

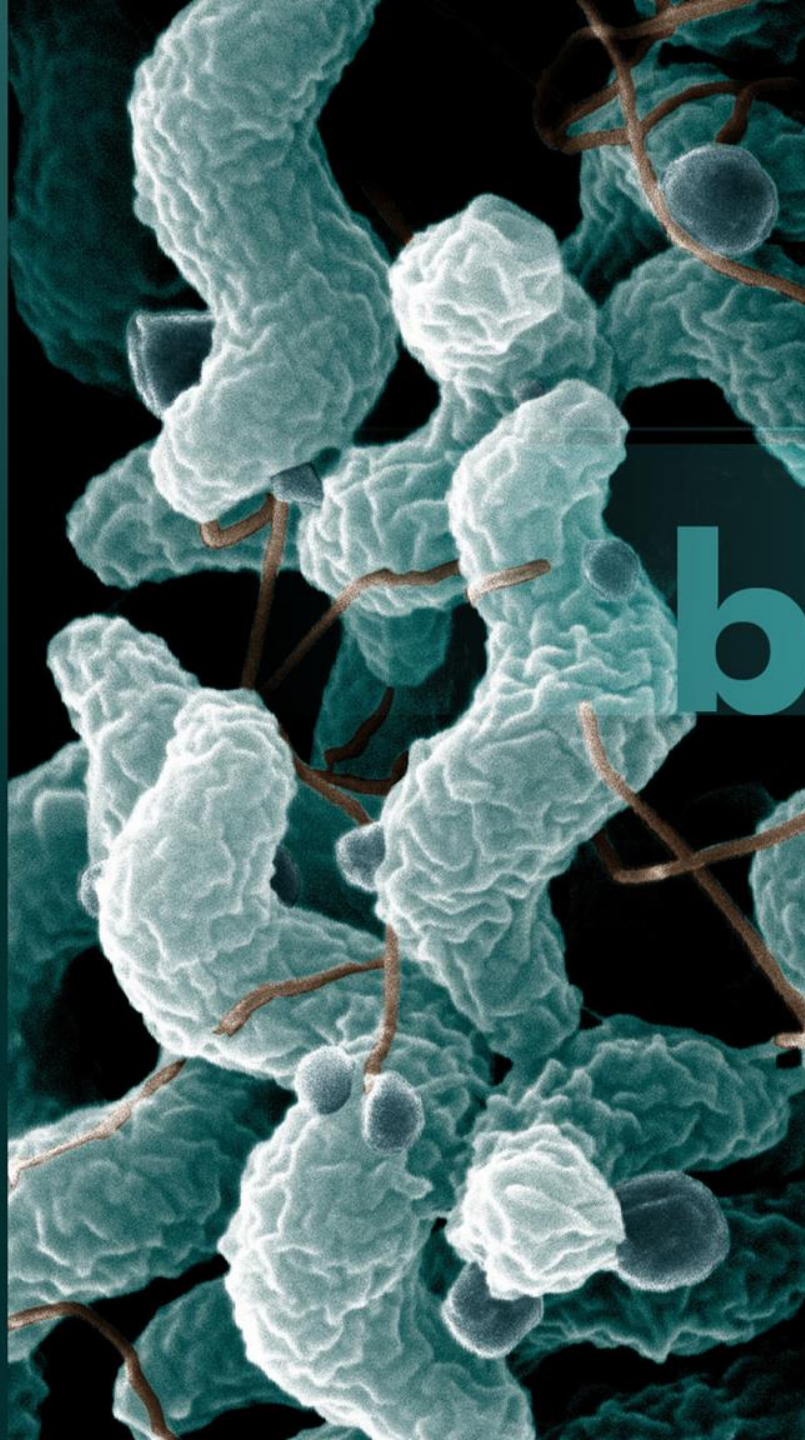
# Mycobacterium

# bacteria

د. حسام سامي

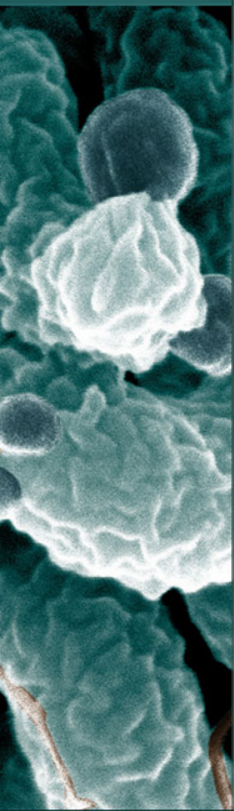
المرحلة الثانية

قسم التحليلات المرضية

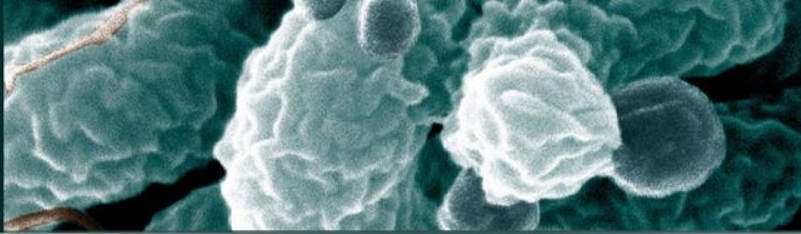


# General characters:

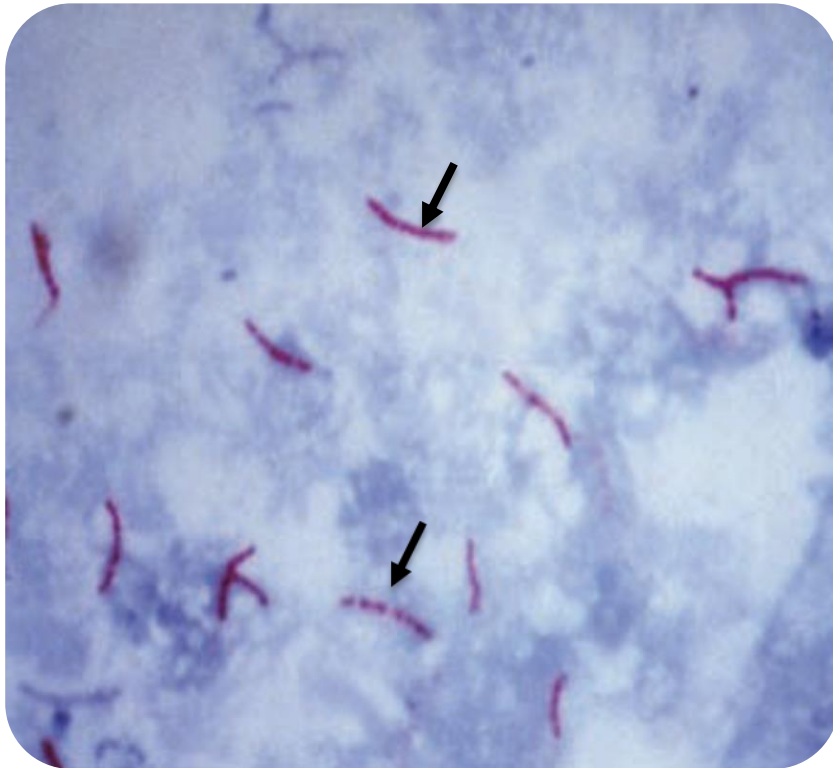
- Mycobacteria are long, slender rods , non-motile and do not form spores .
- Mycobacteria are **strictly aerobic**. Most species grow slowly with generation times of 8 to 24 hours.
- Mycobacterial cell walls are unusual in that they are approximately 60 percent **lipid**, including a unique class of very long-chain (75 to 90 carbons),  $\beta$ -hydroxylated fatty acids (**mycolic acids**).
- These complex with a variety of polysaccharides and peptides, creating a **waxy cell surface** that makes mycobacteria strongly hydrophobic that accounts for their **acid-fast staining** characteristic.
- Their unusual cell walls make mycobacteria impervious to many chemical disinfectants and convey
- resistance to the corrosive action of strong acids or alkalis.
- while non-mycobacterial organisms are digested by such treatments.
- Mycobacteria are also resistant to drying but not to heat or ultraviolet irradiation.



