INFECTION OF SHEEP WITH INTESTINAL CESTODES IN UZBEKISTAN: EPIZOOTIOLOGICAL ANALYSIS, ECOLOGICAL FACTORS, AND PREVENTIVE MEASURES

Avezimbetov Shavkat
Samarkand State University of Veterinary Medicine, Animal Husbandry, and Biotechnology, Nukus Branch, Associate Professor
Bauaddinov Kamaladdin Karamaddinovich
graduate student
Azada Yakupbay qizi Khojamuratova
graduate student

Abstract: This article examines the infection of sheep with intestinal cestodes in the conditions of Uzbekistan, including the spread of monieziosis, thysanieziosis, and avitellinosis, as well as the degree of invasion depending on age and seasonal conditions. The results of the study indicate that the highest levels of monieziosis infection are observed in the spring and autumn seasons, while the degree of invasion decreases in summer. It has also been established that the activity of oribatid (soil) mites, which serve as intermediate hosts for monieziosis pathogens, depends on climatic conditions. The article provides recommendations for the diagnosis and prevention of monieziosis, as well as seasonal deworming and preventive measures based on the results of parasitological examinations.

Keywords: Sheep, intestinal cestodes, monieziosis, thysanieziosis, avitellinosis, epizootiology, invasion prevalence, invasion intensity, oribatid mites, ecological factors, diagnosis, deworming.

M. Mardiyev and R. Kh. Khaitov reported that M. expansa is most commonly found in spring, while M. benedeni is more frequently observed in autumn.

However, M. Mardiyev's study reveals an inconsistency: helminthocoprodiagnostic examinations show the lowest infection rate of monieziosis in spring and the highest in autumn. In contrast, helminthological dissection methods found that monieziosis and thysanieziosis were most prevalent in both studied zones during spring.

According to X. Jurayev (1972), in the desert pastures of the Kashkadarya region, an average of 32.0% of sheep were infected with both types of moniezia, with lambs under one year old showing an invasion rate of 96% for M. expansa and 92% for M. benedeni in spring. The monieziosis rate dropped to 10% in summer and even lower in winter. In adult sheep, monieziosis was less common, but the highest infection rates were observed in spring.

I. Kh. Ergashev (1973) studied monieziosis in sheep under Uzbekistan's conditions and found infection rates of 5.89% in winter, 6.26% in spring, 5.47% in summer, and 5.9% in autumn for M. expansa, and 6.15%, 8.35%, 5.0%, and 4.21%, respectively, for M.

benedeni. The highest overall invasion rate for both cestode species was observed in spring.

By analyzing different zones, it was found that in irrigated areas, infection with M. expansa occurred at rates of 11.0% in spring, 7.0% in autumn, and 8.0% in winter, with no recorded cases in summer. In adult sheep from these zones, M. benedeni was detected at the highest rates year-round, peaking in spring, while this parasite naturally disappeared from sheep in summer and was very rarely found in autumn. M. benedeni was detected in 28.6% of lambs and 4.7% of adult sheep.

In desert pastures, young sheep were primarily infected with moniezia in autumn and winter, while adults were more affected in spring and late autumn, with M. expansa being more prevalent compared to irrigated areas.

In foothill-mountainous zones, M. benedeni was rarely found in adult sheep, while young sheep were more commonly affected by this parasite.

The research was conducted on the small intestines of sheep that had died from disease, were slaughtered due to necessity, or were slaughtered for meat production. The study was carried out in the field and in the scientific research laboratory of the Department of "Veterinary Medicine and Pharmacology," using the method of complete helminthological dissection of internal organs 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 segments of the strobila of each cestode were examined separately using macroscopic and microscopic methods to analyze their shape, size, and the presence of eggs or capsules in mature segments. Once the species were identified, they were preserved in 70% alcohol or 3.0% Barbagallo solution.

