

ANNOTATION

**dissertation work of Kozhayeva Aigerim Romankyzy
on the topic «Clinical and pathomorphological aspects of coenurosis and
monieziosis of saigas in the Ural population» submitted for the degree of
Doctor of Philosophy (PhD) in the educational program
8D09101 – «Veterinary medicine»**

Relevance of the research topic. Saigas are unique relict animals that have survived to the present day and represent a «living fossil».

History has proven that Saigas are potentially vulnerable to poaching and at risk of mass mortality due to harsh winters and diseases of infectious etiology. Over the past 30 years, there have been 11 known mass mortalities, with an average of 34% of the population, or 18% of the total population.

Because in wildlife there are no reliable methods of lifetime diagnostics of infections and invasions, clinical and pathomorphological diagnostics in the first cases of animal deaths, as well as animals died for diagnostic purposes, provide diagnosis with a high degree of reliability.

Given the constant long-distance migration of the Ural saiga population, it is difficult to identify infected animals while they are still alive. Therefore, to determine the cause of their deaths, post-mortem examination of the animal and subsequent study of pathological and morphological changes in the internal organs and tissues of the dead animal is of paramount importance.

No less important and new to science is the study of hematological, histological, and morphological changes in the organism of helminth-infested saigas, as these parameters allow an assessment of the animal's condition and can be used to diagnose.

This dissertation study aimed to investigate the clinical manifestations, pathological and morphological changes, and hematological and biochemical blood parameters of saigas infected with coenurosis and monieziosis in the Ural population.

Research objectives:

1. To study clinical manifestations of coenurosis and monieziosis in saigas of the Ural population.
2. To study hematological and biochemical blood parameters of saigas infected with coenurosis and monioziosis.
- 3 Determine pathological and histological changes characteristic of saigas infected with coenurosis and monieziosis.
4. Develop measures to prevent helminthic diseases in captive saigas from the Ural population.

Materials and research methods. Research work was carried out at the Akboqen nursery located at the Ural Agricultural Experimental Station and in the habitat of the Ural saiga population.

A comparative study of the biochemical and hematological blood parameters of Ural saigas living in the wild and kept in the nursery was carried out to study and evaluate the population immunity of the animals. Blood parameters were determined on a URIT-2900 Vet Plus hematology analyzer. Serum biochemical parameters were counted on a Stat Fax 4500 analyzer (Awareness Technology, USA).

Saiga faeces were examined using the Darling method. Complete helminthological studies were carried out according to the method of K.I. Skryabin. Pathological and anatomical autopsies were performed according to the Shore method. Histological materials were stained with hematoxylin and eosin.

The main provisions for defense:

- The main clinical manifestations of coenurosis and monieziosis in saigas of the Ural population.
- Biochemical and hematological blood parameters of Ural saigas living in the wild and kept in the nursery.
- Biochemical and hematological blood parameters in saigas infected with coenurosis and monieziosis.
- Pathomorphological changes in internal organs and tissues of saigas infected with coenurosis and monieziosis in the Ural population.
- Veterinary and sanitary measures to prevent saiga helminthic diseases.

Description of the main results of the study. The quantitative values of individual parameters differed between wild and hatchery saigas. For example, the amount of total bilirubin was at least 2-fold higher in nursery saigas (5.55-11.54, 5.30-12.29), and the average value of amylase in the blood of nursery saigas was 7-fold higher (6.59-43.69, 7.41-44.56). The elevated amylase and total bilirubin in the blood of saigas from the nursery is probably due to captive feeding and is not a manifestation of serious pathological changes in the pancreas, liver, and biliary tract, as no infectious or invasive diseases were detected.

The slight difference in total protein values (63.2-70.5; 64.6-71.4) may indicate that saigas in the nursery have sufficient protein intake with feed, as do saigas in the wild.

Six blood parameters have been identified in saiga blood, which are indicators of animal body condition. In our studies, there was no significant difference in 4 blood parameters (erythrocytes, leukocytes, hemoglobin, and lymphocytes) between saigas in the nursery and in the wild.

However, elevated platelets (191.22-246.25; 183.34-218.29) and hematocrit (0.42-74.48; 0.43-73.58) were observed in nursery saigas. Elevated hematocrit in nursery saigas indicates polycythemia and lack of body fluids. Blood clotting may be a consequence of sedentary behavior in saigas, as saigas by nature must be constantly on the move. An increase in hematocrit can lead to saigas in the nursery becoming ill with thrombotic complications.

There are no significant differences in the quantitative indices of blood formation in the different age groups of saigas. There is only a difference in

segmented neutrophils, which are more elevated in saigas from 1 to 8 months of age and decrease by 9–12 months of age.

Clinical manifestations of coenurosis and monieziosis were studied by observing saigas in the Ural population on their migration routes using binocular video and photography, followed by post-mortem examination of the dead animals.

Thirty-seven saigas (12 males, 25 females) born in the last year were recorded on the migration routes of saigas infected with coenurosis, including 23 in Zhanibek district and 14 in Kaztalov district. The sick animals were removed from the natural environment and kept in the temporary isolation center of the Akboqen nursery (the Act of removal is attached).

Blood was collected from the jugular vein of 37 saigas infected with coenurosis to study hematological and biochemical parameters, and the dead animals were dissected for pathological and anatomical changes in organs and tissues.

The results showed a decrease in red blood cell count in diseased animals to 21.71%-16.48%, indicating anemia, and an increase in white blood cell count to 60.28%-84.86%, confirming the presence of an inflammatory process in the saiga organism. A decrease in hemoglobin levels to 61.54-43.64% indicates anemia, and an increase in basophils to 0.22-0.27% and eosinophils to 12.57-16.75% indicates the development of allergic reactions. The level of neutrophils in diseased and healthy animals was approximately the same. The level of lymphocytes increased to 0.99-1.40%, and monocytes to 23.14-25.40%, which may be due to the body's immune response to the invasion.

