

EFFICACY OF DORAMECTIN IN THE TREATMENT OF SHEEP NATURALLY INFESTED BY *OESTRUS OVIS*

C.M.B. DE OLIVEIRA¹; E. MORO²; L. CAPRONI JR.²; L.C.B. GONÇALVES²; O. UMEHARA² & L.O. DE OLIVEIRA³

(1) Faculdade de Veterinária da UFRGS, CP 15094, 91540-000, Porto Alegre, RS, Brazil; (2) Laboratórios Pfizer Ltda, Rua dos Ingleses, 569, Cep 01329-905, São Paulo, SP., Brazil; (3) Hospital de Clínicas Veterinárias da UFRGS, CP 15094, Porto Alegre, RS, Brazil

SUMMARY: A study was conducted in the Federal University of Rio Grande do Sul, Porto Alegre, RS State, Brazil, during April-May 1996, to evaluate the efficacy of a single intramuscular injection of doramectin at a dose rate of 200 mcg/kg or 300 mcg/kg against natural infestations of the nasal bot fly, *Oestrus ovis*. Forty-eight (48) corriedale sheep naturally infested by *O. ovis* were randomly allocated to 4 treatment groups (T1, T2, T3 and Sentinel) of 12 animals each. On day 0, the animals of the sentinel group were necropsied, the developmental stages of *Oestrus ovis* larvae present in the nasal cavities and sinuses were identified and counted. Also on day 0, the animals of the T1 group received saline solution at 1 ml/50 kg, the animals of the T2 group received doramectin at a dose rate of 200 mcg/kg and the animals of the T3 group received doramectin at 300 mcg/kg. All treatments were administered by deep intramuscular injection in the left hind-leg. After treatment, the animals were returned to a common paddock where they were maintained together until the end of the study, day 14. At the end of the study all the animals were necropsied and the developmental stages of *Oestrus ovis* larvae were identified and counted. The results show that a single intramuscular injection of doramectin at either 200 mcg/kg (T2) or 300 mcg/kg (T3) was 100% effective against all developmental stages of *Oestrus ovis* larvae (first, second and third instar). Compared to the non-medicated control group (T1), the efficacy of doramectin at 200 mcg/kg or 300 mcg/kg) was highly significant ($p < 0.0001$). The efficacy of the treatment was confirmed by the fact that two weeks after treatment there was a substantial recovery from the sinusitis symptoms. There was no adverse reaction to doramectin in any of the treated animals.

KEY WORDS: Doramectin, *Oestrus ovis*, sheep, nasal bot fly, larvicide.

INTRODUCTION

The nasal bot fly, *Oestrus ovis* (Linneus, 1761) (Diptera: Oestridae) is found in almost all tropical and subtropical regions of the world, always associated with the presence of sheep and goats, their natural hosts. In the hosts, the three larval stages develop in the nasal cavities and sinuses originating the clinical picture of oestrosis also called cavitory myiasis, characterized by frequent sneeze, nasal discharges and uncoordinated movements of the head. HORAK & SNIJDERS (1974) observed that the elimination of the *O. ovis* infestations was followed by a reduction of the nasal discharges and there was an improvement in weight gain. The annual losses caused by *O. ovis* infestation in USA is estimated in 8 million dollars (STELLMAN, 1976). In Rio Grande do Sul State, in Brazil, a study conducted in the Bage county (RIBEIRO *et alii*, 1990) demonstrated that the prevalence ranged between 50 to 100% depending on the season