Among the cestodes of this genus, Moniezia expansa (Rudolphi, 1810) and Moniezia benedeni (Moniez, 1879) are recognized as the main causative agents of monieziasis in small ruminants across many countries worldwide, including all CIS regions. N.V. Demidov (1987) considers M. expansa specific to sheep and M. benedeni specific to calves.

Additionally, in wild mammals such as deer and roe deer, Moniezia species (Koch, 1942) has been identified in Germany, Moniezia species (Massino et Demidova, 1949) in Kyrgyzstan, Moniezia rangiferina (Kolmakov, 1938), Moniezia baeri (Skrjabin, 1931), Moniezia taimerica (Semenova, 1966), Moniezia denticulata (Rudolphi, 1810), and Moniezia crucigera (Nitsch, 1866) Raillet, 1891 in Russia. In Russia, Moniezia species (Kulagin, 1919) and Moniezia species (Ruchljadev, 1948) were found in the European bison (zubr), while Moniezia species (Cameron, 1943) was identified in Canada.

Due to the absence of a digestive system, moniezia, like other adult cestodes, parasitizes the small intestine of its definitive host, exerting mechanical, toxic, allergic, and strong trophic effects. Monieziasis is a dangerous helminthiasis that causes significant economic losses in sheep farming.

Based on literature data and the study of certain key morphological characteristics of the collected cestodes, the species composition of monieziasis-causing agents was determined.

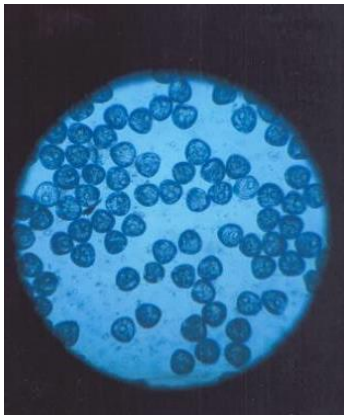
This research is being conducted under the supervision of Prof. B. S. Salimov, in collaboration with assistant professor and candidate of veterinary sciences Sh. X. Qurbonov.

The strobila of M. expansa can reach up to 10 meters in length, has a white, milky color, and consists of thick and robust segments. The segments are very short in length but wide when mature (8–18 mm). The uterus in mature segments is branched, with triangular eggs that have a pyriform apparatus. The genital pores are located on both sides of the segments. The intersegmental glands are ring-shaped and arranged in a single row along the lateral margins of the segments. The scolex is spherical, with four suckers. In our research, we found M. expansa with a strobila length of up to 6 meters and 50 centimeters in an 8-month-old lamb.

The strobila of M. benedeni reaches 4–5 meters in length and is milky-white or light yellow in color. Mature segments are 20–24 mm wide and are thinner and more delicate compared to those of M. expansa. The intersegmental glands are ribbon-shaped and are located in the middle of the lateral edges of each segment. The uterus is branched, with rectangular eggs that also possess a pyriform apparatus. The scolex has four suckers.

For both species, the neck is short, and segments begin to form rapidly, expanding in width as the strobila grows. In our study, we found M. benedeni with a strobila length of up to 4 meters and a width of 24 mm in lambs over one year old.

"Figure 2.2.2.1. Scolex, maturation, and terminal mature segments of M. expansa"



"Figure 2.2.2.2. Eggs of M. expansa"

"Figure 2.2.2.3. Mature segments of M. benedeni (center) and M. expansa (left and right)"

**Moniezia are biohelminths, and their larval development occurs in oribatid (soil) mites. The infection of animals with Moniezia and the contamination of oribatid mites with the oncospheres of these parasites depend on the activity of oribatid mites. This, in turn, requires sufficient soil and atmospheric humidity and temperature.

Oribatid mites belong to the class Arachnida, the order Acari, and represent an ecologically free-living group. They are found in all irrigated, foothill, and desert-pasture

biocenoses of Uzbekistan. Oribatid mites are widespread and reproduce abundantly in humid biotopes with high soil humus content.

