

# Dystrophic Changes in Echinococcus Cysts Complicated by Fungi of Aspergillus and Paecilomyces Genus

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**Abstract** **Relevance of the Research Problem:** To establish that fungi found in echinococcus are representatives of Paecilomyces genus. **Materials and methods:** The study of blood in animals on the content of Paecilomyces and micrometric study of hydatidic bubbles, presence of spherules of fungi and microflora hydatidic fluid. **Results.** In all tissues of hydatid bilayer capsule a marked necrotic reaction that in the three cases was the area of fresh necrosis was noted. Occurrence of eosinophilic reactions caused by parasite morphological modifications has not been established: it was found in one-third of capsules of parasites of all modifications. Only in infertile echinococcus a capsule contained considerably more of cellular elements. In bacteriological examination most diverse microflora was found in the fluid of dystrophically changed hydatidic cysts. Unlike viable cysts in half cases they contained monoculture and in half cases association of various microbes containing fungi. **Conclusion:** Contrary to the majority of researchers we established that echinococcus fluid contains microbial flora in 74% of cases including Aspergillus and Paecilomyces genus as well.

**Keywords** Echinococcus capsule, Paecilomyces, Fungi

## 1. Relevance of the Research Problem

Fungal diseases are a serious complication of echinococcus. Frequency of all kinds of complications of various echinococcus localization varies from 16.3 to 32.7% [3,6]. The results of morphological research received by the authors confirmed the existence of degenerative, necrotic and inflammatory processes in the chitinous membrane, total destruction of a germinal layer [1,4]. Along with the above pathological changes in morphological research, fungous mycelium - Aspergillus, infiltrating a chitinous membrane as a wood pattern were found and Paecilomyces genus fungi forming arachnoidal branchings in some cases were found [2,5,7].

## 2. Objective

In fundamental monographs by F.G. Nazyrov et al (1999, 2004 [1]) there was given the material of morphological researches of echinococcus from the operated sick people

where various forms of fungi which had an impact on cellular reaction around parasite cysts are clearly shown in the patterns. Unfortunately the authors did not aim at least to determine the genus of the fungi revealed in echinococcus. For the first time we established that fungi found in echinococcus are related to representatives of Paecilomyces genus.

## 3. Materials and Methods

At present we carried out blood tests of 74 animals with dystrophic changes of echinococcus and revealed spherules of Paecilomyces genus fungi in the blood of all animals. In the given announcement we provide the material of morphological study of 41 echinococcus cysts with signs of dystrophic process received from 41 sick animals. Paecilomyces genus fungi were revealed in all 41 animals echinococcus cysts and Aspergillus fungi in 7.

The sizes of cysts were 2×2 cm – 3,3×4 cm – 15, 4×4 – 12, 6×6 – 5, 10×10 – 2; Morphological modification: E. acephalocysticus – 19, E. veterinorum – 17, E. hominis – 5; localization in the lungs – 21, in the liver – 12, in the heart – 3, in a spleen – 1, in the brain – 1. Thickness of a chitinous membrane at dystrophically changed parasites and made up to 0.02 mm – in 4, up to 0.04 mm – in 4, up to 0.06 mm – in 2, 0.1 mm in one and up to 0.13 mm also in one cyst. In one microscopic out the chitinous membrane was absent.

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## 4. Results of the Study

Both in viable, and at dystrophically changed echinococcus cysts there was formed a capsule which in some cases had the morphological features: in 5 cysts it had single-layer, in 22 - two-layers and in 9 - three-layer structure.

One of single-layer capsules consisted of a necrotic layer 1 mm thick, one - of a layer of granular tissue no more than 1 mm thick, two - of the powerful fibrous layer which is in a condition of hyaline transformation, 1.5 mm thick.

Two-layer capsule in dystrophically changed echinococcus cysts occurs a little more often than in viable. Of 25 two-layer capsules 6 consisted of internal necrotic and external granular layers, 1.5 mm of general thickness on the average, at domination of a layer of a necrosis, at 10 capsules of inside necrotic and external fibrous layer which thickness in 3 capsules did not exceed 1 mm, in 5 - reached 1.5 mm and in 2 - 2 mm.

Thus, in both morphological versions of the two-layer capsule marked necrotic reaction which in three cases represented the area of fresh necrosis was noted: in one case - with the outcome in the organization, in two - with the outcome in a petrification, 10 with the outcome in hyalinoses the other 9 two-layer capsules had internal granular and external fibrous layers, without signs of necrotic reaction, with average thickness of 1.9 mm.

Of 8 three-layer capsules 7 had a usual arrangement of layers: the necrotic belt adjoined to parasite membranes, it was followed by granular and external fibrous layers. In one capsule the order of alternation of layers was broken: necrotic belt adjoined to parasite membranes, it was followed by a fibrous layer, and the last was granular which bordered on parenchyma of the organ.

Thickness of the three-layer capsule in 2 cysts was 1 mm, in 4 - 2 mm, in 2 - 2.5 mm. In three-layer capsules the outcome of a necrosis was well visible in the organization of connecting tissue (in 3 capsules), or in hyalinoses (in 5 capsules).

Micrometria of separate layers of the three-layer capsule yielded the following results: thickness of the necrotic layer up to 0.5 mm, is installed in 2 capsules, from 0.5 mm to 1 mm - 6, thickness of the granular layer from 0.5 mm - in 5, from 0.5 mm to 1 mm - in 2 from 1.0 to 1.5 mm - in one, thickness of a fibrous layer up to 0.05 mm - in 6, from 0.5 to 1.0 mm - in 2 capsules.

