TUBERCULOSIS. ETIOLOGY, SOURCES, ROUTES AND FACTORS OF TRANSMISSION OF INFECTION

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The causative agent of tuberculosis and its properties. The causative agent of tuberculosis, discovered in 1882 by the German scientist Robert Koch, is usually called in his honor Koch's bacterium (KB) or mycobacterium tuberculosis (MBT) (mykes - fungus). The causative agent of tuberculosis belongs to a large group of fungi, the genus of mycobacteria, the family of actinomycetes (radiant fungi; astis - ray). Among the many mycobacteria known in nature, three groups are distinguished:

1) pathogenic;
2) opportunistic (or atypical);
3) saprophytes.

The first group, pathogenic , includes Mycobacterium tuberculosis (MBT) and Mycobacterium leprosy, which cause diseases of the same name.

Of the second group, opportunistic or potentially pathogenic MBT, the vast majority of them are not pathogenic for humans. However, some species, under certain conditions, can cause damage to the lungs and other organs in humans. Diseases caused by atypical MB are called mycobacteriosis and belong to the group of atypical pneumonia, although their clinical course and radiological signs are similar to tuberculosis. The causative agents of mycobacteriosis are usually naturally primarily resistant to most antibiotics and anti-tuberculosis drugs. They are usually detected by bacteriological studies by type, growth pattern, growth rate, pigment formation , etc., and according to these characteristics they are classified according to Runyon’s grouping (1959) into four groups (1 - photochromogenic , 2 - scotochromogenic , 3 - non-pigmentous and 4 - fast-growing).

Mycobacteria of the third group, acid-resistant saprophytes , such as MB of timothy grass, butter, milk, etc., are quite widespread in nature. But they cannot cause disease in humans and are non-pathogenic. However, when stained under a microscope, acid-fast saprophytes look like tuberculosis MB, which can lead to overdiagnosis of tuberculosis. At the same time, when treated with javel water for 20 minutes or 3% hydrochloric acid alcohol for 30 minutes, they become discolored. When characterizing MBT, it should be emphasized that the causative agent of tuberculosis is a microscopic formation and is not detectable with the naked eye. It can only be determined using a special staining method (Ziehl -Neelsen) when examining a stained preparation (smear of pathological material) under a microscope at high magnification objective using an immersion system. Under a microscope, the causative agent of tuberculosis has the shape of rods with a length of 0.8 to 3-5 microns (microns) and a thickness of 0.3 to 0.5 microns, which are slightly curved in length, thickened at one or both ends, lying one at a time. several in parallel or in clusters,

and when staining the preparation according to Ziehl-Neelsen, the MBs are determined to be pink-red in color.

Under fluorescence microscopy they have a golden color. With electron microscopy, in the bacterial cell of the causative agent of tuberculosis, its three components are differentiated: the causative agent of tuberculosis, its three components are differentiated: 1) cell membrane (no capsule); 2) cytoplasm with individual organelles; 3) nuclear substance. However, to this day, many questions related to the ultrastructure of the cell, the biochemical composition and functional significance of some organelles remain unclear, which is largely due to the polymorphism of Mycobacterium tuberculosis.

The causative agent of tuberculosis has many significant features.

1st feature. Firstly , there are 4 main types of tuberculosis pathogen:

1) human type (typus humanus) - highly pathogenic for humans, guinea pigs are highly sensitive to it;

2) bull type (typus bovis) - the causative agent of tuberculosis in cattle (also pathogenic for rabbits);

3) bird type (typus avium) - causes tuberculosis in birds and white mice; 22 4) mouse type (typus microti) is the causative agent of tuberculosis in field mice. In addition, transitional forms are observed between individual MBT species. The main causative agent of tuberculosis in humans is the human type (in 95-99% of cases), and much less frequently (1-5%) tuberculosis in humans can be caused by the bovine type. The avian type is opportunistic and can extremely rarely cause disease in humans. Mouse type for not pathogenic to humans.

The second feature of MBT is its pathogenicity and virulence. Pathogenicity is characterized by the ability of a pathogen to cause specific lesions in humans and animals, i.e. a disease called tuberculosis. However, the degree of pathogenicity can manifest itself in different ways , which is characterized by the virulence of MBT. When guinea pigs are infected with the causative agent of tuberculosis, based on the timing of their illness or death, it is possible to experimentally determine highly virulent, moderately virulent , low and weakly virulent MBT strains as a manifestation of the quality of the individual characteristics of a particular MBT strain.

The 3rd feature of MBT is manifested in the characteristic features of growth and reproduction of the pathogen in a living organism and on artificial nutrient media. The growth of MBT cultures under normal conditions in body tissues and on nutrient media occurs mainly through simple cell division or a more complex cycle of division of a microbial individual - budding. One of the possible, but not yet proven ways of MB propagation is considered to be sporulation, which makes them similar to actinomycetes. It is important to emphasize that the reproduction of MBT occurs slowly, the cycle of simple division of the mother cell into two daughter cells takes from 20 to 24 hours, and therefore the visible growth of MBT colonies on the surface of a solid nutrient medium can be detected no earlier than 12-20 days (2-3 weeks).

When cultivating MBT on nutrient media x, it must be taken into account that they:

1) they are aerobes (therefore, when artificially growing MBT, one must strive for maximum aeration of the culture);

2) sensitive to the pH of the environment. The optimal acidity of the medium is pH 6.8-7.2 (the growth range of MBT is 5.5-8.0 pH , but they grow slowly);

3) the optimal temperature for the reproduction and growth of MBT colonies on a nutrient medium is a temperature of 37-38 ° C (temperature range 29-42 ° C). Similar conditions of MBT are found in the lymph of an infected patient, therefore they are characterized by lymphotropism . which is the 4th feature of MBT.

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