



REVIEW ARTICLE

Tuberculosis: A Review

Kambham Venkateswarlu^{*1}, O. Sreenivasa Krishna², A. Srikanth², N. Devanna³, M. Gowri Sree²

¹*M.Pharm Scholar, Department of Pharmaceutics,*

²*Faculty of Pharmacy, Department of Pharmacology,*

³*Director of Jntua-Otri, JNTUA-Oil Technological Research Institute, Beside Collector Office,
Anantapur, Anantapur District, Andhra Pradesh, India.*

Manuscript No: IJPRS/V2/I4/00250, Received On: 21/12/2013, Accepted On: 28/12/2013

ABSTRACT

TB is an airborne disease caused by the bacterium *Mycobacterium tuberculosis*. Closely related mycobacterial species are *M. bovis*, *M. africanum*, *M. microti*, *M. caprae*, *M. pinnipedii*, *M. canetti* and *M. Mungi*. *M. tuberculosis* organisms are also called tubercle bacilli. This covers all the information about tuberculosis. Tuberculosis patient may prone to get a HIV.

KEYWORDS

T.B, MDR-TB, Symptoms, Diagnosis, Testing, Treatment

INTRODUCTION

History

In Canada incidence of TB is low.

In the United States, the majority of TB cases are caused by *M. tuberculosis*.

Tuberculosis is more common at elderly stage.

The disease may affect all organs of the body, but frequently affects the lungs.¹

Causative Organism

Phylum: Actinobacteria.

Family: Mycobacteriaceae

Genus: *Mycobacterium tuberculosis*

The first member of genus was lepra bacillus discovered by Hansen in 1868.

The mammalian tubercle was discovered by Koch in 1882 and was proved its causative role in tuberculosis.

Koch was a physician who isolated *Bacillus anthracis*, the tuberculosis bacillus and the cholera vibrio.

Nobel Prize for Physiology and Medicine in 1905.²

Features of Causative Organism

Mycobacteria are slender rods.

Sometimes it resembles fungal mycelium because of sometimes it shows branching filamentous forms.

Morphology

It is a straight or slightly curved rod.

M.tuberculosis present in air borne particles called droplet nuclei.

Droplet nuclei diameter is 1-5 μ .

Size: 3 \times 0.3 μ m.

***Address for Correspondence:**

Kambham Venkateswarlu

M.Pharm Scholar,

Department of Pharmaceutics,

Anantapur, A.P, India.

E-Mail Id: k.v.reddy9441701016@gmail.com

It can occur singly or in pairs.⁵

Cultural Characteristics

The bacilli grow slowly.

The generation time is being 14-15 hrs.

The colonies appear in 2 weeks and sometimes may takes upto 8 weeks.

Optimum temperature is 37°C.

It can't grow below 25 °C and above 40 °C.

Optimum pH is 6.4-7.0.

The growth of *M.tuberculosis* improves by addition of 0.5% glycerol.

The human tubercle bacilli do not grow in the presence of P-nitrobenzoic acid.⁵

Types

TB disease can occur in pulmonary and extrapulmonary sites.³

Pulmonary TB

TB which occurs in lungs called as Pulmonary TB.³

Extra pulmonary TB

TB which occurs in other than lungs called as Extrapulmonary TB.³

Symptoms

It has two stages namely

1. Latent TB
2. Active TB

Latent TB

In this stage the following characteristics may be appearing:

1. Here the person is not infectious.
2. The TB causative organism is present in the body.
3. No symptoms.⁴

Active TB

Here the person is infectious and can be spread by

- A. Coughing
- B. Weight loss
- C. Night sweats
- D. Fever
- E. Chest pain
- F. Sneezing
- G. Laughing⁴

M. Avium Complex (Mac)

MAC is a group of species which cause a death in AIDS patients.

