Mycobacterium

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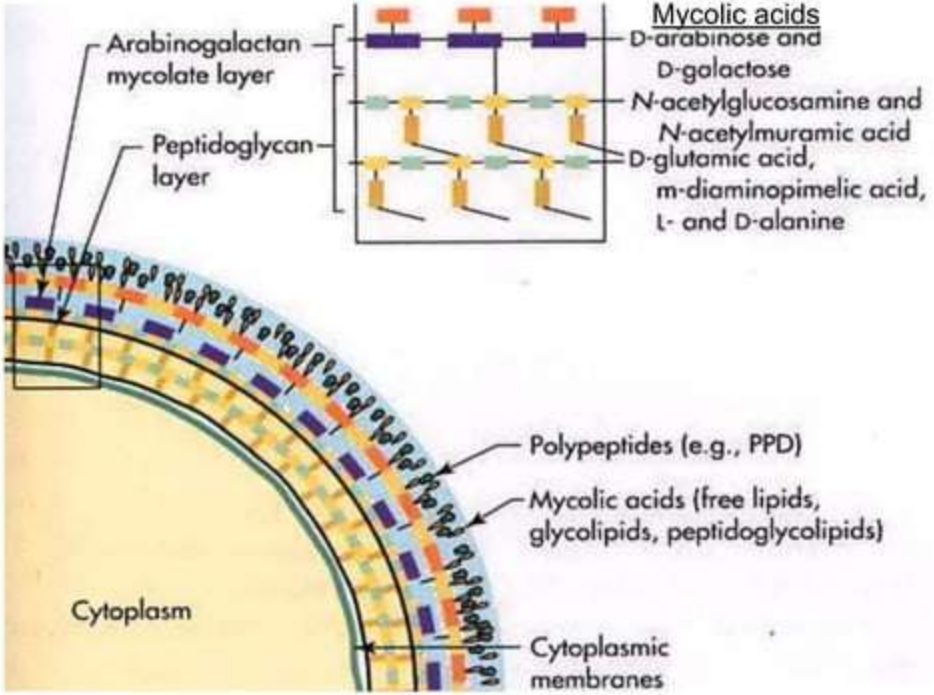
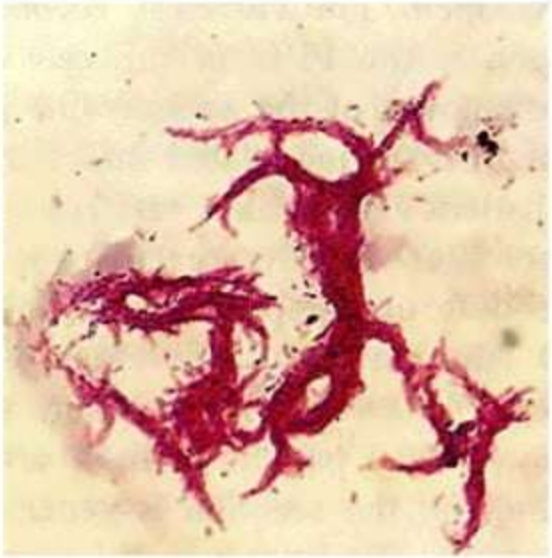
Kingdom:	Bacteria
Phylum:	Actinobacteria
Order:	Actinomycetales
Suborder:	Corynebacterineae
Family:	**Mycobacteriaceae**
Genus:	***Mycobacterium***

- Mycobacterium Tuberculosis
- Mycobacterium Leprae (uncommon)

Lipid Rich Cell Wall



Acid-Fast (Kinyoun) Stain



- Cord growth (Serpentine arrangement) of virulent strains.
- Kinyoun similar to Ziehl-Neelsen Stain

Ziehl-Neelsen Stain Procedure

- 1. Cover with tissue paper or if not then without paper its possible.

- 2. Flood slide with carbolfuchsin, the primary stain, for 3-5 minutes while heating with steam or heating on hot plate.

Continued…

- 3. Remove paper cover, decolorize slide with a mixture of hydrochloric acid and ethanol.

- 4. Counterstain with methylene blue or Malachite green.