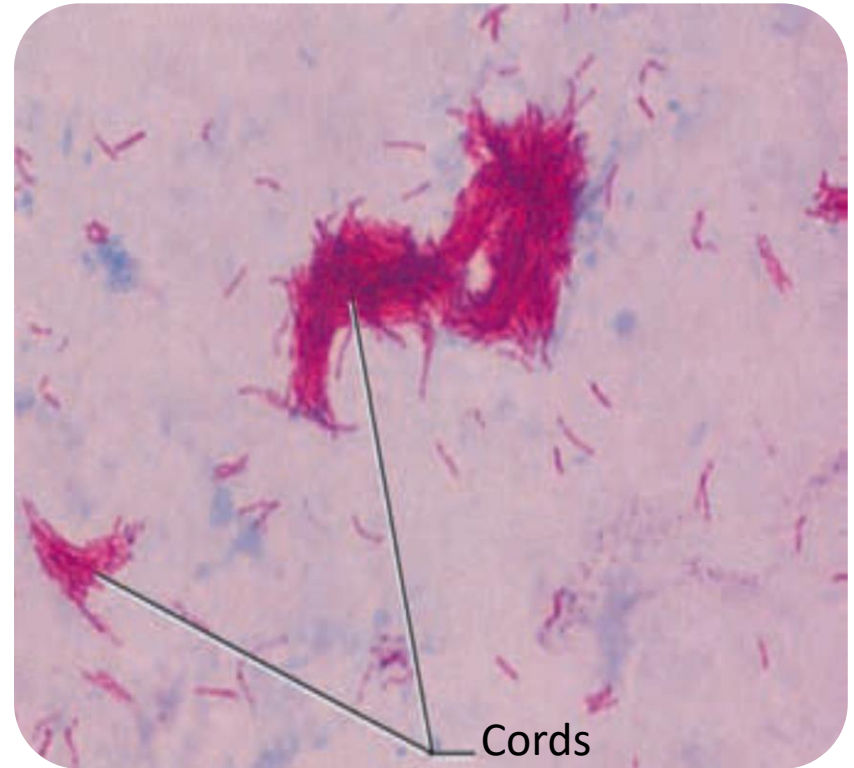




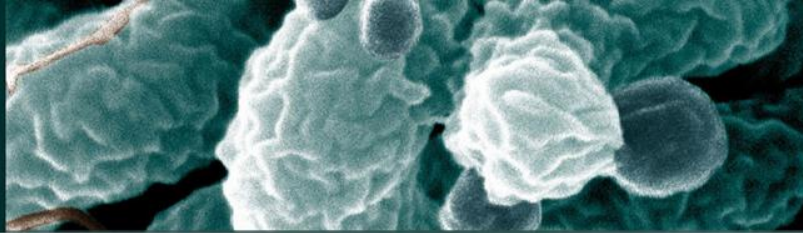
## Figure



**A. Acid-fast stain of sputum from a patient with tuberculosis.**



**B. Typical growth pattern showing "cording" (that is, growing in strings).**



## Classification of bacteria

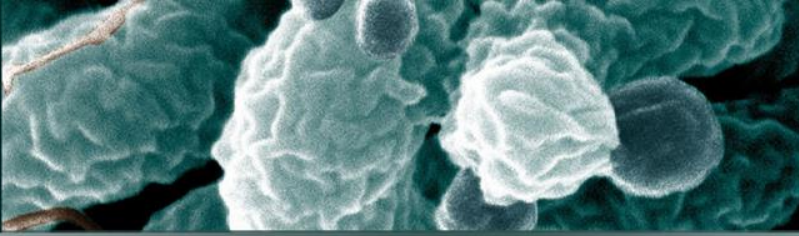
### Medically Important Bacteria

**Rigid**

**Filamentous**

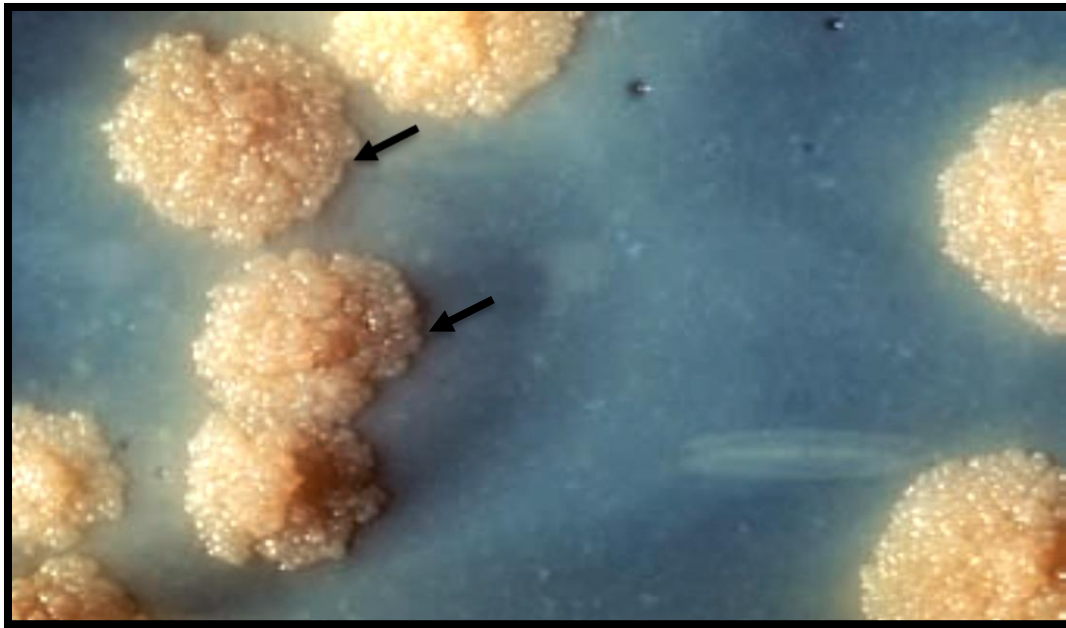
**Mycobacteria**

- *Mycobacterium abscessus*
- *Mycobacterium avium-intracellulare*
- *Mycobacterium bovis*
- *Mycobacterium chelonae*
- *Mycobacterium fortuitum*
- *Mycobacterium kansasii*
- *Mycobacterium leprae* **S**
- *Mycobacterium marinum*
- *Mycobacterium scrofulaceum*
- *Mycobacterium tuberculosis* **S**
- *Mycobacterium ulcerans*

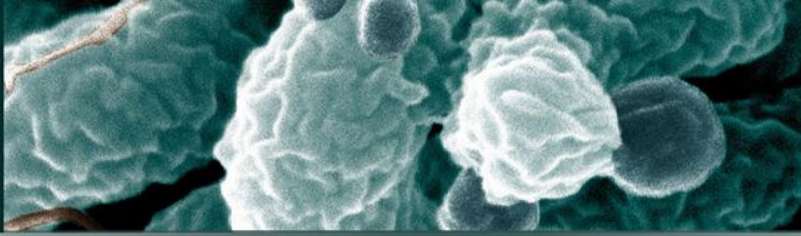


