

**The Balkans Scientific Center of the
Russian Academy of Natural Sciences**



1st International Symposium:

**Modern Trends in Agricultural
Production and Environmental
Protection**

PROCEEDINGS

**Tivat-Montenegro
July 02-05.
2019.**

**The Balkans Scientific Center of the
Russian Academy of Natural Sciences
Belgrade**

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PARAMISTOMIDAE SPECIES IN SMALL RUMINANTS IN SERBIA

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ABSTRACT

Paramphistomatidae are the most important trematods of rumen and reticulum in ruminants. They elapse their maturity period in rumen and reticulum and have no changes in these organs and risk for host. But there are larval forms of these trematods in small intestine while generate pathologic changes there. During study about helminthes of small ruminant at Serbia were performed in period between 2009 and 2019. After histological determination, we concluded that occurred paramphistomided belonging to the species *Paramphistomum cervi* and *Paramphistomum microbotrium*. *P. cervi* has been found in sheep and cattle in Serbia, but during our examination *P. cervi* and *P. microbotrium* was first time occurred at goats.

Key words: paramphistomidae, small ruminants, *Paramphistomum cervi*, *Paramphistomum microbotrium*

INTRODUCTION

Way of breeding of sheep and goats had prerequisite to a lot of infections especially parasitoses. They are usually kept under extensive conditions and graze or brows on any land that is not being cultivated. Pasture breeding make possible contact within small ruminants and eggs, larvae stages and intermediate host of parasites. In pasture breed condition helminth infection are common especially during late spring and autumn months (Pavlović et al. 2012). Research of goats and sheep parasites were made systematic during last 20 years in Serbia, especially in period between

2011 and 2019, and we have more new data about them. During that study investigations performed in the hilly areas of Serbia (Šar Planina, Stara Planina) (Pavlović et al.1995, 2015a), south, south east and west part of Serbia, (Pavlović et al.2013a,b, 2018a), at Timok District (Ilić,1990, Ilić i sar.1991Pavlović et al.2011), Belgrade area (Pavlović et al.2011,2012) Vojvodina (Pavlović et al.2018b) and South Kosova (Milanović et al.2018). In our paper we presented results of occurrence of platyhelminth infection with specially care to platyhelminth of genus *Paramphistomidae*.

MATERIALS AND METHODS

During study we collected fecal samples and examinations were performed using standard coprological technique with saturated NaCl solution and sedimentation (Euzeby,1981, Pavlović i Rogožarski,2017). Eggs per gram count (EPC) and degree of infection we assessed by McMaster technique where EPC of 50-700 eggs we treated like low rate of infection, to 1100 like moderate and up 1100 like high. At same time we performed post-mortem examination of dead or slaughtered animals. Found parasits we collected, preservated and determinate by morphological characteristic. Determination of parasites and parasites eggs we performed by keys given by Euzeby (1981).

Found paramphistomidae parasites were fixed in 10% buffered formalin and prepare to histological examination. Selected parasites were embedded in paraffin, sectioned medio-sagittal to 5-6 micrometers, and stained with hematoxylin-eosin. Identification of these flukes was originally based on morphological criteria established by Näsmark (1937). These criteria were later revised by Eduardo (1982a). Identification is based o the morphology of the acetabulum, pharynx, terminal genitalium, tegumental papillae, and internal organs of flukes.

Determination of species we performed based the morphological characteristic as observed of acetabulum and the genital atrium at histological cuts of parasites. The acetabulum was examined for determination of genera and the genital atrium and acetabulum for determination of *Paramphistomidae* species. The dorsal part of the acetabulum was characteristic. The dorsal circular muscle was divided into

two parts, the dorsal exterior circular muscle series 1 and the dorsal exterior circular muscle series 2. These circular muscle layers are used for the determination of the genus *Paramphistomum*. The ventral exterior circular muscle series, the ventral interior circular muscle series, the radial muscle fibers, the external longitudinal and median circular muscle series of the acetabulum specifically identified the parasites species (Vujić 1965, Vishnyakov 1980).

RESULTS AND DISCUSSION

During our examination *Paramphistomum* species were occurred at 11.24% of examined goats and 12.48% sheep. Two paramphistomum species were established *P.cervi* and *P. microbothrium*. *P.cervi* was most abundant then *P. microbothrium*. Number of *P.cervi* found in sheep was average 197.96 ± 521.850 and 73.31 ± 281.612 in goats. Number of *P. microbothrium* found in sheep was average 201.96 ± 321.850 and 59.31 ± 281.612 in goats. The highest infection in the sheep infected with *Paramphistomum* spp. was found during the summer (July to August) (6.7, 2 %) and followed by the autumn seasons (November to October).

