INFECTION OF SHEEP WITH INTESTINAL CESTODES IN UZBEKISTAN: EPIZOOTIOLOGICAL ANALYSIS, DIAGNOSTIC METHODS, AND EFFECTIVE PREVENTIVE MEASURES

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Abstract: This article examines the prevalence, seasonal and age-related variations, and epizootiological status of sheep infected with intestinal cestodes in the southern regions of Uzbekistan. According to the research findings, significant changes were observed in the spread of *Moniezia*, *Thysaniezia*, and *Avitellina* parasites. In recent years, *M. expansa* has become the most prevalent species, whereas *T. giardi*, which was previously dominant, has declined. The study compares the effectiveness of the Fullborn and sequential washing methods in diagnosing *Moniezia* infections. Additionally, practical recommendations on deworming methods, anthelmintic drugs, and seasonal preventive measures are provided. The research findings are crucial for developing effective strategies to control and prevent intestinal helminth infections.

Keywords: Sheep, intestinal cestodes, monieziasis, thysanieziasis, avitelliniasis, epizootiology, invasion extensiveness, invasion intensity, diagnostics, Fullborn method, deworming, anthelmintic drugs.

M. Mardiev, during his study of *Moniezia* infection in sheep in the southern part of Uzbekistan from 1964 to 1967, found that *M. benedeni* was more than twice as prevalent as *M. expansa*, similar to R. Khaitov's findings. He noted that sheep were most heavily infected with *M. expansa* in summer and with *M. benedeni* in autumn. According to him, the susceptibility to *Moniezia* infection increases with age in sheep.

M. Mardiev reported that among all intestinal cestodes, *T. giardi* accounted for 54.6%, *M. benedeni* for 23.7%, *M. expansa* for 17.4%, and *A. centripunctata* for 2.6% (totaling 98.3%). He later determined that *Thysaniezia* infection occurred year-round in sheep, with the highest prevalence in autumn (46.6%) and the lowest in summer (3.0%) and winter (4.7%). However, these figures lack consistency, as his dissertation abstract states that *Thysaniezia* infection in sheep was 4.06% in autumn, 0.3% in summer, 0.47% in winter, and 0.63% in spring.

According to the author, *Thysaniezia* infection first appears in lambs at four months of age but is more common in sheep aged seven months to two years. *M. benedeni* was found in all seasons, with an infection rate of 0.33% in winter and 2.13% in autumn. M. Mardiev's dissertation presents inconsistent data regarding the seasonal and regional

variations of *Moniezia* and *Thysaniezia* infections. For instance, in foothill-mountain zones, sheep aged one to two years had a higher prevalence of *Moniezia* than lambs under one year old, whereas in desert-pasture zones, adult sheep had an average *Moniezia* infection rate of 43.3%, which increased to 71.6% in autumn. Meanwhile, in the foothill-mountain zone, adult sheep had a lower *Moniezia* infection rate of 18.4% and *Thysaniezia* infection rate of 0.9%, but the factors influencing these differences were not clarified.

According to the author, in desert-pasture zones, the prevalence of *Moniezia* increases with age: 18.6% in sheep born that year, 24.5% in sheep up to two years old, and 45.3% in older sheep. However, in the foothill-mountain zone, lambs under one year old had a *Moniezia* infection rate of 28.9%, compared to 36.9% in two-year-old sheep, while the infection rate in adult sheep was lower (18.4%). Thus, *Moniezia* infection rates vary by age in different ecological zones. Similarly, *Thysaniezia* infection rates were more than twice as high in adult sheep (41.6%) compared to one-year-old lambs (18.3%) and sheep under two years old (18.6%) in desert-pasture zones. However, in the foothill-mountain zone, adult sheep had the lowest *Thysaniezia* infection rate (0.9%). These discrepancies suggest that the reported data do not accurately reflect the true epizootiological characteristics of *Moniezia* and *Thysaniezia* infections but instead introduce confusion.

Research was conducted on the intestines of sheep that had died from disease, were culled, or slaughtered for meat production. The examinations were carried out on-site or in the research laboratory of the "Veterinary Medicine and Pharmacology" department using the complete helminthological dissection method developed by academician K.I. Skryabin. All cestodes found in the intestines were washed with clean water and placed in special glass containers. The scolex, neck, and proglottids of each cestode, as well as the shape, size, and eggs or capsules in the mature segments, were studied using macroscopic and microscopic methods. After identifying their species, they were preserved in 70% alcohol or 3.0% Barbagallo solution.

