Journal of Animal and Veterinary Advances 3 (11): 726-729, 2004
© Grace Publications Network, 2004

Therapeutic Efficacy of Doramectin Injectable Against Gastrointestinal Nematodes in Donkeys (*Equus asinus*) in Khartoum, Sudan

[1]H. I .Seri, [2]T. Hassan, [3]M.M. Salih, [1]A.D. Abakar, [4]A. A. Ismail and [4]T. A. Tigani
[1]Department of Clinical Studies, Faculty of Veterinary Science. University of Nyala. Sudan
[2]Department of Med. Pharmacology and Toxicology. Faculty of Veterinary Medicine, University of Khartoum, Sudan; [3]Central Veterinary Research Laboratory (CVRL) Soba. Sudan; [4]Department of Pathology, Faculty of Veterinary Science. University of Nyala. Sudan

Abstract: A study was conducted to evaluate the therapeutic efficacy of doramectin administered intramuscularly and subcutaneously at a dose rate of 0.2 mg/kg to donkeys naturally infected with gastrointestinal nematodes in Khartoum State, Sudan. The study involved 34 donkeys, animals were randomly allocated to a non-medicated control group or doramectin treated groups (DT1 and DT2). On day 0, donkeys in DT1 received an intramuscular injection of doramectin (0.2 mg/kg), whereas those in group DT2 received a single subcutaneous injection of doramectin (0.2 mg/kg). Individual faecal egg counts were performed daily for the first week and then on days 14, 21, and 28. Between days 14 and 20, two animals from each group were slaughtered, and worm burdens were determined. Treatment efficacy was based on the mean faecal egg count reduction (FECR) 14 days post treatment. Faecal egg reduction of 100% was found after treatment with doramectin intramuscularly, but only 99.24% reduction was found after subcutaneous injection. At necropsy, only adult nematodes and mainly *Strongylus vulgaris* (L4) were recovered. Doramectin injected intramuscularly was highly efficacious against gastrointestinal nematodes of the donkey. Despite the fact that the drug has not being registered for use in donkeys, no abnormal clinical signs nor adverse reactions were observed in any of the donkeys treated with doramectin.

Key words: anthelmintic, doramectin, donkeys- nematode, Sudan

Introduction

The Sudan is a vast country and has the largest livestock population in both the Arabic world and Africa. Most of these animals are owned by nomadic or semi-nomadic tribes living in the semi arid regions. According to Ministry of Animal Resources census (SBAR, 2000), livestock population was reported to be about 121 million head, composed of 35.825, 44.802, 37.346, 3.031, and 0.65, 6.35 million head of cattle, sheep, goats, camels, horses and donkeys respectively. However, donkey's population is relatively large compared to camels and horses. Donkeys are used in carrying water, commodities, ploughing and as means of transportation.

For many years the control of equine parasites has relied almost entirely on the routine administration of anthelmintics to remove the adult parasites and thus prevent contamination of the environment with eggs or larvae (Duncan, 1985). Gastrointestinal nematodes are important factors in the etiology of gastrointestinal diseases and are also of economic importance in equines throughout the world (Davies and Schwalbach, 2000). In Sudan, infestation with nematode was the main problem reported among donkeys brought to veterinary clinics (Ali *et al.*, 2001). The development of anthelmintic resistance has indicated the need for an alternative or complementary method of parasite control and additional effective drugs (Davies and Schwalbach, 2000). An example of the more recently developed drugs is doramectin, an avermectin currently registered for use in sheep, cattle and swine (Dectomax® injection, Pfizer, France). In South Africa, although not registered for use in equines, doramectin was used by many horse owners. Davies and Schwalbach (2000) claimed excellent results and no adverse side-effects were reported.

The aim of this study was to investigate the therapeutic efficacy of doramectin, where limited studies have been conducted to date, as an anthelmintic to donkeys.

Materials and Methods

Study Animals: This study involved 28 donkeys, aging 3-10 years, divided into two groups of 14 donkeys each. The donkeys had naturally acquired mixed parasitic infections, comprising gastrointestinal nematodes. Infections were confirmed before the beginning of the study by egg flotation and the parasites were identified after performing larval culture. Individual egg count was determined by using a modified McMaster technique (MAF, 1986). After treatment, experimental animals were penned by treatment groups until the end of the observation period. The animals were kept on tap water and straw *ad libitum*.

Additional six animals (intended for slaughtering) were divided to three groups, each group comprising two animals. Group one (DT1) received single injection of doramectin intramuscularly, the second group (DT2) received single injection of doramectin subcutaneously, the third group remained as untreated control group.

