FREQUENCY OF SPECIES OF THE GENUS *Eimeria* IN NATURALLY INFECTED CATTLE AND SHEEP OF RIO GRANDE DO SUL STATE, BRAZIL.

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Resumo: A coccidiose é uma doença economicamente importante na pecuária, porque o parasito invade e destrói o epitélio intestinal dos seus hospedeiros, causando manifestações clínicas que variam de assintomática a diarreia grave com presença de sangue e tecido do revestimento intestinal e também perda de apetite, perda de peso ou redução no ganho de peso, resultando em efeitos potencialmente duradouros, principalmente nos animais mais jovens. O objetivo deste estudo observacional foi determinar a frequência de *Eimeria* spp. localizada no Rio Grande do Sul, Brasil. As amostras foram obtidas a partir de 6 diferentes cidades. As amostras foram coletadas via retal. As 122 amostras de fezes analisadas pela técnica de centrifugação-flutuação foram positivas para, pelo menos, uma espécie de *Eimeria*. Observou-se a presença de três espécies patogênicas em bovinos infectados: *Eimeria bovis* (34,1%), *Eimeria zuernii* (1,1%) e *Eimeria alabamensis* (3,3%). Em ovinos, foi identificada apenas uma espécie patogênica: *Eimeria ovinoidalis* (38,7%). Conclui-se que há infeção por coccídeos do gênero *Eimeria* no Rio Grande do Sul e devem ser tomadas medidas profiláticas para minimizar os efeitos causados por este parasita.

Abstract: Coccidiosis is an economically important disease in livestock, because the parasite invades and destroys the intestinal epithelial of their host, causing clinical manifestations that vary from asymptomatic to severe diarrhea with blood and gut lining tissue in the feces and also loss of appetite, weight loss or reduced weight gain, resulting in potentially long lasting effects, mainly in younger animals. The aim of this cross-sectional observational study was to determine the frequency *Eimeria* spp. located in Rio Grande do Sul, Brazil. Samples were obtained from 6 different cities. The samples were obtained rectally. The 122 feces samples analyzed by the Centrifugal-flotation technique were positive for, at least, one *Eimeria* species. It was observed the presence of three species pathogenic in single infection by cattle: *Eimeria bovis* (34.1%), *Eimeria zuernii* (1.1%) and *Eimeria alabamensis* (3.3%). In sheep, pathogenic species were identified in single infection: *Eimeria ovinoidalis* (38.7%). It is concluded that there is infection by coccidia of the genus *Eimeria* in Rio Grande do Sul and prophylactic measures should be taken to minimize the effects caused by this parasite.

Palavras-Chave: Coccidiose. Oocistos. Patogênica.

Keywords: Coccidiosis. Oocysts. Pathogenic.
INTRODUCTION

Parasitic infections are one of the major constraints for dairy industry and livestock in tropical and subtropical countries (SINGH et al., 2012), including Brazil. Eimeriosis is a disease caused by coccid protozoa belonging to the phylum Apicomplexa, family Eimeriidae and genus *Eimeria* that infect specific hosts, such as cattle and sheep, by invading and destroying the intestinal epithelial cells through rapid multiplications (LEVINE, 1985). More commonly but not exclusively, occurs in younger animals (CORNELISSEN et al., 1995), causing clinical manifestations that vary from asymptomatic to severe diarrhea with blood and gut lining tissue in the feces and also loss of appetite, weight loss or reduced weight gain, resulting in potentially long lasting effects (SARTIN et al., 2000; MUNDT et al., 2005). Moreover, economic losses that they cause in relation to low herd productivity, delayed animal development, death and significant expenses on management and medication. Lassen and Østergaard (2012) compared group control with group infected with *Eimeria* and found annual losses to the gross margin of the herd due to *Eimeria* ranged 8–9% and the losses may amount to US$ 120 million when costs associated with disease (SILVA, et al. 2011).