MAC can spread through the bloodstream to infect lymph nodes, bone marrow, liver, spleen, spinal fluid, lungs and intestinal tract. ^[6]

Symptoms of MAC

- A. Night sweats
 - B. Weight loss
 - C. Fever
 - D. Fatigue
 - E. Diarrhoea
 - F. Enlarged spleen.
- M. avium causes Lady Windemere's Syndrome.⁷

M. tuberculosis complex (MTBC):

This is a Causative organism of human and animal tuberculosis.

This complex includes the following species:

- A. *M. tuberculosis*, the major cause of human TB
- B. *M. bovis*
- C. *M. bovis* BCG
- D. *M. africanum*³

Mode of Transmission

Mostly through the cough [sputum or droplets].

It includes primary and secondary tuberculosis.

It affects mainly the upper lobes of the lungs, the lesions undergoing necrosis and tissue destruction leading to cavitations.

Other symptoms are headache, cough, spectrum release, rapid pulse, harshness of throat, loss in weight.

- A. By sharing common eating facilities with an infected person.
- B. Through the air from person to person.
- C. Through insect bites.
- D. By touching surfaces that are contaminated with *M. tuberculosis*.

Incubation period: From few months to few years.⁶

Resistance

MDR TB is caused by organisms which are resistant to both isoniazid and rifampin (most effective anti-TB drugs).

These can be killed at temperature above 60 °C for 15-20 min.

The cultures also killed by direct exposure to sunlight for 2 hrs.⁸

Diagnosis

Early morning sputum is collected for diagnosis:

- From this staining can be carried out
- Lung infection can be detected by X-ray.
- The sign of exposure to the organism can be determined by tuberculosis skin test.⁸

Treatment

Prophylaxis

Immuno prophylaxis is by intradermal injection of the live attenuated vaccine, BCG vaccine i.e 0.05 mL.

Chemoprophylaxis

It is carried out by administration of anti-tubercular drugs.

Classification

The standard four medications (yes, all at once) for starting treatment for TB in the US are:

- Isoniazid (INH)
- Rifampin
- Pyrazinamide (PZA)
- Ethambutol

Antibiotics

The following antibiotics are used in TB as year wise development:

- Streptomycin-1945
- Para-amino salicylate (PAS)-1946
- Thiacetazone-1946
- Isoniazid-1952
- Pyrazinamide-1952
- Cycloserine-1955
- Ethionamide-1958
- Capreomycin-1960
- Ethambutol-1963
- Rifampin-1967
- Rifapentineb-1999

Drugs Used In Mdr-Tb

Branch-1

First-line oral drugs

- Ethambutol (E)
- Pyrazinamide (Z)

Branch-2

Oral bacteriostatic second-line drugs

- Ethionamide (Eto)
- Prothionamide (Pto)
- Cycloserine (Cs)
- Terizidone (Trd)
- Para-Aminosalicylic Acid (PAS)

Branch-3

Injectable drugs

- Kanamycin (Km)
- Amikacin (Am)
- Capreomycin (Cm)
- Viomycin (Vm)

Branch-4

Fluoroquinolones

- Levofloxacin (Lvx)
- Moxifloxacin (Mfx)
- Gatifloxacin (Gfx)^{2,3,4}

Prevention

TB patients should be detected as early as possible by the examination of sputum, X-ray, tuberculosis.

Infected persons should be isolated.

All the detected tuberculosis patients should be promptly treated with specific drugs for tuberculosis.

While coughing the patient should wear the mask or keep the handkerchief before his mouth.⁹

Tuberculin test

This test is performed to find out whether the particular person had previous tuberculosis infection or not.

In this test sufficient quantity of tuberculin is administered intradermally into the skin of the left fore arm.

Then the site of injection examined after 72 hrs.

The test is considered positive if there is a swelling of at least 6-10 mm in diameter at the site of injection.

The redness of skin is no consideration.

Reactions less than 6mm in diameter are considered negative.