of the year. The *O. ovis* infestation control measures, aim for the elimination of the larvae and to avoid or to minimize the harm caused to the hosts. The compounds trichlorfon, rafoxanide, closantel, ivermectin and moxidectin have been indicated for the treatment of *O. ovis* infestations. Trichlorfon was tested among others by KNAPP & DRUDGE (1964) and BUKSHYNOV (1982); rafoxanide was tested by HORAK (1977) and RONCALLI (1984) who evaluated also the effect of ivermectin against *O. ovis*. SANTIAGO *et alii* (1981) obtained good results with closantel. PUCCINI *et alii* (1994) observed that moxidectin 1% injectable solution at a dose of 0.2 mg/kg, was 96% effective against L1 and 100% against L2 and L3 larval stages. DORCHIES *et alii* (1996) reported that moxidectin 1% injectable was effective against first instar larvae of *O. ovis*, but an oral solution at 0.1% was ineffective. DORCHIES *et alii* (1997) compared the oestricide efficacy of closantel at a dose rate of 10 mg/kg and ivermectin at a dose of 200 mcg/kg by subcutaneous and oral

administration and reported 100% efficacy for closantel and ivermectin injectable and 98% for ivermectin administered orally. The therapeutic efficacy of doramectin (Dectomax, trademark of Pfizer Inc.), as larvicide has been demonstrated in cattle by MOYA-BORJA *et alii* (1993a) and OLIVEIRA *et alii* (1997) against *Dermatobia hominis* and MOYA-BORJA *et alii* (1993b) and MUNIZ *et alii* (1995) against *Cochliomyia hominivorax*, the flies causing respectively, the dermatobiosis and the primary cutaneous myiasis. There is no published literature on the efficacy of doramectin against the larvae of *Oestrus ovis* in sheep. Therefore the objective of the present study was to evaluate the efficacy of doramectin at a dose rate of 200 mcg/kg or 300 mcg/kg administered by IM injection, against *Oestrus ovis* larvae in sheep naturally infested under field conditions in Brazil.

MATERIALS AND METHODS

The experiment was conducted in the Faculty of Veterinary Medicine, Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul State, Brazil, during the period of April and May 1996. Fifty-four (54), castrated male, corriedale sheep, 7 to 24 months old, from a commercial farm in Encruzilhada do Sul county showing clinical signs of *O. ovis* infestations were selected for the study. Clinical signs were defined as sneeze, shaking heads, purulent or mucous nasal discharges, nose pushed to the ground or against forelegs or between other sheep, and difficult breathing. On day -4 (four days before initiation of the experiment), six animals were killed on the farm and their nasal cavities, frontal and maxillary sinuses were examined to confirm the presence of live, first, second and third instar larvae of *O. ovis*. On day -1, twenty-four (24) hours before treatment (b.t.), the remaining forty-eight (48) sheep were transported to a common grazing paddock of the Federal University of Rio Grande do Sul. They were identified by a numbered white ear tag placed in the right ear, weighed and randomly allocated to four (4) treatment groups (T1, T2, T3 and Sentinel) of 12 animals each. On day 0, with the exception of the sentinel group, all the sheep were treated by a deep intramuscular injection (I.M.) in the superior third and posterior portion of the left hind-leg. The animals of the T1 group received saline solution at 1 ml/50 kg, the animals of the T2 group received doramectin at a dose rate of 200 mcg/kg and the animals of the T3 group received doramectin at a dose of 300 mcg/kg. All animals were then observed for 5 hours post-treatment (p.t.) for possible clinical signs of adverse reaction to medication. The animals of the sentinel group were killed, their head were severed from the carcasses, the mucosae of the nasal cavities and sinuses were examined and the developmental stages of *O. ovis* larvae present were identified and counted. For examination of nasal cavities and sinuses, four cuts were made on each head: first cut sagittally immediately right of the nasal septum; one transverse cut in the frontal bone anterior to the eyes; another transverse cut posterior to the eyes, through the parietal bone and the caudal portion of the frontal bone and, a fourth cut