Among the 22 sheep infected with monieziosis, 11 (50.0%) were affected by *M. expansa*, 7 (31.8%) by *M. benedeni*, and 4 (18.4%) were infected by both species. A total of 208 cestodes of both species were found in the infected sheep, with an average invasion intensity of 9.4 cestodes per sheep. The number of *M. expansa* specimens was 132, while *M. benedeni* accounted for 76.

In 17 sheep infected with thysanieziosis, 92 specimens of *T. giardi* were found, with an average invasion intensity of 5.4 per sheep.

In 20 sheep suffering from avitellinosis, 144 specimens of *Avitellina* were found in the small intestine, resulting in an average invasion intensity of 7.2 parasites per sheep.

These research findings indicate the presence of four intestinal cestode species in sheep in the Samarkand region. In terms of intensity, *M. expansa* ranked first, *A. senripunctata* second, *T. giardi* third, and *M. benedeni* fourth. This shows that, compared to previous studies (R.Kh. Khaitov, 1953; M. Mardiev, 1967; Sh.A. Azimov, 1974), the prevalence and ranking of these cestodes have changed. While *T. giardi*, which was previously the most common intestinal cestode (accounting for 47-54% of all cases), has now fallen to third place, *M. expansa* has moved from third to first place, and *A.*

cenripunctata, which was previously rare, has risen to second place. This suggests that the epidemiological characteristics of monieziosis, thysanieziosis, and avitellinosis in sheep have changed in recent years. Studies by B.S. Salimov, Sh.Kh. Kurbonov, and T.I. Tayloqov (2012-2013) indicate the emergence of new cestode species. Our own research (B.S. Salimov, Sh.Kh. Kurbonov, S.I. Khudayorova, M. Bolibekova, 2013) also confirmed the occurrence of new moniezia species alongside *M. expansa* and *M. benedeni*.

In a second experiment, five proglottids of *M. expansa* expelled from a lamb's rectum were examined. One of them (12 mm wide) was crushed on a glass slide, revealing hundreds of mature eggs. The *M. expansa* eggs were washed into a beaker and allowed to settle for 20 minutes. The surface water was pipetted off, leaving about 20 ml of sediment, which was then divided into 2 ml portions and mixed with fecal samples from parasite-free sheep in the university vivarium. These samples were placed into 10 beakers and mixed with 5-10 g of water, further diluted with about 150 ml of water, and filtered twice through fine mesh. Each beaker was labeled, and the suspension was transferred into corresponding 1-liter glass jars at different time intervals: The first sample was washed after 4 minutes, the second after 5 minutes, the third after 6 minutes, the fourth after 7 minutes, the fifth after 8 minutes, the sixth after 9 minutes, the seventh after 10 minutes.

The first sample took 20 minutes to prepare, the second 25 minutes, the third 30 minutes, the fourth 35 minutes, the fifth 40 minutes, the sixth 45 minutes, and the seventh 50 minutes. Each sample was examined under a microscope for 5 minutes, totaling 40 minutes for all samples. The results showed the number of *M. expansa* eggs in each sample: 4-minute washing: 31 eggs, 5-minute washing: 36 eggs, 6-minute washing: 41 eggs, 7-minute washing: 43 eggs, 8-minute washing: 46 eggs.

Sediments in 1-liter jars were left to settle. These sediments were transferred to 200 ml beakers and washed every 10 minutes. When the sediments became clear, they were examined under a microscope. The first beaker contained 11 M. expansa eggs, the second beaker contained 8, the third contained 7, the fourth contained 5, the fifth contained 6, the sixth contained 4, and the seventh contained 3 eggs.

Thus, when fecal samples were washed at 4-minute intervals, the first sediment contained 31 eggs, and the second contained 11 eggs. When washed at 5-minute intervals, 40 and 8 eggs were found; at 6-minute intervals, 45 and 7 eggs; at 7-minute intervals, 48 and 5 eggs; at 8-minute intervals, 52 and 6 eggs; at 9-minute intervals, 57 and 4 eggs; and at 10-minute intervals, 60 and 3 eggs.

A thorough examination of each fecal sample showed that when washing at 4-minute intervals, 73.8% of parasite eggs were detected; at 5-minute intervals, 83.3%; at 6-minute intervals, 86.5%; at 7-minute intervals, 89.6%; at 8-minute intervals, 90.5%; at 9-minute intervals, 93.4%; and at 10-minute intervals, 95.0%.

