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## **THE SPREAD OF FASCIOLIASIS OF SHEEP IN THE CONDITIONS OF THE WEST KAZAKHSTAN REGION**

### **ANNOTATION**

Animal husbandry is the second most important branch of agriculture, the development of which is significantly hindered by infectious and invasive diseases of farm animals. Flukes, including fascioliasis, cause great damage to livestock. The study of trematodes at different stages of development is of great theoretical as well as practical importance in solving the problems of fighting fascioliasis. Observation methods are determined and organized primarily by the biology of the parasite, the life cycle of which includes many links and is related to the environment. To study the current situation with fascioliasis, it is necessary to conduct regular monitoring of this invasion by general methods among animals.

The main experimental and statistical data on the current epizootic situation of fascioliasis of ruminants in the West Kazakhstan region were obtained from the territory of the Terekty district. The collection of statistical and invasive materials was carried out at animal disease control stations and slaughterhouses. Thus, coprological studies revealed that the extensiveness of helminthiasis in sheep was 40.8%, the intensity of invasion was  $34.4 \pm 2.6$ . Helminthological autopsy of 158 sheep of different ages revealed that 60 of them were infected with fascioliasis. Many water sources create favorable conditions for the life of various mollusks, which serve as an intermediate in the development of fascioles and cause the spread of the disease. The results of veterinary and sanitary reports and research show that fasciolosis is registered in sheep all year round.

**Key words:** *fascioliasis of sheep, coprological studies, extensiveness and intensity of invasion*

Introduction. Fascioliasis – helminthiasis, occurring with damage to the hepatobiliary system and characterized by a long-term chronic course. The pathogens are the trematodes *Fasciola hepatica* and *Fasciola gigantica*. At the stage of puberty, fascioles parasitize humans and many herbivorous animals, including sheep, goats, cattle, less often pigs, horses, dogs. The lifespan of fascioles in humans reaches 10 years or more, in animals – 3-5 years.

*Fasciola hepatica* – liver fluke (common) has a flat leaf-shaped body measuring 20–30x8-12 mm. The front part of the body is covered with spines and elongated into the proboscis. The oral and abdominal suckers are located on it. The mouth opening on the corresponding suction cup leads to the pharynx and further into the esophagus, from which two branches of the intestine with a large number of branching lateral processes depart. Following the abdominal sucker in the front part of the body is a rosette-shaped compact uterus, the loops of which are filled with eggs. Next are the branched ovaries and testes. Liver fluke eggs have dimensions of 0.13– 0.145x0.07-0.09 mm. They are yellowish-brown in color and have a cap and a thickening of the shell at the poles.

*Fasciola gigantica* is a giant fluke. Its dimensions are 33–76x5–12 mm. The eggs of the giant fluke are brown in color, the dimensions are 0.15–0.19 x 0.075–0.09 mm. Helminth eggs are released into the environment with the feces of invaded animals and humans. In water or moist soil, a larva covered with cilia, a miracidium, is formed in an egg for 4-6 weeks. When it enters the water, it invades the mollusk or dies if it does not penetrate this intermediate host within 8 hours. In the body of

a mollusk, complex development and reproduction of larval generations of helminth occur, ending with the formation and release into the water of a cercaria larva with a tail. The tail of the cercaria soon disappears, a special secret is released, enveloping the larva and forming a closed capsule around it. An encapsulated larva is called an adolestarium. The larva is fixed on the underside of aquatic plants. Infection of humans and final host animals occurs through water, edible grasses growing in reservoirs, on wet or irrigated lands, as well as through greens, vegetables and fruits washed with water contaminated with fasciole larvae. In areas with an abundance of shallow reservoirs with standing water, as well as in hot humid climates, the risk of infection increases [1-4].

According to medical and veterinary statistics in Kazakhstan, fascioliasis is currently a widespread helminthic disease and one of the most massively registered zoonoses. According to veterinary reports, an average of 9-11% of animals infected with fascioles are found at meat processing plants during the slaughter of productive animals in Kazakhstan. Parasitization of the *F. hepatica* trematode in the animal's body allows viruses and bacteria to penetrate into the tissues of organs. In combination, they lead to mixed diseases and death of the animal. Fascioliasis of horned animals is widespread in various climatic zones of our country. The prevalence of fascioliasis of animals in Kazakhstan was reported by K.I. Scriabin [1], S.N. Boev [2], B.K. Kasymbekov [3]. According to Kasymbekov B.K. [3], cattle are often infected with the trematode *F. hepatica*, which has a high degree of invasiveness. Many researchers report that the infestation of animals with fascioles can reach from 18 to 50% or more.

