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Original Article

Therapeutic Efficacy Assessment of Dectomax® (Doramectin) in Sheep and Cattle From Timis County, Romania

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Abstract

Introduction: Gastrointestinal parasitic infestations are one of the major health concerns worldwide; hence, this study aimed to investigate the efficacy of a doramectin-based anti-parasitic drug.

Methods: To achieve this goal, we collected fresh faecal samples (50-100 g) from 20 sheep and 20 cattle, which were subsequently examined through coproparasitic methods.

Results: Pre-therapeutic coproscopic screening of samples from sheep and cattle led to the identification of digestive strongyles, *Eimeria* spp., *Balantidium coli,* Cestodes, and *Toxocara* spp. The prevalence rates for sheep were 100%, 35%, 35%, 30%, and 15%, respectively, and 80%, 30%, 30%, 10%, and 10% for cattle.

Conclusion: The study led to the identification of parasites belonging to three different species: Sporozoa, Nematoda, and Cestoda. None of the investigated helminths proved resistant to Dectomax®, meaning that the average efficacy rate of Dectomax® in sheep and cattle naturally infected with digestive strongyles, *Eimeria* spp. or *Toxocara* spp. was 94% and 95%, respectively.

Keywords: Gastrointestinal parasites, Cattle, Sheep, Efficacy, Doramectin

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Introduction

Gastrointestinal parasitic infestations are one of the major health concerns worldwide. They lead to important economic loss in the field of farming, causing health issues in both animals and humans (1). Anthelmintic drugs act either locally to eliminate parasites from the gastrointestinal tract or systemically to eradicate adult helminths or other evolutionary stages that invade tissues and organs (2).

The use of chemotherapeutic drugs for controlling internal and external parasites is a common practice among animal breeders with various broad-spectrum anthelmintic drugs available on the market. To ensure therapeutic success, it is necessary to act on parasites both when they are undergoing stages that are found inside the definitive host as well as inside the intermediary host, reservoirs, or vectors represented by animals of economic interest.

According to Waller (3), most gastrointestinal parasites that affect domestic animals exhibit resistance toward common-use anti-parasitic drugs, especially in warm and humid parts of the world. This situation might be a consequence of frequently applied treatments or ineffective therapeutic strategies. The sub-clinical evolution of parasitic diseases, a common occurrence in multiple regions worldwide, especially in temperate areas, in both temporary and permanent grazing systems, leads to a decrease in animal performance. This causes considerable economic losses by means of reduced growth rate, low feed conversion rate, and low milk and meat production, all of which eventually lead to the installation of a sub-productivity syndrome (4-7).

This study aimed to assess the efficacy of a doramectin-based product (i.e., Dectomax®) on sheep and cattle from a farm in Timis county, Romania.

Materials and Methods

The study took place in Bethausen locality, Cliciova village and included 40 animals (20 sheep and 20 cows). Two groups of animals (control and experimental) were considered, and each group consisted of 10 animals. The age of the animals varied between 2-12 years. Dectomax® was administered intramuscularly to sheep and subcutaneously to cows (1 mL product/50 kg body weight).

Approximately 50-100 g of fresh faeces were collected individually in plastic bags from the sheep included in the study. The collected samples were kept at a

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temperature of 4°C until further processing, which took place at the Faculty of Veterinary Medicine, Timişoara. The coproparasitological tests were performed using the Willis, Baermann, and sedimentation methods (8-10).

The efficacy of the anthelmintic drugs was assessed with the help of the FECRT test according to the Presidente and Borgsteede relations as recommended by W.A.A.V.P. (11,12).

The Presidente relation (%): 1- [T2/T1xC1/C2] × 100,

where T1 and T2 = EPG of the treated group day 0 (T1) and day 14 (T2), while C1 and C2 = EPG of the control group on day 0 (C1) and day 14 (C2).

The Borgsteede relation (%): (1 – T2/T1 x Global average of subjects on day 0/control group average day 14) × 100,

where T1 and T2 = EPG of the treated group on day 0 (T1) and 14 (T2).

