COMPARATIVE PRODUCTIVITY OF GROWING CATTLE TREATED WITH TWO INJECTIONS OF DORAMECTIN (200 MCG/KG) OR ONE INJECTION OF IVERMECTIN (630 MCG/KG) FOR PARASITE CONTROL

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SUMMARY: A study was conducted in Brazil, from May to October 1999, to compare the anti-parasitic efficacy and productivity effects of 2 subcutaneous injections of doramectin (200 mcg/kg) administered 56 days apart with that of a single injection of ivermectin (630 mcg/kg) in growing cattle. Ninety-six crossbred male cattle were randomly allocated to 3 groups of 32 animals, based on bodyweight. All animals grazed the same pasture during the study. Treatments consisted of either 2 injections of doramectin (days 0 and 56), one injection of ivermectin (day 0), or no treatment (controls). Cattle weight, nematode egg counts, coprocultures, tick counts, tropical warble nodule counts, and presence of screw worms were determined on days 0, 28, 56, 84, 112 and 140. Mean fecal egg counts from cattle in both medicated groups were significantly reduced compared to those of controls. Coprocultures showed a predominance of *Cooperia* spp. and *Haemonchus* spp. On days 84 and 112, fecal egg counts of doramectin-treated cattle were significantly ($p<0.05$) lower than those for ivermectin-treated cattle. Tick counts were also reduced in the doramectin- and ivermectin-treatment groups compared to those for controls. On day 84, ticks counts of doramectin-treated cattle were significantly lower than those of ivermectin-treated cattle. At the end of the 140-day study, doramectin-treated cattle had a mean weight gain of 11.3 kg and 14.1 kg higher than that of ivermectin-treated cattle ($p<0.05$) and controls ($p<0.05$), respectively. It is concluded that, growing cattle treated with two injections of doramectin (200 mcg/kg) administered 56 days apart had better productivity and parasite control over a 140-day period, than cattle treated with a single injection of ivermectin (630 mcg/kg).

KEY WORDS: Doramectin, ivermectin, endo and ectoparasite, cattle, productivity.

INTRODUCTION

Parasite infestations due to gastrointestinal nematodes or external parasites such as *Dermatobia hominis* larvae (tropical warble), *Cochliomyia hominivorax* larvae (screwworm myiasis) and the cattle tick *Boophilus microplus* associated with the poor feeding and handling conditions, are the main cause of the low cattle productivity. The parasites are responsible for a great economic loss in the South American countries including Brazil (ENTROCASSO, 1987; HORN, 1987). The strategic control program of nematode infections using conventional anthelmintics, improved the beef cattle weight gain in about 15 to 45 kg/animal in the central western regions of Brazil (BIANCHIN & MELO, 1985; BIANCHIN & HONER, 1987). The strategic control including ectoparasiticides greatly improves the productivity of the cattle (HONER & GOMES, 1990). Modernly, the endectocides of the macrocyclic lactone family have been used for the simultaneous control of the endo and ectoparasites with a single product, with the advantage over the conventional products due to lower number of treatment required, reduced man labor, and reducing the stress of handling the animals many times. More recently, a new long acting formulation of ivermectin (Ivomec Gold – Merial) against internal and external parasites has been launched in the Brazilian market. This formulation given at a dose of 1mL/50 kg (630 mcg/kg) showed a better parasite control (nematode e.p.g., *Dermatobia hominis* and *Boophilus microplus* infestations) compared to a non-treated or to one treatment with doramectin at 200 mcg/kg in a study conducted during 112 days (CARVALHO *et alii*, 1998). In a previous study, LEITE *et alii* (1997) obtained a better parasite control and higher weight gain of doramectin given at a two doses regimen of 200 mcg/kg compared to two injections of ivermectin conventional at 200 mcg/kg during 140 days. The objective ofthe present study was to evaluate the effect of two

injections of doramectin administered at a dose rate of 200 mcg/kg or one injection of ivermectin long-acting given at a dose of 630 mcg/kg on the parasite control and the productivity of growing cattle during a period of 140 days.

MATERIALS AND METHODS

Study site and animals:

The study was conducted in a commercial beef cattle farm located in Medeiros Neto County, Bahia State, Brazil during the period of May to October 1999. A total of 96 Red North cattle, 5 to 8 months old were used in the study. The animals were selected from a bigger herd and allocated randomly to three treatment groups (T1, T2 and T3) of 32 animals each based on body weights. On day -1, the animals were identified by a numbered ear tag, weighed and ranked in descending order of body weights. The three heaviest animals of the list were allocated to the three groups. The procedure was repeated with the next three animals of the list and thus, successively until all 96 animals were allotted to the three groups.

