Microbiological examination of the meat of animals affected by echinococcosis

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Abstract. The purpose of our research was to monitor the safety and quality of slaughter products of cattle and small cattle obtained in the conditions of the Aktobe region. Under certain conditions, animal slaughter products can be a source of not only typical infectious and invasive diseases in humans (echinococcosis, cysticercosis, etc.), but also various food diseases, which include toxico-infections and toxicoses. Toxico-infections and toxicoses are a large group of mainly acute food diseases of people. The very names "food diseases", "food toxico-infections", "food toxicoses" indicate that the main role in their occurrence is played by food products. The consistency of the meat, the smell, the state of the muscles on the cut, the transparency and aroma of the broth, the pH of the meat of a healthy animal and a sick animal, the calculation of CMAFAnM, the amount of BGCP in 0.1 grams of the test product, the number of Salmonella bacteria in 25 g of the test product were determined. According to the results of the organoleptic examination, a conclusion was made about the freshness of the meat. Meat of cattle and small cattle, classified according to the results of organoleptic evaluation and bacteriological examination as meat of questionable freshness, is subjected to chemical and microscopic analyses. At present, with a variety of producing enterprises, various forms of ownership with a possible violation of technological production modes and violation of sanitary standards, poor-quality meat of cattle and MSS can enter the consumer market, which can become a source of various infectious and invasive diseases. Therefore, the quality expertise of this product group is very important and relevant.

1. Introduction

Nutrition in the entire history of mankind has always been and remains the most significant factor that has a permanent impact on the state of human health. In recent years, the problem of the safety of food raw materials and food products has become particularly relevant. The safety of food raw materials and food products is evaluated by the quantitative or qualitative content of anti-nutritional substances of microbiological, chemical and biological nature. It is known that many food products of plant and animal origin are able to accumulate environmentally harmful substances-contaminants from the environment and concentrate them in dangerous amounts [1].

Echinococcosis is a zoonanthropohelminthiasis that is caused by the tapeworm Echinococcus. This disease is characterized by severe destructive lesions of the liver, lungs, kidneys and other organs, as
well as serious complications, often leading to fatal outcomes. That is why the World Health Organization has included echinococcosis in the list of diseases that are subject to immediate eradication [1–3].

It is known that the main source of infection is carnivorous and agricultural animals, as well as fruits and vegetables affected by echinococcus. However, the role of meat products in the development of the disease at the moment remains ambiguous. Since, on the one hand, heat treatment of meat almost completely destroys the parasite, and on the other hand, meat obtained from sick animals can be a reservoir for pathogens of salmonellosis, listeriosis, escherichia coli and other diseases. As a result, there is a risk of food poisoning.

Currently, due to the increased consumption of meat products, the problem of veterinary assessment and quality is growing. The number of products infected with parasitic diseases is increasing. Parasitic diseases include protozoa, which are caused by pathogenic protozoa (amoebiasis, toxoplasmosis, malaria, etc.), and helminthiasis, they are also called helminthic infestations [4].

The most common invasions of productive animals include echinococcosis—a ubiquitous disease caused by the larval stage of the cestode Echinococcus granulosus [5].

Taking into account the above, we set a goal—to assess the probability of the presence of the causative agent of food diseases in meat products with echinococcosis.

2. Materials and methods

The research was carried out on the basis of the research and testing laboratory of Microbiology and Virology.

The study materials were the internal organs and muscles of small and large cattle affected by echinococcosis. The assessment of the freshness of meat was carried out using organoleptic and laboratory methods of research. Post-slaughter inspection of animal raw materials was carried out according to the generally accepted rules of veterinary and sanitary inspection of slaughter products and meat products.

In the following sequence: “Head: Examined, probed the oral cavity. The muscles of the upper and lower jaw, the mucous membrane (to determine cysticerci) in the heart were cut, then examined: the pericardial sac was opened. The middle shell - the myocardium and the inner shell - the endocardium were examined.

The lymph nodes of the slaughtered animals were examined. The spleen is not enlarged, the consistency is elastic, has a dark red color.

Dystrophic and necrobiotic lesions were noted in the liver. The lungs are enlarged in volume, red in color, heavier than normal, the pleura is smooth, and on palpation, blisters with fluid were found.

Carcasses of animals are infected with ecinococcosis, noted less developed muscles, weak development of the fat layer.

To study the microflora of meat and its quality, smears-prints were made. Single sticks and cocci were found in the preparations from the surface layer of lamb and beef. Microscopy of smears-prints from deep layers of meat of bacteria in the field of view was not found.

During the study of meat affected and not affected by echinococcosis, we found that the sample of muscle tissue was light red, slightly moist, normally drained of blood, and did not leave wet spots on the paper for filtering. The muscle tissue is dense, elastic, with a hole formed, if slightly pressed with your fingers, which instantly aligns, with a clean surface, sticky, has a specific smell that is characteristic of cattle meat.

The fat layer has a white color, a firm consistency, if crushed little crumbles. The tendon is elastic, dense, the surface of the joint is smooth, shiny. To determine the quality of the broth liquid, which was obtained from the meat of a healthy animal and an animal with echinococcosis, we conducted a cooking test according to GOST 7269-79.

It was found that the broth liquid obtained from the meat of a healthy animal was fragrant, transparent, fat droplets formed on the surface, and the broth liquid obtained from the meat of a sick animal was cloudy, with a small amount of fat. The water extract obtained from the meat of a healthy
animal and an animal with echinococcosis was filtered in the same way, but their filtrates were more transparent than the filtrate from the meat of a sick animal.

