AMERICAN JOURNAL OF EDUCATION AND LEARNING
ISSN: 2996-5128 (online) | ResearchBib (IF) = 9.918 IMPACT FACTOR
Volume-3| Issue-5| 2025 Published: |30-05-2025|

GENERAL CHARACTERISTICS OF THE TUBERCULOSIS PATHOGEN

https://doi.org/10.5281/zenodo.15484172

Muratbaeva Biybimaryam Jalǵasbay qizi
Nukus branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies, assistant teacher
Seytova Nargiza Jursunbekovna
Nukus branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies, assistant teacher
Abatbaeva Aygul Muratbay qizi
Nukus branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies,student
Amirova Laylo Tohir qizi
Nukus branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies,student

Abstract:
This article explores the general biological, morphological, and pathogenic characteristics of Mycobacterium tuberculosis, the bacterium responsible for tuberculosis (TB). It examines the structural features of the pathogen, such as its acid-fast cell wall, slow growth rate, and intracellular survival mechanisms. The article also discusses the bacterium's modes of transmission, resistance to environmental conditions, and immune evasion strategies. Understanding these fundamental traits is crucial for the development of effective diagnostic tools, treatment regimens, and public health strategies to combat TB globally.

Keywords:
Mycobacterium tuberculosis, tuberculosis, acid-fast bacillus, morphology, pathogenicity, intracellular survival, transmission, drug resistance.

Introduction

Microorganisms that grow in the form of long threads in a nutrient medium are called mycobacteria. At the ends of these threads, a tubular swelling appears, sometimes the threads branch. When viewed under a microscope, the culture resembles the mycelium of a mold fungus, and this feature brings them closer to actinomycetes.Mycobacteria are found in nature in their pathogenic and saprophytic species. Saprophytes live in soil, water bodies, manure, milk, and grass. Pathogens - mainly mycobacterium tuberculosis - cause disease in humans and animals. The causative agent of leprosy in humans and the causative agent of

AMERICAN JOURNAL OF EDUCATION AND LEARNING
ISSN: 2996-5128 (online) | ResearchBib (IF) = 9.918 IMPACT FACTOR
Volume-3| Issue-5| 2025 Published: |30-05-2025|

paratuberculosis in large mammals are also mycobacteria.The causative agents of tuberculosis belong to the Actinomycetales order, the Mycobacteriaceae family, and the Mycobacterium genus. All mycobacteria can in some cases migrate to humans or other species of animals and cause disease.

The causative agent of tuberculosis was discovered by R. Koch in 1882 and named Mycobacterium tuberculosis. Later, mycobacteria were divided into five types:

1. M.tuberculosis - the causative agent of human tuberculosis. (also found in monkeys and domestic animals);

2. M.bovis - the causative agent of bovine tuberculosis (also found in humans);

3. M.avium - the causative agent of poultry tuberculosis (also found in pigs and cattle);

4. M.murium - the causative agent of mouse tuberculosis;

5. M.poikilothermorum - the causative agent of tuberculosis in cold-blooded animals;

Tuberculosis is a chronic infectious disease of humans, mammals and poultry, characterized by the formation of specific nodules (tubercles) in the affected organs and tissues. Morphology and tinctorial properties. The microbe is most often a thin, straight or slightly curved rod with a curved tip, 0.8 - 5.5 µm long and 0.2 - 0.6 µm wide.

Their size is not constant. It varies depending on the type of bacteria, nutrient medium, growth conditions, etc. Compared to M.tuberculosis, M.bovis is shorter and thicker, while mycobacteria grown in animal tissues and nutrient medium are longer. In the cytoplasm of the bacterium there are granules of various shapes and sizes. In smears, they are located singly or in groups. Mycobacterial rods are non-motile, do not form spores or capsules. Resistant to acids, alkalis, and alcohol. Gram-positive.

Resistance. Tuberculosis bacilli are quite resistant to physical and chemical effects. In cultures, they usually die after 8-10 months. Bacteria live in dried sputum for 7-10 months, in rotting organs for 2-6 months, in manure for 7-10 months, in water for 2 months, in soil for more than 2 years; milk dies in 30 minutes when heated to 85oC, in 3-5 minutes when boiled.

Disinfectants - 5% phenol, 20% freshly slaked lime, 3-5% lysol, 3% formaldehyde, etc. Under the influence of these agents, the tubercle bacilli die in 12-24 hours. Manure is biothermally neutralized.

*Antigen structure:*The activity of antigens of tuberculosis bacteria is low. The protective properties of the antigen are associated with mycolic acid compounds.

