DETECTION OF ANTIHELMINTIC RESISTANCE TO 15% ALBENDAZOLE OF GASTROINTESTINAL NEMATODES IN HAIR LAMBS OF A VENEZUELAN FLOCK

Detección de resistencia antihelmíntica al albendazol 15% de nematodos gastrointestinales en corderos de pelo de un rebaño venezolano

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ABSTRACT

In order to assess the antihelmintic efficacy of Albendazole in a 15% concentration against gastrointestinal nematodes in hair lambs, it was made a research with 30 crossbreed West African lambs, three months old, naturally infected. The lambs were divided in two groups, one treated with the antihelmintic and else as control untreated. The faeces samples were taken directly of the rectum, previous to the treatment and at seven and fourteen days post treatment (DPT), analyzed through McMaster modified technique. To evaluate the antihelmintic efficacy was used the faecal eggs count reduction test (FECRT) *"in vivo"* and the identification of the infective larvaes recovered from faecal cultures. The treatment did not showed any effect against the FECRT, observed in the treated groups means of 5,110 and 5,790 eggs per gram of faeces (EPG) and the control 3,452 and 3,330 EPG, to the seven and 14 DPT, respectively. From faecal cultures infective larvaes of *Haemonchus* spp., *Trichostrongylus* spp., *Bunostomun* spp. and *Strongyloides papillosus* were recovered. Antihelmintic resistance was detected in gastrointestinal nematodes against Albendazole in hair lambs of a Venezuelan flock.

Key words: Antihelmintic resistance, Albendazole, nematodes, lambs.

RESUMEN

Con la finalidad de valorar la eficacia antihelmíntica de Albendazol 15% frente a nematodos gastrointestinales en corderos de pelo, se desarrolló una investigación en 30 animales con mestizaje predominante West African de tres meses de edad, con infecciones naturales. Fueron divididos en dos grupos, uno tratado con Albendazol 15% y el otro testigo no tratado. Las muestras de heces se tomaron directamente del recto los días cero, siete y 14 postratamiento (DPT), las cuales se analizaron a través de la técnica de McMaster modificada, realizando coprocultivos para la identificación de larvas infectivas. Para la valoración de la eficacia se utilizó el método del porcentaje de reducción en la eliminación fecal de huevos (MPREFH) "*in vivo*", realizados en los diferentes días del muestreo. El tratamiento con Albendazol 15% no mostró ningún efecto sobre el MPREFH, presentando el grupo tratado medias de 5.110 y 5.790 huevos por gramo de heces (HPG), y el testigo 3.452 y 3.330 HPG, a los siete y 14 días postratamiento, respectivamente, recuperándose larvas infectivas de *Haemonchus* spp., *Trichostrongylus* spp., *Strongyloides papillosus* y *Bunostomun* spp. Fue detectada resistencia antihelmíntica de nematodos gastrointestinales al Albendazol en corderos de pelo en un rebaño venezolano.

Palabras clave: Resistencia antihelmíntica, Albendazol, nematodos, corderos.

INTRODUCTION

One of the main problems that impact in the hair ovines (*Ovis aries*) production systems are the gastrointestinal nematodes (GIN), which induce injuries that interfere with the nutrition status, delay in the sexual maturity, decrease in the milk and meat production and important clinical signs as: anorexia, weight loss, anemia, growth delay, predisposition to other diseases and economics losses [3, 11].

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The cure and control of these diseases had been made since the 60´s decade by antihelmintics application. The low price and good efficacy against nematodes, have caused its generalized use in ruminants production. But, its indiscriminated utilization have caused the antihelmintic resistance (AR) apparition, which is defined as the heritable capacity of the parasite population of tolerate the therapeutic doses of a drug in relation with a normal population of the same species [8].

Drug resistance can arise in a limited number of ways: a) a change in the molecular target, so that the drug no longer recognizes the target and is thus ineffective; b) a change in metabolism that inactivates or removes the drug, or that prevents its activation; c) a change in the drug distribution in the target organism that prevents the drug from accessing its site of action; d) amplification of target genes to overcome drug action [20].

In different places, AR had been observed to the majors groups of drugs and is a problem in sheep, goat (*Capra hircus*) and horse (*Equus ferus caballus*) parasites [10, 20].

Albendazole is an antihelmintic drug belong to the benzimidazoles group, which binds nematode tubulin inhibiting the polymerization of microtubules, which are subsequently unable to transport secretory granules or secrete enzymes within the cell cytoplasm; this eventually results in cell lysis and helminth paralysis [9, 20].

The AR of GIN to albendazole have been reported by numerous authors. For example, in Ethiopia, was observed in goats flocks [16], in Netherlands in sheep [1] and Slovakia [2, 19], to same that Mexico [17] and Argentina [12]. In Venezuela, the antihelmintic efficacy of different drugs have been evaluated, showing a good efficacy to the macrocyclic lactones and the benzimidazoles [11, 13].

A history of poor results in the improvement of the body condition after a antihelmintic application in a hair ovines flock, led to the development of this research with the aim of evaluating the antihelmintic efficacy of Albendazol against GIN in a tropical hair ovines flock, West African crossbred.

MATERIALS AND METHODS

This study was conducted in an ovine flock from a farm in La Cañada de Urdaneta Municipality, Zulia State, Venezuela, located in a tropical warm weather zone [6]. The lambs had three months old to begin of the research and they were kept together on the same pastures (*Echlnochloa polystachya*) during the trail with *ad libitum* water sources.