The infection of ruminant animals occurs by the ingestion of oocysts with food and water contaminated by feces. Under conditions of intensive rearing, with high population density, disease transmission takes place more readily and oocysts are highly available within the environment. Stressful situations such as weaning, transportation, starting of confinement, changes in the weather and debility caused by other pathogens may induce outbreaks of eimeriosis (SÁNCHEZ et al., 2008; REHMAN et al., 2010).

Studies have shown that the intensity of *Eimeria* parasite species and gastrointestinal parasites in cattle varies between different regions of Brazil (REBOUÇAS et al., 1994; ALMEIDA et al., 2011). Pathogenicity varies with species and few are considered pathogenic enough to cause clinical manifestations of the disease (LIMA, 2004). Many species of *Eimeria* have been cited as causing production and economic losses around the world, and *E. zuernii* and *E. bovis* are considered to be the most pathogenic species from cattle and *E. crandallis* and *E. ovinoidalis* from sheep (CORNELISSEN et al., 1995; LIMA, 2004; TAUBERT et al., 2008). This indicates the importance of knowledge of the frequency of occurrence of each species in herds. The present study had the aim of investigating the frequencies of occurrence of species of the genus *Eimeria* in cattle and sheep of Rio Grande do Sul State, Brazil.
MATERIAL AND METHODS

Feces samples from 104 calves and 18 sheeps of eight farms located in Rio Grande do Sul State in the municipalities of Bagé, Caçapava do Sul, Santiago, Santo Antônio das Missões, São Borja and Silveira Martins were collected. Individual fecal samples were collected directly from the rectal ampulla and were packed in plastic bags that were identified with the farm name and date of sampling. This fecal samples were stored under refrigerated conditions until were tested for *Eimeria* spp. oocysts in the laboratory.

For individual quantification of oocysts (OPG) per gram of feces, the technique of Gordon and Whitlock modified (1939) was used. After counting, the oocysts were separated using the centrifugal flotation technique in Sheather’s sugar flotation solution (DUSZYNSKI; WILBER, 1997).

Oocysts were examined at 40X and 100X magnification on optical microscope. *Eimeria* species were described based on morphological (size, shape, color, absence or presence of micropyle and micropylar cap, texture of the external wall, shape of sporocysts, absence or presence and characteristics of sporocyst residue, and Stieda body and morphometric characteristics (dimensions) of oocysts and sporulating oocysts as proposed by Taylor et al. (2009).

After, the data were submitted to one-way analysis of variance followed by the Student’s t test (P<0.05). Values were represented as mean ± standard deviation.

RESULTS AND DISCUSSION

In cattle the 104 samples, 102 (98.1%) had oocysts of *Eimeria*. Of these, 89.2% (91) were *Eimeria* considered pathogenic (*E. bovis*, *E. zuernii* and *E. alabamensis*). Single and multiple infections were found. 80.8% samples showed *E. bovis* being 30.1% samples with single infection, 17.6% multiple infection *E. bovis* and *E. zuernii* and 39% multiple infection *E. bovis* and *E. alabamensis* (Figure 1). São Borja and Santo Antônio das Missões cities (Figure 2) presented 100% samples with *E. bovis*.

Regarding to *E. zuernii* 27.9% samples were positives, being that Santo Antônio das Missões City (Figure 2) had the bigger presence, 54.5% samples. These positive *E. zuernii* samples, only 1.1% were single infection (Figure 1).
The presence of *E. alabamensis* was significantly lower, with only 9.6% of positive samples, but of these, 3.3% were single infections (Figure 1). Santiago (Figure 2) was the city that had the bigger positive, 15.3% of samples coming from this region.

Multiple infection by pathogenic and nonpathogenic *Eimeria* were found in 33.3% samples and only nonpathogenic *Eimeria* were found in 10.6% samples.