According to Karmaliev R.S. [4] in the conditions of Western Kazakhstan, fascioliasis of cattle and small cattle is a very common disease caused by two types of fascioles: *F. hepatica* and *F. gigantica*. The results obtained by this author during the post-slaughter study of the liver of cattle show that the greatest invasion of fascioles was observed in December, the least - in March.

Of course, it is impossible to achieve a significant reduction in the incidence of fascioliasis by preventive deworming of productive animals, since they are not carried out regularly and massively. The timing of deworming of animals in each natural and climatic zone is different and is based on the peculiarities of the biology of the fasciola, the peculiarities of the development of its intermediate host and local production conditions of animal husbandry (the beginning of grazing, the duration of the pasture season, the amount of precipitation). Sometimes the above aspects contribute to the reproduction of small pond mollusks, the development of fasciole larvae in them and the occurrence of acute infection of animals with trematodes. Based on the above, it is noted that the existing preventive measures and antifascial drugs are not effective enough. By themselves, these methods do not completely cure animals of parasitic diseases.

The purpose of this article is to study the invasion of fascioles by sheep in the conditions of Western Kazakhstan (according to coprological studies and post-slaughter diagnostics).

Fasciola causes an inflammatory process, which is a consequence of both mechanical action and tissue irritation by toxins, acts depressingly on the functions of the digestive system, suppresses the protective functions of the animal's body, which facilitates the penetration of pathogens of other etiologies (viruses, bacteria, protozoa) and promotes combined diseases [5,6,7].

Analysis of the literature data shows that fascioles invasion is quite common in the territory of Western Kazakhstan and requires constant monitoring, taking into account the economic consequences [4]. In recent years, for a number of reasons, economic and economic changes have been taking place in agriculture, which have had, among other things, a significant impact on the spread of fascioliasis of farm animals. Based on the above, it is of considerable interest to study the extensiveness and intensity of fasciogenic invasion and to clarify various factors affecting the infection of *F. hepatica* sheep in Western Kazakhstan.

Fascioles, despite parasitizing in the liver and bile ducts, reduce the productivity of farm animals and cause significant economic damage [7,8,9,10].

Although several studies on helminthiasis were conducted earlier in Western Kazakhstan, this is the first work on the epizootology of fascioliasis in the Terekta district. Therefore, the relevance of the topic is acute.

The spread of fascioliasis, changes in their quantitative dynamics are influenced by climatic factors: air humidity, temperature, sunlight, the height of pastures. It should be noted that the average annual precipitation in this region is 90-335 mm. The main indicators correspond to the months of

April-May. There are also several water pools in this area, each of which is a favorable environment for the spread and development of the disease.

As a result of studies conducted in the Terekty district, it was found that two types of fascioliasis pathogens live in this area: *Fasciola hepatica* and *F. gigantica*. According to literary sources, it is known that the stages of development of these helminths are carried out with the participation of intermediate and additional hosts [10,11,12,13].

According to H. G. Nurkhametov, D. A. Yenikeev (1997), two types of fasciol - fasciol *hepatica* and fasciol *gigantica*-parasitize domestic animals and humans on the territory of our country [14]. According to studies conducted on the territory of the Republic of Kazakhstan, during fascioles, corpses of animals were exhausted, there was a pronounced hardening of the skin, baldness. During the pathoanatomic examination of internal organs, they noted an increase in the liver, the cut surface of which was yellow-brown in color, and the lobule was well visible due to the growth of interstitial connective tissue. When cutting the bile ducts, young and sexually mature fascioles were found. In sick animals, the rate of bone growth and development decreased. There was a decrease in the strength of compact bone tissue, thinning or complete loss of the bone septum. Changes in the circulatory system of bone tissue were found, in which the osteon system is covered with thin-walled and strongly flattened endotheliocytes [3,4,13].

Novobilský A, Höglund J (2015) found destructive changes in the liver, peripheral nervous system, and pituitary gland, which are the leading organs of the endocrine system, in patients with fasciolosis of sheep. With fascioles in cows, significant histological changes are observed in the structure of neurons, nerve fibers, neuroglia, blood vessels of spinal nodes and solar plexus. In the body of sick animals, there was a decrease in the level of afferentation and a violation of Mineral Metabolism. The similarity and difference between the clinical parameters of cows with enzootic osteodystrophy and secondary osteodystrophy in fasciol is proved [15,16,17].