Moniezia do not have a larval developmental stage in the external environment. The mature proglottids of adult cestodes in the intestines of animals detach and are excreted with feces. Due to the movement of these proglottids, the uterus ruptures, releasing larval eggs (six-hooked oncospheres) that adhere to the animal's feces. These eggs are ingested by the intermediate host of Moniezia—tiny soil-dwelling oribatid mites—which become infected with the larvae. The infection of oribatid mites with invasive Moniezia eggs depends on abiotic factors that enhance their activity, such as air and soil temperature, relative humidity, and oxygen availability. Within 85-100 days, the Moniezia larvae inside oribatid mites develop into cysticercoids, which are infectious to small and large ruminants. These larvae overwinter inside the mites and remain viable even in summer anabiotic conditions. Animals become infected with Moniezia when they ingest these mites along with green plants and soil. The parasites mature in the intestines of the host within 38-53 days and survive for 3-3.5 months.

For the intermediate hosts of Moniezia to become infected, the necessary ecological conditions mentioned above must be present. Similarly, for maximum transmission of the parasite to animals, the same abiotic environmental factors are required.

When the ground freezes, oribatid mites enter a winter anabiotic state and hibernate in deeper soil layers. During this period, Moniezia transmission to animals does not occur. At the end of winter and the beginning of spring, rising air temperatures and soil warming stimulate the activation of mites. With the emergence of fresh pasture grass due to precipitation, high humidity and temperature cause mites to undergo vertical migration and climb onto plant surfaces. Morning dew and rainfall in spring further increase mite activity, leading to a peak in Moniezia infection rates among animals.

As air and soil humidity decrease and temperature rises, sunlight exposure drives oribatid mites back into the soil, where they accumulate in slightly moist areas around plant roots. The unfavorable ecological conditions for the intermediate hosts of Moniezia significantly reduce the risk of infection in animals. This period corresponds to summer.

Moniezia are biohelminths, and their larval development occurs in oribatid (soil) mites. The infection of animals with Moniezia and the contamination of oribatid mites with the oncospheres of these parasites depend on the activity of oribatid mites. The activity of these mites, in turn, requires sufficient soil and atmospheric humidity and temperature.

Oribatid mites belong to the class Arachnida, the order Acari, and form one of the free-living ecological groups. They are found in all irrigated, foothill, and desert-pasture biocenoses of Uzbekistan. Oribatid mites are most abundant in moist biotopes rich in soil humus, where they actively reproduce.

Moniezia do not have a free-living larval development stage in the external environment. The mature proglottids of adult cestodes detach and are excreted with animal feces. Due to the movement of proglottids, the uterus ruptures, and the larval (six-hooked oncosphere) eggs inside it adhere to the animal feces. These eggs are then consumed by the intermediate host— oribatid mites, which become infected with the larvae. The infection

of oribatid mites with invasive Moniezia eggs depends on abiotic factors that increase their activity, such as air and soil temperature, relative humidity, and oxygen availability. Within 85–100 days after ingestion, the Moniezia larvae develop into cysticercoids, which become infectious to large and small ruminants. These larvae overwinter in the mite's body and can survive in an anabiotic state during the summer. Animals become infected by ingesting these mites along with green plants or soil. Inside the animal's intestines, the parasites mature in 38–53 days and live for about 3–3.5 months.

The transmission of Moniezia to animals requires the presence of the same abiotic ecological factors that influence the infection of intermediate hosts. Oribatid mites enter winter anabiotic states when the ground freezes and overwinter in deeper soil layers. During this period, Moniezia transmission to animals ceases. By late winter and early spring, as air temperatures rise and soil warms up, mites become active again. The emergence of green grass in pastures due to rainfall, along with increased temperature and humidity, triggers the vertical migration of mites, causing them to climb onto plant stems. Morning dew and precipitation in spring further increase mite activity. During this time, the risk of Moniezia infection in animals rises significantly. As air and soil moisture decrease, and temperature rises, mites migrate deeper into the soil and gather around moist areas near plant roots. These unfavorable ecological conditions in summer lead to a sharp decline in Moniezia transmission to animals.