Figura 1. Percentage of *Eimeria* observed in bovine fecal samples (n = 104) of the Rio Grande do Sul State, Brazil, analyzed during the period June to December 2012.
According Lassen et al. (2009) E. zuernii and E. bovis, could be found together in 72% of the herds, and potentially able to cause disease if the right conditions manifest. On pastures E. alabamensis is known to cause problems in first grazing animals (SVENSSON, 2000).

The reason for the different frequencies observed are due host factors such as immune status, race, age, physiological state; related with the parasite such as strain and specificity; related with the environmental such as humidity, temperature; and, finally, linked to the management system, which can favor the sporulation of oocysts of Eimeria spp. and its transmission (TEMBUE et al., 2009; PENZHORN et al., 1994). This is mainly because the coccidiosis affects animals of all ages, it is more prevalent in young animals and especially in newly weaned and confined animals. And these last are most susceptible to the disease and account for most clinical cases (FOREYT, 1990). Also because, the oocysts are very resistant structures that can remain viable in the environment for several months under favorable conditions (LIMA, 2004).

In sheep, 100% of samples were positive, and 94.4% (17) of the samples were positive for Eimeria considered pathogenic (E. crandallis and E. ovinoïdalis). According Silva et al. (2011) in a study of Rio Grande do Norte State, the most lambs had multiple infections while fecal samples containing oocysts from three or more different species (Figure 3).
Figure 3. Percentage of *Eimeria* observed in ovine faecal samples (n = 18) of the Rio Grande do Sul State, Brazil, analyzed during the period June to December 2012.

Relative to *E. crandallis* 16.7% of samples were positive, and all in multiple infections with *E. ovinoidalis* and nonpathogenics *Eimeria*. Samples from Caçapava do Sul showed the largest percentage of this species, 60% of the samples. *E. ovinoidalis* was present in 88.9% of the samples analyzed, being 38.9% single infection. Multiple infections between pathogenic (*E. crandallis* and/or *E. ovinoidalis*) and nonpathogenic *Eimeria* were found of 55.6% samples. One sample (5.6%) was positive only to nonpathogenic *Eimeria*.

In sheep, the oocyst elimination peak of *E. ovinoidalis*, which is one of the most pathogenic of sheep parasites (McDOUGALD, 1979; GREGORY et al., 1989), occurred at week 6 and coincided with that of *E. crandallis*.

Infection of animals occurs after the ingestion of these oocysts along with water and/or food contaminated with fecal matter (SILVA et al., 2007). Long periods of constant low oocyst uptake are more likely to reflect the natural conditions of calves and the subsequent impact on growth rate. This is in contrast to experimental single-high-dose infections often resulting in clinical disease, recovery, and protective immunity (NIELSEN et al., 2003; LARSSON et al., 2006).

Bruhn et al. (2012) showed that dairy farms in the south of Minas Gerais, the use of modern management practices, with the aim of increasing productivity, has not been accompanied by greater sanitary care for the herd. This situation has led to the existence of
this association between factors indicative of higher degrees of technification on farms and higher levels of *Eimeria* spp. and gastrointestinal nematode infections among dairy calves. According to Bangoura et al. (2011) the significance of coccidiosis still seems to be underestimated by both veterinarians and farmers, because only very few facilities showed an awareness of the problem with targeted control strategies (hygiene, use of anticoccidial agents).

Moreover, it is important to emphasize that the results of feces analysis are not sufficient for the diagnosis of coccidiosis, however could be a review of the infection in the herd. Therefore, and that the presence of oocysts in the feces of animals with diarrhea is not sufficient to establish the diagnosis of coccidiosis, especially considering that most oocysts found may belong to species of low pathogenicity (LIMA, 2004).

**CONCLUSION**

In conclusion, this study has clearly demonstrated that the animals studied were affected by a mixed combination of coccidian parasites and indicates that there is a need to adopt control measures against these intestinal parasites, with the aim of minimizing the possible damage caused by subclinical infections.

**REFERÊNCIAS BIBLIOGRÁFICAS**