Treatments:

Animals of T1 group received no treatment and served as negative controls. The animals of T2 group received two SC injections of doramectin (Dectomax – TM Pfizer Inc.) at a dose rate of 200 mcg/kg (1 mL/50 kg) on days 0 and 56, and the animals of T3 group received a SC injection of ivermectin long acting (Ivomec Gold – TM Merial) at a dose of 630 mcg/kg (1 mL/50 kg) on day 0. The three groups of animals were grazed together for a total of 140 days in the same pasture, at a stocking rate of one animal per hectare. The animals were fed on pasture of *Brachiaria decumbens* with salt licks to provide adequate sources of Ca, P and other trace elements.

Parasitological assessment and weighing operations:

Every time individual weights were collected, animals of the three groups were confined the night before without feed and water. Individual weights were taken at 28 days interval for the duration of the study. From day 0 and every 28 days thereafter until the end of the study, individual fecal samples were collected for e.p.g. counts. Each time, pooled fecal samples per treatment group were used for coprocultures and species identification. On those same days, the number of female ticks (approximately 4.5 mm or larger) present on the right side of the body of each animal were counted and recorded. The total number of warble nodules containing live larvae of *D. hominis*, was assessed visually and by palpation on the whole body surface of each animal and recorded. The presence (Y=yes) or absence (N=no) of screwworm wounds in each animal was also recorded. The study was terminated on day 140.

Statistical Analysis:

Body weights were analyzed using a general mixed model repeated measures analysis of variance. Pairwise comparisons between treatments were made for each data collection time point (day of study) using Fisher's protected LSD. Treatment least-squares means were calculated for each day of study. Gain between day -1 and day 140 was calculated for each treatment using estimate statements. Gain was compared between treatments using estimate statements. The eggs per gram of feces or tick counts, were transformed by taking the natural logarithm of the count +1 for data analyses. The transformed e.p.g.'s or tick counts, were analyzed using a mixed model repeated measures analysis of variance. Pairwise comparisons between treatments were made for each data collection time point (day of study) using Fisher's protected LSD. Geometric means were calculated by back-transforming the least-squares means. The significance level was set at alpha = 0.05.

RESULTS AND DISCUSSION

Weight Gain:

Doramectin treatment at 2 doses regimen of 200 mcg/kg given 56 days apart, resulted in increased mean weight that was significantly higher ($p<0.05$) than one injection of ivermectin long-acting administered at a dose of 630 mcg/kg, from day 84 to the end of the study on day 140 (Table 1 and Figure 1). During the 140 days, doramectin treated animals had a mean weight gain of 62.8 kg per animal that was significantly higher ($p<0.05$) than the 51.5 kg/animal gained by the animals treated with ivermectin long-acting. Doramectin had an improvement of 11.3 kg higher than ivermectin long-acting and 14.1 kg/animal higher than the control. The mean weight gain of the control group was 48.7 kg/animal. CARVALHO *et alii* (1998) reported a better parasite control and higher weight gain of one treatment of ivermectin long-acting (630 mcg/kg) compared to one treatment of doramectin (200 mcg/kg) in a study of 112 days.

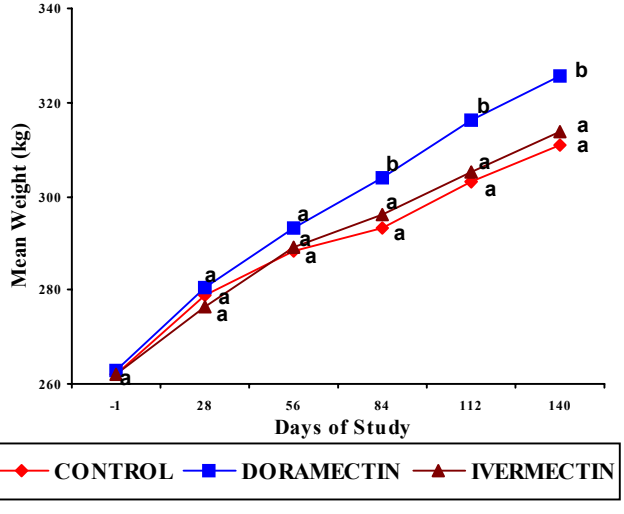

Fig. 1 – Arithmetic means of body weights at each observation day. [a,b] = Between treatments, means with dissimilar letters are significantly different ($p<0.05$).

