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HEMATOLOGICAL CHANGES IN THE BLOOD OF SHEEP INFECTED WITH PARABRONEMA SKRJABINI (NEMATODA: HABRONEMATIDAE)

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ABSTRACT

This article analyzes the hematological changes in the blood of sheep caused by nematodes affecting the digestive system of small ruminants. The study found a decrease in hemoglobin, erythrocytes, and total protein levels, while leukocyte counts increased. As a result, suppression of the immune system and a decline in productivity indicators were observed in the infected animals.

KEYWORDS: *Sheep, Nematode, Blood, Hemoglobin, Erythrocyte, Leukocyte.*

INTRODUCTION

Ruminants, including mammals, are one of the economically significant suborders. They are distributed from plains to mountainous regions and form an essential component of Uzbekistan's biodiversity and livestock sector.In Uzbekistan, among the parasitic nematodes affecting the abomasum and intestines of sheep, goats, cattle, camels, and other ruminants is *Parabronema skrjabini*, a species belonging to the family Habronematidae and the genus *Parabronema* Baylis, 1921. In recent years, this nematode has been frequently recorded and has caused significant economic damage to livestock production, leading to serious physiological changes in the organisms of ruminants (Abramatov et al., 2010). To date, cases of parabronemosis have been reported in several countries, including Egypt, Saudi Arabia, Iran, China, and Uzbekistan, where ruminant livestock have been infected with this disease (El-Azazy, 1990, 1995; Borji et al., 2010; Zhao et al., 2012; Anvari-Tafti et al., 2013). Different types of helminths cause varying levels of harm to ruminants by affecting their immune systems, leading to susceptibility to various viral and allergic diseases (Galimova et al., 2014; Dashinimaev et al., 2015; Kalugina et al., 2018; Kalugina et al., 2017; Kosminkov et al., 2021; Malakhov et al., 1982; Manko et al., 2011). Under the influence of helminths, the functions of organs and tissues are disrupted, pathological processes develop, and both the biochemical and morphological composition of the blood changes. Therefore, blood analysis plays a crucial diagnostic role in helminthic diseases (Fedorov et al., 2010; Fedchenko et al., 1970; Shul'gina et al., 2003).

According to the data by Simonyan G.A. and Khisamutdinov F.F. (1995), hematological research allows for the identification of the initial, vague clinical signs of diseases, predicts the risk of recurrence, and provides control over the course of therapy and pathological processes. Furthermore, blood analysis in parasitic diseases offers valuable information for determining immunoreactivity, etiology, pathogenesis, diagnostics, prognosis, and therapeutic intervention in animals (Simonyan et al., 1995).

In his studies, Volkov A.Kh. (2000) recorded significant changes in hematological indicators in infected bulls even in the absence of clinical signs. On the 30th day after invasion, hemoglobin levels decreased by 26.8%, erythrocytes by 11.1%, and the erythrocyte sedimentation rate (ESR) doubled. The number of leukocytes increased by 2.05 times. The leukocyte formula showed a shift toward juvenile and band neutrophils, while the number of lymphocytes decreased by 15.6% (Volkov et al., 2000).

Petrov F.Yu. and others (2009), in studies on 18-month-old bulls with mixed invasion, noted an increase in hemoglobin, erythrocytes, total protein, albumin, leukocytes, and gamma-globulins, along with elevated activity of the enzymes AlAT, AsAT, and α-amylase. The phagocytic activity of neutrophils against *E. coli* and *Staph. albus* was also recorded. The degree of these changes correlated with the intensity of the invasion (Petrov et al., 2009).

The Aim of This Research is to determine the hematological changes in the blood of small ruminants (sheep) infected with *Parabronema skrjabini*.

MATERIALS AND METHODS

The research material was collected during 2024–2025 in livestock and farming facilities in the Pop and Mingbulok districts of Namangan region, Fergana Valley, Uzbekistan. Samples were also collected from 17 slaughtered sheep at poultry farms located in Tashkent city. A total of 29 sheep were examined using complete and partial helminthological dissection methods (Skrjabin, 1928). Collected helminthological specimens were fixed in 70% ethanol solution. Their taxonomic classification was carried out based

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on morphological features according to the works of Ivashkin et al. (1981, 1989).

For blood sampling, sheep were fasted overnight, and blood was drawn in the morning from the auricular vein (posterior part of the ear) into EDTA.K3 vacuum tubes (3 ml) and red-top tubes (4 ml). Both the animals and the tubes were numbered sequentially [9].

RESULTS AND ANALYSIS

According to the helminthological investigations, among the 29 sheep examined from Namangan region (Pop and Mingbulok districts) and slaughterhouses in Tashkent, 11 sheep (37.9%) were found to be infected with the nematode *Parabronema skrjabini* (Table 1). Blood samples were taken from infected sheep numbered No. 3, 4, 8, 11, 16, 18, 24, 29, 30, 31, and 33.