Immunity to tuberculosis is non-sterile, cellular (T – lymphocytes). For its emergence and maintenance, live tubercle bacilli must be present in the animal's body. Live mycobacteria of the BSJ vaccine strains persist in the animal's body for a long time after vaccination, maintaining the strength of immunity.Diagnosis consists of bacteriological, serological, allergic tests. Bacterial diagnosis is of great importance. The final diagnosis is made on the basis of positive results of pathoanatomical or bacteriological examination during the examination of the farm. Determination of the type of mycobacteria is necessary to find the source of infection. Gon method. The swab material is thoroughly crushed in a sterile mortar and mixed with 10-12% sulfuric acid in a ratio of 1:4 and centrifuged for 10-15 minutes at 3000 rpm. The exposure to acid should not exceed 20-30 minutes. Smears are prepared from the precipitate, inoculated into nutrient media.

For bioassays, the precipitate should be washed 1-2 times with sterile saline. Alikaev method. Used when working with slightly contaminated, fresh material. For this, the swab material is cut into pieces of 0.5 cm3 in size, placed in a sterile mortar and a 10-8-6% sulfuric acid solution is added to it and left for 10-20 minutes. The concentration of the acid, the exposure time, and the degree of contamination of the material. Then the acid is poured out, replaced with sterile physiological solution, and after 8 minutes it is also poured out, and the material is thoroughly crushed in a mortar with physiological solution. Smears are prepared from the finished suspension, 5-6 test tubes are inoculated into nutrient media, and a bioassay is performed.The duration of the cultural examination is two months.The bioassay is performed by injecting a dose of 1.0 ml under the skin of a guinea pig's chin, into an ear vein for rabbits, and into a subwing vein for chickens. The observation period is three months. With a positive result, when an animal dies, tubercles characteristic of tuberculosis are found in the liver, spleen, and other organs.Guinea pigs are necessarily tested for allergies with tuberculin before a bioassay. Those that give a positive result are considered unsuitable for bioassay. The duration of the biological examination is 3 months.Differentiation (typing) of types of tuberculosis mycobacteria. Mycobacteria differ in the nature and speed of growth in nutrient media, morphology, pathogenicity and other properties. Many methods have been proposed for the differentiation of the type of tuberculosis mycobacteria - microscopic, cultural, biochemical, biological, etc. M.bovis grows very slowly on dense nutrient media and forms dry, smooth and expanded colonies. M.tuberculosis grows quickly, and it is difficult to distinguish it from M.bovis by the nature of its growth. M.avium grows faster than M.tuberculosis and M.bovis. Their colonies are smooth, small, round, with smooth edges. For this purpose, a biological method is often used. For bioassays, three guinea pigs, three

rabbits and, if necessary, three chickens are infected with the above doses and methods.

Based on the following data, the type of culture being tested is determined.

1. M. bovis culture causes generalized tuberculosis in guinea pigs and rabbits.

2. M. tuberculosis – causes generalized tuberculosis in guinea pigs and local tuberculosis in rabbits 3. M.avium - causes a septic process in rabbits, as a result of which the rabbit

dies. Sometimes a local process can also occur. In guinea pigs, only a local process occurs, and more often an abscess occurs in the place where the culture was sent.

In chickens, a generalized process occurs. In serological diagnosis, PR, AR, DPR, KBR, GAR, hemolysis reactions have been studied. PR and AR were ineffective in animals. Only in chickens, the AR blood drop method gave reliable results. The complement fixation reaction is used as an additional method for separating animals that have reacted to tuberculin for controlled slaughter. A complex mixed antigen or complex antigen is used. To perform the reaction, the sera to be tested are inactivated in a water bath at 600C for 30 min. Antigen and complement are titrated. Serum is diluted in test tubes in 0.25 ml in titers of 1:5, 1:10, 1:20, 1:40, 1:80, and 0.25 ml of antigen and complement are added. Then the rack is kept in a water bath with the test tubes for 30 minutes at 37-380C. Then the rack is removed and a hemolytic system is added to the test tubes (0.25 ml of 2% erythrocytes and 0.25 ml of hemolysin). The rack is again placed in a water bath for 15 minutes. The reaction result is read after removing the test tubes from the water bath and after 16-18 hours. Titers of 1:20 and above are considered positive.

REFERENCES

1. Kislenko V.N.,Kolichyov N.M.,Suvorina O.S. Chastnaya veterinarnaya mikrobiologiya i immunologiya. Chast 3. Chastnaya mikrobiologiya. M.KolosS, 2007.S.126-134.

2. Yemelyanenko P.A i dr. Veterinarnaya mikrobiologiya. M.. Kolos, 1982 S. 245-253.

3. Timakov V.D. Mikrobiologiya. Uchebnik. M. Medisina. 1983. S.348-353.

4. Kostenko T.S. i dr. Praktikum po veterinarnoy mikrobiologiii I immunologii. M., 1989. S.218-227.

5.Smirnova N.I. Rukovodstvo k prakticheskim zanyatiyam po veterinarnoy mikrobiologii. M. 1977.S.126-135.