Design of Study: Faecal samples were collected from all donkeys and analyzed the same day using a modified McMaster technique with a sensitivity of 50 EPG. Donkeys were allocated to 2 equal sized treatment groups according to the EPG and, where possible sex and age. They were weighed and treated as follows: Doramectin – treated group1 (DT1) received a single intramuscular injection of 200 mcg/kg doramectin (Dectomax ® injection, Pfizer France), doramectin- treated group 2 (DT2) received a single subcutaneous injection of 200 mcg/kg doramectin (Dectomax® injection, Pfizer France). Injections were administered in the lateral mid- line of the neck. The remaining two animals were kept untreated as control animals (intended for slaughtering).Donkeys were then observed for possible adverse reactions for 2 hours after injection. Faecal egg counts were performed on each animal daily for the first week and then on days 14, 21 and 28.

On each of days 15, 16, 17, 18, 19, and 20 two animals (one per each day) from each group (control, DT1 and DT2) were killed and necropsied. Day of slaughter for each animal had been determined on day zero by random assignment at the same time as donkeys were allocated to treatment groups.

Animals were slaughtered and methods used for worm recovery were the same as those previously described by Reinecke and Le Roux (1972).

After donkeys were slaughtered, the thoracic and abdominal cavities were opened by making an incision along the ventral line of the animal and the left half of the thorax and the abdominal wall was removed. The organs from the thoracic and abdominal cavities were removed from the carcass.

The different organs from the gastro-intestinal tract were then isolated by tying double ligatures around the gut to separate it into the stomach, small intestine, caecum, colon and rectum.

The contents of the different organs were removed and then sieved through a 150 μm sieve to obtain residue samples. Iodine was added and the residues preserved in 10% formalin. Residue samples of ingesta were examined macroscopically. Nematodes present were placed in a specimen bottle containing 10% formalin. Helminthes were identified at a later stage by placing them on glass slides, clearing them with lactophenol, examining them microscopically and classifying them using the descriptions of Lichtenfels (1975).

Data Analysis: The anthelmintic effect of doramectin was estimated using the faecal egg count reduction test (FECR) and for nematode burdens. Arithmetic means of the egg counts and nematode burdens were calculated to determine the mean percentage reductions within each group, according to the following formula:

$$\text{FECR\%} = \frac{\text{Pre- treatment epg- Post- treatment epg}}{\text{Pretreatment epg}} \times 100$$

Results

Faecal Egg Count Reductions: The results of day zero to day 28 mean EPG values from both treatment groups are presented in Tables (1 and 2), together with the mean faecal egg count reductions. Doramectin produced 100% reduction of nematode eggs on day 6 onwards on (DT1), whereas on DT2 doramectin showed 94.78% reduction after the same time.

On day 0 all donkeys had positive egg counts with a range of 100-2800 EPG at DT1and a range of 100-4100 at DT2 .On day 14, at DT1 all donkeys had negative egg counts, whereas in DT2 group only one animal had positive egg counts ranging from 200- 50 from day 14 to the end of the experiment.

Larval Identification: The pre-treatment larval cultures yielded 56.8% Cyathostomes and 42.2% *Stronsylus spp.*1% *Trichostrogylus axei* at DT1, and 59.6%, 39.4%. and 1% Cyathostomes, *Strongylus spp.* and *Parascaris equorum*, respectively in DT2.

Postmortem Findings: The results of postmortem findings and the nematodes collected were present in table (3). The results obtained indicated that animal's received doramectin intramuscularly showed zero nematode burdens except for the larval stages of *Strongylus vulgaris* larvae (L4) present in the cranial mesenteric artery. In the trunk of the cranial mesenteric artery (and its main branches), in the iliac, celiac, femoral arteries larvae cause inflammation of the arterial wall, formation of thrombuses, thickening and dilatation of the wall of arteries, aneurysms. Where animals treated with doramectin subcutaneously in addition to *Strongylus vulgaris* larvae (L4)

Table 1: Mean faecal egg counts (± standard deviation) and reductions for doramectin – treated donkeys (DT1) (intramuscular injection)

Day	Arithmetic mean (EPG)	Range	Mean % reduction
0	1553.6±968.2	100-2800	-
1	1139.3±1033.9	0-3050	26.26 %
2	714.3±571.2	50-1800	54.02 %
3	185.7±265.6	0-900	88.09 %
4	146.4±294.5	0-1100	90.60 %
5	17.6±31.7	0-100	98.91 %
6	0±0	0-0	100 %
7	0±0	0-0	100 %
14	0±0	0-0	100 %
21	0±0	0-0	100 %
28	0±0	0-0	100 %

Table 2: Mean faecal egg counts (± standard deviation) and reductions for doramectin – treated donkeys (DT2) (subcutaneous injection)

Day	Arithmetic mean (EPG)	Range	Mean % reduction
0	1839.3±1209.9	100-4100	-
1	1303.6±1033.9	50-3200	29.15 %
2	889.3±623.6	50-2250	51.66 %
3	339.3±596.5	0-2300	81.57 %
4	167.9±371.4	0-1400	90.92 %
5	50±135.9	0-500	97.28 %
6	96.4±346.7	0-1300	94.78 %
7	57.1±150.5	0-500	96.90 %
14	14.3±53.5	0-200	99.24 %
21	3.6±13.4	0-50	99.80 %
28	3.6±13.4	0-50	99.80 %