In various natural and climatic zones, ecological parasitic systems of fasciolic-dicroceliosis invasion operate. In most cases, dicrocelia, parasitized by fascioles in the liver of animals, has a severe pathological effect on the animal's body [18,19].

Buffoni L. (2012), Zafra R (2013 a,b), Yap HY, Smooker PM (2016), Almeida MS(2003) during mono-invasion and Myxtinvasia, deep changes in the functions of organs and systems occur as a result of mechanical action, toxic effects of parasites and activation of pathogenic microorganisms. This, in turn, leads to an allergic state of animals, which are significantly lagging behind in growth and development, milk productivity decreases, and the biological value and quality of meat deteriorates.

As noted by Maggioli G, (2011), trematodosis affect the quality of meat, which is accompanied by atrophic and dystrophic changes at the cellular level. In myxtinvasia with trematodes, the acute process is characterized by pronounced edema and catarrhal-hemorrhagic inflammation of the duodenum and pyloric part of the stomach. In a sick animal, the papillae of the pancreatic mucosa are exposed and atrophied [20,21,22,23,24,25].

At the initial stage of migration of young fascioles, focal parenchymal hepatitis occurs. In the parenchyma of the liver, during the migration of fasciol larvae, winding dark red wires are formed, 0.5-1 cm long, bordered by a gray belt. The liver is enlarged, tuberous, dense consistency, unevenly greenish-brown in color. The organ capsule is slightly thickened [26]. Externally, the section shows thick, winding yellow-white wires of the dilated bile ducts. Their walls are thickened, with a cartilaginous consistency, containing a semi-liquid greenish-brown mass with sexually mature fascioles, the number of which reaches several tens and hundreds of specimens. With severe infestations, there is peritonitis, ascites, and sometimes severe abdominal bleeding. Acute catarrhal enteritis in the intestines, the stool is liquid, slightly colored with bile.

Shelyakin I. D. together with the co-authors noted that the wall of the bile ducts is thickened. In certain parts of the epithelium, there are periods of destruction, sometimes death. There are separate bile ducts, where there is an increase in connective tissue. Therefore, with fasciolosis of animals, deep destructive processes that affect the functional state of the liver are identified. First of all, there is a reaction of the macrophage system of the body, which is manifested by infiltration of the liver parenchyma with lymphocytes, macrophages and plasma cells. At the same time, foci of hepatocyte necrosis appear. Also in people F. there are data on the development of acute pancreatitis in hepatica infection [8; 21].

In recent years, the literature has been enriched by numerous works on the treatment of animals and the prevention of fascioliasis [26,27]. Many anthelmintics have been proposed for

fascioliasis. Some of them (hexychol, dertil, bithionol, etc.) are quite effective against mature fascioles, while others (acemidophene, etc.) are effective against young trematodes. Nevertheless, many drugs used for deworming of animals with chronic fascioliasis have a number of significant drawbacks (they reduce milk yields, require compliance with a special regime during treatment, often cause complications and death of animals), which dictates the need for further research of more effective and harmless drugs for animals.

In the world literature, the problems of epizootology of fascioles, the biology of the pathogen, pathological morphology, pathogenesis, therapy and prevention of trematode invasion are covered quite fully. It can be noted that fascioliasis, as a zoonosis, is subject to global monitoring on a global scale. At the same time, priority is given to the dynamic study of the problem of regional pathology and ecology of invasion in different types of agricultural and wild animals. In numerous works by K.I.Scriabin [13], Kasymbekov [3], et al. The problems of *F. hepatica* biology, epizootology, therapy and prevention of this invasion are reflected in a comprehensive manner. According to these authors, the parasitic system of *F.hepatica* has five levels of biological protection, which guarantees the 9 epizootic manifestation of fascioliasis in agricultural and wild animals [28]

Studies by Buffoni L [28,29] showed a gradual slight decrease in the degree of fasciole infestation in both cattle and sheep and goats, which, according to the author, is due to planned deworming. However, recent studies have shown that despite climate change, the severe epizootological situation of fascioliasis persists in the European part. Acute outbreaks of fascioliasis were also recorded in the Far East, in the flood zones of 2013 - 2014 [29]. In European countries, animal fascioliasis is also found with high IE parameters, reaching up to 47-69% on individual cattle farms [30]. In the literature, we have not found information about the spread of fascioliasis in the West Kazakhstan Region, which confirms the need for such studies.