Results and Discussion

The age of the sheep varied between 2-6 years. Following coproscopy (Willis and McMaster methods), which was performed during the pre-therapeutic period on samples from the studied animals, we have identified the following parasites: digestive strongyles 100%, *Eimeria* spp. 35%, *Balantidium coli* 35%, Cestodes 30%, *Toxocara spp.* 15%, negative samples 0. Multi-parasitism was also noticed among the examined samples. Moreover, the coproscopic method chosen to reveal the presence of pulmonary nematode larvae did not serve its purpose in the case of the studied sheep (Table 1).

The McMaster quantitative method was used to observe the level of infestation with the identified parasites and to calculate the efficacy of the antiparasitic drug Dectomax® (Zoetis).

According to Table 2, the values of the EPG on day 0 for the two sheep groups were different. Thus, data obtained on day 14 prove the fact that, in the case of the experimental group, the efficacy of Dectomax® for sheep

Table 1. Results Obtained Following the Willis Faecal Exam in Sheep

Species	Age	Digestive Strongyles	*Eimeria* spp.	*Balantidium coli*	*Toxocara* spp.	Cestodes	Negative
Sheep	3	Yes	Yes	Yes	No	No	No
Sheep	4	Yes	No	No	No	No	No
Sheep	3	Yes	No	No	No	No	No
Sheep	5	Yes	Yes	Yes	No	No	No
Sheep	3	Yes	No	No	No	Yes	No
Sheep	6	Yes	Yes	No	Yes	No	No
Sheep	2	Yes	No	No	No	Yes	No
Sheep	5	Yes	No	No	No	Yes	No
Sheep	3	Yes	No	No	No	No	No
Sheep	3	Yes	Yes	No	No	No	No
Sheep	6	Yes	No	Yes	Yes	No	No
Sheep	3	Yes	No	No	No	Yes	No
Sheep	2	Yes	No	No	Yes	No	No
Sheep	3	Yes	No	No	No	Yes	No
Sheep	4	Yes	Yes	No	No	No	No
Sheep	4	Yes	No	No	No	No	No
Sheep	4	Yes	Yes	Yes	No	No	No
Sheep	3	Yes	Yes	No	No	Yes	No
Sheep	5	Yes	No	No	No	No	No
Sheep	3	Yes	No	No	No	No	No

Table 2. EPG Load in the Studied Groups

		Average	1	2	3	4	5	6	7	8	9	10
Experimental group	Day 0	495	650	550	400	500	550	450	650	350	400	450
	Day 7	15	0	50	0	0	50	0	0	50	0	0
	Day 14	30	0	100	50	0	50	0	50	0	0	50
Control group	Day 0	510	550	450	350	550	450	600	450	350	600	750
	Day 7	435	400	350	400	650	450	550	250	450	300	550
	Day 14	470	650	500	400	300	350	400	650	550	450	450

Note. EPG: Electronic programming guide.

was 94% based on the Presidente and Borgsteede relations.

The mean value of the EPG on treatment day 0 was 495 with a minimal EPG and a maximal value of 350 and 650, respectively.

For treatment days 7 and 14, the mean value of the EPG on days 7 and 14 was 15 and 30, respectively. On day 7, the minimum value of the EPG was 50, while on day 14, the minimal value for the EPG was 50, and the maximal value was 100 as illustrated in Figure 1.

With regards to the control group, the mean value of EPG measured on day 0 was 510 with the minimal EPG around 350 and a maximum value of 750. Likewise, the mean of EPG measured for the control group on day 7 was 435 with a minimal EPG of 250 and a maximum EPG of 650. Furthermore, the mean EPG measured for the control group on day 14 was 470 with a minimal EPG of 300 and a maximum EPG of 650 as presented in Figure 2.

Comparing the parasite species distribution before and after the administration of Dectomax®, a decrease was observed in the parasitic population following antiparasitic treatment. A careful analysis of the results obtained through efficacy testing based on two calculus relations highlights the fact that Dectomax® has an efficacy rate of 94% in sheep.

This study also aimed to evaluate the efficacy of Dectomax® on cattle whose ages varied from 2-12 years (Table 3).