In autumn, when precipitation increases, oribatid mites become active again, creating favorable conditions for Moniezia infection in animals.

Results:

Research conducted on the intestinal cestode infections of sheep in Uzbekistan has shown the following results:

Monieziosis, Thysanieziosis, and Avitellinosis are widespread, with invasion extensiveness and intensity depending on seasonal factors.

The highest prevalence of Monieziosis occurs in spring and autumn, while infection rates decrease in summer.

The distribution patterns of *M. expansa* and *M. benedeni* differ: *M. expansa* is more common in spring and summer, whereas *M. benedeni* is more prevalent in autumn and winter.

Oribatid mite activity significantly influences the spread of Monieziosis, with peak activity occurring in spring and autumn.

The prevalence of Thysanieziosis and Avitellinosis also exhibits seasonal variations, with an increased relative proportion of Avitellinosis noted.

Among diagnostic methods, the Fülliborn method was found to provide quick and accurate results, while the sequential washing method was more cost-effective and convenient for detecting trematode infections.

Discussion: When comparing the study results with previous scientific sources, certain changes in the distribution of intestinal cestodes were observed. *M. expansa* has become the dominant epizootiological species, while *T. giardi* has declined. This indicates changes in the ecological and epizootiological characteristics of intestinal parasites.

Seasonal variations significantly influenced parasite distribution. In spring and autumn, increased oribatid mite activity led to a higher risk of infection in lambs. During the summer, the invasion rate decreased.

When comparing the diagnostic efficiency of the Fülliborn and sequential washing methods, the Fülliborn method was noted for its precision and speed, while the sequential washing method was found to be economically efficient and useful for detecting trematodes.

The study revealed that lambs are the most susceptible group to Monieziosis. They become infected as early as 1–2 months of age, with peak infection intensity occurring in spring and autumn. The extensiveness and intensity of Monieziosis decrease with age, but in some cases, adult sheep were also found to harbor parasites.

The activity of oribatid mites, which is influenced by ecological factors, played a crucial role in the transmission of these parasites. Increased air and soil humidity led to heightened mite activity, which resulted in peak Monieziosis cases in spring and autumn. In summer, high temperatures and drought conditions caused mites to retreat into the soil, reducing their activity and the spread of the disease.

Conclusion: The study results indicate that intestinal cestodes, particularly Monieziosis, Thysanieziosis, and Avitellinosis, are widely prevalent among sheep in Uzbekistan. In recent years, *M. expansa* has become the dominant epizootiological species, while *T. giardi*, which was previously widespread, has now declined to the third position.

The seasonal dynamics of the disease are characterized by peaks in the spring and autumn months, while the invasion rate decreases relatively in the summer months. Although the Fullborn method has been confirmed as an effective diagnostic tool, the sequential washing method has been noted for its economic efficiency and usefulness in detecting trematodes.

These research findings serve as a significant scientific basis for developing strategies to combat intestinal cestodes in veterinary practice and for designing effective preventive measures.

Future Research Directions

1. A more in-depth study of the population dynamics of intestinal cestodes and their changes depending on ecological factors.
2. Accurate identification of intestinal cestode species using modern molecular methods (PCR, ELISA).
3. Investigation of the interaction mechanisms between the immune system of sheep and intestinal parasites.
4. Testing the effectiveness of new anthelmintic drugs and biopreparations against intestinal parasites.
5. Studying the impact of climate change on the distribution of intestinal cestodes and developing an ecological monitoring system.
6. Developing comprehensive prevention and treatment programs against monieziosis, thysanieziosis, and avitellinosis.

7. Conducting selection work to enhance the resistance of sheep to parasitic infections.

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

REFERENCES:

1. Абдиев Т, Сувонкулов У, Коваленко Д, Абдиев Ф, Арзиев Х. Распространенность гельминтозов в Узбекистане. Журнал проблемы биологии и медицины. 2014 Aug 15(3 (79)):2-3.