Table 3: Summary of worms recovered from control and treated animals with doramectin at necropsy (Mean ± Standard deviation)

Organs examined	Control	DTI	DT2
Cranial mesenteric artery			
Strongylus vulgaris	130	110	5
Stomach			
Gastrophilus sp.	667	0	1
Habronema sp.	320	0	0
Trichostrongylus axei	50	0	0
Small Intestine			
Parascaris equorum	10	0	0
Caecum			
Gastrophilus sp.	30	10	0
Strongylus sp.	820	0	0
Cyathostomes sp.	1000	0	0
Colon			
Strongylus sp.	3360	0	0
Cyathostomes + *Strongyloides westeri* + *Oxyuris equi*	22500	0	240
Rectum			
Gastrophilus sp.	110	0	10
Oxyuris equi	20	0	0

present in the cranial mesenteric artery showed some Gastrophilus larvae in the stomach, rectum and caecum, and Cyathostomes in the colon.

Discussion

In this study, a 100% reduction in faecal egg count was shown at DT1 group after administration of doramectin by intramuscular injection. This finding is in accordance with the findings of Davies and Schwalbach (2000) in horses in South Africa. These findings indicate that doramectin appears to be effective against adult Cyathostomes, *Strongylus spp.*, *Trichostrongylus axei* and *Parascaris equorum* in donkeys.

Nematode burden in the treated animals were much lower from that recovered from the control animals. But the presence of some nematodes in the animals treated with doramectin subcutaneously support our findings that doramectin injected subcutaneously was 99.24-99.80% effective. No adverse reactions were observed such as irritation or swelling at the injection site in any of the donkeys.

The faecal egg count reduction of 99.24% recorded in day 14 after administration of doramectin subcutaneously confirms the results obtained from the slaughtered animals. Abbakar and his colleagues (2003), reported the same observation in sheep treated subcutaneously with doramectin. The fact that doramectin may be administered by intramuscular injection ensures that no anthelmintic is wasted hence no under dosing occurs, providing the animal weight is accurately determined. Under- dosing has been suggested as an important factor in hastening the development of resistance (Prichard,1990) and this is often a risk associated with oral dosing, as spillage frequently occurs.

A single intramuscular injection of doramectin administered at a dose rate of 200 mcg/kg body weight was highly efficient against naturally acquired infections of adult Cyathostomes, *Strongylus spp.*, *Trichostrongylus axei* and *P. equorum* gastrointestinal nematodes in donkeys. These findings suggest that further research into the use of doramectin as an equine anthelmintic might be warranted.

Acknowledgment

The generous financial support granted by the Central Veterinary Research Laboratory (CVRL) (Soba), and German Academic Exchange Service (DAAD) was greatly acknowledged. Due thanks are extended to staff members of the Radioisotopes department (CVRL) Soba.

References

Abbakar, A. D., H. I. Seri and A. A. Ismail, 2003. The effect of anthelmintic treatment on internal parasites in communally grazed sheep as reflected in the faecal nematode egg count in the South Darfur State of Sudan. 7th Sci. Cong. Egyptian Society for Cattle Diseases, Assiut, Egypt., 148-152.

Ali, T. M. O., K. E. E. Ibrahim, E. H. A. Eltom and M. E. Hamid, 2001. Animal diseases diagnosed at the University of Khartoum Veterinary Teaching Hospital (1995-1998). Sud. J. Vet. Sci. Anim. Husb., 40: 38-44.

Davies, J. A. and L. M. J. Schwalbach, 2000. A study to evaluate the field efficacy of ivermectin, fenbendazole, and pyrantel pamoate, with preliminary observations on the efficacy of doramectin, as anthelmintic in horses. J. South. Afri. Vet. Assoc., 71: 144-147.

Duncan, J. L., 1985. Internal parasites of the horse and their control. Equine Vet. J., 17: 79-82.

Lichtenfels, J. R., 1975. Helminthes of domestic equids. Proceedings of the Helminthological Society of Washington 42 special Issue, pp: 92.

MAF, 1986. Manual of Veterinary Parasitological Techniques, 3rd edition. HMSO, London, pp: 160.

Prichard, R. K., 1990. Anthelmintic resistance in nematodes: extent, recent understanding and future directions for control and research. International J. Parasiotology, 20: 515-523.

Reinecke, R. K. and Le Roux, 1972. Anthelmintic activity of mebendazole in equines. Journal of the South African Veterinary Medical Association, 43: 287-294.

SBAR, 2000. Statistical Bulletin for Animal Resources. Ministry of Animal Resources, 10: 14.