According to Eduardo (1982a) the body surface of *P. cervi* is lacking tegumental papillae, the genital opening of *P. cervi* is of gracile type. According to the literature, the genital atrium of *P. cervi* is located at the level of the posterior part of the oesophagus (Willmoth, 1950), which is more posterior than in flukes studied by us. The genital atrium of *P. cervi* is located at the level of the posterior part of the oesophagus and the absence of tegumental papillae observed in *P. cervi* is just a normal morphological variation seen in one species. These entire morphological characteristic we occurred during our determination of occurred paramphistomides to concluded that was *Paramphismoumu cervi*.

At *P. microbothrium* dorsal part of the acetabulum was characteristic. The dorsal circular muscle was divided into two parts, the dorsal exterior circular muscle series 1 and the dorsal exterior circular muscle series 2. These circular muscle layers are used for the determination of the genus *Paramphistomum* . The ventral exterior circular muscle series, the ventral interior circular muscle series, the radial muscle fibers, the external

longitudinal and median circular muscle series of the acetabulum specifically identified the parasites as *P. microbothrium* (Vishnyakov, 1980; Samnaliev, 1981).

At numerous infected animals during necropsy (or post mortal examination at slaughter house) we found visible lesions include muscular atrophy, subcutaneous edema, accumulation of fluid in body cavities and duodenal mucosa superior portion thickening, Bloody mucus in intestinal and sometimes, ulcer and hemorrhage have been recorded in the bowel mucosa. The largest number of adult parasites of both species was found in the rumen and, to a lesser extent in the omasum and reticulum. At the the rumen - primary site of infestation, we occurred destruction of the papillae as well as hyperplasia of the epithelium and inflammatory reaction with the lymphocytes, similar to that described by Singh et al (1984), Pavlović et al. (2007) and Seck et al. (2007).

Young parasites were found attached just distal to the pylorus, with the wall and folds so thickened that the intestinal lumen was almost completely occluded. In those places they looked like brownish-pink cluster in the mucosa of the duodenum. In the mucosa we had a visible erosions and minor haemorrhages and the intestinal content was discoloured red. In those places serosa was reddened, blood vessels enlarged and prominent. Within the pale areas there were irregular patches up to 1mm in diameter.

Although infections with trematodes are less frequent, related to gastrointestinal helminths, they can also cause serious health problems, including fasciolosis and distomatosis (Pavlovic et al., 2007). Paramphistomiasis is a seldom-reported platyhelminth infection in ruminants (Horak 1971, Silvestre et al.2000) . The development of *Paramphistomum* sp. includes an intermediate host – a snail of the genus *Bulinus* (Soulsby 1977) After the ingestion of the metacercaria by the final host, the development is completed after the passage through the rumen, abomasum, and small intestine (Vujić, 1965). The prepatent period is 8 week in cattle and 10 week in sheep (Rangel-Ruiz et al., 2003) and under normal conditions, the complete infection cycle takes 3-4 month. The disease is characterized by sporadic epizootics with acute parasitic gastroenteritis, followed by high morbidity and mortality of predominantly young animals (Seck et al., 2007).

Infections of paramphistomidae are worldwide spread, especially at Africa countries and East Asia (Sissay et al.2007, Seck et al.2007). In Southern and Eastern Europe, the species *Paramphistomum microbothrium*, *P.cervi* and *P. ichikawai* (Horak, 1971, Kotrlá and Kotrlý 1982, Vishnyakov, 1980, Silvestre et al.2000) have been recorded in domestic and wild ruminant. In Serbia, *P.cervi* has been found in sheep and cattle and *P.microbothrium* has been found in sheep and cattle as well as in deer and red deer (Vujić and Petrović, 1971, Pavlović et al., 2007,2012a).

CONCLUSIONS

During our study performed in 2009-2019 were occurred two *Paramphistomum* species were occurred at 11.24% of examined goats and 12.48% sheep. *P.cervi* was most abundant then *P. microbothrium*. In Serbia, *P.cervi* and *P. microbothrium* has been found in sheep and cattle, but during our examination both species of paramphistomidae was first time occurred at goats.

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REFERENCE

Eduardo, S. L. 1982a. The taxonomy of the family Paramphistomidae Fiscoeder, 1901 with special reference to the morphology of species occurring in ruminants. I. General considerations. Systematic Parasitology, 4,7-57.

Eduardo, S. L. 1982b. The taxonomy of the family Paramphistomidae Fiscoeder, 1901 with special reference to the morphology of species occurring in ruminants. II. Revision of the genus Paramphistomum Fiscoeder, 1901. Systematic Parasitology, 4, 189-238.

Fiscoeder F. 1901. Die Paramphistomiden der Säugethiere. Zoologischer Anzeiger 24, 367-375.

Horak, I. G. 1971. Paramphistomosis of domesticated ruminants. In Advances in parasitology, Vol. 9. B. Davies (ed.). Academic Press, New York, New York, 33-72.

Kotrlá B, Kotrlý A. 1982. The incidence of flukes of the genus *Paramphistomum* in Czechoslovakia. *Veterinary Medicine (Praha)* 27(8), 483-490.

Pavlovi I., Kulišić Z., Nešić D., Romanić S. 1995, Endoparasites of sheep and goats in Prizren district. 3rd International Conference of Sheep and Goats Production, Ohrid, Macedonia, 106-110 pp.