Pre-therapeutic coproscopy (Willis and McMaster methods) performed on cattle included in the present study revealed the presence of the following parasitic eggs: 80% digestive strongyles, 30% *Eimeria* spp., 30% *B. coli*, 10% Cestodes, 10% *Toxocara* spp., and 0 negative samples.

As Table 4 depicts, the EPG loads on day 0 were different for the two groups of cattle. On day 14, data indicated that the efficacy of Dectomax® used for the experimental group of sheep was 95% according to the Presidente and Borgsteede calculation formulas.

As observed in Figure 3, the average value of the EPG on treatment day 0 was 295 with a minimum EPG of 150 and a maximum EPG of 450. Further, the average value of the EPG on days 7 and 14 was 25 and 20, respectively. The minimal EPG on day 7 was 50, while the minimum EPG on day 14 was 50 and the maximum was 100.

According to Figure 4, the average value of the EPG obtained on day 0 for the control group was 295 with a minimum of 150 and a maximum of 450. Moreover, on day 7, the average value of the EPG was 350 with a minimum EPG of 250 and a maximum EPG of 550, while on day 14, the average EPG for the control group was 355 with a minimum and maximum EPG of 250 and 550, respectively.

The results regarding the efficacy of Dectomax® on sheep and cattle are explicable due to the specific hepatic enzyme equipment which is more complete in ruminants. The isoenzyme P 450 IIIa is also quite precocious, being present during the biotransformation processes right from the first days of life in lambs and calves (13).

Faecal examinations in sheep revealed a gastrointestinal parasitism rate of 94%. However, the coproparasitic studies conducted in Belarus (14), Belgium (15), and the Netherlands (16) highlighted an efficacy rate of 100%, 54.5–100%, and 15% for doramectin, respectively.

Experimental infestations with larval stages and adults from three different species of nematodes were performed in order to demonstrate the efficacy of doramectin in cattle.

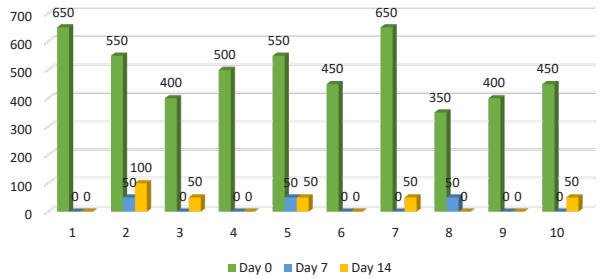

Figure 1. Graphic Distribution of the EPG for the Group Treated With Dectomax®. *Note.* EPG: Electronic programming guide.

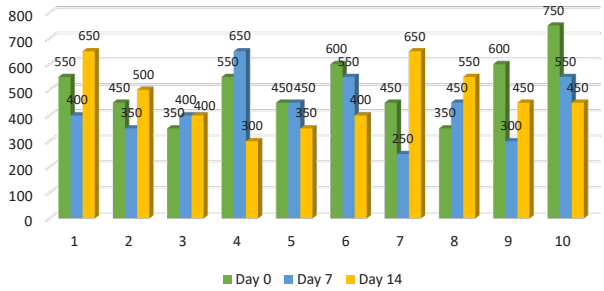

Figure 2. The Graphic distribution of the EPG for the Control Group. *Note.* EPG: Electronic programming guide.

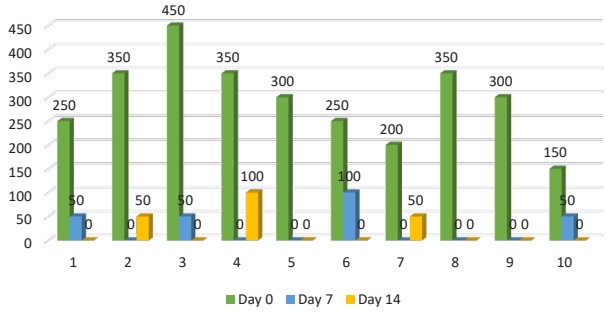

Figure 3. Graphical Distribution of the EPG in Animals Treated With Dectomax®. *Note.* EPG: Electronic programming guide.

