

FUNGI OF THE GENUS PAECILOMYCES AND THEIR ROLE IN DEVELOPMENT ECHINOCOCCOSIS

¹Vakhidova Adolat Mamatkulovna, ²Khudayarova Gavhar Normamatovna, ³Muradova Emma Vladimirovna

¹Doctor of Biological Sciences, Associate Professor of the Department of Microbiology, Virology, Parasitology and Immunology, Samarkand Medical University, Uzbekistan

²Assistant of the Department of Microbiology, Virology, Parasitology and Immunology, Samarkand Medical University, Uzbekistan

³PhD, Doctor of Biological Sciences, Lecturer of the Department of Microbiology, Virology, Parasitology and Immunology, Samarkand Medical University, Uzbekistan

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Abstract. Nazyrova et al. (1999) showed that various forms of fungi, the specific, generic affiliation of which was not established by the authors, were often found in echinococci from operated patients, and the cellular reaction of the host tissue surrounding the parasite depended on their presence. *Materials and methods of research.* The methods of helminthological, morphological, hematological, bacteriological, biochemical, immunological and serological studies were used in the work. Echinococcal fluid from 105 animals of various species (sheep, cattle, pigs, horses, camels, goats) was examined for the presence of fungi of the genus *Paecilomyces* and in all cases, spherules of representatives of the genus *Paecilomyces* were detected. In all animals, spherules of a fungus of the genus *Paecilomyces* were also detected in the blood. Their number in the blood and in the echinococcal fluid was calculated, the correlation dependence of the concentration of fungal elements in the blood and fluid or the contents of parasite cysts was established.

Keywords: research results and their discussion. The results of studying larval echinococcus, microbiology of echinococcal fluid, properties of microorganisms isolated from echinococcal fluid, morphological modification of the parasite, histological structure of the walls allow us to draw the following conclusions.

Echinococcal fluid from 105 animals of various species (sheep, cattle, pigs, horses, camels, goats) was examined for the presence of fungi of the genus *Paecilomyces* and in all cases, spherules of representatives of the genus *Paecilomyces* were detected. In all animals, spherules of a fungus of the genus *Paecilomyces* were also detected in the blood. Their number in the blood and in the echinococcal fluid was calculated, the correlation dependence of the concentration of fungal elements in the blood and fluid or the contents of parasite cysts was established. Research results and their discussion. The results of studying larval echinococcus, microbiology of echinococcal fluid, properties of microorganisms isolated from echinococcal fluid, morphological modification of the parasite, histological structure of the walls allow us to draw the following conclusions. Contrary to the claims of most researchers, we found that echinococcal fluid in 74% of cases contains microbial flora. At the same time, as evidenced by histological studies of the shells of the parasite and the walls of the capsule of echinococcal bladders, it can also be in the echinococcal fluid of a fully viable parasite, just as bacteriologically sterile echinococcal fluid can be contained in echinococcal bladders with dystrophically altered and even dead membranes. Consequently, even the necrosis of the echinococcal bladder does not always cause infection of the echinococcal

fluid, and not altered, viable shells of echinococcus are not an obstacle to the penetration of infection into the parasite. Most often we found mixed microflora in the echinococcal fluid, half as often – pure monoculture. Thus, all microbes found in echinococcal fluid belong to the so-called pyogenic microflora. In this paper, we did not set the task to find out the causes and ways of penetration of microbes into the contents of the echinococcal bladder, but we can still note that the bacteriological analysis of fluid samples of echinococcal bladders from the same animal in cases of multiple echinococcosis indicates that infection of the contents of the echinococcal bladder depends not only on the condition of the parasite shells, not only from the presence of an infected focus in the body of the affected animal, and not even from a combination of both of these factors. For example, in many samples of echinococcal fluid taken from different bladders parasitized by the same animal, different microbial flora was detected. Consequently, not only the condition of the parasite itself and the presence of infection in the host's body causes the penetration of infection into the echinococcal fluid. Apparently, there are some other conditions, but not known to us, that influence this process. As expected, a large number of various free amino acids were detected in the echinococcal fluid with different quantitative content of them in individual samples. As can be seen from Tables 1-2, there was some qualitative, and especially quantitative difference in the amino acid composition of echinococcal fluid in sheep with echinococcosis and those affected by echinococcosis in the experiment.