Table 1 – Arithmetic means of body weights at each observation day.

Days on Test	Control	Doramectin (2 X 200 mcg/kg)	Ivermectin (1 X 630 mcg/kg)
-1	262.2[a]	262.7[a]	262.2[a]
28	278.9[a]	280.5[a]	276.4[a]
56	288.3[a]	293.3[a]	289.1[a]
84	293.4[a]	303.9[b]	296.2[a]
112	303.2[a]	316.3[b]	305.3[a]
140	310.8[a]	325.5[b]	313.7[a]
Total weight gain	48.7[a]	62.8[b]	51.5[a]

[a,b] = Between treatments, means with dissimilar letters are significantly different (p<0.05).

Table 2 – Geometric mean e.p.g. counts on fecal samples at each observation day.

Days on Test	Control	Doramectin (2 X 200 mcg/kg)	Ivermectin (1 X 630 mcg/kg)
0	156.1[a]	182.3[a]	285.0[a]
28	552.4[a]	17.0[b]	17.1[b]
56	289.3[a]	22.7[b]	37.8[b]
84	283.4[a]	10.3[b]	70.1[c]
112	671.5[a]	26.7[b]	174.3[c]
140	1,583.7[a]	419.9[b]	463.6[b]

[a,b,c] = Between treatments, means with dissimilar letters are significantly different (p<0.05).

CARVALHO *et alii* (1999) reported also a better response of ivermectin long-acting when given at 2 doses regimen compared to 2 doramectin in a year-long parasite control program. In the present comparative study, two doses of doramectin conventional (200 mcg/kg) was superior than one treatment with ivermectin long-acting (630 mcg/kg).

Parasitological Assessment:

The nematode e.p.g. counts following treatment with doramectin or ivermectin long acting were significantly (p<0.05) reduced compared to the control group during all observation period after treatment (Table 2 and Figure 2). Compared to ivermectin long acting, doramectin-treated animals had mean e.p.g. counts significantly lower (p<0.05) on days 84 and 112 p.t. The coproculture results (Table 4)

Table 3 – Geometric mean number of ticks at each counting day.

Days on Test	Control	Doramectin (2 X 200 mcg/kg)	Ivermectin (1 X 630 mcg/kg)
0	10.3[a]	9.0[a]	9.6[a]
28	0.6[a]	0.0[b]	0.0[b]
56	1.0[a]	0.8[ab]	0.5[b]
84	66.2[a]	0.1[b]	32.4[c]
112	7.8[a]	11.7[b]	7.2[a]
140	101.3[a]	115.4[a]	101.7[a]

[a,b,c] = Between treatments, means with dissimilar letters are significantly different (p<0.05).

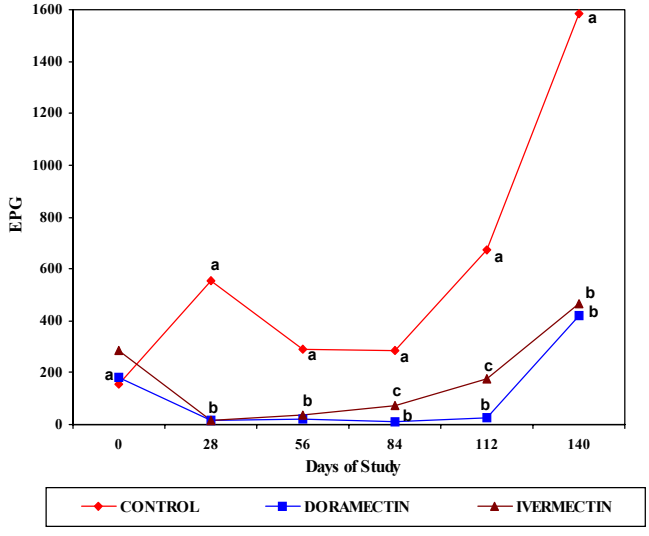

Fig. 2 – Geometric mean e.p.g. counts on fecal samples at each observation day. [a,b,c] = Between treatments, means with dissimilar letters are significantly different (p<0.05).