The results of biochemical studies of blood serum from saigas infected with coenurosis showed a decrease in magnesium to 1%-0.83%, phosphorus to 3.37-2.18%, and an increase in calcium to 8.57-11.89%, total protein 0.18-5.52%, and bilirubin 13.7-17.56%, which probably indicates disruption of metabolic processes and the development of dystrophic changes in the organism of diseased animals.

At postmortem examination of saigas that had died of infestation, coenural blisters were found in 7 saigas in the frontal brain, in the temporal brain in 28 saigas, in the occipital brain in 1 saiga, and in the cerebellum in 1 saiga.

Cerebral vesicles were located mainly in the right hemisphere of the brain, and there was acute cerebral edema and perivascular infiltration.

In the liver, pathological anatomical changes were manifested as hepatosis - parenchymatous granular dystrophy, a slight increase of the organ in volume, and detection of small whitish-yellow necrotic foci and mosaic coloration of the organ. Histologically, karyopycnosis, karyorrhesis, and karyolysis predominated in the nuclei of saiga liver cells. No pathological changes were observed in heart muscle or other organs.

The mortality of young saigas with signs of monieziosis was mainly recorded during the grazing period. When observed on the migration routes, saigas with monieziosis were lethargic, emaciated, and lagged the herd. Diarrhea, dehydration, and emaciation were noted in 5–to 6-month-old saigas.

The sick animals (167) were removed from the natural environment and kept in the temporary isolation ward of the Akboqen breeding facility (the Act of Removal is attached) for blood and fecal examinations. The dead saigas were examined for pathological and anatomical changes in internal organs and tissues.

The results showed a decrease in erythrocyte counts in sick animals to 21.7-14.3%, indicating anemia, and an increase in leukocyte counts to 60.2-66.2%, confirming the presence of inflammation in the saiga organism. A decrease in hemoglobin levels to 1.62-2.20% indicates anemia, and an increase in basophils to 0.22-0.35% and eosinophils to 12.57-17.56% indicates the development of allergic reactions. Decrease in neutrophils level in patients to 10.2-6.48% is indicative of immune system disorders. The level of lymphocytes increased to 10.02-9.63%, monocytes to 23.1-25.1%, which is probably related to the immune response of the body to invasion.

Biochemical studies of blood serum in saigas infected with monieziosis, compared with healthy animals, showed significant changes: in diseased animals, the percentage of calcium was reduced to 8.57–5.13%, total protein to 5.46–6.77%, urea to 27.7–22.9%, magnesium to 1-0.56%, and phosphorus to 3.37–2.72%.

Pathological and anatomical changes in saigas died by monieziosis were mainly observed in 2-3 month-old saigas and 5-6-year-old adult stock.

The corpses were emaciated, visible mucous membranes were anemic, musculature was pale and hydramic, and subcutaneous tissue was infiltrated, in some places strongly edematous. The small intestine was hyperemic, with pinpoint and banded hemorrhages, and the abundance of thick mucus, mesenteric, and mesenteric lymph nodes was swollen and enlarged.

The main pathological changes were characterized by damage to mucous membranes, lungs, liver, and kidneys, as well as swelling, redness, and accumulation of exudate in the abdominal cavity in the form of ascites. Enlargement of lymph nodes (lymphadenitis) and hemorrhagic hemorrhages in various organs were also detected.

Histologic examination of the duodenum revealed pronounced necrotic inflammation and significant pathologic changes in the form of lymphoid-histiocytic infiltration, mucosal atrophy, and cellular dystrophy.

During the research, the coordinates of saiga fecal sampling sites were noted, and the coordinates of the locations of invasive infestations in natural biocenoses were determined.

To prevent the mass spread of invasive diseases among saiga, measures have been developed to conduct comprehensive epizootological monitoring of parasitic diseases among saiga populations and farm animals in the saiga habitat.

Justification of the novelty and importance of the results obtained. New epizootological data on the distribution of coenurosis and monieziosis among the Ural saiga population were obtained. The boundaries of the unfavorable point and threatened zone (joint pastures, places of common watering) for the wide spread of

helminths among farm and wild animals were determined. A comparative study of biochemical and hematological blood parameters of saigas from the Ural population living in the wild and kept in the nursery was carried out. Clinical, pathomorphological, hematological, and biochemical parameters of the organism of saigas infected with coenurosis and monieziosis in the Ural population were studied.

1 utility model patent was obtained.

Relevance to scientific development directions or state programs. The dissertation research was carried out under the grant project AP09260294 «Complex methods of diagnostics of helminthiasis (coenurosis, monieziosis and echinococcosis) of saigas of the Uralsk population, development of an algorithm for preventive measures» for 2021-2023 (Registration No. 0121RK00191).

Description of the doctoral student's contribution to the preparation of each publication. The doctoral student mastered all research methods and actively participated in the discussion and publication of the results obtained.

In total, 16 scientific papers were published about the dissertation, including 3 articles in peer-reviewed scientific journals, included in the Scopus database, 6 in the publications recommended by the CCSES of the Ministry of Education and Science of the Republic of Kazakhstan, 4 - in the materials of international scientific-practical conferences. 2 recommendations were developed and published, 1 protection document of the Republic of Kazakhstan was received.

Scope and structure of the dissertation. The dissertation consists of an introduction, materials and methods, results of own research, generalization, and evaluation of research results, conclusion, and list of used literature, including 147 sources and appendices. The dissertation is outlined on 115 pages of computer text, illustrated with 13 tables, and 45 figures.