Pavlović I., Savić B., Ivetić V., Radanović O., Žutić M., Jakić-Dimić D., Bojkovski J. 2009. The effect of parasitic infections to production results of sheep. IV Balkan Conference of Animal Science BALNIMALCON 2009, Challenges of the Balkan Animal industry and the Role of science and Cooperation, Stara Zagora, Bulgaria, 389-391 pp.

Pavlović I., Ivanović S., Žujović M., Tomić Z. 2011. Helminthoses of goats breeding at Belgrade area. *Biotechnology in Animal Husbandry* 27 (4), 1499-1504

Pavlović I., Savić B., Ivanović S., Ćirović D. 2012a First Occurrence of *Paramphistomum microbothrium* (Fischöeder 1901) in Roe Deer (*Capreolus capreolus*) in Serbia. *Journal of Wildlife Diseases* 48(2), 520–522.

Pavlović I., Ivanović S., Žugić G., Jovčić D., Bojkovski J, Pajić M. 2012b. Season distribution of gastrointestinal helminths of small ruminants in spread Belgrade area. *Lucrări Științifice Medicină Veterinară Timișoara*, XLV(3), 155-160.

Pavlović I., Ivanović S., Stokić-Nikolić S., Bojkovski J., Šekler M., Savić B., Žutić M. 2013a. Season distribution of gastrointestinal helminths of goats in south-east Serbia. *Lucrări Științifice Medicină Veterinară Timișoara* XLVI (5), 138-143

Pavlović I., Stokić-Nikolić S., Ivanović S., Rogozarski D., Bojkovski J., Šekler M. 2013b. Gastrointestinal helminths of goats in south Serbia. - 23rd International Symposium New Technologies in Contemporary Animal Production, Novi Sad, Serbia, 122-124 pp.

Pavlović I., Ivanović S., Savić M., Ćirković D., Jovčevski Sr., Jovčevski St., Savić B., Bečkei Ž., Marčić D. 2015a. Gastrointestinal helminths of goats breeding at Stara plana area (Serbia). *Lucrări Științifice Medicină Veterinară Timișoara* XLVIII (3), 159-166.

Pavlović I., Ivanović S. 2015b. The influence of environmental factors on the occurrence of gastrointestinal helminths of goats in Serbia. 4th International Congress New Perspectives and Challenges of Sustainable Livestock Production, Belgrade, Serbia, 549-557 pp.

Pavlović I., S. Ivanović S., Ćirković D., Petrović P.M., Caro Petrović V., Maksimović N., Ivanović D. 2017a. Gastrointestinal helminths of sheep

breeding at south west Serbia. *Bulgarian Journal of Veterinary Medicine*, 20, Suppl. 1, 402-406

Pavlović I., Becskei Z., Ivanović S., Petrović P.M., Savić M., Caro Petrović V., Bojkovski J. 2017b. Biodiversity of helminths of sheep breed in Vojvodina (Northern Serbia). *Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca* 74 (2), 162-166

Seck M. T., Marchand B, Ba C. T. 2007. Etude histopathologique du rumen de bovins infestés par *Carmynerius marchandi* (Gastrothylacidae) et par *Paramphistomum microbothrium* (Paramphistomidae), dans la région sud du Sénégal. *Annales de Médecine Vétérinaire*, 151, 200-206.

Silvestre A, Sauvé C., Cabaret J. 2000. Caprine *Paramphistomum daubneyi* (Trematoda) infection in Europe. *Veterinary Record*, 146(23), 74-75.

Singh R.P., Sahai B.N., Jha GJ. 1984. Histopathology of the duodenum and rumen of goats during experimental infections with *Paramphistomum cervi*. *Veterinary Parasitology*, 15(1), 39-46.

Sissay M.M., Ugglu A., Waller P.J. 2007. Prevalence and seasonal incidence of nematode parasites and fluke infections of sheep and goats in eastern Ethiopia. *Tropic Animal Health Production*, 39(7), 521-531

Soulsby 1977 *Helminth, Arthropods and protozoa of Domesticated Animals*, Baillier, Tindall and Cassell ed. London.

Vishnyakov, Yu. I. 1980. Differential diagnosis of paramphistome infections in ruminants. *Doklady Vsesoyuzno i Akademii Selskohozyalastvenih Nauk imeni V. I. Lenin* 6, Moscow

Vujić, B. 1965. Paramphistomosis in ruminants and methods to its identification. *Veterinaria*, 14, 471-478.

Vujić, B., Petrović Z. 1971. A contribution to the knowledge of paramphistomides in Yugoslavia and their determination. *Première Multicolloque Européen de Parasitologie*. Rennes, France, Proceedings. 388-391.

Willmoth, S. 1950. On the species of *Paramphistomum* Fiscoeder, 1901 occurring in Britain and Ireland with notes on some material from the Netherlands and France. *Journal of Helminthology*, 24 (4), 155-170.

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