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Correlations between coproparasitological, hematological and physical variables of Santa Inês sheep parasitized by gastro intestinal nematodes

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ABSTRACT

We evaluated the relationships among the eggs per gram feces (EPG) counts, hematocrit, ocular mucosa coloration, body condition score (BCS), and fecal cultures in 34 Santa Inês sheep at 30 and 15 days before parturition, the day of parturition, and 7, 15, 30, 45, and 60 days postpartum. All animals were treated with 1% ivermectin. Seven days after treatment, there was a decrease of 81.4% in the EPG count. The microhematocrit values decreased as the EPG scores increased, with the lowest value of 23.4% reached at parturition. Both low hematocrit values and ocular mucosa coloration in sheep must be evaluated in association with EPG count and fecal larvae culture because of the interaction of the gastrointestinal parasites on these parameters.

KEYWORDS correlations, Haemonchus, EPG, hematocrit.

INTRODUCTION

Gastrointestinal helminthiases are responsible for large economic losses in sheep husbandry. The parasites that cause these diseases reduce growth and may lead to the death of the animal, thereby decreasing potential productivity. Sheep maintained under intensive and semi-intensive farming conditions are generally parasitized concomitantly by different species of gastro intestinal helminths. Parasites of the *Haemonchus* genus are blood-sucking parasites of the abomasum and are considered the most pathogenic and prevalent sheep parasites in different regions ofBraziland the world(Troelletal.,2005,Santosetal.,2012). The presence of this parasite is correlated with an increasein eggs per gram feces (EPG)count and with the appearance ofclinical signs such as anemia,submandibular and abdominal edema,weight loss,anddeath.

Another aspect affecting the physiopathology and epidemiology of helminthiasesis, the effect of the peripartum period on the parasiteload and EPG count (Acevedo-Ramírezetal.2012).Helminthiasis can cause weight loss and a decrease in the overall body condition, and the correlation coefficient between the live body weight and body condition is a median value (r=0.365). This suggests that the body condition score (BCS) can be used to evaluateanimal resistance to parasites (Quirinoet al.2011).

In this study, the relationship between the EPGcounts, hematocrit, BCS, ocular mucosa coloration, andlarvae fecal cultures in SantaInês sheep during peripartum and before and after anthelmintic treatment was evaluated.

MATERIALS AND METHODS

The study group comprised 34 Santa Inês sheep between 1-2 years old. The sheep were estrus-synchronized by intravaginal sponge containing 60 mg medroxy progesterone acetate (MPA), and the sheep were then artificially inseminated. Pregnancy was confirmed by ultrasonography 35 days after insemination. The animals were naturally infected with *Haemonchus* (68%) *Trichostrongylus* (26%), *Oesophagostomum* (5.7%), and *Strongyloides* (0.3%).

Collection of blood and fecal samples, assessment of the BCS and ocularmucosa coloration of each sheep were performed on days 30 and15 before parturition, at parturition, and at 7, 15, 30, 45,and 60 days after parturition.

The BCS was evaluated usinga scale ranging from 1-6, in which 1 is very thin and 6 is obese, with 0.5 intervals. The animals were scored after inspection of the fat level and muscle thickness by palpation of the backbone and behind the last rib according to the method of Russelletal. (1969).

The appearance of the ocularmucosa coloration was evaluated with scores ranging from 1-4 as follows: 1=very pale, 2=pale, 3=light pink, and 4=pink (VanWyk& Bath, 2002).Allassessments were performed by the same score evaluator.

A technique modified by Gordon and Whitlock was used for the EPG counts and fecal larvae cultures were evaluated according to the O'Sullivan modified protocol (Ueno

&Gonçalves,1998). The recovered larvae were storedin tubes at 4°C for subsequent identification.

Blood samples were collected from animals using jugular vein puncture. The samples were collected insterile BD *Vacutainer®* tubes containing10% EDTA and used for the determination of packed cell volume by the micro hematocrit method.

When the average EPG count sexceeded 1,800 eggs, the animals were treated with 1% ivermect into maintain animal health.

Pearson's correlation coefficient was determined between the EPGcount, hematocrit, BCS, ocular mucosa coloration score, and larvae using Graph Pad *Prism 5* statistical software.

RESULTS AND DISCUSSIONS

Figure1 showsthe average values of the EPG countand hematocritpercentile in different samples before and after parturition. At parturition,the mean EPG count reached 1,855 and the hematocrit was 23.4% when they were treated withivermectin. As shown in Figure 1, the lowest hematocritpercentagecoincided with the peak EPG counts. These results are consistent with those found in lambs by Kawano et al. (2001).

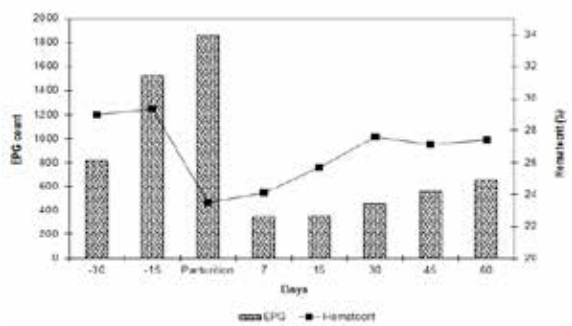

Figure1: Average values of egg per gram feces (EPG) count and hematocrit percentage during the peripartum period of sheep.