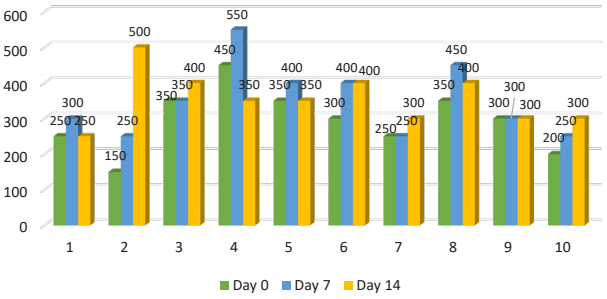

Figure 4. Graphical Distribution of the EPG in the Control Group. *Note.* EPG: Electronic programming guide.

Table 3. Results Obtained Following Faecal Examination of Samples Collected From Cattle Using the Willis Method

Species	Age	Digestive *Strongyles*	*Eimeria* spp.	*Balantidium coli*	*Toxocara* spp.	Cestodes	Negative
Cattle	4	Yes	No	No	No	No	No
Cattle	6	Yes	Yes	No	No	No	No
Cattle	12	Yes	Yes	No	No	No	No
Cattle	5	Yes	No	No	No	Yes	No
Cattle	6	No	Yes	Yes	No	No	No
Cattle	3	Yes	No	No	No	No	No
Cattle	2	Yes	No	Yes	Yes	No	No
Cattle	5	Yes	No	No	No	No	No
Cattle	4	Yes	No	Yes	No	No	No
Cattle	8	Yes	No	No	No	No	No
Cattle	6	Yes	No	Yes	No	No	No
Cattle	8	No	No	No	No	No	No
Cattle	4	Yes	No	No	No	No	No
Cattle	5	Yes	No	No	No	No	No
Cattle	3	Yes	Yes	No	No	No	No
Cattle	10	Yes	Yes	No	Yes	No	No
Cattle	5	No	No	Yes	No	No	No
Cattle	6	No	No	Yes	No	No	No
Cattle	4	Yes	No	No	No	Yes	No
Cattle	11	Yes	Yes	No	No	No	No

Table 4. EPG Loads of the Studied Groups

		Average	1	2	3	4	5	6	7	8	9	10
Experimental group	Day 0	295	250	350	450	350	300	250	200	350	300	150
	Day 7	25	50	0	50	0	0	100	0	0	0	50
	Day 14	20	0	50	0	100	0	0	50	0	0	0
Control group	Day 0	295	250	150	350	450	350	300	250	350	300	200
	Day 7	350	300	250	350	550	400	400	250	450	300	250
	Day 14	355	250	500	400	350	350	400	300	400	300	300

Note. EPG: Electronic programming guide.

Each cow was parasitized with 30 000 *Ostertagia ostertagi*, 20 000 *Cooperia* spp. and 10 000 *Trichostrongylus axei*. Subsequently, they received treatment with doramectin within 6 days after infestation. The treatment was given in a single-dose regime of 200 µg/kg, demonstrating a 99.9–100% efficacy in a study from New Zealand (17).

Other coproscopy studies conducted on cattle from Turkey (18), Brazil (19), Iran (20), and the UK (21) revealed 100%, 16-100%, 59.14-99.57% and 95.1-98.1% efficacy rate of doramectin, respectively, in natural infestations, while the rate in the present study reached 95%.

Conclusion

The study led to the identification of parasites belonging to three different species: Sporozoa, Nematoda, and Cestoda. None of the investigated helminths proved resistant to Dectomax®, meaning that in sheep and cattle naturally infected with digestive strongyles, *Eimeria* spp., or *Toxocara* spp., the average efficacy rate of Dectomax® was 94% for sheep and 95% for cattle.

Authors' Contribution

Conceptualization: CBS, SM, BJ and IL, Methodology: CBS, SM, AC, Validation: CBS, SM and IL Formal Analysis: CBS, BJ, SM, IL, AC.

Conflict of Interests

The authors declare that they have no conflict of interests.

Ethical Issues

Not applicable.

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Not applicable.

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