frontal to each maxilla for maxillary sinus exposure. The larvae found were counted and recorded as dead or alive. Live larvae were defined as intact and with movement when stimulated. Dead larvae had a more or less intact integument but contained a liquefied larval body. Live larvae were preserved in 70% alcohol for further microscopic examination and identification of the developmental stage. The presence of rhinitis and/or sinusitis in frontal and maxillary sinuses were recorded as absent if no inflammatory process was present; or seromucous or purulent, according to the nature of the exudate. Rhinitis examinations were made on the right and left side of the nasal cavity, thus, the maximum of score 2 per animal and 24 in total for the group was recorded. For sinusitis, there were also considered the right and left side of the frontal anterior and posterior sinuses and the maxillary, thus the maximum score per animal was 6 and for the group was 72. On day 14 p.t., all animals of the 3 groups were killed, their nasal and sinus cavities were examined and the developmental stages of *Oestrus ovis* larvae were counted and recorded as described above.

Statistical Analysis

The total counts of larvae (live + dead), the counts of each stage (first, second and third instar larvae) and the total live larvae counts were analyzed using a one-way analysis of variance. The counts were analyzed as the natural log of the count + 1. Percent efficacy of doramectin was calculated using the arithmetic means compared to the control group. The significance level was fixed at $\alpha = 0.05$.

RESULTS AND DISCUSSION

The mean number of *O. ovis* larvae recovered and the percentage of efficacy of doramectin at dosages of 200 mcg/kg (T2) and 300 mcg/kg (T3) are shown in Table 1. Both dosages were 100% effective since no live L1, L2 or L3 larvae developmental stages were recovered. These results are highly significant ($p < 0.0001$) when compared to the control group (T1). No doramectin treated sheep showed any adverse reaction to treatment. The predominance of L1 larval stage over L2 and L3 found in the present study is in agreement with other authors (KETTLE, 1973; ALZIEU & CHIARIZOLI, 1990) and seems to indicate a populational pattern for the species. The mean infestation number of 22.167 larvae/animal recovered from the animals in the control group (T1), is lower than that found by MELENEY *et alii* (1962) in southwestern United States, and YLMA & DORCHIES (1991) in southwest France, that reported a mean of 25.6 and 24.8 respectively, and is superior to those found by HORAK & BUTT (1977) in South Africa and RIBEIRO *et alii* (1990) in Rio Grande do Sul State in Brazil, that found respectively 15.2 and 11.38 larvae/animal. These discrepancies may be explained at least in part by the different sheep management practice and the different geographical and epidemiological conditions where the studies were conducted. The efficacy of the doramectin treatment was confirmed by the

Table 1 - Mean number of *Oestrus ovis* larvae in sheep and percent efficacy of 200 mcg/kg and 300 mcg/kg of doramectin, 14 days post treatment.

Groups	Number animals	Mean total larvae count (live + dead)	Mean N° live first instar larvae	Mean N° live second instar larvae	Mean N° live third instar larvae	Mean total live larvae	% efficacy
T1 Saline	12	22.167 ^a	17.583 ^a	3.500 ^a	1.083 ^a	22.167 ^a (1-45) ^{**}	-
T2 Doramectin 200 mcg/kg	12	0.250 ^{b*}	0.000 ^b	0.000 ^b	0.000 ^b	0.000 ^b	100%
T3 Doramectin 300 mcg/kg	12	0.500 ^{b*}	0.000 ^b	0.000 ^b	0.000 ^b	0.000 ^b	100%

^{a, b} = Between treatments different superscripts are significantly different ($p < 0.0001$).

* = All larvae counted were dead.

** = Minimum and maximum number of larvae.

Table 2 - Summary of observation of rhinitis and sinusitis from principal sheep at necropsy.

Treatments	Rhinitis [*]		Sinusitis ^{**}			
	Absent	Present	Absent	Present		
				Total	Seromucous	Purulent
Saline Control	0	24	0	72	72	0
Doramectin 200 mcg/kg	0	24	66	6	6	0
Doramectin 300 mcg/kg	10	14	72	0	0	0

* Rhinitis observations were made on the left and right side of the nasal cavity. Each side of the nasal cavity was evaluated as rhinitis present (+) or absent (-). Therefore the maximum score for an animal was 2, the maximum score for a treatment was 24.