2. Абдиев ТА, Сувонкулов УТ, Куркина ТН. Лечение эхинококкоза и других гельминтозов. Инфекция, иммунитет и фармакология. 1999:4.

3. Dosumbetovich, A. S., Uli, A. D. M., & Abdusalim, A. (2023). QORAQOLPOQSTON SHOROITIDA MAYDA UY HAYVONLARIDA NEMOTODA KASALLIGINING TARQALISHI. *Scientific Impulse*, *1*(8), 43-47.4. Abatbaeva AM, Arziyev XY, Axmedov BN, Murodov XU. QARAQALPAQSTAN RESPUBLIKASÍ QUSSHÍLÍQ XOJALÍQLARÍNDA MAREK KESELLIGINIŃ JASQA BAYLANÍSLÍ DINAMIKASÍ: https://doi. org/10.5281/zenodo. 14223535. InInternational scientific and practical conference 2024 Nov 15 (Vol. 1, No. 1, pp. 165-169).

5. Reypnazarova NE, Murodov XU, Arziyev XY. QUSLAR JUQPALI LARINGOTRAXEIT KESELLIGINIŃ ALDIN ALIW HÁM EMLEW: https://doi. org/10.5281/zenodo. 14223230. InInternational scientific and practical conference 2024 Nov 15 (Vol. 1, No. 1, pp. 149-153).

6. Yuldashevich AK, Salomatovich TM, Ogli OD, Kizi AA, Amangeldiyevna MG. THE ROLE OF DEWORMING IN THE HEALTHY CARE OF HORSES. European International Journal of Multidisciplinary Research and Management Studies. 2022 Sep 30;2(09):85-9.

7. Arziev KY, Togaymuradov MS, Allamurodov BP, Abdusamadov AA, Khudoyberdiev BK, Yusupov NB. The Role Of Anesthesia In The Prevention Of Cenurosis. The American Journal of Veterinary Sciences and Wildlife Discovery. 2021 May 12;3(03):1-7.

8. Arziev KY, Rasulov SM, Togaymurodov MS. Blood Indications In Echinococcosis Of Large Horned Animals. The American Journal of Veterinary Sciences and Wildlife Discovery. 2021 Feb 27;3(01):9-15.

9. Абдиев Т, Сувонкулов У, Салимов Б, Вахобов Т, Арзиев Х. Научные основы профилактики эхинококкоза. Журнал проблемы биологии и медицины. 2016 Nov 14(4 (91)):200-2.

10. Абдиев Т, Саидахмедова Д, Сувонкулов У, Качугина Л, Вахобов Т, Абидов З, Арзиев Х. Клинические аспекты хронической посттравматической головной боли у детей и подростков. Журнал проблемы биологии и медицины. 2015 Nov 14(4, 1 (85)):8-9.

11. Erimov Sirijiddin Farhodovich, Djumaboev Abdurasul Baxt ugli, & Son of Mirzabekov Miyirbek O'mirbek ugli. (2023). «QUYON OTODEKTOZI»NING BIOMORFOLOGIK XUSUSIYATLARI, UNING SISTEMATIKADAGI O'RNI,

LABORATORIYA DIGINOZI. *Intent Research Scientific Journal* , *2* (6), 132–140. https://intentresearch.org/index.php/irsj/article/view/

12. Farxodovich, E. S. (2023). DIXROSELIOZ QO`ZBARCHI SISTOGONİYASI PROGRESSIYASI BOSHQACHINING BA'ZI BIOLOGIK XUSUSIYATLARI. *Intent Research Scientific Journal* , *2* (10), 70-77.

13. Erimov, S. F., Erimov, F. F., & Jumaniyozova, J. M. (2024 yil, noyabr). GASTROFILYOZ-OTLAR (EQUUS FERUS CABALLUS) HAVFLI ENTOMOZ KASALLIGI: https://doi. org/10.5281/zenodo. 14222253. *Xalqaro ilmiy-amaliy anjumanda* (1-jild, 1-son, 95-110-betlar).

