FASCIOLOSIS IN CATTLE IN UZBEKISTAN AND KARAKALPAKSTAN: EPIZOOTOLOGICAL FEATURES, PATHOANATOMICAL CHANGES, AND DIAGNOSTIC METHODS – A COMPREHENSIVE STUDY

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Abstract: This article analyzes the epizootology, invasion intensity, and pathoanatomical changes of fasciolosis in cattle across nine regions of Uzbekistan and the Republic of Karakalpakstan, based on research conducted over 15 years. Studies indicate that in the foothill-mountain zones, the prevalence of fasciolosis in cattle averages 64.5%, with an invasion intensity of 42 parasites. Age-based indicators show that the number of parasites averages 33.6 in one-year-old cattle, 42.2 in two-year-olds, and 42 in older cattle. In Samarkand region, the average prevalence of fasciolosis is 43.7%, with an invasion intensity of 95.5 parasites, highlighting the dominance of F. gigantica as the primary causative agent.
Additionally, the article compares these findings with research conducted in Russia, Chechnya, and other countries, discussing the development of fasciolosis and similar helminthic diseases, diagnostic methods, and clinical-pathoanatomical changes. Based on the results of this study, scientific recommendations have been developed for rapid diagnosis, prevention, and treatment plans. The findings are of significant relevance in improving local veterinary practices and enhancing the quality of beef products.
Keywords: Fasciolosis, cattle, epizootology, invasion intensity, *Fasciola hepatica*, *Fasciola gigantica*, pathology, diagnostic methods, Uzbekistan, Karakalpakstan.

Introduction: In the foothill-mountain zone, 64.5% of cattle were found to be infected with fasciolosis, with an average invasion intensity of 42 parasites. In sheep, this rate was slightly lower. The invasion intensity in calves under one year of age was 62.5%, in animals aged 1–2 years, it was 71.1%, and in older cattle, it was 62.8%. The average invasion intensity was 33.6 parasites in one-year-old cattle, 42.2 parasites in two-year-olds, and 42 parasites in older cattle.

In this zone, fasciolosis infection rates are highest in winter across all age groups. However, in one- and two-year-old animals, infection rates peak in autumn. Calves in the foothill-mountain zone were first observed to be infected with fasciolosis at 3–4 months of

age. In the irrigated zones, younger forms of fasciolosis are more prevalent in cattle compared to those in the foothill-mountain zone, with their numbers decreasing between August and December.

Epizootological Characteristics of Fasciolosis in Cattle in Samarkand Region: In studying the epizootological characteristics of fasciolosis in cattle in Samarkand region, **Z.A. Azimov** determined that the average invasion rate in the region is **43.7%**. The average invasion intensity in Samarkand region was **95.5 parasites**, with **¾ of them belonging to** *Fasciola gigantica*.

The proportion of *F. gigantica* among the fasciola species found in different districts of Samarkand region was as follows:

- Oqdaryo district – 66.0%,
- Bulung‘ur district – 53.7%,
- Jomboy district – 34.2%,
- Payariq district – 75.4%,
- Ishtikhon district – 91.1%,
- Narpay district – 71.3%,
- Paxtachi district – 64.2%,
- Samarkand district – 12.3%,
- Urgut district – 7.3%.

Thus, *F. gigantica* was identified as the dominant causative agent of fasciolosis in Kattakurgan, Ishtikhon, Payariq, Narpay, Oqdaryo, and Paxtachi districts.

According to S.A. Baryukova, the prevalence of fasciolosis and paramphistomosis in cattle in Vologda region ranged from 6% to 29%. The average annual invasion extensiveness was 56%. The author also noted that calves born during the current year were observed to become infected as soon as they started grazing.

Analysis of the Epizootic Situation of Helminth Infections: According to the author and a group of co-authors analyzing the epizootic status of helminth infections, the invasion extensiveness (IE) of fasciolosis in the **lowland and foothill-mountain zones of the Republic of Dagestan** ranged from **3.3% to 20%** (with an invasion intensity (II) of **3–56 parasites**). In the case of **dicrocoeliosis**, the **IE ranged from 46.6% to 50%**, with an **II of 78–3100 parasites**.