Pathogenic Mycobacterium

M. tuberculosis Complex

- M. tuberculosis - Common
- M. leprae - Uncommon
- M. africanum
- M. bovis
- M. ulcerans

Rare

All are Strictly Pathogenic

Continued…

Runyon Group I (Slow growing photochromogens)

- M. kanasii - Common
- M. marinum
- M. simae

Uncommon

All are usually pathogenic not strictly

Continued…

Runyon Group II (Slow growing scotochromogens)

- M. szulgai
- M. scrofulaceum
- M. xenopi

Uncommon

Usually pathogenic

Sometimes pathogenic

Continued…

Runyon Group III (Slow growing nonchromogens)

- M. avium complex – common
- M. genavense
- M. hemophilum
- M. malmoense

uncommon

Strictly pathogenic

Usually pathogenic

Continued…

Runyon Group IV (Rapid growers)

- M. fortuitum
- M. chelonae — Common
- M. abscessus
- M. mucogenicum — Uncommon

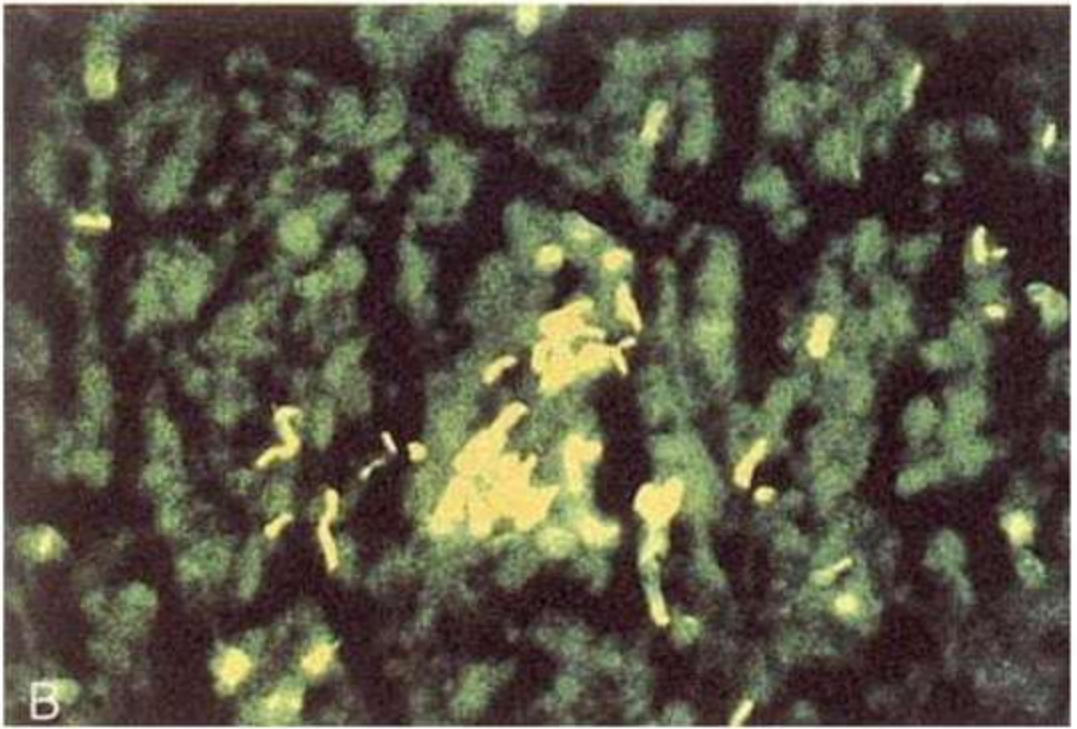
Sometimes pathogenic

MYCOBATERIUM TUBERCULOSIS

Structure and Physiology

- Weakly gram positive
- Strongly acid fast
- Aerobic bacilli

Mycobacterium Tuberculosis Stained with Fluorescent Dye



Lipid rich cell wall, makes organism resistant to

- Disinfectants
- Detergents
- Common antibacterial antibiotic

Virulence

- Capable of intracellular growth in unactivated alveolar macrophages
- Disease primarily host response to infection

Epidemiology

- Worldwide , one third of the population is infected
- 16 million existing cases and 8 million new cases
- Most common in Southeast Asia, Sub- Shaharan Africa and Eastern Europe

Continued…

Patients at the greatest risk are the

- Immunocompromised patients (HIV)
- Drug and alcohol abusers
- Homeless
- Individuals exposed to infected patients

Humans are only the reservoir

Person to person infection by aerosols

Diseases

- Primary infection is lungs
- Dissemination to any other site occurs mostly in the immunocompromised and untreated persons

Diagnosis

- Positive PPD
- Chest X-Ray
- Microscopy and culture – it is sensitive

Treatment, Prevention and Control

- Multiple drugs regimens and prolonged treatment are required to prevent development of drug resistance strains