Some quantitative differences in the amino acid composition of the echinococcal fluid of various morphological modifications have been established: for example, the echinococcal fluid of *E. acephalo-cys-ticus*, in comparison with other modifications of the parasite, contains more cystine, glutamic acid, methionine, valine, and tryptophan, in the fluid of *E. veterinorum* – more histidine, arginine and aspartic acid. Microorganisms have a significant effect on the amino acid composition of the echinococcal fluid. In infected echinococcal fluid, the amount of histidine, arginine, glycine, threonine and phenylalanine is increased, in bacteriologically sterile – glutamic acid. H. Mirkhalimov (1985), Sh.M. Mukhitdinov (1990) N.M. Matchanov et al. (2004) and other researchers claim that different microorganisms do not consume the same amount of amino acids in the course of their vital activity. Therefore, it is not surprising that the amino acid composition of the echinococcal fluid is to a certain extent determined by the composition of the microbial flora contained in it. This dependence is particularly evident in the study of echinococcal fluid samples containing the most pathogenic strains. It is very significant that viable echinococcal bladders have the smallest size, the largest are dead. This is explained by the different age of the parasites, that is, the duration of the period from the beginning of their development to death. As micrometry has shown, in the process of dystrophy, the chitin shell becomes much thicker, and with the necrosis of the parasite, its thickness increases several times and therefore it can serve to some extent as a criterion for the viability of the echinococcal bladder. The dystrophic process in the shells of echinococcus, as well as complete necrosis, to a certain extent depends on the nature of the microflora contained in it. For example, out of 24 echinococcal bladders, in the contents of which the most pathogenic strains of staphylococci were found, 16 had complete necrosis of the membranes during histological examination, 7 had severe dystrophy of them with foci of necrosis and only in one bladder the parasite shells did not change significantly. A manifestation of the local tissue reaction of the body to the introduction of an echinococcal embryo is the formation of a so-called carrier capsule around it, the structure of which depends on many reasons emanating from both the parasite itself and the host organism. The peculiarities of the local tissue reaction,

of course, to some extent depend primarily on the spheres of the fungus genus *Paecilomyces* and on the properties of the tissues themselves, as well as on the organ in which the parasite is localized and its capsule is formed. For example, of the 22 echinococcal bladders found in the liver, 18 had a necrotic reaction in the carrier capsule, whereas when localized in the lungs, 50 out of 78 had a necrotic reaction. The granulation and fibrous reaction in the carrier capsule is expressed approximately equally in the localization of parasites, both in the lungs and in the liver. Apparently, the structure of the carrier capsule depends on the characteristics of both the parasite and the host organism, as well as the parasitocenosis, in the center of which there are mushrooms. The shells of echinococcus and the capsule developing around them form a so-called echinococcal cyst, but the pathological process caused by it in the affected organ is not limited, but spreads to adjacent areas of the organ, causing significant structural changes in them. When the parasite is localized in the lungs, fibrosis of the lung tissue develops in a large area around the capsule.

In it, the lumen of the alveoli is not visible, the small bronchi are compressed and as a result of scarring changes, in which the bronchial wall is often involved, its traction occurs with the formation of bronchiectasis. General anemia of the affected areas of lung tissue is characteristic. All these changes gradually decrease as they move away from the capsule wall. Thus, there is undoubtedly a constant and multilateral relationship between the state of the parasite, the nature of its contents and the structure of the carrier capsule, which determines the peculiarities of the course of the pathological process in each case. Microbiological characteristics and amino acid composition of echinococcal fluid are of particular importance in this regard, taking into account the constant companions of echinococcus fungi of the genus *Paecilomyces*.

Hyaluronidase in fungi of the genus *Paecilomyces* from echinococci parasitized in the lungs of patients. We have found that echinococcosis of the lungs is often accompanied by pecilomycosis. With such combined diseases, we found for the first time that the vegetative form of the fungus, hyphae with mycelium, parasitizes in the echinococcal capsule. Apparently, fungi of the genus *Paecilomyces* perceive the chitinous shell of echinococcus and the fibrous capsule as soil in the surrounding nature, where the vegetative form of the fungus is widespread. The complication of echinococcosis with pecilomycosis has become an acute problem in surgery and veterinary medicine. The term "complication of echinococcosis with pecilomycosis" appeared. 35 lambs were taken under the experiment, which were infected with echinococcal eggs taken from donor dogs, 5 lambs with cenurosis, 5 with ovarian cysticercosis, 5 with alveococcosis, 5 with pecilomycosis, infected with material from patients and 5 lambs made up the control group. Before infection, pulse, respiratory movements, blood tests (leucoformula and ESR), determination of hemoglobin, sugar, phospholipids, protein and immunoglobulins were performed three times in lambs. Then the same studies were conducted every other day, on the 5th day and every 10 days. The lambs received 5,000 units of eggs inside. The eggs were asked once. Control and infected, distributed according to the principle of analogues. We studied the change in the concentration of phospholipids in experimental echinococcosis of lambs in combination with pecilomycosis. We have established the following results for the first time. Lambs who received antibiotics for a long time and did not take antifungal drugs were ill, cardiac symptoms appeared, fatigue, decreased motor activity, shortness of breath. There were toxic symptoms of heart damage. The general condition of the infected lambs was more severe compared to the control ones. The general condition of the infected lambs was more severe compared to the control ones. After a single infection with helminth eggs, large focal infiltrates of lymphocytes formed in the myocardium of