In the Kabardino-Balkarian Republic, the average infection rate of dicrocoeliosis was 28.3%, while in 11 districts of the Chechen Republic, it averaged 32.8%.

Methods Section: Acute and mixed forms of fasciolosis with high invasion intensity pose a serious threat (**B.S. Salimov, Sh. Avezimbetov, et al.**).

In small ruminants, fasciolosis progresses in three stages. In cattle and other animals, it usually manifests in chronic and mixed forms.

The acute form of fasciolosis develops rapidly due to the massive invasion of adolescariae into the animal’s body. During the developmental stage of young *Fasciola* parasites, acute hepatitis occurs, leading to severe hemorrhaging in the liver. As a result, the mucous membranes of the eyes become pale. The animal’s body temperature rises to

41.0–41.6°C, the heart rate increases to 160–180 beats per minute (tachycardia), and respiration becomes rapid and shallow. Other symptoms include bloody diarrhea, constipation, bloating, restlessness, and convulsions. In sheep, the abdominal area begins to sag, and the reaction to external stimuli decreases. If specific and symptomatic treatment is not applied, the animal's condition rapidly worsens, leading to sudden death.

Additionally, Vishnyauskas' flotation method is used for diagnosis. In this technique, 1 gram of feces is placed in a mortar, 40–50 ml of water is added, and the mixture is stirred using the mortar pestle. The suspension is filtered through a metal sieve into a glass container up to 100 ml. The pestle and sieve are washed multiple times, adding 50–60 ml of water each time, with a total of 100 ml of water used in the process.

The resulting filtrate (100 ml) is left to settle for 5 minutes. After settling, the supernatant is carefully removed or decanted, leaving 20 ml of liquid along with the sediment at the bottom of the container. 8 ml of water is then added to the sediment, and it is left to settle for another 5 minutes.

Next, the supernatant is removed, and the remaining 10 ml is transferred into a centrifuge tube and spun in a centrifuge for 1 minute at 1500 rpm. After centrifugation, the supernatant is removed, leaving only the sediment. Zinc sulfate solution is then added to replace the removed liquid.

The tube is filled to the top, and a cover glass is placed over the opening, ensuring it touches the liquid surface. The tube is then centrifuged again for 0.5 minutes at 1500 rpm. During centrifugation, eggs adhere to the cover glass, which is then placed onto a glass slide and examined under a microscope.

It is important to distinguish fasciolosis eggs from paramphistomid and dicrocoelium eggs. *Fasciola* eggs are dark yellow in color, densely filled with yolk cells.

Fasciola hepatica eggs measure 0.13 × 0.14 × 0.07–0.09 mm.

Fasciola gigantica eggs are larger, reaching up to 0.16 × 0.10 mm.

Paramphistomid eggs are similar in size to *Fasciola* eggs but are light gray in color. The yolk cells inside occupy only a portion of the egg. *Dicrocoelium* eggs, on the other hand, are small, dark brown, and contain an embryo with shimmering "eye spots".

When an animal dies, its liver is examined by a complete helminthological dissection to detect young and mature *Fasciola* parasites.

Young *Fasciola hepatica* range from 1.0 mm to 18.0–19.0 mm in length.

Young *Fasciola gigantica* range from 1.0 mm to 28.0–29.0 mm in length.

The young stages of both species are white and milky in appearance and lack fully developed eggs in their uteri.

Adult *Fasciola hepatica* measures 20–40 mm in length and has a leaf-like shape.

Adult *Fasciola gigantica* measures 40–75 mm in length and has an elongated body shape.

For a definitive diagnosis, clinical signs, epizootiology, and pathological changes must be carefully analyzed. The final confirmation is made through a coprological examination (fecal analysis), where *Fasciola* eggs are detected microscopically.

It is essential to differentiate fasciolosis eggs from paramphistomid and dicrocoelium eggs:

Fasciola eggs are dark yellow and densely filled with yolk cells.

Fasciola hepatica eggs: 0.13 × 0.14 × 0.07–0.09 mm

Fasciola gigantica eggs: up to 0.16 × 0.10 mm, making them larger.

Paramphistomid eggs are light gray, and yolk cells occupy only part of the egg.