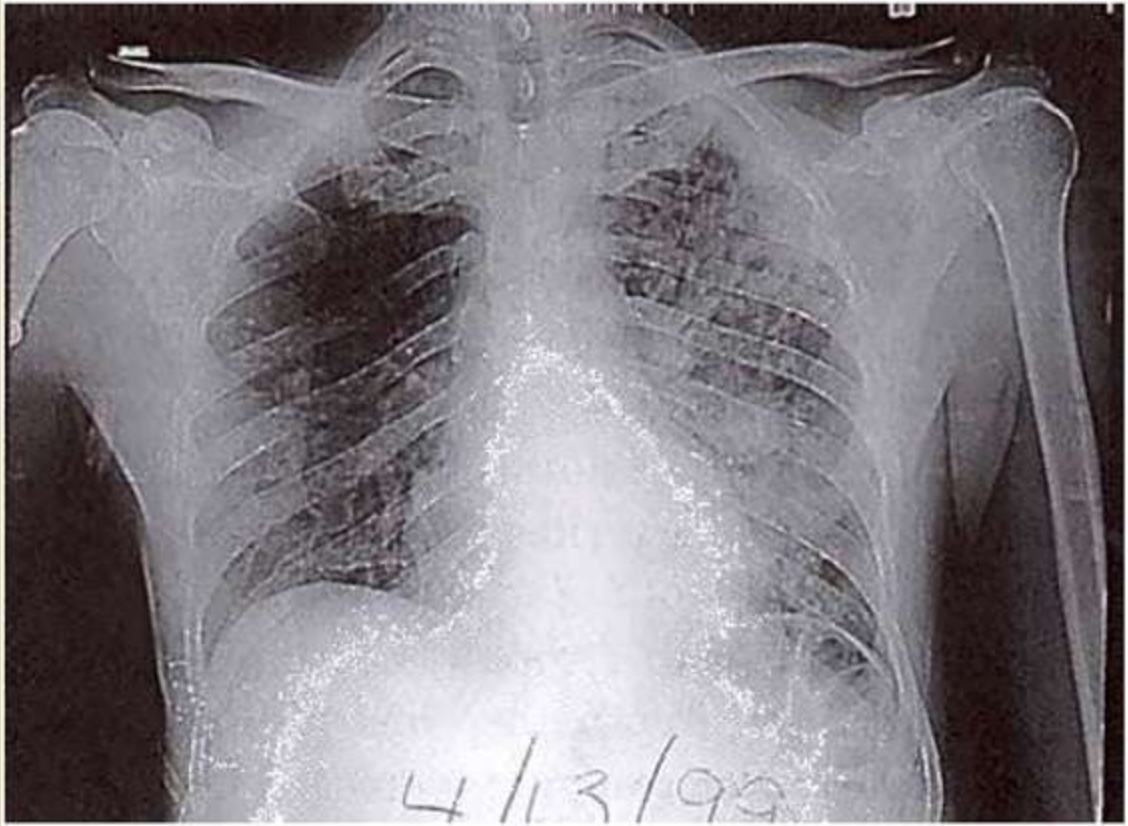
- MDR-TB is global health threat

Continued…

- Treatment include isoniazid and rifampin for 9 months + pyrazinamide + ethambutol or streptomycin
- Immunoprophylaxis with BCG in endemic countries
- **Control-** active surveillance , prophylactic and therapeutic interventions and monitoring of the case

Progression of Pulmonary TB

- Pneumonia
- Granuloma formation with fibrosis
- Caseous necrosis
  - Tissue becomes dry & amorphous (resembling cheese)
  - Mixture of protein & fat (assimilated very slowly)
- Calcification
  - Ca^{++} salts deposited
- Cavity formation
  - Center liquefies & empties into bronchi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MYCOBACTRIUM LEPRAE

Structure and Physiology

- Weakly gram positive
- Strongly acid fast bacilli
- Lipid rich cell wall
- Unable to culture on artificial medium

Virulence

- Capable of intracellular growth
- Disease primarily from host response to infection

Epidemiology

- Common in Africa and Asia
- Armadillos are naturally infected and are reservoir
- Lepromatous form of disease is highly infectious
- Spreads by inhalation of aerosols
- Individual in direct contact with patients are at greater risk

Forms of Diseases

- Tuberculoid form of leprosy
- Lepromatous form of leprosy
- Intermediate form of leprosy

Diagnosis

- Microscopy is sensitive for the lepromatous but not for tuberculoid form
- Skin testing is required for tuberculoid leprosy
- Culture cannot be used

Treatment, Prevention and Control

- Dapsone with or without rifampin is used to treat tuberculoid form
- Clofazimine is added for the lepromatous form
- Therapy is usually prolonged

- For prophylaxis –DAPSONE

- Control – by prompt recognition and treatment of infected patients

Lepromatous form

Tuberculoid form

Pre and Post Treatment


Thank You!