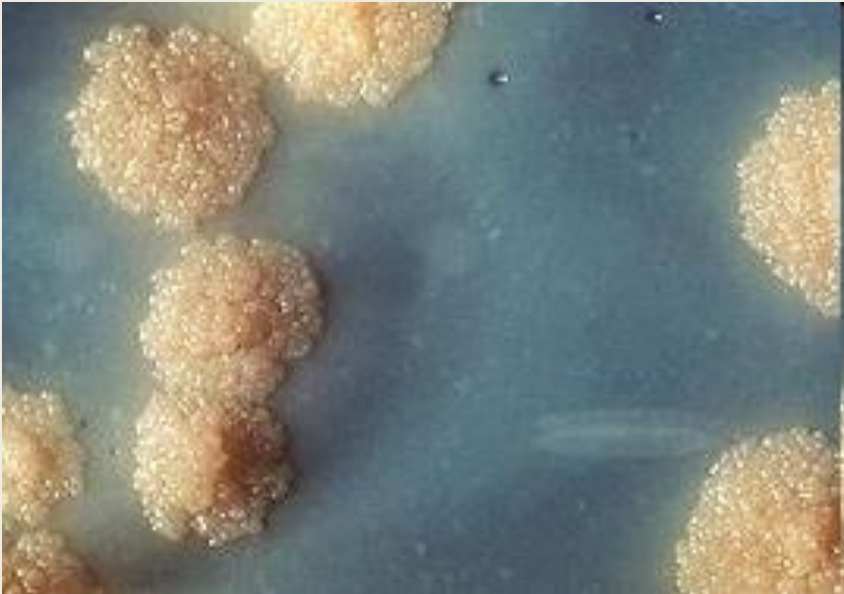
Laboratory Diagnosis

○ **Cultivation:**

- *Media include: - Lowenstein-Jensen (L-J) medium – Middlebrook's medium*
- *Incubation is at 35-37 °C in 5-10% CO₂ for up to 8 weeks.*
- *If culture negative and acid-fast Positive , a set of inoculated media should be incubated at 24-33°C for 12 weeks.*

Cultural Characters

They grow as brown pigmented “rough, tough and buff” colonies



Colony of Mycobacterium On
Lowenstein – jensen Agar



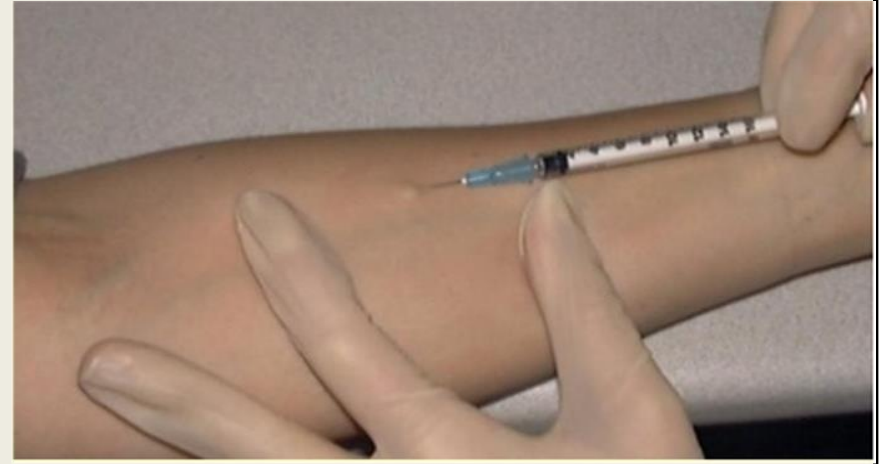
Photochromogenic
Middlebrook

The Mantoux test

- *Also known as the Tuberculin Sensitivity Test, is a diagnostic tool for tuberculosis.*
- *Tuberculin is a glycerol extract of the tubercle bacillus.*
- *A standard dose of 5 Tuberculin units (0.1mL) is injected intradermally and read 48 to 72 hours later.*
- *The reaction is read by measuring the diameter of induration across the forearm in millimeters.*

The Mantoux test

- It is considered positive if the induration 10mm or more in diameter.*



The Mantoux test

- *A positive test indicates that an individual has been infected in the past.*
- *It does not imply that active disease or immunity to disease is present.*
- *Tuberculin positive person are of risk of developing disease from reactivation of the primary infection.*

Mycobacterium avium

Also known as M avium intracellulare MAI.

These organisms grow optimally at 41°C and produce smooth, soft, nonpigmented colonies.

Cultured from water, soil, food, and animals, including birds.

Cause disease in immunocompetent human.

Mycobacterium leprae

- *Typical acid-fast bacilli, singly, in parallel bundles, or in globular masses,*
- *It causes leprosy.*
- *Diagnosis: scraping from skin or nasal mucosa are smeared a slide and stained by the Ziel-Neelsen technique.*
- *Biopsy of skin for histological study.*



Thank You For Listening

MCQ Questions

1. *M. tuberculosis* are characterized by being:

a. *Strict anaerobes*

b. *Acid fast bacilli*

c. *Capsulated*

d. *Motile*

e. *Able to grow on ordinary media*

MCQ Questions

2. *One of the following media is used for growing M. tuberculosis:*

a. MacConkey's agar

b. Blood agar

c. Nutrient agar

d. Lowenstein Jensen medium

e. Loeffler's serum

MCQ Questions

3. The following methods are used in the diagnosis of pulmonary tuberculosis except:

- a. Examination of ZN stained direct sputum smear*
- b. PCR of sputum*
- c. Culture on selective medium*
- d. INVC Tests*
- e. Detection of specific antibodies*