Thus, our research demonstrates that the sequential washing method of animal fecal samples is a valid diagnostic approach for monieziosis in veterinary laboratories.

Recommendations for Practice:

To prevent the spread of monieziosis and the infection of sheep by its causative agents, they should be dewormed in winter, spring, and autumn. During these seasons, it is advisable to administer anthelmintic copper and salt mixtures.

For treatment or prophylactic deworming against monieziosis, the use of Brontel Plus, Praziquantel, Albendazole + Closantel, or Fenbendazole is recommended. After deworming, sheep should be kept in an enclosure for at least 12–18 hours, following a 3–4 hour waiting period.

To determine whether monieziosis is spreading, declining, or completely disappearing in a particular area, it is necessary to analyze the changes in key abiotic factors through hydrometeorological and phenological observations.

Results: Research on the degree of intestinal cestode infection in sheep and its epizootological characteristics in the southern regions of Uzbekistan has shown the following results:

Monieziosis, Thysanieziosis, and Avitelliniosis are widespread diseases. In recent years, M. expansa has become the most significant epizootologically, while the spread of T. giardi has decreased.

The seasonal dynamics of monieziosis show that it peaks in spring and autumn, while the level of invasion decreases in summer. M. expansa is more common in spring and summer, whereas M. benedeni is more frequently observed in autumn and winter.

Comparison of the Diagnostic Efficiency of the Fyülliborn and Sequential Washing Methods

The diagnostic efficiency of the Fyülliborn and sequential washing methods was compared. While the Fyülliborn method provided accurate and rapid results, the sequential washing method was noted to be more cost-effective.

Regarding invasion intensity, monieziosis ranked first (50%), avitelliniosis second (32.2%), and thysanieziosis third (27.4%). In terms of invasion extensiveness, 50% of sheep infected with monieziosis were infected only with *M. expansa*, 31.8% were infected only with *M. benedeni*, and 18.4% were infected with both parasites. The prevalence of thysanieziosis and avitelliniosis has changed, with the previously widespread *T. giardi* decreasing in relative proportion, while *A. centripunctata* has moved to second place.

Discussion and Debate: A comparison of these study results with previous scientific sources indicates significant changes in the distribution of intestinal cestodes. *M. expansa* has become epidemiologically dominant, while *T. giardi* has declined, indicating changes in the ecological and epidemiological characteristics of intestinal parasites.

Additionally, the study identified the age and seasonal distribution of parasites. *M. expansa* was more prevalent in spring and summer, whereas *M. benedeni* was more common in autumn and winter. While these results partially align with previous studies, notable differences exist.

When comparing the diagnostic efficiency of the Fyülliborn and sequential washing methods, the Fyülliborn method stood out for its accuracy and speed, but the sequential washing method was found to be more cost-effective and useful for detecting trematodes as well.

The study revealed that lambs are the most vulnerable group to monieziosis. They become infected from the age of 1–2 months, with the highest disease intensity observed in spring and autumn. The extensiveness and intensity of monieziosis decrease with age, although some adult sheep also harbor parasites.

Conclusion: The study results indicate that intestinal cestodes, particularly monieziosis, thysanieziosis, and avitelliniosis, are widespread among sheep in Uzbekistan. In recent years, *M. expansa* has become the most epidemiologically significant species, while the previously widespread *T. giardi* has fallen to third place.

The seasonal dynamics of the disease are characterized by peaks in spring and autumn, with a relative decline in summer. While the Fyülliborn method has been confirmed as effective for diagnosis, the sequential washing method has been found to be more cost-effective and useful for detecting trematodes.

These findings serve as an important scientific basis for developing control strategies against intestinal cestodes in veterinary practice and for implementing effective preventive measures.

Future Research Directions:

Conduct an in-depth study of the population dynamics of intestinal cestodes and their dependence on ecological factors.

Use modern molecular methods (PCR, ELISA) to accurately identify intestinal cestode species.

Investigate the interaction mechanisms between the sheep immune system and intestinal parasites.

Test the effectiveness of new anthelmintic drugs and biopreparations against intestinal parasites.

Study the impact of climate change on the distribution of intestinal cestodes and develop an ecological monitoring system.

Develop comprehensive prevention and treatment programs for monieziosis, thysanieziosis, and avitelliniosis.

Conduct selective breeding programs to enhance sheep resistance to parasites.

These studies will contribute to the further development of livestock farming in Uzbekistan and improve the control of intestinal parasites in veterinary practice.

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