## Growth of *M. tuberculosis*

*M. tuberculosis* can only be obtained by culturing the Organism on **Lowenstein-Jensen medium** , Although **2 to 8 weeks** are required to culture the tubercle bacillus because of its slow growth on laboratory media, such cultures can detect small numbers of organisms in the original sample.



*Mycobacterium tuberculosis* colonies grown on Lowenstein-Jensen medium



## antigenic structure and immunity

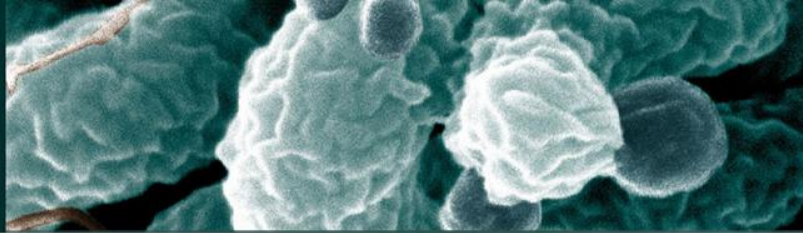
*M. tuberculosis* stimulates both a humoral and a cell mediated immune response. A specific immune response develops after about 1 month, and this changes the character of the lesions.

**Cell-mediated immunity** to *M. tuberculosis* and hypersensitivity to its antigens (tuberculo proteins) not only confer

an enhanced ability to localize the infection and curb growth of the organism, but also cause a greater capacity to damage the host.

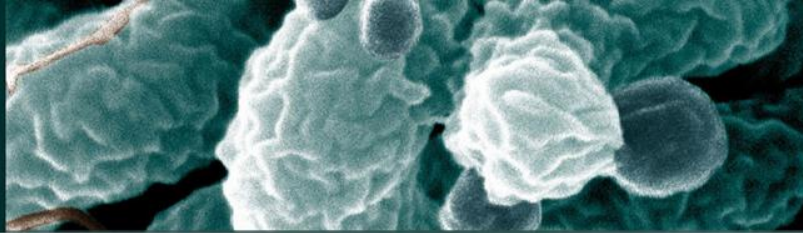
Macrophages, activated by specific T- lymphocytes, begin to accumulate and destroy the bacilli.