The pH of the meat of a healthy animal was about 5.94±0.07, and the pH of the meat of a sick animal was on average 6.22-6.47, which indicates that a microbiological analysis is necessary. When a high-quality reaction to peroxidase was performed, the extracts obtained from the meat products of healthy animals acquired a blue-green color, which after a while turned into a brown-brown, i.e., the reaction was positive. At the same time, the meat samples obtained from the sick animal were colored brown (the reaction was negative).

The contamination of all samples was determined using bacteriological methods. For the microbiological study, we used: Endo medium (for the isolation of enterobacteria), meat-peptone agar (for the calculation of CMAFAnM), Kliger medium (for the differentiation of gram-negative bacteria by their ability to produce hydrogen sulfide and ferment glucose and lactose) and blood agar (a special medium designed to isolate bacteria and establish their hemolytic activity).

In accordance with GOST ISO 7218-2011 "Microbiology of food and animal feed. General requirements and recommendations for microbiological studies" the study material was diluted in saline solution in a ratio of 1:9. Then, crops were sown on all the above-mentioned nutrient media. Petri dishes and culture tubes were placed in a thermostat and incubated at 37°C for 48 hours.

3. Results and Discussion.

The organoleptic parameters of the meat samples were evaluated on a 9-point scale.

So, during the cooking test, the broth from the meat of healthy animals was transparent, did not contain flakes, had a smell characteristic of meat broth and was rated at 9 points. Broth from meat samples from large and small cattle affected by echinococcosis was characterized by a slight turbidity, lack of flakes and a pleasant smell. Therefore, this sample was rated by us at 8.0 points.

The consistency of meat from healthy animals was elastic and very tender and was 9 points. Meat samples from animals affected by echinococcosis were characterized by sufficient elasticity and tenderness, so they were assigned 8.0 points.

The appearance, color and smell of meat samples from healthy and sick animals were normal, so these indicators were estimated at 9 points. All the results of the organoleptic evaluation are summarized in Table 1.

| Table 1. Organoleptic parameters of cattle meat and MS in echinococcosis |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                            | Beef                        |                            | Mutton                      |                            |
|                            | healthy (control).          | affected by echinococcosis.| healthy (control).           | affected by echinococcosis.|
| Cooking test               | The broth is clear,         | Light turbidity, no        | The broth is clear,          | Light turbidity, no        |
|                            | without flakes              | flakes                     | without flakes              | flakes                     |
| Appearance                 | On the surface of the meat there is a crust of drying, the surface color is pale red | There is a crust of drying on the surface of the meat, the surface color is pale red |
| View and color on the section | On the incision, the muscle tissue is slightly moist, and leaves almost no stains on the filter paper | On the incision, the muscle tissue is slightly moist, and leaves almost no stains on the filter paper |
| Consistency                | The consistency is elastic and dense | The consistency is elastic and dense |
| Smell                      | Aromatic, meaty             | Aromatic, meaty             |                            |                            |

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Scores of 9.8.7 were rated as "excellent", "very good" and "good", which meets the requirements for good-quality meat products. Based on the above, it follows that according to organoleptic data, the meat of animals with echinococcosis does not differ from the meat of healthy animals.

Microbiological analysis of meat samples was carried out according to the following indicators: determination of CMAFAnM, BGCP, the presence of salmonella and other foreign microflora, yeast and mold.

In the course of bacteriological studies of meat samples, BGCP, salmonella, yeast and mold were not detected, and the amount of CMAFAnM did not exceed the permissible standard values (Table 2).

| Normative microbiological indicators of chilled meat of | Beef | Mutton |
|---|---|---|
| large and small cattle | healthy (control) | affected by echinococcosis | healthy (control) | affected by echinococcosis |
| Number of KMAFAnM, CFU / g | 0,8×10³ | 0,9×10³ | 0,8×10³ | 0,9×10³ |
| The amount of BGCP in 0.1 g of the test product | not detected | not detected |
| The number of Salmonella bacteria in 25g of the test product | not detected | not detected |

4. Conclusion

Thus, the data obtained indicate that the samples of meat affected by echinococcosis fully comply with the requirements of SanPiN 2.3.2. 1078-01 "Food raw materials and food products. Hygienic requirements for the safety and nutritional value of food products. Sanitary and epidemiological rules and regulations".

Since no Salmonella and Escherichia coli bacteria were detected during bacteriological studies, it can be concluded that a low degree of animal invasiveness with echinococci does not affect the bacterial contamination of slaughter products of large and small cattle.

References

[1] Kotenko D V, Poroshin K V, Dovgan N B 2016 Features of veterinary and sanitary expertise of slaughter products in echinococcosis Almanac of World Science 5-1(8) 35-38
[2] Donnik I M, Sazhaev I M 2012 Distribution and generic composition of pathogens of helminthiasis and protozoonosis of pig-headed livestock organizations Agrarian Bulletin of the Urals 9(101) 10-13
[3] Karataeva D A 2018 Echinococcosis – as a world problem and ways to solve it Theory and practice of combating parasitic diseases 19 190-192
[4] Mamukaev M N, Lalaev V K, Daurov A A 2011 Epizootology of babesioses (piroplasmidoses) in the Tskhinvali region of the Republic of South Ossetia Izvestiya GGAU 48(1) 147-150
[5] Ivanyuk V P, Bobkova G N, Krivopushina E A 2020 Veterinary and sanitary examination of cattle slaughter products in helminthiasis Actual problems of veterinary medicine and intensive animal husbandry: materials of the national scientific and practical conference dedicated to the 82nd anniversary of the birth of the Honored Worker of the Higher School of the Russian Federation, Honorary Professor of the Bryansk State Agricultural Academy, Doctor of Veterinary Sciences, Professor Tkachev A. A. (Bryansk: Publishing House of the Bryansk State Agrarian University) pp 45-49