** Sinusitis observations were made on the left and right side of the anterior frontal sinuses, posterior frontal sinuses and the maxillary sinuses. Each side in each sinus was evaluated as sinusitis present (+) or absent (-). If sinusitis was present it was classified as either seromucous or purulent. For sinusitis, the maximum score for an animal was 6, the maximum score for a treatment was 72. The total number of seromucous or purulent observations is recorded, regardless of location.

clinical observations that demonstrated a substantial recovery of sinusitis symptoms (Table 2 and Figure 1) two weeks after treatment.

A single dose of doramectin administered intramuscularly to sheep at a dose rate of 200 mcg/kg or 300 mcg/kg was 100% effective against the first, second and third instar of *Oestrus ovis* larvae. Compared to the control animals, the efficacy of doramectin at 200 mcg/kg or 300 mcg/kg was highly significant

($p < 0.0001$). The efficacy of treatment was confirmed by clinical observations that demonstrated a substantial recovery from sinusitis two weeks after treatment. There were no adverse reactions to doramectin in any of the treated animals.

SUMÁRIO

Foi realizado um estudo na Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil, para avaliar a eficácia de uma única injeção intramuscular de doramectin, na dose de 200 mcg/kg ou 300 mcg/kg, contra infestações naturais por *Oestrus ovis*. Quarenta e oito ovinos da raça corriedale naturalmente infestados por *O. ovis* foram distribuídos ao acaso em 4 grupos (T1, T2, T3 e Sentinela) de 12 animais cada. No dia 0, os ovinos do grupo sentinela foram necropsiados e as larvas de *Oestrus* encontradas nos sinus e cavidades nasais, foram identificadas por estágio de desenvolvimento e contadas para confirmação da infestação. No mesmo dia 0, os animais do grupo T1 receberam solução salina na dose de 1 ml/50 kg, os do grupo T2 doramectin na dose de 200 mcg/kg e os do grupo T3 doramectin na dose de 300 mcg/kg. Todos os tratamentos foram administrados por injeção intramuscular profunda. Após o

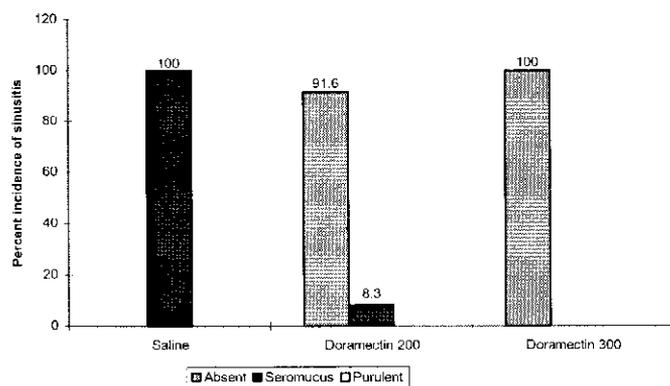


Figure 1. Incidence of seromucous and purulent sinusitis and absence of sinusitis as a percentage of all observations.

tratamento, os animais retornaram a um piquete comum onde permaneceram até o final do estudo. Quatorze dias após o tratamento, todos os animais foram necropsiados para identificação e contagem das larvas de *O. ovis*. Uma única injeção de doramectin na dose de 200 mcg/kg ou de 300 mcg/kg foi 100% eficaz contra as larvas de primeiro, segundo e terceiro estádios de *O. ovis*. Comparada com o grupo controle não medicado (T1), a eficácia de doramectin (200 mcg/kg ou 300 mcg/kg) foi altamente significativa ($p < 0,0001$). A eficácia do tratamento foi confirmada pelas observações clínicas as quais demonstraram uma substancial recuperação dos sintomas de sinusite duas semanas após o tratamento. Não houve reação adversa ao uso de doramectin nos animais tratados.

PALAVRAS-CHAVES: Doramectin, *Oestrus ovis*, ovino, larvas.

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