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Evaluation of Robenidine to Defaunate Pelibuey Lambs and the Production and Digestibility

J. Lopez Camarena, J.R. Orozco-Hernandez, J.H. Medina-Villarreal,
J.J. Uribe-Gomez, H. Verdin-Sanchez and V.O. Fuentes-Hernandez
Departamento de Ciencias Biologicas, Centro Universitario de Los Altos,
Universidad de Guadalajara, Mexico

Abstract: Some products used against coccidia as feed additives in ruminants affect the production. However, no information was found on the effect of robenidine as defaunation agent on the intake or apparent digestibility of nutrients in the Pelibuey lamb. The experiment comprised three trials, in the first, eighteen lambs (average weight of 20 kg) were use to assess production. In the second, nine Pelibuey crossbred males (average weight 20 kg) were used. Animals were individually lodged and fed a corn stalk based ration and concentrate. The protected robenidine was added at 0, 33 and 66 mg kg^{-1} live weight. The Average Daily Gain (ADG), intake and *in vivo* apparent digestibility of dry matter, organic matter and structural carbohydrates was assessed. The ADG, daily intake and digestibility were similar among treatments ($p>0.05$). In the third trial, three rumen cannulated lambs were used in a 3×3 Latin square arrangement. No effect was observed in the pH or number of total protozoas ($p>0.05$). The robenidine has no effect on production parameters or the rumen fauna.

Key words: Defaunation, robenidine, lamb production, *in vivo* digestibility, organic matter, ADG

INTRODUCTION

Sheep production using Pelibuey breed is becoming an important income source for the Mexican producer who submit's them to intensive feeding to obtain the most of the fattening system. Lambs are ruminants that depend on the unique microbial ecosystem of the rumen formed by microflora (bacteria and fungi) and microfauna (protozoos) to take the most out of the feed they receive (Veira and Ivan, 1983; Eugene *et al*., 2004; Santra *et al*., 2007). Nevertheless, some studies have shown that protozoa are bacteria scavengers, affecting negatively total tract digestibility of structural carbohydrates (Jouany, 1996; Eugene *et al*., 2004; Chandramoni *et al*., 2002) since bacteria is more fiber user than protozoa. The use of tree leaves or plant extracts reduces the number of rumen protozoos and improves the fiber digestion (Teferedegne, 2000; Eugene *et al*., 2004; Wallace, 2004; Wina *et al*., 2005; Koenig *et al*., 2007; Sirohi *et al*., 2009; Patra and Saxena, 2009). Few non vegetable products are used to reduce the number of protozoos in the rumen liquor, for instance lauril sulfate (Santra *et al*., 2007) or sodium laurate (Hristov *et al*., 2004).

Robenidine is a synthetic product use against the protozoa coccidia and efficiently controls their number. No study was undertaken to assess rebenidine addition to the diet on lamb performance and total tract digestion.

MATERIALS AND METHODS

The present project consisted in three trial; production, digestibility and rumen parameters. All the chirurgical procedures were performed by a credited veterinarian following the bioethics stated on the use of animals for research act of the CUALTOS-University of Guadalajara. In the first trial eighteen Pelibuey crossbred male lambs (initial average weight of 20 km) were used to assess the effect of three levels of robenidine (0, 33, and 66 mg kg^{-1} of body weight) in the feed on the Average Daily weight Gain (ADG; kg day^{-1}). Initial weight was used as covariate for gain of weight. Animals were housed in elevated (60 cm from the floor) crates (1.3 m^2/animal) with plastic slats (1.2 cm of separation between). Crates were divided in sections to have two lambs per replicate, assigned randomly to treatments. Feed offered consisted in corn stalk with grain, ground sorghum grain (20% of total feed), soybean meal, canola and a commercial vitamin -mineral mix. The feed was daily offered at 10 am. The trial lasted 50 days with two periods of 25 days and at the end ADG was assessed.

On the other hand, nine 19 kg Pelibuey male lambs were individually lodged in crates (total surface of 1.2 m^2) with cribbated (1 cm Ø) plastic floor. The ventral part of the crate had plastic to separate urine from feces during the test and sample taking period. Three crates (and animals) were randomly assigned to each treatment. The

Corresponding Author: J.R. Orozco-Hernandez, Departamento de Ciencias Biologicas, Centro Universitario de Los Altos, Universidad de Guadalajara, Mexicio

lasted 15 days during which 10 were used to adapt the animal to crate and handling and the rest to assess intake and fecal production. Samples of feed and feces were daily taken and pooled mixed and then a subsample was obtained to determine Dry Matter (DM; at 70°C for 72 h), Organic Matter (OM; ashing at 550°C in a furnace) and Neutral Detergent Fiber (NDF; Van Soest method). Data were used to evaluate *in vivo* apparent digestibility of DM, OM and NDF.

