

## REVIEW

on the doctoral dissertation of PhD student Bermukhametov Zhanaidar Zhagparovich  
“Prevalence of Sarcocystosis in Cattle in the Kostanay Region”  
submitted for defence for the degree of Doctor of Philosophy (PhD) in the specialty 8D09101  
– Veterinary Medicine

*Sarcocystis* spp. are abundant worldwide distributed protozoan parasites infecting reptiles, birds and mammals. They are characterised by a compulsory two-host, prey-predator life cycle; sarcocysts are mainly formed in muscles of the intermediate host, and sporocysts develop in small intestine of the definitive hosts. Some of the *Sarcocystis* species are pathogenic for their intermediate hosts causing various symptoms. Up to date more than 200 *Sarcocystis* species are described, however, it is presumed that the actual number of *Sarcocystis* species is much higher.

Up to eight *Sarcocystis* species have been reported in cattle worldwide. Of these, *S. heydorni*, *S. hominis*, *S. sigmoideus* are zoonotic, *S. cruzi* is transmitted via canids, *S. hirsuta* is transmitted via felids, definitive hosts of *S. bovis* are felids and presumably mustelids, while definitive hosts of *S. bovini* and *S. rommeli*, which genetically seems to represent the same species, are unknown. It should be noted that livestock are best studies for the *Sarcocystis* infection. Despite that, zoonotic *S. heydorni* has been described in 2015, while *S. sigmoideus* was discovered in 2024, and its zoonotic potential was revealed in March of 2025 in France. Notably the *Sarcocystis* spp. infection prevalence in cattle in different geographical regions is very high reaching up to 100%. Macroscopic cysts of *S. hirsuta* found in the oesophagus, diaphragm, and skeletal muscles of cattle, leads to considerable economic losses as the contaminated meat is excluded from the market. Acute infection of *S. cruzi* in cattle can lead to miscarriages or reduced productivity, causing significant losses in animals' husbandry. Furthermore, *Sarcocystis* spp. can cause bovine eosinophilic myositis, characterized by grey-yellow-green to white round or fusiform focal lesions in the muscles of cattle. For the better identification and characterisation of *Sarcocystis* species integral morphological, biochemical and genetic investigation in different geographical regions should be carried out.

The present study aiming to evaluate the sarcocystosis in cattle in the Kostanay region is undoubtedly relevant, significant, and novel due to the lack of the *Sarcocystis* infection data in cattle from the Republic of Kazakhstan. In general, the goal and tasks are formulated clearly and appropriately. Notably, a very large amount of biological material has been analysed, 976 cattle carcasses, and a total of 2,928 muscle tissue sections. I am impressed by the variety of analytical methods used whose encompasses traditional morphological using light microscopy, histological, hematological, molecular and carpological analyzing feces of dogs as potential definitive hosts of *Sarcocystis* spp. The conclusions corresponded to the set work tasks and are based on the performed experimental tests. During the present study for the first time in the Kostanay region, the prevalence of sarcocystosis in cattle was established. The intensity of infestation of neck, heart, skeletal muscles, and diaphragm legs was established. Dog infestation with *Sarcocystis* was confirmed. Based on methods applied, infestation and degree of muscle damage, localization, types, forms, and sizes of sarcocysts were determined. *Sarcocystis* species were established using combined morphological methods and sequence analysis of mitochondrial *cox1* gene. Finally, preventive measures and recommendations against sarcocystosis were set. Results on the dissertation topic were published in four works, including the “*International Journal of Veterinary Science*” journal, which is indexed in Scopus database, ranking of Q2 quartile in Veterinary Science category.

To my understanding, the main results of this work are as follows, 60-80% *Sarcocystis* spp. infection prevalence in cattle from Kostanay region, by invasion level mainly mild or moderate infection intensity, significant differences in biochemical blood compositions

comparing infected and uninfected calves, significant histological changes related to *Sarcocystis* spp. infection, genetic identification of three *Sarcocystis* species, *Sarcocystis cruzi*, *Sarcocystis bovifelis*, and *Sarcocystis dehongensis*, seasonal fluctuations in *Sarcocystis* infection levels in dogs. Undoubtedly, in scientific terms, the most important result is the first identification of *S. dehongensis* in cattle, which means that it is a new host record, and it raises a number of questions about the evolutionary host specificity of *Sarcocystis* species, which should be resolved in the future. Notably, *S. dehongensis* previously was described in water buffalo. On the discussion side, I would add to one of the recommendations that the prevention of *Sarcocystis* infection in cattle should also encompass – monitoring the maintenance and feeding of definitive hosts covering not only dogs, but also cats and wild canids, felids and mustelids.

**Final conclusion.** To my opinion the work “PREVALENCE OF SARCOCYSTOSIS IN CATTLE IN THE KOSTANAY REGION” by Bermukhametov Zhanaidar Zhagparovich fulfils the requirements for doctoral dissertations, therefore I propose to grant the author a doctoral degree in Veterinary Medicine.

dr. Petras Prakas  
Chief researcher

Laboratory of Molecular Ecology, State Scientific Research Institute Nature Research Centre  
Member of the Young Academy of the Lithuanian Academy of Sciences

22<sup>th</sup> April 2025