14. Shakilov, U. N., Erimov, S. F., & O'ktamov, A. A. (2024, November). ATLAR GASTROFILYOZI QOZǴAWTIWSHILARINA EKOLOGIYALIQ FAKTORLAR TÁSIRI: https://doi. org/10.5281/zenodo. 14219999. In *International scientific and practical conference* (Vol. 1, No. 1, pp. 78-84).

15. Erimov, S. F., Erimov, F. F., & Jumaniyozova, J. M. (2024, November). QORAQALPOG'ISTON RESPUBLIKASI ARID IQLIM SHAROITIDA OTLAR GASTROFILYOZI: https://doi. org/10.5281/zenodo. 14222297. In *International scientific and practical conference* (Vol. 1, No. 1, pp. 110-116).

16. Shakilov, U. N., Erimov, S. F., & O'ktamov, A. A. (2024, November). GASTROFILYOZ KESELLIGI QOZǴAWTIWSHILARINA ANTIGELMINT DÁRI ÓNIMLERI TÁSIRI: https://doi. org/10.5281/zenodo. 14220032. In *International scientific and practical conference* (Vol. 1, No. 1, pp. 84-88).

17. Farhodovich, E. S. (2024). OTLAR GASTROFILYOZI QO 'ZG'ATUVCHILARIGA EKOLOGIK OMILLAR TA'SIRI. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *56*(5), 186-191.

18. Farhodovich, E. S. (2024). GASTROFILYOZ KASALLIGI QO'ZG'ATUVCHILARIGA ANTIGELMINT DORI VOSITALARI TA'SIRI. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *56*(5), 181-185.

19. Erimov, S. F., Erimov, F. F. va Djumaniyazova, J. M. (2024). GASTROFILOZ OTLARNING XAVFLI ENTOMOSIK KASALLASI (EQUUS FERUS CABALLUS). *DUNYODA TA'LIM, FAN VA INNOVATSIYA G'OYALARI* , *56* (5), 174-178.

20. Erimov, S., Erimov, F., & Jumaniyozova, J. (2024 yil, noyabr). QORAQALPOG'ISTON RESPUBLIKASIDA QURG'OQ IQLIM SHARTLARIDA OTLARNING GASTEROFILOZI. *TIBBIYoT, FAN VA TA'LIM BO'YICHA XALQARO KONFERENTSIYADA* (1-jild, No10, 63-70-betlar).

21. Erimov, S., Erimov, F., & Jumaniyozova, J. (2024). GASTROFILOZ-OTLAR (EQUUS FERUS CABALLUS)-HAVEN ENTOMOSIS. *Pedagogika fanlari shakllanishining nazariy jihatlari* , *3* (19), 127-133.

22. Farxodovich, E. S., & Arislanbek o'g'li, A. I. (2023). ARALSEEBUCHTDA QO'YLARNING ORIENTOBILGARSİOZI EPIZOOTOLOGIYASI. *Intent Research Scientific Journal* , *2* (10), 106-114.

23. Dauletabaev, N. P., & Tajimuratov, Q. (2024, November). YIRIK SHOXLI MOLLARDA PODODERMATIT KASALLIGINING ETIOPATOGENEZI, TARQALISHI VA UNI DAVOLASH: https://doi. org/10.5281/zenodo. 14222207. In *International scientific and practical conference* (Vol. 1, No. 1, pp. 102-105).

24. Dauletboev, N. P. (2024). Turli xil tabiiy sharoitlarda kurkalarning tug'ruqdan keyingi ontogenez davrida oyoq suyaklari va mushaklarining morfometrik xususiyatlari adabiyotlarni ko'rib chiqish. *Fan va innovatsiyalar* , *3* (Maxsus 47-son), 698-701.