Thus, from 41 investigates dystrophically changed echinococcus cysts in capsules of 25 cysts necrotic reaction was marked as the inside necrotic layer making a considerable part of thickness of all capsule.

According to our observations formation of a fibrous layer in the capsule of echinococcus is more sharply marked at localization of a parasite in the lungs of animals. So, the fibrous layer in the capsule was found in 29 of 41 echinococcus and in 16 they were found in lungs and 13 - in the liver, heart, spleen.

Giant cell reaction in the capsule of dystrophically

changed echinococcus occurs a little more often than at viable; it is established in 25 of 41 studies capsules, including 6 - in the form of the single, seldom scattered cells and in 14 - in the form of extensive nested congestions. Rather more often giant cell reaction was noted at the single-layer and three-layer structure of the capsule (in half of cases) and is slightly more rare - in two-layer capsule (in one third of cases) as the lack of giant cells was noted in those morphological versions of the two-layer capsule where there was no necrotic layer.

Morphological modification of parasite apparently has some effect on giant cell reaction: it was in the capsule in 8 of 18 dystrophically changed echinococcus cysts of *E. acephalocysticus* modification, in 5 of 16 cysts of *E. veterinorum* modification, in 2 of 3 echinococcus cysts of *E. hominis* modification.

Eosinophilic reaction in capsules of dystrophically changed echinococcus occurs more often than in viable capsules. So, at the research of capsules of 41 dystrophically changed echinococcus it was noted in 19, including 12 in the form of seldom scattered single cells and in 7 in the form of separate congestions, at localization of a parasite in the lungs, in 3 - in the liver, in 3 - in a wall of the heart and in one - in the brain.

The dependence of emergence of eosinophil reaction on morphological of a parasite was not established: it was found in one third of capsules of parasites of all modifications.

At bacteriological research of dystrophically changed echinococcus cysts contents 7 turned out to be sterile and 34 contained various microbe flora. Therefore as it is possible to expect in the fluid of dystrophically changed echinococcus cysts microflora is contained more often than in the fluid of viable ones.

The infection in the contents of dystrophically changed echinococcus occurs equally often in large and small cattle. It does not also depend on localization of dystrophically changed echinococcus the infection is revealed in contents in 17 of 21 parasites found in the lungs, and 9 of 13 - being in a liver. The number of the infected tests of echinococcus fluid of *E. acephalocysticus* and *E. veterinorum* modifications approximately equal in 12 of 15 and in 12 of 16 accordingly, as for 3 dystrophically changed echinococcus of *E. hominis*, all of them contained in the infected liquid.

At bacterial research the most various microflora was found in the fluid of dystrophically changed echinococcus cysts. Unlike viable cysts in half of causes there was revealed monoculture and in another half - association of various microbes in them, containing fungi. In the fluid of 15 cysts, containing monoculture, staphylococci were found in 8, bacteria of colibacillus - 6, streptococci - in one; in the fluid of 15 cysts containing microbe associations, staphylococci with bacteria of colibacillus group in 6, staphylococci with bacteria of colibacillus group and streptococci - in 3, bacteria of colibacillus group with streptococci - in 2, staphylococci - in 2, bacteria of colibacillus group with microbes of protea group - in 2 and staphylococci with bacteria of colibacillus group and diplococci - in 2.

The histologic research of capsules of echinococcus cysts revealed some dependence of their structure of microflora of liquid contents. So, in the presence in contents of a cyst of staphylococcic pure culture necrotic reaction was noted, in 5 of capsules with a part of capsules having two-layer and a part three-layer structure.

The similar structure of capsules was noted at liquid infection of echinococcus cysts by staphylococcic bacteria of colibacillus group and microbes of group a protea and fungi of Paecilomyces genus. Thus, in all cases when in echinococcus fluid dystrophically changed echinococcus bacteria of colibacillus group were revealed whether in the form of a monoculture, whether in association with other microbes local tissue reaction was characterized by formation of necrosis.

For comparison of the structure of the capsules infected and sterile in the bacteriological relation of dystrophically changed echinococcus cysts we subjected them to histologic research of 7 dystrophically changed cysts containing fungi of Paecilomyces genus unlike a viable in 4 necrotic reaction was noted, and in 3 it was absent.

Around the capsule of both a viable and dystrophically changed echinococcus there is a local reaction extending to the tissue, adjacent to echinococcic cyst. In parasite localization in the liver sharply marked granular dystrophy of hepatocytes on the background of general anemia of tissue is always noted. Only in one preparation in the area surrounding the capsule there were visible vessels filled with blood, in two preparations – the extensive area of necrotic hepatic cells with cirrhosis phenomena and in two-multiple scattered round-cell infiltrates.

## 5. Conclusions

Results of studying of a larval echinococcus microbiology of echinococcus fluid properties of the microorganisms isolated from echinococcus fluid, morphological modifications of a parasite, the histologic structure of walls make it possible to draw the following conclusions.

Contrary to the approvals of most of researchers, we established that echinococcus fluid 74% of cases contains the microbic flora including fungi of Aspergillus genus and Paecilomyces. At the same time, as histologic researches of parasite membranes and walls of the capsules of echinococcus cysts testify, it can also be echinococcus fluid of quite viable parasite, as well as sterile echinococcus in the bacteriological relation can be contained in the echinococcus cysts with dystrophically changed and even lifeless membranes.

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