**Materials and research methods.** The research was conducted in 2019-2020 in villages located along the left bank of the Ural River. A coprological study of 374 sheep heads was conducted, and post-slaughter liver and gallbladder samples were taken from 158 sheep heads. Fecal samples from 374 heads of sheep of different ages were taken from private farms along the Ural River (Akzhaik village 87 heads, Aksogym village 69, Aksuat village 76 heads, Tonkeris village 58 heads, Dolinsky village 46 heads, Uzunkol village 38 heads) and a coprological study was conducted by the Vishniaukas method. Animal fecal samples were examined by sequential washing to account for the number of eggs in a drop of the test liquid. The research was carried out every month for a year. The dynamics of infection of sheep with *F. hepatica* trematodes was studied in farms of the West Kazakhstan region on the basis of the results of veterinary and sanitary examination (helminthological autopsies of the liver and gallbladder (according to K.I. Scriabin, 1928) [13]. Fascioloid invasion in the liver of sheep was recorded and examined at the slaughter station, then, by conducting a veterinary and sanitary examination, the identified fascioles were fixed in 70% ethyl alcohol and Barbagallo liquid.

**Results and its discussion.** According to the results of a coprological study, fasciolosis is very widespread in the Terekti district, in rural districts along the Ural Rivers and Lake Shalkar. 374 samples were subjected to coprological examination and the results are presented in the following table (Table 1).

Table 1 – Infestation of sheep *Fasciola hepatica*

Rural district	Examined	Invaded	Invasion extensity (IE), %	Invasion intensity (AI), in 1 gram of feces
Akzhaik	87	39	44,8	38,6±2,8
Aksogym	69	33	47,8	41,8±3,2
Aksuat	76	35	46,1	40,7±3,2
Tonkeris	58	22	37,9	31,3±2,4
Dolinsky	46	18	39,1	32,4±3,0
Uzunkol	38	11	28,9	21,6±1,8
Total	37,4	158	-	-
Average indicator	-	-	40,8	34,4±2,6

According to the results of a coprological study, 87 heads of sheep were examined in the village of Akzhaik, of which 39 sheep had fasciole eggs, respectively, IE is 44%, II is 38.6±2.8 pieces, and in the village of Aksogym out of 69 sheeps studied, 33 sheep had fasciole eggs, IE 47.8%, II-41.8±3.2 pieces. Of the studied 76 sheeps in the village of Aksuat, infection of 35 sheep with fascioles was revealed, IE - 46.1%, II - 40.7 ± 2.2 pcs., in Tonkeris – 22 infected heads were found in 58 sheeps, IE-37.9%, II-31.3 ± 2.4.

Table 2 – Results of post-slaughter examination (*Fasciola hepatica*)

Rural district	Examined	Invaded	Invasion extensity (IE), %	Invasion intensity (II), in 1 gram of feces
Akzhaik	38	13	34,2	7±0,42
Aksogym	27	12	44,5	8±0,39
Aksuat	34	16	47,1	9,7±0,49
Tonkeris	19	6	31,6	5±0,44
Dolinsky	21	8	38,1	3±0,36
Uzunkol	19	5	26,3	6±0,38
Total	158	60	-	-
Average indicator			36,9	6,3±0,41

The liver and gallbladder of 158 sheep removed from the slaughterhouse were examined. According to Table 2, in the village of Akzhaiksky, the ducts of the liver and gallbladder were examined in 38 heads, fascioles were found in 13 of them. That is, it turned out that IE-34.2%, II-7 ± 0.42 pcs., and in the village of Aksogym, out of 27 sheep heads examined after slaughter, 12 heads were infected with fascioliasis (IE - 44.5%, II-8 ± 0.39 pcs.). In Aksuat village, fasciol was found in 16 heads of sheep from 34 post-slaughter examined (IE-47.1%, I-9 = 0.49 pcs). Of the 19 sheep studied in the village of Uzunkol, 6 were infected (IE - 31.6%, and - 0.44 pcs). In Dolinsky S.O. 8 infected sheep out of 21 were found, respectively, IE-38.1%, II - 3 ± 0.36 pcs.

**Conclusion.** Thus, in the course of coprological studies, it turned out that in sheep the intensity of helminthiasis was 40.8%, the intensity was 34.4 ± 2.6. During an incomplete autopsy of 158 sheep heads of different ages, it was revealed that 60 of them were infected with fascioliasis. And the IE indicator reaches 36.9%, and the II indicator is 6.3 ± 0.41 pcs. According to the results of post-slaughter examination of the liver and gallbladder, out of 158 heads of sheep of different ages, 60 heads were infected with fascioles. The rate of invasion is IE-36.9%, and II - 6.3 = 0.41 pcs. Numerous water sources create a favorable environment for the life of various aquatic snails. And they, in turn, serve as an intermediate for the development of fascioles and provoke the spread of the disease.