For the third trial three rumen fistulated and cannulated (hypoallergenic plastic canula, Ankom, USA) Pelibuey male lambs (25 kg of body weight) were used. Animals were logged in a 1.4 m^2 crates with plastic cribbated floor. Each animal was assigned to one of the robenidine levels in feed. Rumen liquor was obtained by suction (using a 50 cc disposable syringe each time) 2 h before and two after feeding. Rumen fluid pH was immediately determined using a portable pH meter (Orion, model SA 210). The rumen fluid was filtered through four cheesecloth layers and then diluted (1 liquor: 2 fixing solution of 40% formaldehyde). Total protozoos counting was performed using a Neubauer improved® (Marienfel, Germany) chamber and an optic microscope. The trial was designed as 3×3 Latin square that had three 15 days period during which eleven days were used to adapt the animal and the rest to measure pH and total protozoos in rumen liquid.

During all three trials, clean and fresh tap water was always available for consumption from an automatic waterer. Data of ADG, digestibility and rumen parameters were statistically analyzed as a randomized trial using an alpha of 0.05 to declare differences using the SAS package.

RESULTS AND DISCUSSION

The ADG of the lambs averaged 0.207 kg and similar among treatments (0.204, 0.212 and 0.201 kg day^{-1} for control, 33, or 66 mg of robenidina, respectively; $p>0.05$). The parameter was similar to those observed for Pelibuey lambs using low grain levels as in the present trial. The feed to ADG ratio was 7.78, 6.89 and 7.69 for the corresponding robenidine level without statistical difference ($p>0.05$). Eugene *et al*. (2004) observed in their meta-analysis of defaunation that frequently body weight was did not change.

In the second trial, the DM intake averaged 803.8 g day^{-1}, however no difference was observed between treatments (Table 1; $p>0.05$). Similar pattern was observed for the OM and NDF (average; 717 and 292.4 g day^{-1}, respectively; $p>0.05$). Furthermore, the digestibility of DM, OM and NDF was unaffected ($p>0.05$) by the robenidine level of addition to the feed of lambs. Hristov *et al*. (2004) using sodium laurate to defaunate reported no changes in the apparent digestibility, which are similar of the present trial.

Table 1: Intake and digestibility of treatments using Pelibuey lambs

	Robenidine (mg/kg body weight)			
Treatments	0	0.33	0.66	SE
Dry Matter (DM)				
Intake (g day^{-1})	820.62	815.21	829.71	33.32
Digestibility (%)	74.61	75.39	72.57	1.33
Organic Matter (OM)				
Intake (g day^{-1})	731.75	726.92	739.85	29.70
Digestibility (%)	84.62	85.43	84.70	0.86
Neutral Detergent Fiber (NDF)				
Intake (g day^{-1})	298.54	296.57	301.85	12.12
Digestibility (%)	62.32	64.31	62.51	2.12

SE: Standard Error

The rumen liquor pH was in average 6.88, with slight variation with the robenidine in the lamb feed (6.53, 7.05 and 7.05, for control, 33 and 66 mg of robenidina, respectively; $p>0.05$). The latter could be a reflection of the lack of effect of the robenidina in the microbiota and related to the digestion process of the Pelibuey lambs fed primarily with corn stalk. Koenig *et al*. (2007) reported that when a partial or complete defaunation of the rumen is performed, a low ruminal fiber degradation is observed.

But, Hristov *et al*. (2004) did not observe a depression in NDF digestibility with the use of sodium laurate compared with the unsupplemented control. This is line with the observation of the present trial using a synthetic defaunating agent. Furthermore, total protozoos was in average 19.83×10^4 for control, with quite similar values (22.17 and 22.83×10^4 for 33 and 66 mg of robenidine) in the other treatments not reaching statistical differences among them ($p>0.05$). Hristov *et al*. (2004) using sodium laurate induced no significant changes on the rumen protozoos count, as observed in this study with robenidine. Eugene *et al*. (2004) in their meta-analysis study on defaunation reported little effect of the procedure on intake or nutrient digestibility. Probably, the chemical used in the present study did not kill protozoa but may have slightly influence other aspects of the rumen ecosystem as suggested by Jouany (1996).

CONCLUSION

Based on the results, it could be concluded that robenidina cannot be considered a synthetic defaunation agent for Pelibuey lambs.

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