the heart, and later fibroblast proliferation occurred. Later, pronounced changes in myocardial cardiomyocytes were found, characterized by swelling and fragmentation of myofibrils. Significant destructive changes were found in the mitochondria, they were manifested by the destruction of the outer membrane, the disorganization of the crist. This explains the increase in phospholipids in the initial stage of the disease. However, after a month, structural changes in cardiomyocytes became less pronounced, which indicates compensatory functions of the body. From the general clinical indicators, persistent anemia was observed, in the leukocyte formula, along with monocytosis, lymphocytosis and eosinophilia were observed, ESR was within normal limits. As for the biochemical parameters, the total serum phospholipids were significantly increased in infected lambs, compared with control ones. Investigating the dynamics of the picture of the protein composition of blood in echinococcosis, pecilomycosis, cysticercosis, alveococcosis, it was found that the first contact of invasive larvae of helminths and spheres of fungi of pecilomyces to host tissues caused changes in the spectrum of blood proteins. The decrease in total protein was due to albumins and gammaglobulins, which indicates the suppression of protective humoral factors. Subsequently, a significant decrease and a return to the initial level was established. This is due to the mobilization of nonspecific gamma globulins, and with the growth of parasites, oppression occurs. Repeated increase is associated with the formation of specific gammaglobulins. Cytotoxins, which are products of tissue decay and cause the development of autoallergia, play a great role in the development of the pathological process in the tissues of the heart with helminthiasis. These observations allow us to conclude that with many helminthiasis complicated by pecilomycosis, morphological changes develop in the heart muscle of animals regardless of the migration path of larvae and the localization of helminths. The morphological picture in the heart during invasion is nonspecific and serves as a manifestation of allergic myocarditis, accompanied by alteration, necrosis of the walls of blood vessels and myofibrils, eosinophilic infiltration of tissue and degeneration of cardiomyocytes. According to the degree of myocardial damage, it significantly affects the severity of clinical manifestations and the outcome of diseases.

Conclusions

1. Pathological conditions of the lungs during therapy with anthelmintic drugs occur with an inflammatory reaction in this organ. At the same time, morphological manifestations are stereotypical in nature with a predominance of the reaction of the vessels of the microcircular bed and the formation of exudate. As a rule, the inflammatory reaction in the lungs is focal in nature and is associated with bronchitis. In addition, the consequence of acute venous fullness may be dystrophic and necrotic changes in lung tissue, as in the appointment of therapeutic doses of mebendazole, albendazole and increased doses of furazolidone. herefore, in the treatment of parasitic diseases, homeopathic preparations such as todikamp, chablin, chablin SK-1, irillen, obtained from various medicinal raw materials, were used. Homeopathic medicines began to attract the attention of surgeons and parasitologists. Structural changes that occur around a viable echinococcal bladder are not limited to the formation of a capsule, but also spread to the tissues adjacent to it.
2. Some quantitative differences in the amino acid composition of the echinococcal fluid of various morphological modifications have been established: for example, the echinococcal fluid of *E. acephalo-cys-ticus*, in comparison with other modifications of the parasite, contains

more cystine, glutamic acid, methionine, valine, and tryptophan, in the fluid of *E. veterinarum* – more histidine, arginine and aspartic acid.

3. Microorganisms have a significant effect on the amino acid composition of echinococcal fluid. In infected echinococcal fluid, the amount of histidine, arginine, glycine, threonine and phenylalanine is significantly increased, in bacteriologically sterile – glutamic acid. The microbiological characteristics and amino acid composition of the echinococcal fluid are of particular importance in this regard, taking into account the constant companions of the echinococcus of fungi of the genus *Paecilomyces*.

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