Morphological Observations: *Parabronema skrjabini* (parabronemosis) is a pale red nematode possessing six cuticular hooks in the anterior part of its body. Males are 10–18 mm long, with a spiral-shaped tail. The unequal spicules measure 0.24–0.26 mm and 0.55–0.92 mm in length. The gubernaculum is very small and triangular. In front of the anal opening, there are four pairs of horn-like papillae and two pairs of suckers located behind it.

Females are 18–42 mm in length, with a tail measuring 0.12–0.20 mm. The vulva is located 4.4–7.2 mm from the anterior end.

Eggs measure 0.035–0.046 mm in length and 0.008–0.011 mm in width, containing thin-shelled larvae (see figure). These nematodes parasitize the abomasum of ruminants. This species feeds on the blood of large and small ruminants, primarily causing anemia in the host animals.

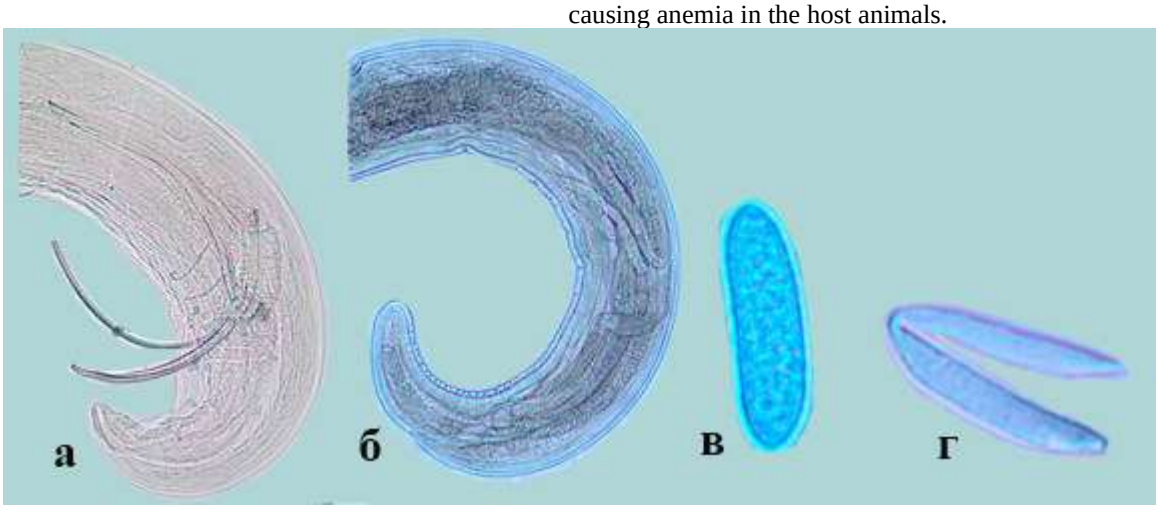


Figure 1. Parabronema skrjabini nematode: a) male; b) female; c) egg; d) larva (original).

The identified species *P. skrjabini* feed by attaching to the walls of the digestive tract of ruminants, consuming partially digested food.

Hematological Research Results

According to the hematological analysis, the average hemoglobin content in the blood of healthy sheep was 98.7 g/l, while in sheep infected with *P. skrjabini*, it decreased by 37.5 g/l.

Table 1. Hematological changes in small ruminants (sheep)

Parameter	Healthy sheep, n=3 (M±m)	*P. skrjabini*, n=3 (M±m)
Hemoglobin g/l	67,8-128,3, (98,7±3,8)	59,2-78,3, (61,2±2,4)
Erythrocytes $10^{12/l}$	8,2-11,3, (10,6±0,5)	6,1-8,1, (7,8±1,4)
Leukocytes $10^{9/l}$	6,2-12,7, (9,8±0,7)	15,4-19,7, (16,9±1,3)
Total protein g/l	62,3-78,6, (71,4±2,7)	49,3-78,4, (55,9±1,4)

The erythrocyte count in healthy sheep averaged 10.6×10^{12}/l, whereas in sheep infected with *P. skrjabini*, it decreased by 2.8×10^{12}/l. Leukocyte levels in healthy sheep were 9.8×10^{9}/l, while in infected sheep, they increased by 7.1×10^{9}/l. The total protein level in healthy sheep was 71.4 g/l, whereas in infected animals it decreased by 15.5 g/l.

DISCUSSION

Changes in blood parameters indicate a disruption of the immune system. An increase in leukocytes is typically associated with inflammatory processes caused by parasitic invasion (Yakubovsky M.V., 1997). According to V.S. Ershov (1968, 1985), during helminth ontogenesis, the host's immune system changes. The degree of immune resistance in helminth infections largely depends on the number and activity of the helminths entering the organism, the frequency of reinfection, and the physiological state of the animal (Ershov, 1985; 1968). A properly functioning immune system provides strong protection for the host. Its dysfunction can lead to various diseases. Among immune disorders, acquired secondary immunodeficiency is the most common. Parasitic infections are

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a major cause of secondary immunodeficiency (Shchurova, 2006).

CONCLUSION

Based on the results of the conducted study, it was determined that infection of sheep with *Parabronema skrjabini* leads to significant changes in hematological parameters, which may result in decreased immune function and productivity in the animals.

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