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## **ТҮЙІН**

Мал шаруашылығы-ауыл шаруашылығының екінші маңызды саласы, оның дамуы ауылшаруашылық жануарларының жұқпалы және инвазиялық ауруларымен айтарлықтай тежеледі. Трематодтар, соның ішінде фасциолез, малға үлкен зиян келтіреді. Дамудың әртүрлі кезеңдерінде трематодтарды зерттеу үлкен теориялық, сондай-ақ фасциолезге қарсы күрес мәселелерін шешуде практикалық маңызы бар. Бақылау әдістері ең алдымен паразит биологиясымен анықталады және ұйымдастырылады, оның тіршілік циклі көптеген тізбектерді қамтиды және қоршаған ортамен байланысты. Фасциолезбен қазіргі жағдайды зерттеу үшін жануарлар арасында жалпы әдістермен берілген инвазияға үнемі мониторинг жүргізу қажет.

Батыс Қазақстан облысындағы күйіс қайыратын жануарлардың фасциолезі бойынша ағымдағы эпизоотиялық жағдай туралы негізгі эксперименттік және статистикалық деректер Теректі ауданының аумағынан алынды. Статистикалық және инвазивтік материалдарды жинау мал ауруларын бақылау станциялары мен мал сою орындарында жүргізілді. Осылайша, копрологиялық зерттеулер қойдағы гельминтоздың таралу жиілігі 40,8%, инвазия қарқындылығы  $34,4 \pm 2,6$  құрады. Әр түрлі жастағы 158 қойдың гельминтологиялық жарып тексеру нәтижесі олардың 60-ы фасциолезбен ауырғанын анықтады. Көптеген су көздері әртүрлі былқылдақденелілердің тіршілігіне қолайлы жағдай жасайды, олар фасциолалардың дамуының аралық буыны болып табылады және аурудың таралуын тудырады. Ветеринариялық-санитариялық есептер мен зерттеулердің нәтижелері қойларда фасциолез жыл бойы тіркелетінін көрсетеді.

## **РЕЗЮМЕ**

Животноводство - вторая по важности отрасль сельского хозяйства, развитие которой существенно сдерживается инфекционными и инвазионными заболеваниями сельскохозяйственных животных. Трематоды, в том числе фасциолез, наносят большой урон домашнему скоту. Изучение трематод на разных стадиях развития имеет большое теоретическое, а также практическое значение в решении задач борьбы с фасциолезом. Методы наблюдения определяются и организуются в первую очередь биологией паразита, жизненный цикл которого включает множество звеньев и связаны с окружающей средой. Для изучения современной ситуации с фасциолезом необходимо проводить регулярный мониторинг данной

инвазии общими методами среди животных. Основные экспериментальные и статистические данные о текущей эпизоотической ситуации по фасциолезу жвачных животных в Западно-Казахстанской области получены с территории Теректинского района. Сбор статистических и инвазивных материалов проводился на станциях контроля болезней животных и скотобойнях. Таким образом, копрологические исследования выявили, что экстенсивность гельминтоза у овец составила 40,8%, интенсивность инвазии -  $34,4 \pm 2,6$ . Гельминтологическое вскрытие 158 овец разного возраста выявило, что 60 из них были инвазированы фасциолезом. Многие водные источники создают благоприятные условия для жизни различных моллюсков, которые служат промежуточным звеном в развитии фасциол и вызывают распространение болезни. Результаты ветеринарно-санитарных отчетов и исследования показывают, что у овец фасциолез регистрируется круглый год.

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## ТҮЙЫҚ СУМЕН ҚАМТАМАСЫЗ ЕТУ ҚОНДЫРҒЫЛАРЫ ЖАҒДАЙЫНДА ӨСІРІЛЕТІН БЕКІРЕ БАЛЫҚТАРЫНЫҢ STR-ЛОКУСТАРЫ БОЙЫНША ПОЛИМОРФИЗМІН БАҒАЛАУ

### Аннотация

Акваөсірудің тұрақты дамуы үшін өндірістік жағдайларға неғұрлым бейімделген, өнімділігі анағұрлым жақсартылған балықтарды шығаруға және құнды балық түрлерінің генетикалық әртүрлілігін сақтауға бағытталған селекциялық-генетикалық жұмыстарды жүргізудің өзектілігі артып келеді. Бұл мақалада бекіре балықтарының ДНҚ-ның 7 микросателлиттік локусы бойынша полиморфизмін бағалау бойынша зерттеулердің