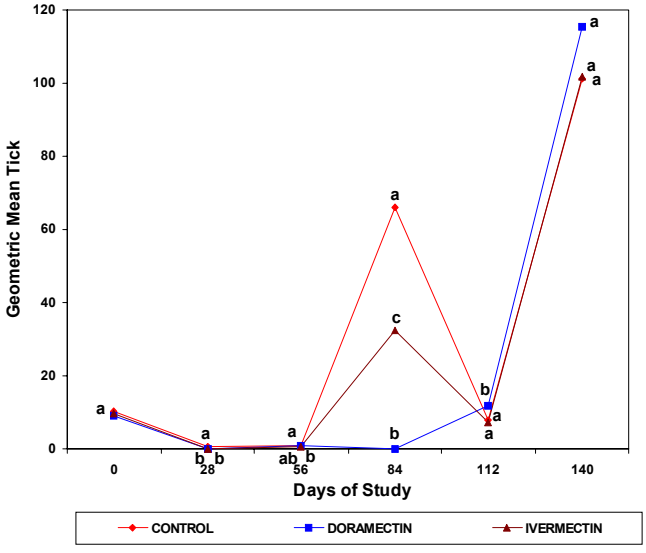

Fig. 3 – Geometric mean number of ticks at each counting day. [a,b,c] = Between treatments, means with dissimilar letters are significantly different (p<0.05).

Table 4 – Percent of nematode species identified in coprocultures of pooled fecal samples per treatment at each observation day.

Days on Test	Nematode species	Control	Doramectin (2 x 200 mcg/kg)	Ivermectin (1 x 630 mcg/kg)
0	*Cooperia*	51.5	69.0	47.5
	Haemonchus	39.0	23.5	43.5
	Oesophagostomum	9.5	7.0	9.0
	Strongyloides	0	0.5	0
28	*Cooperia*	46.5	100	18*
	Haemonchus	36.5	0	0
	Oesophagostomum	17.0	0	0
56	*Cooperia*	24.0	48*	96*
	Haemonchus	62.0	0	0
	Oesophagostomum	14.0	0	0
84	*Cooperia*	65.0	100	96.0
	Haemonchus	20.0	0	4.0
	Oesophagostomum	15.0	0	0
112	*Cooperia*	23.0	98.0	61.0
	Haemonchus	60.0	2.0	34.0
	Oesophagostomum	17.0	0	5.0
140	*Cooperia*	20.7	50.0	28.0
	Haemonchus	59.2	48.8	65.0
	Oesophagostomum	20.1	1.2	7.0

*Actual number counted.

showed that the predominant species of nematode was *Cooperia*, followed by *Haemonchus* and *Oesophagostomum*.

The tick counts were also reduced in the doramectin or ivermectin treated groups compared to the control group (Table 3 and Figure 3). The geometric mean tick counts of doramectin-treated cattle were significantly lower ($p<0.05$) after each treatment, i.e., on days 28 and 84, compared to the control. Also on day 84, the mean tick count of doramectin-treated cattle was significantly lower ($p<0.05$) than ivermectin long acting. On day 112, the tick count of ivermectin-treated cattle was similar to the control, while doramectin was higher than the control or ivermectin.

Regarding *Dermatobia hominis* larvae or screwworm, only one nodule of *D. hominis* was found in one animal of the control group on day 140 and screwworm myiasis was found in only one animal of control group on day 28 and in one animal of ivermectin long acting group on day 84, and thus, no analysis was done for these parasites.

Two doses of doramectin at a dose rate of 200 mcg/kg was more effective than ivermectin long acting given once at a dose of 630 mcg/kg in the reduction of nematode e.p.g. counts in fecal samples and in the number of tick counts. Doramectin treatment resulted in significantly higher ($p<0.05$) weight gain than ivermectin long acting and the control animals. Doramectin had a mean weight gain of 62.8 kg/animal compared to 51.5 kg/animal afforded by the ivermectin long acting and 48.7 kg/animal by the control. Doramectin treatment had a mean of 11.3 kg/animal higher weight gain than ivermectin long acting and 14.1 kg/animal higher than the control. No adverse drug effect was observed in either treatment groups.

