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PROTOSAN INFECTION OF SMALL RUMINANTS IN SOUTH PART OF SERBIA WITH EMPHASIS TO NORTH KOSOVO

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Summary

Enteral protozoan infection was of great importance to health status of small ruminants and its performances. This was parasitic infection caused by protozoas from genus *Eimeria*, *Cryptosporidium* and *Giardia*. Lamb and kids infection had moderate morbidity and low mortality rate. Clinical sign of infection is usually presented in animals at 4-10 days old. The study about parasitic fauna - protozoa helminths, and arthropods of small ruminant at south part of Serbia, with emphasis to North Kosovo were performed during 2017. The study included the examination in total of herds flocks of goats and sheep from Zvečan and Leposavić district (villages Ceranja, Majdevo, Zemanica, Mure, Rudine, Žitkovac, Oraovica, Mošnica, Donji Krnjin, Belo brdo, Mioliće, Drenova and Beliće. Collected faeces samples were examined using routine coprological methods. Determination of parasites we performed by morphological characteristic. Infection with protozoa occurred at and on 46.14% of examined sheep and 29.42% of examined goat herds. Coccidiosis was found at 43 sheep and 27 goat herds. We usually occurred mixed infection with 2-3 coccidia species. At sheep most abundant species were *E. faurei*, followed by *Eimeria ahsata*, *E. ovinoidalis*, *E. intricata* and *E. pallida*. At goats most abundant species were *E. arlongy*, followed by infection with *E. hirci*, *E. nina-kohlyakimovae*, *E. christenseni* and *E. caprina*. Oocyst were found at adult and young animals, but clinical sign of disease were present only at young animals. During our examination *Cryptosporidium spp.* was found at 29 sheep and 23 goat herds. Determination of subspecies we not performed. Lambs between five and twenty-one days were the most susceptible for infection. Lambs cryptosporidiosis has high morbidity and mortality rate. Symptoms of acute cryptosporidiosis include inappetence, and weight loss. Infection with *Giardia duodenalis* was found at 2 sheep herd. Determination of subspecies we not performed.

Keywords: North Kosovo, Serbia, small ruminants, protozoa infection

Enteral protozoan infection was of great importance to health status of small ruminants and its performances. This was parasitic infection caused by protozoas from genus *Eimeria*, *Cryptosporidium* and *Giardia*. Infections are worldwide present and it is nearly impossible to find a flock without some protozoa infection (2, 14, 24, 34, 37, 45). Usually poor management is the reason why numbers of protozoan infection increase excessively; thus, coccidiosis may be considered a man-made

disease (1, 11, 30, 48). This also suggests that protozoosis can not be adequately managed (5, 7, 11, 18, 26). Usually it is presented at young animals at 4-10 weeks. Infection had moderate morbidity and low mortality rate. Environmental contamination and resulting clinical disease is generally influenced by local weather conditions and the grazing management practices of the flock (10, 21, 42).

The economic impact of protozoan infection in small ruminants is not well documented and there is no published data about estimate for economic losses due to subclinical or clinical disease. The economic cost is considerable, in terms such as low growth performance, decrease in productivity, mortality, morbidity, and the cost of prevention and treatment (4, 23, 32, 38, 39).

Protozoan infection in small ruminants (sheep and goats) in Serbia has been examined in the last fifteen years and in our paper we presented results of the our examination at south part of Serbia, with emphasis to North Kosovo (the status of Kosovo is in accordance with UNSCR 1244 and the Opinion of the International Court of Justice on the Kosovo Declaration of Independence).

Materials and methods

During 2017 we examined 114 herds of small ruminants from Zvečan and Leposavić district (villages Ceranja, Majdevo, Zemanica, Mure, Rudine, Žitkovac, Oraovica, Mošnica, Donji Krnjin, Belo brdo, Mioliće, Drenova and Beliće). Geographical conditions in examined area favor for breeding of small ruminants. In this area is mostly mountainous and hilly, with large areas under pastures (31). All herds were examined for the presence of ticks, gastrointestinal and pulmonary helminths and protozoa (30, 44).

During study we collected fecal samples during the whole year. Grazing animals of both sexes (220 males and 380 females, a total of 600) were randomly chosen. There were 410 adults (one-year-old and above) and 190 lambs and kids. Coprological examinations we performed with faecal concentration techniques, especially zinc sulphate flotation, and with sedimentation technique (40, 49, 50). Direct smear or wet mount examination for oocyst and trophozoites can also be performed. However, because of the cyclical nature of cyst excretion, several samples need to be examined to detect the organism. The diagnosis of parasites is commonly established by microscopic identification of oocyst, cysts or less commonly trophozoites in faecal wet smear stained with iodine (9, 24). Determination of subspecies of cryptosporidia and giardia we not performed. Examinations we performed with AxioLab A1 microscope with the AxioCam 105 Color microscope camera and Zen Lite software, manufactured by Carl Zeiss.

Results and discussions

Infections with protozoa occurred at and on 46.14% of examined sheep and 29.42% of examined goat herds.

Coccidiosis were found at 43 sheep and 27 goats herds. We usually occurred mixed infection with 2-3 coccidia species. At sheep most abundant species were *E. faurei*, followed by *Eimeria ahsata*, *E. ovinoidealisis*, *E. intricata* and *E. pallida*. At goats most abundant species were *E. arlongy*, followed by infection with *E. hirci*, *E. nina-kohl-yakimovae*, *E. christensenii* and *E. caprina*. Oocyst were found at adult and young animals, but clinical sign of disease were present only at young animals (2, 13, 14).