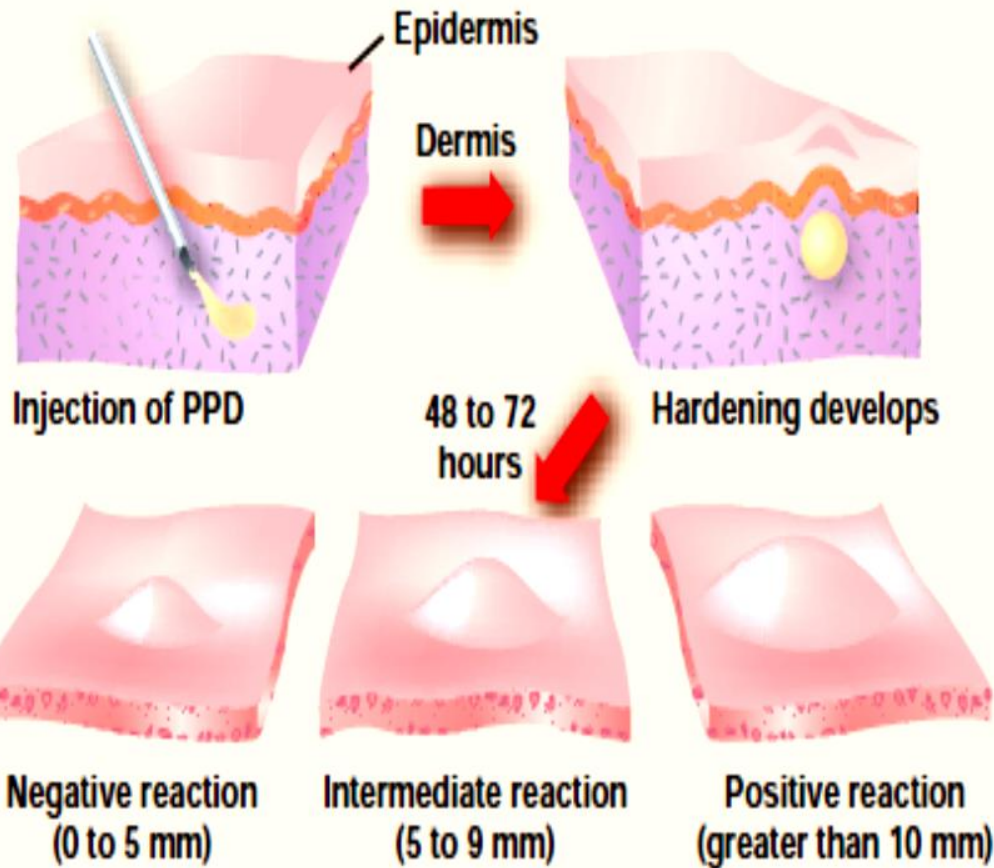
## antigenic structure and immunity

**Tuberculin reaction:** The tuberculin reaction test is a manifestation of delayed hypersensitivity to protein antigens of *M. tuberculosis*. Although such tests can be used to document contact with the tubercle bacillus, they **do not confirm** that the patient currently has active disease. In the **Mantoux test**, **p**urified **p**rotein **d**erivative (**PPD**) is prepared from culture filtrates of the organism and biologically standardized. Activity is expressed in tuberculin units. In the routine procedure (Mantoux test), a measured amount of PPD is injected intradermal in the forearm. It is read 48 to 72 hours later .