Thirty lambs were utilized, identified and dividied in two groups. One was treated orally with 15% albendazole at a dosage of 5 mg/kg of body weigth and the group two was untreated control. The samples were taken in the morning, before the treatment and the seven and 14 days post treatment (DPT), directly from the rectum with gloves, rotulated and transported under refrigeration to be analized. Counts of nematode eggs per gram of faeces (EPG) were performed using the modified McMaster technique [14]. For the faecal cultures, positive faeces samples to nematodes eggs were used. They were incubated (WTC Binder ED-53, Germany) at 26°C with controlled humidity for ten days. Infective third-stages larvae were recovered by the Baermann technique and their identification was made according to published keys [7, 18].

The antihelmintic efficacy was determinated for faecal egg count reduction test (FECRT) "*in vivo*", following the World Association for the Advancement of Veterinary Parasitology (WAAVP) recomendations [4, 5].

RESULTS AND DISCUSSION

Antihelmintic efficacy of 15% Albendazole against GIN in hair lambs in a Venezuelan flock was evaluated by the FECRT and compares the epg values between the groups (FIG. 1), it was detected AR, because the FECRT of the treated group was cero if compared to the control group; in both, seven and fourteen days post treatment (DPT), raising the EPG in the experimental groups, with values of 5,110 and 5,790 in the treated group and 3,452 and 3,330 EPG in the control group, to the seven and 14 DPT, respectively. The obtained larvaes from the faecal cultures were: *Haemonchus* spp., *Trichostrongylus* spp., *Strongyloides papillosus* and *Bunostomun* spp.

The AR to Albendazole by GIN has been showed in several places where ovines are exploited, by FECRT, as Netherlands [1] or México [17]. In Slovakia with this method, a study to determinate the prevalence of Albendazole resistance (ABZR) on ovines farms was carried out, which was present in a farm and suspected in other, with FECRT values ranged from 69.8% to 31.8% [2]. In sheep from Netherlands [1], it was observed ABZR in animals that remained positives after treatment, where the larvaes recovered from faecal cultures were *Teladorsagia*, *Trichostrongylus* and *Haemonchus*.

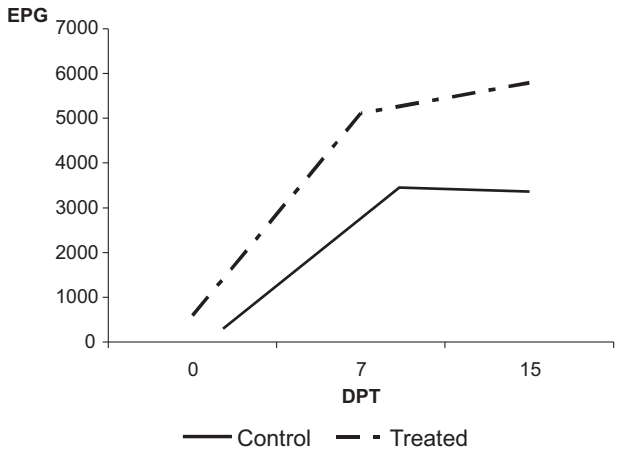

FIGURE 1. EPG VALUES OF GASTROINTESTINAL NEMATODES IN HAIR LAMBS.

In México, the benzimidazole resistance in surveyed farms with Pelibuey crossbreed hair ovines [17] was shown where AR was present in 15.8% of the farms; where *Haemonchus* was the only genus present in the faeces of treated groups and the faecal cultures of the control groups in those resistant flocks had a mixture of *Haemonchus*, *Trichostongylus* and *Oesophagostomum.* In goats flocks had been determinate ABZR against GIN, where the showed genus were *Haemonchus* and *Trichostrongylus* [16].

Several factors as genetic, biological and operational, and their possible interaction, contribute to the selection of AR against GIN [2]. It is possible that the AR was selected on the farm by a wrong use, but it is also possible that resistance could be introduced since other flock with bought in stock [1].

The evolution of resistance was determined by the extent to which nematodes survive to antihelmintic treatment, contribute their genes to future generations, where the risk of development of resistance depends on its genetic basis (whether resistance is controlled by a single major gene or by several genes, and whether these genes are dominant, partially dominant, or recessive) and on the intensity of the selection pressure, which is influenced by: the frequency and timing of antihelmintic treatment, the dose rate, the drug efficacy against the stages of nematode present in the host, the life expectancy and fecundity of adult nematodes, the proportion of the susceptible population exposed to the antihelmintic compared with that on pasture and the parasite generation time [15].

It is accepted that one of the most important factors in the development of AR is the genetic contribution with genes for AR that the nematodes which survive treatment make to its offspring in the next generation [5], that is determined by the proportion of the nematode population in refugia as eggs, developing larvae and infective third stage larvae, which are not exposed to antihelmintic treatments and the proportion in the host as incoming third-stage larvae, fourth-stage larvae and adults are exposed to antihelmintic treatments, where the rate of development of resistance varies inversely with the proportion of the nematode population in refugia at the time of treatment, because if the proportion of freeliving nematode parasites at the time of antihelmintic treatment is large, then the offspring of resistant nematodes is diluted [15].

The frequent dosing may increase the occurrence of AR in a zone as a high treatment frequency is the principal cause of rapid selection for resistance, which is a common problem identified in many small ruminant production systems, where some farmers could failed to follow any drug rotation scheme, while others farmer rotated drugs excessively. One important factor identified is the inadequate dosing of animals, few farmers treated animals according to true weight, and very farmers used visual appreciation to determine doses, which could be over or underdosifications, raise the risk to AR [17].

CONCLUSIONS

The anthelmintic resistance was detected in gastrointestinal (HPG) nematodes (RHEH) against Albendazole in hair lambs of a Venezuelan flock, through of faecal egg count reduction test. The flock evaluated in the current study accounts for a very small part of the Venezuelan sheep population; therefore, widerranging studies are needed to evaluate the real dimension of albendazole resistance, and to establish the resistance prevalence of other drug families that are being used in these flocks.

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