During our examination *Cryptosporidium spp.* was found at 29 sheep and 23 goat herds. Symptoms of acute cryptosporidiosis include inappetence, weight loss, and diarrhea which is usually yellow to yellowish-brown and of a creamy texture (23). The rapid loss of nutrients and fluids during diarrhea results in dehydration. Some animals do not develop into chronic cases and become continuous carriers of infection (13, 14, 15, 17).

Infection with *Giardia duodenalis* was found at 3 sheep herds.

During our examination we established that usually poor management is the main reason why numbers of protozoan infection increase excessively; thus, may be considered by adequately managed (5, 7, 11, 18, 26). The parasite causing infection is passed through fecal to oral contact. Adult animals were main source of infection, because they permanent excreted oocyst by faeces (29, 38, 42). Presence of oocyst in stables induced contamination of food and water and infection to young animals.

Parasites of the genus *Eimeria* cause a disease commonly called coccidiosis. Coccidiosis is known as a "stealth killer" of goats because symptoms are easy to miss and irreversible damage can be done if the illness is not quickly treated (9, 10, 30). Historically, some *Eimeria spp.* were thought to be infectious and transmissible between sheep and goats, but the parasites are now considered host-specific (29). At sheep were established next coccidial species: *Eimeria ahsata*, *E. ammonis*, *E. arkhari*, *E. crandallis*, *E. dalli*, *E. danielle*, *E. faurei*, *E. gilruthi*, *E. gonzalezii*, *E. granulosa*, *E. intricata*, *E. marsica*, *E. ovina*, *E. ovinoidealisis*, *E. pallida*, *E. parva* Kottlán, *E. punctata* and *E. rachmatullinae* (14, 15). At goats were established *Eimeria absheronae*, *E. africensis*, *E. alijevi*, *E. arloingi*, *E. babaevi*, *E. caprovina*, *E. christensenii*, *E. hirci*, *E. jolchijevi*, *E. kocharii*, and *E. nina-kohl-yakimovae* (9, 21, 23, 24, 38). All species of coccidia are not disease causing. There are only some species that are responsible for the outbreak of the disease.

For sheep *E. ovinoidealisis* can be very pathogen and other species such as *E. bakuensis* (*E. ovina*) and *E. crandallis* may exacerbate the symptoms of the former two species. The most pathogen *Eimeria* species for goats are *E. nina-kohl-yakimovae*, followed by *E. arloingi* and *E. christensenii* (20, 30). This was confirmed during our research both in the north of Kosovo and in other areas of Serbia (37, 38, 41, 42).

Signs of clinical disease we generally occur about 18 to 20 days after ingestion of sufficient amounts of coccidia oocysts from the contaminated environment. Clinical coccidiosis occurs when damage to the gut is sufficiently severe to cause dysfunction. This normally occurs at the beginning of the parasite's sexual multiplication stage, when parasite numbers reach their peak (48). Due to the

damage of the cells lining the intestines, the primary symptoms of coccidiosis is diarrhea, which may be foul smelling and contain mucus and blood. Diarrhea may have a dark tarry appearance and, in severe cases, large blood clots can be seen (22, 20, 52).

At small ruminants were established several *Cryptosporidium* species: *C. parvum*, *C. hominis* (previously *C. parvum* genotype 1), *C. canis*, *C. felis*, *C. meleagridis*, and *C. muris*. (18, 45, 46). This is parasitic disease with clinical signs at lambs and kids old at 4 to 10 days (27, 28, 35). During our examination we established that animals between five and twenty-one days were the most susceptible for infection. Cryptosporidiosis has high morbidity and mortality rate. Symptoms of acute cryptosporidiosis include diarrhea, inappetence, and weight loss (44, 45, 48). The rapid loss of nutrients and fluids during diarrhea results in dehydration. Since intestinal tract cells are disrupted, absorption of feed nutrients is restricted, and the animal loses more nutrients through the digestive tract and have lower feed conversion ratio (7, 11, 51).

During our research diarrhea which is usually yellow to yellowish-brown and of a creamy texture especially on the second and third day from the onset of clinical symptoms (35, 36).

G. duodenalis are a flagellate parasite, is one of the most prevalent and widespread intestinal parasite in humans and numerous vertebrate animal (mammals, birds, amphibian). Infection are spread worldwide (3, 8). Parasites causing a diarrheal condition known as giardiasis. According morphology and genetic evidence six species have been recognized in the genus *Giardia* but only *G. duodenalis* caused infection of small ruminant. Phylogenetic analysis and enzyme electrophoresis examination *G. duodenalis* revealed the existence of eight assemblages A–H within the species. In goats higher occurrence genotype E, with genotypes A and B being less frequent (6, 16, 19, 25). Ruminants which infected with *G. duodenalis* are mostly asymptomatic, but subclinical signs such as impairment in feed conversion efficiency, reduction in growth rate and persistent diarrhea. During our examination we confirmed that giardiasis is more surveys from sheep than goat populations. This is also indicated by the fact that it is fewer publications on giardia in goats (3, 12, 13, 30, 47, 53).

During this examination was first time established giardiasis in sheep in Serbia. Later, during 2018, we established first occurrence of giardiasis in goats breeding in south part of Serbia near by north Kosovo (43). Our research confirmed the presence of *Giardia duodenalis* in small ruminants herds in Serbia.

Conclusions

Enteral protozoan infection was of great importance to health status of small ruminants and its performances. This was parasitic infection caused by protozoas from genus *Eimeria*, *Cryptosporidium* and *Giardia*. Infection usually had moderate morbidity and low mortality rate. Consequence is significant increase of lambs and kid accrescence, its weakens and less growth. The best preventive measure a sheep and goat producer can take is to use a feed with a coccidiostat added. With careful management and sound preventive measures, the losses associated with this disease can be reduced to minimal level.

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