SUMÁRIO

Um estudo foi conduzido no Brasil, no período de maio a outubro de 1999, para comparar a eficácia antiparasitária e os efeitos na produtividade de 2 injeções subcutâneas de doramectin (200 mcg/kg) administrados com 56 dias de intervalo ou injeção única de ivermectin (630 mcg/kg) em bezerros na fase de crescimento. Noventa e seis (96) bezerros machos Red Norte, foram distribuídos em 3 grupos de 32 animais, baseado no peso corporal. Todos os animais foram mantidos em um mesmo pasto durante todo o período do estudo. Os tratamentos consistiram em 2 injeções de doramectin (dias 0 e 56), uma injeção de ivermectin (dia 0) ou não tratados (controles). O peso dos animais e contagens de ovos de nematódeos por grama de fezes (o.p.g.), coproculturas e contagens de carrapatos, bernes, e bicheiras foram determinados nos dias 0, 28, 56, 84, 112 e 140. A média de o.p.g. nos animais dos grupos tratados foram significativamente reduzidos comparados com a média dos animais controles. A coprocultura mostrou uma predominância de *Cooperia* spp. e *Haemonchus* spp. Nos dias 84 e 112, os números de o.p.g. do grupo tratado com doramectin foram significativamente ($p<0,05$) menores do que no grupo tratado com ivermectin. As contagens de carrapatos também foram reduzidas nos grupos tratados com doramectin e ivermectin comparadas com o grupo controle. No dia 84, as contagens de carrapatos no grupo tratado com doramectin foram significativamente menores ($p<0,05$) do que o grupo ivermectin. Ao final do período de 140 dias do estudo, os animais tratados com doramectin tiveram uma média de ganho de peso de 11,3 kg e 14,1 kg maiores do que os animais tratados com ivermectin ($p<0,05$) e o grupo controle ($p<0,05$)

respectivamente. O tratamento com 2 injeções de doramectin (200 mcg/kg) com intervalo de 56 dias teve uma melhor produtividade e controle de parasitas por um período de 140 dias do que uma injeção de ivermectin (630 mcg/kg).

PALAVRAS-CHAVE: Doramectin, Invermectin, endo e ectoparasitas, bovinos, produtividade.

REFERENCES

BIANCHIN, I & MELO, H.J.H., (1985). Epidemiologia e controle de helmintos gastrointestinais em bovinos de corte nos cerrados. In Circular Técnica, 16. Embrapa-CNPG, Campo Grande, MS, 60 p.

BIANCHIN, I & HONER, M.R., (1987). Helminth parasites of beef cattle in the cerrado region of Brazil. *Trop. Anim. Hlth*. Prod. 19, 39-45

CARVALHO, L.A.; BIANCHIN, I.; BRIDI, A.A.; MACIEL, A.E.B.; SANTOS, A.C.M.; MALACCO, M.A.F.; CRUZ, J.B.; BARRICK, R.A.; COX, J., (1998). Controle antiparasitário em gado de corte com endectocida de ação prolongada, em comparação com produto convencional. *A Hora Veterinária*. 18(106), 53-58.

CARVALHO, L.A.; BRIDI, A.A.; CRAMER, L.G.; LANGHOLF, W.K., (1999). Impact of an ivermectin long-acting injectable formulation on the productivity of beef cattle. Proc. 17th IINTERNATIONAL CONFERENCE OF THE WORLD ASSOCIATION FOR THE ADVANCEMENTE OF VETERINARY PARASITOLOGY, Copenhagem, Denmark, 15-19 August, 1999, Abstract, c.7.42.

ENTROCASSO, C.M., (1987). Economic impact of gastrointestinal verminosis in the temperate climate areas of South America, with special reference to Argentina. Proc. of the MSD AGVET Symposium. The economic Impact of Parasitism in Cattle. In association with XXIII WORLD VETERINARY CONGRESS. Montreal, Quebec, Canada. Ed. W.H.D. Leaning & Jorge Guerrero, p. 53-58.

HONER, M.R.; GOMES, A., (1990). O manejo integrado de mosca dos chifres, berne e carrapato em gado de corte. *Circular Técnica*, 22. Embrapa-CNPG, Campo Grande, MS, 60 p.

HORN, S.C., (1987). Bovine ectoparasites and their economic impact in South America. Proc. of the MSD AGVET Symposium. The economic Impact of Parasitism in Cattle. In association with XXIII WORLD VETERINARY CONGRESS. Montreal, Quebec, Canada. Ed. W.H.D. Leaning & Jorge Guerrero, p. 25-27.

LEITE, R.C.; CAPRONI Jr., L.; MORO, E.; OLIVEIRA, P.R.; UMEHARA, O.; GONÇALVES, L.C.B. (1997). Comparative efficacy of program use of two doses of doramectin and ivermectin in the control of endo- and ectoparasite infestations and their productivity of fattening cattle. Proc. 16th INTERNATIONAL CONFERENCE OF THE WORLD ASSOCIATION FOR THE ADVANCEMENT OF VETERINARY PARASITOLOGY. Sun City, South Africa, 10-15 August, 1997. Abstract 040, p.13.