Interferon Gamma Release Assay (IGRA)¹⁰

Some famous people who died caused by TB as follows:

Cardinal Richelieu, Spinoza, Simon Bolivar, John Keats, Elizabeth Barrett Browning, Edgar Allen Poe, Emily Bronte, R.L. Stevenson, Anton Chekov, Eleanor Roosevelt, D.H. Lawrence.

Drugs for Treatment of Adverse Drug Reactions

The following adverse effects may be seen while treatment of TB:

1. Neurological toxicity
2. Headache
3. Others

Neurological toxicity

This adverse effect treated by using pyridoxine with cycloserine and terizidone as adjuvant therapy.¹¹

Headache

This adverse effect treated by generally with analgesics.

Particularly the combination of codeine and acetaminophen may be used.

The reason for using above combination is “it can suppress simultaneously moderate pain.”^[12]

Others

Corticosteroids and oxygen can be used for treating the respiratory insufficiency.

Bronchodilators can be used for lung disease which may be appearing after treatment.

After treatment bronchodilators can be used.^[13]

At Seizures conditions

The following drugs can be used.

- Phenytoin
- Carbamazepine
- Valproic acid
- Phenobarbital

At Hypothyroidism conditions

The following drug can be used in this condition.

- Levo-thyroxine^{14,15}

At Diarrhoeal conditions

The following drugs can be used.

- Loperamide

At Nausea, vomiting conditions

The following drugs can be used.

- Metoclopramide
- Cyclizine
- Promethazine
- Bismuth subsalicylate^{14, 15}

CONCLUSION

T.B is a one of the dangerous disease, so all should be aware about this disease and also these patients easily can get a HIV.

REFERENCES

1. Sharma HL, Sharma KK, A Text Book of Principles of Pharmacology. Paras medical publisher, 2nd edition, 753-761.
2. Trioathi KD, A Text Book of Essentials of Medical Pharmacology, Jaypee brothers medical publishers, 6th edition, 739-750.
3. Rang, Dale, Ritter, Flower, Henderson, A Text Book of Rang & Dale's Pharmacology. Elsevier churchil livingstone publishers, 7th edition, 634-3-635.
4. Hardman Limbard, Gilman Goodman & Gilman's pharmacological basis of therapeutics. Mc Graw Hill medical publishers, 10th edition, 1284-1288.
5. Braunwarld, Kasper, Henser, Longo, Jameson: A text book of Harrison's principles of internal medicine. Mc Graw Hill medical publishers, vol-1, 1024-1035.
6. Bertram G, Katzung: A text book of basic & clinical pharmacology. Paramount publishers, 6th edition, 707-712.
7. P.N.Bennet, M.J.Brown: A text book of clinical pharmacology. Elsevier churchil livingstone publishers, 249-53.
8. Golan DE, Tashjian AH, Jr Edhrich, Armstrong J, April W. Armstrong: a text book of principles of pharmacology. Wolter's Kluwer publishers, 3rd edition, 719-720.
9. Clark MA, Finkel R, Rey JA, Karen Whalen, A text book of lippincott's illustriated reviews. Wolter's Kluwer publishers, 5rd edition, 421-427.
10. Barar FSK, A text book of essentials of pharmacotherapeutics. S. Chand & company Ltd. 5th edition, 560, 434-441.
11. Tortora GA, Derrickson B, A text book of anatomy & physiology. Joh Wiley & son's publishers, 13th edition, 960.
12. Goyal RK, Mehta AA, Balaraman R, Burande MD, A text book of Derasari and Gandh's elements of pharmacology. B.S.Shah prakashan publications, 20th edition, 547-553.
13. Kumar PU, A text book of medical pharmacology, CBS Publishers, 3rd edition, 444-451.
14. Mohan H, A text book of pathology. Jaypee brothers medical publishers, 6th edition, 149-157.
15. Murugesh N, A concise text book of pharmacology. Sathya publishers, 6th edition, 249-253.