

جامعة الانبار

كلية: الصيدلة

قسم: العلوم المختبرية السريرية

اسم المادة باللغة العربية: الاحياء المجهرية

اسم المادة باللغة الإنكليزية: **microbiology**

المرحلة: الثانية

التدريسي: سليمان عجاج عبدالله

عنوان المحاضرة باللغة العربية: بكتريا السل

عنوان المحاضرة باللغة الإنكليزية: **Mycobacterium**

Mycobacterium

Members of the Genus *Mycobacterium*

1. *Mycobacterium tuberculosis complex (MTC)*:

* ***M. tuberculosis***, Human is the only reservoir

* ***M. bovis***, Both cows and humans (extra pulmonary TB)

2. *Non-tuberculous mycobacteria (NTM)*:

****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’.

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 (**murine**) in their cell wall.
- ❖ Over 60% of the mycobacterial cell wall is lipid, consists of **mycolic acid, Cord factor, and Wax-D**

Laboratory Diagnosis

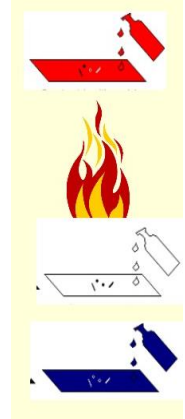
- Specimens: include sputum,
- Early morning sputum specimens collected on 3 consecutive days, from a deep productive cough, give the best results
- An excess of 10,000 bacteria per ml of sputum are needed to visualize the bacilli with a 100X

Direct Detection:

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

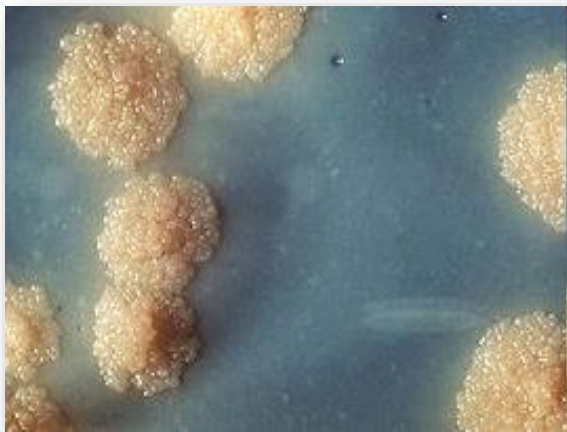


Cultivation:

- Media include: - **Lowenstein-Jensen (L-J) medium** and **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



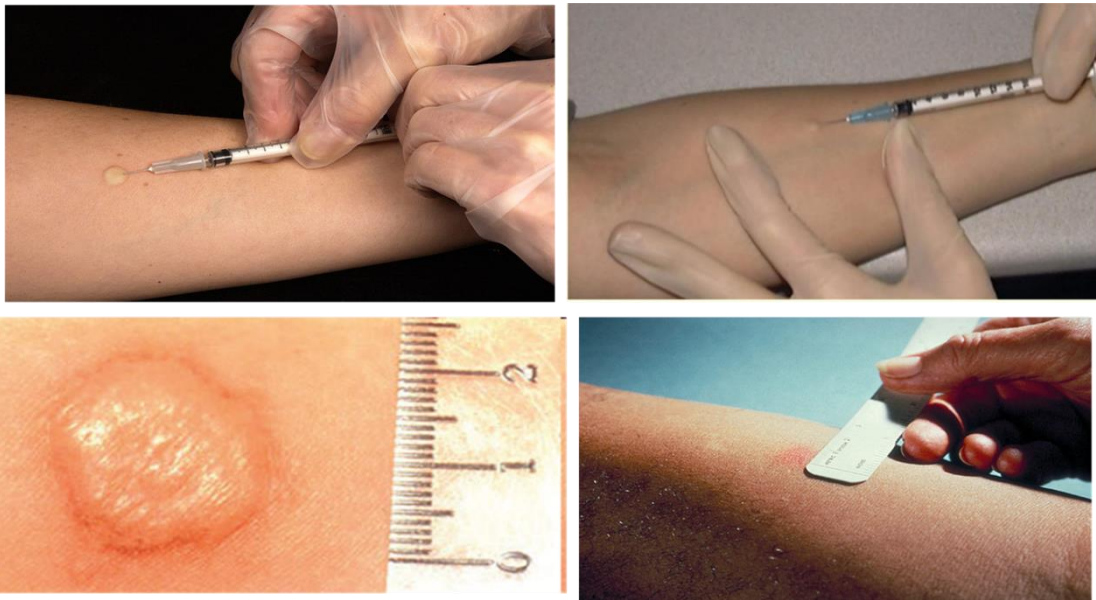
Colony of *Mycobacterium* On
Lowenstein – jensen Agar



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



Interpretations

- 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 persons are risk of developing disease from reactivation of the primary infection.

Mycobacterium avium

- Also known as *M. avium* intracellular 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 immunocompromised 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 on a slide and stained by the Ziel-Neelsen technique.
- Biopsy of skin for histological study.