Dicrocoelium eggs are small, dark brown, with a shimmering "eye spot" embryo inside.

Upon an animal's death, its liver undergoes a full helminthological dissection to identify both young and mature *Fasciola* parasites.

Results Section: Diagnostic Methods for Detecting Trematode Infections in Animals

To determine the presence of trematode infections in livestock, the following diagnostic methods are used:

Helminthoovoscopy Method: This method involves sequential washing of approximately 5 g of fecal samples taken from the animal's rectum. The process is carried out as follows:

Each fecal sample is placed into a 150–200 ml glass or plastic cup.

5–10 ml of water is added, and the mixture is stirred using the lower part of a test tube or a specially prepared wooden stick.

If analyzing sheep fecal pellets, they should be crushed before adding water for better efficiency.

Another 100–150 ml of water (depending on cup size) is added, and the mixture is stirred again.

To remove food debris, the mixture is filtered through a fine wire mesh with 0.15–0.20 mm diameter holes into another cup.

If necessary, this process is repeated twice.

The filtered mixture is left undisturbed for 5 minutes, allowing sediments to settle.

3/4 of the liquid is carefully poured off, leaving only the sediment.

More water is added, and after another 5-minute settling period, the excess liquid is poured off again.

This step is repeated until the sediment becomes clear.

After 3–4 minutes, the upper part of the sediment is discarded, and the remaining sediment is transferred to a large glass slide.

The sample is examined under a microscope using an ocular lens (7–10x) and an objective lens (8x).

Under the microscope, trematode eggs are identified based on their size, shape, and color, allowing for differentiation between various trematode species.

This method is used to diagnose fascioliasis, paramphistomiasis, dicrocoeliasis, eurytremiasis, and hastilesiosis in livestock. Additionally, it is used to detect prosthogonimosis, notocotylidosis, and echinostomatidosis in poultry.

Discussion Section: The mollusk species Lymnaea auricularia, L. bactriana Hutton, and L. subdisisjuncta Nev, which are widespread in the Republic of Karakalpakstan, have been recorded as intermediate hosts of Fasciola gigantica in other regions of Uzbekistan and Turkmenistan [24.25.95.112.143]. These mollusks are now more commonly found in irrigation water structures and rice fields rather than in lakes. As a result, among all trematodes, F. gigantica remains significant in Karakalpakstan, and the fascioliasis it causes continues to be an important disease in terms of etiology and epizootiology.

Based on the current distribution status of trematodes and trematodoses in Karakalpakstan, the following conclusions can be drawn:

Due to the environmental crisis caused by the Aral Sea disaster, the species composition, population, and geographical distribution of trematodes in Karakalpakstan have changed drastically.

The drying up of lakes, swamps, and wet pastures has led to the disappearance of several previous endemic foci of trematodoses. In previously disease-prone areas, the epizootic process of diseases caused by currently existing trematodes (such as orientobilharziasis and paramphistomatosis) has significantly weakened due to various abiotic and biotic factors.

Post-Mortem Findings in Cattle Infected with Fascioliasis: The necropsy of cattle that died from fascioliasis revealed the following observations:

The overall physical condition of the animal remained unchanged, and depending on the feeding conditions, the cattle could be either emaciated or well-fed.

In acute parenchymatous fascioliasis, the fat in the meat appears yellowish. However, in the chronic stage, once F. gigantica enters the bile ducts and gallbladder, the fat color returns to normal—yellow in older or emaciated animals and white in young or well-fed animals.

Lung Changes

In acute fascioliasis, black spots are observed in the lungs, with sizes ranging from 30 mm to 100 mm.

As the disease progresses into the chronic stage, these spots disappear, and no significant lung changes are detected.

Liver Changes

The most significant changes occur in the liver, particularly in the acute stage of fascioliasis.

The liver enlarges, and in severe cases, its size can increase threefold.

A distinct color change is observed in the liver.

Upon careful examination, small perforations are found on the liver parenchyma, and when pressure is applied, a serous-blood fluid oozes out.

This fluid can accumulate up to 0.5 liters in the abdominal cavity.

The excessive proliferation of juvenile fasciolae in the liver causes extensive perforation of the liver membrane, which ultimately leads to the animal's death.

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