Seven days after parturition,there was an81.4% decrease in the EPG counts as a result of ivermect in administration in these animals immediately following parturition. However, a zero count was not observed, most likely because of partial resistance to this anthelmintic. Resistance was observed inall genera, *Haemonchus, Trichostrongylus, Oesophagostomum,* and *Strongyloides* (Fig. 2). Other factors that may have favored the increase in EPG counts in subsequent blood collections were re-infection of the animals and decreased immunity that occurs during the peripartum period and in lactating animals as described by several authors (Santiagoetal., 1970; Amaranteetal.1992)

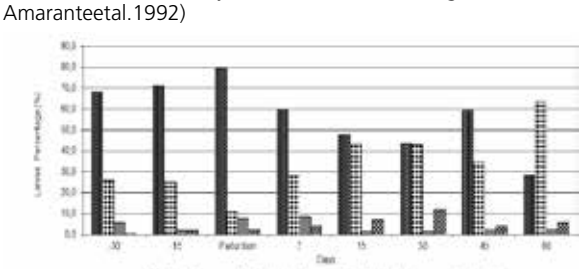

Figure2: Percentage of helminth larvae recovered from fecal cultures of Santa Inês sheep during the peripartum period.

The micro hematocrit values decreased as the EPG scoresincreased and reached the lowestvalue of 23.4%at parturition. Notably, after anthelmintic treatment, the EPG counts dropped and the hematocrit values increased, most likelybecause they feed on blood and tearthe intestinal mucosacausing small hemorrhages,to slow hematopoietic response stated by Rahman & Collins (1992).

The results of the larvae cultures on different collection days (Fig. 2) show the predominance of *Haemonchus* larvae, particularly at prepartumand parturition. There was also an increase in percentage of *Trichostrongylus* and *Strongyloides* larvae during the postpartum period after ivermectin administration, most likely due to either low efficacy of this drug against these parasites or resistance to ivermectin.

Table 1 shows the average ocularmucosa colorations coresranging from 2.47 to 3.1, and the BCSs ranging from3.69 to 4.47. The lowest scores occurred at parturition when the EPG counts were highest and when anthelmintic treatment was administered. The average ocularmucosa coloration scores remained low until seven days later. After the day 15 post partum, the color of the ocular mucosa and the BCS increased in response to ivermect in. Helminthic infections usually cause a decrease in food consumption and the ability to digest and absorb nutrients. This results in a reduction in body weight gainand BCS and also leads to anemia, which is detected as a change in the colorof the ocular mucosa.

Table1: Average values of ocular mucosa coloration scores and body condition scores during peripartum in Santa Inês sheep.

Days	Ocular mucosa coloration	Body condition score
-30	2,74	3,99
-15	2,91	4
Parturition	2,56	3,69
7	2,47	3,75
15	2,81	3,92
30	3	4,05
45	3,1	4,47
60	2,61	4,19

Table 2 presents the Pearson's correlation coefficients measured in the Santa Inês sheep naturally infected withgastrointestinal helminths.

The correlation coefficient for the EPG countsand hematocritwas negative(-0.46), indicating that a decrease in the red blood cell volume occurred when the EPG counts increased, which was partially caused by *Haemonchus* parasitism.This was supported by the correlation coefficient between the EPG counts and ocular mucosa coloration, which was also negative (-0.43) and highly significant (P<0.0001), indicated that among the various clinical signs of anemia, a decrease in mucosal coloration is a good indicator.These results are consistent with several authors reporting a correlation between coloration ofthe ocular mucosa, hematocrit value,and incidence of the hematophagousparasite *H.contortus* (VanWyket al., 1997).

Table2: Correlation coefficients between egg pergram feces (EPG) counts, hematocrit, body condition score(BCS), ocular mucosa coloration(OMC) of Santa Inês sheep.

	EPG	Hematocrit	BCS	OMC
EPG	—	-0.46**	-0.19*	-0.43**
Hematocrit	-0.46**	—	0.44**	0.59**
BCS	-0.19*	0.44**	—	0.44**
OMC	-0.43**	0.59**	0.44*	—

*** P<0.05, ** P< 0.0001.**

Positive correlation coefficient was observed between the hematocrit andocular mucosa coloration (0.59). However, Van Wyk et al.(1997) found higher values when the hematocrit values were associated with differential coloration of the ocular conjunctival mucosa based on five degrees of anemia classified using computerized graphical charts, in which they showed a correlation of 0.8 with greater than 95% confidence for *H.contortus* infections.

The correlation between EPG counts and BCS is low and negative (-0.19), indicating the ability of some adult animals to with stand high parasitic loads. The EPG count is the most widely used diagnostic tool for parasitic worms in ruminants, although there are significantly large standard deviations. Accordingly, the BCS is not a variable that can be correlated with the EPG count of an animal.

Low hematocrit values and ocularmucosa coloration in sheep are associated with the EPG count and fecal larvae culture because a correlation was observed between these parameters and gastro intestinal parasites.

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