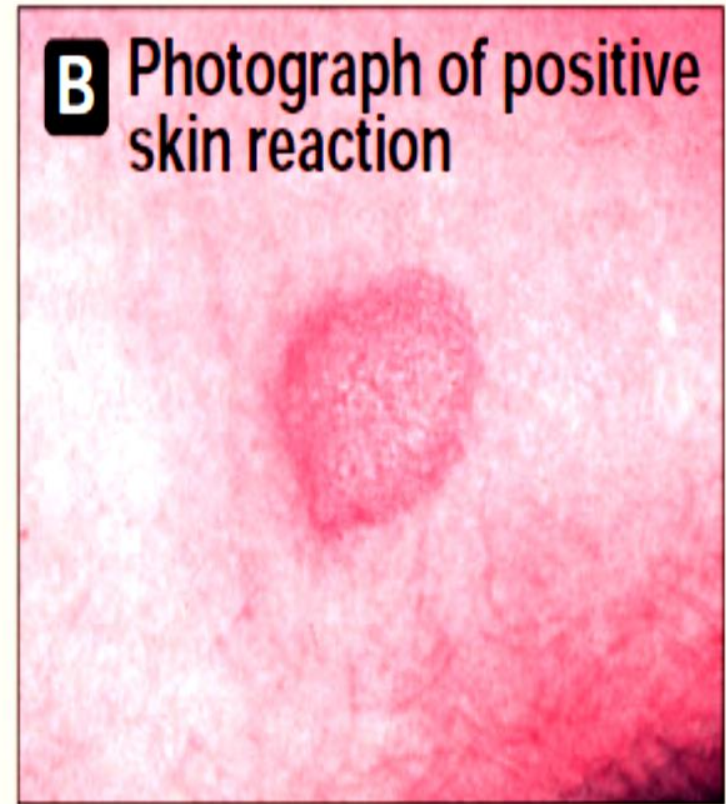


# antigenic structure and immunity

## **A** Schematic summary of test

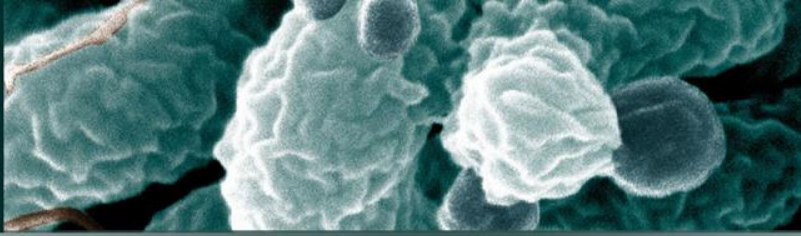


## **B** Photograph of positive skin reaction



0 10 20 30 40  
mm





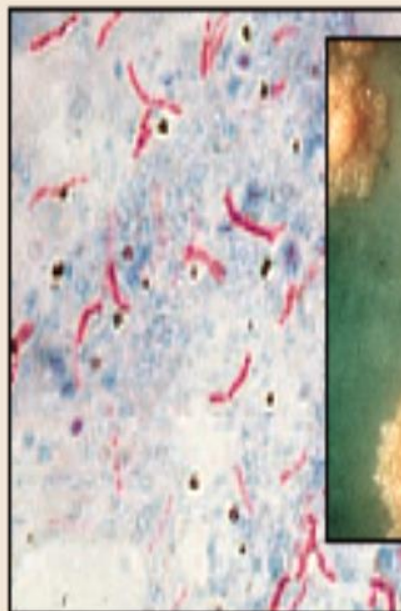
## *Mycobacterium leprae*

Leprosy, called Hansen's disease

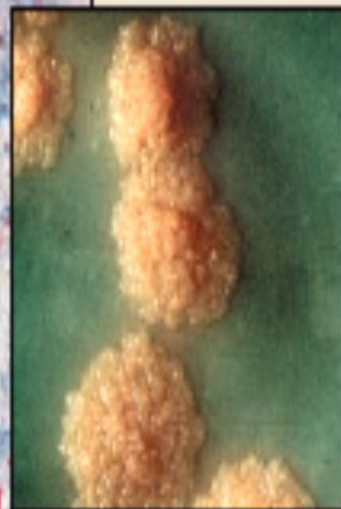
Pathogenicity: *Mycobacterium leprae* is transmitted from human

- to human through prolonged contact, for example, between exudates
- of a leprosy patient's skin lesions and the abraded skin of another individual.

# ***Mycobacterium* species**



*Mycobacterium tuberculosis*  
(acid-fast stain)

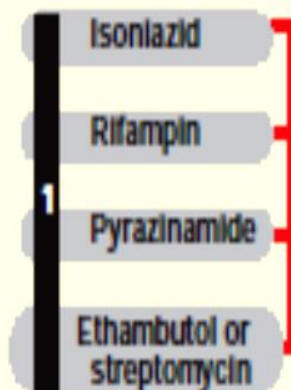


*Mycobacterium tuberculosis* (colonies  
on Lowenstein-Jensen media)

- Acid-fast rods
- Not colored by Gram stain due to lipid-rich cell walls
- Long, slender, nonmotile rods
- Aerobic
- Resistant to drying
- Culture *Mycobacterium tuberculosis* on specialized medium such as Lowenstein-Jensen agar;
- *Mycobacterium leprae* does not grow in culture

## ***Mycobacterium tuberculosis***

- Tuberculosis:



## ***Mycobacterium leprae***

- Hansen disease (leprosy)

