EFFICACY OF PYRANTEL PAMOATE EITHER ALONE OR COMBINED WITH TRICHLORFON FOR CONTROL OF CYATHOSTOMES OF HORSES

EFICÁCIA DE PAMOATO DE PIRANTEL, ISOLADO OU ASSOCIADO AO TRICLORFON, NO CONTROLE DE CIATOSTOMÍNEOS DE EQÜINOS

Marcelo de Campos PEREIRA[1]; Maurício Del BIGIO[2]; Reinaldo de CAMPOS[3]

SUMMARY

The anthelmintic efficacy of pyrantel pamoate, either alone or combined with trichlorfon, was evaluated for the control of strongyles of Thoroughbred horses. In all cases of positive strongyle egg counts per gram of feces (EPG) before and after treatment, pure populations of cyathostomes larvae with eight intestinal cells were consistently observed in fecal cultures. The fecal egg count reductions (FECR) were evaluated between day 7 and day 45 post-treatment. The post-treatment mean strongyle EPG counts of the horses treated with the combination of pyrantel pamoate (13.2 mg/kg) plus trichlorfon (30 mg/kg) and pyrantel pamoate alone (13.2 mg/kg) did not show significant differences ($P \leq 0.05$) during the trial, both groups reducing strongyle egg output by almost 100% on day 7, and still exhibiting an FECR of greater then 90% between day 7 and day 21. This finding indicates that both formulations are effective compounds in reducing the cyathostome fecal egg outputs in horses under field conditions.

UNITERMS: Anthelmintics; Pyrantel pamoate; Trichlorfon; Cyathostomes; Equidae

INTRODUCTION

The recent increase in the number of horses in Brazil has caused, in turn, a resurgence of interest in the worm parasites that share their nutrition and sometimes kill them, usually more insidiously than infectious disease organisms[5].

Despite the recognition of the value of developing a equine parasite control programme which does reduce reliance on anthelmintics, such as mechanical "cleaning" of horse paddocks[10] and dose and move strategies, these methods are, respectively, costly and not practical under most today horse management systems in Brazil. It thus becomes clear that anthelmintic drugs will continue to dominate roundworm practices, certainly in the immediate and short-term future.

Although there appears to have been a steady stream of new anthelmintics into the market in recent years, the majority were additional compounds in existing drug classes (notably the benzimidazole class). This is of little benefic from the standpoint of resistance because side-resistance within a drug class often rapidly develops[20]. Therein, nematodes of the subfamily *Cyathostominae* (also known as small strongyles) are considered common and important horse parasites, and their resistance to benzimidazole anthelmintics is recognized n different countries[1,5,10,13,14,15]. However, some of the more recent chemically unrelated compounds, such as the avermectins, and novel formulations of long established drugs, such as the pyrantel paste formulations, provided marked advances in the field of equine parasite control.

The main purpose of the present study was to determine if paste formulations of pyrantel pamoate alone or combined with trichlorfon, given in single doses, were effective in reducing the fecal nematode egg output in horses under field conditions and suspected to be carrying benzimidazole-resistant populations of small strongyles.

MATERIAL AND METHOD

Experimental animals

Twenty-four mares of a Thoroughbred breeding stock, between 5 and 14 years of age and belonging to a State of São Paulo horse farm, were selected by a random process from a herd of 123 horses that had been routinely dewormed at 6-8 week intervals using benzimidazoles on most occasions during recent years. A prior anthelmintic trial on this herd had demonstrated an incomplete reduction of small strongyle egg counts per gram of feces (EPG) by benzimidazoles (unpublished data). The horses grazed as a single group throughout the trial and were not treated with an anthelmintic for at least 4 months prior to the beginning of this study.

1-Doutor - Instituto de Ciências Biomédicas, Universidade de São Paulo, São Paulo, Brasil
2-Selectchemie - São Paulo, Brasil
3-Veterinário - Jockey Club, São Paulo, Brasil

Treatments

The horses were decreasingly ranked on the basis of the mean values of three pre-treatment strongyle EPG performed on days -2,-1 and 0.Each of the three highest mean EPG values were randomly allocated to one of three pre-treatment groups (G). The process was repeated using animals of lower mean EPG values until all the horses had been assigned to the following treatment groups on day 0: G1- pyrantel pamoate at 13.2 mg/kg and trichlorfon at 30 mg/kg*; G2- pyrantel pamoate at 13.2 mg/kg**; G3- untreated control.

The anthelmintics used in this trial were all oral paste formulations administered once at the start of the trial on day 0. Individual doses of each product were calculated on the basis of an estimate of body weight by measurement of the girth circumference with a weight tape. The horses were observed for adverse reactions daily for 7 days after treatment.

Parasitologic procedure

Fecal egg output was monitored at 7-10-day intervals for 45 days after treatment. A strongyle EPG was performed on the samples using a modified McMaster's technique[21] which had a minimum detection level of 50 eggs/g. Cultures were done on composite fecal samples from five horses in each group at each sampling time, although not necessarily the same five horses each time. Third stage larvae were harvested from 7-day cultures at 27°C and, where possible, up to 100 larvae were identified by the method of RUSSEL[17] (1948).

Statistical analysis

Logarithmic transformations ($\log_{10} [x+10]$) were carried out to minimize the association between means and variances, and geometric mean EPG were then calculated. Percentage reductions in post-treatment geometric means were also determined using a modification of the fecal egg count reduction (FECR) test [19]. This reduction may be measured by the statistics:

$$R = 100(1-T/C)$$

where: R= calculated percentage reduction of the strongyle EPG; T= geometric mean of (EPG+10) in the treated group; C= geometric mean of (EPG+10) in the untreated group.

Means determined on day 0 and subsequently were tested for significant differences ($p \leq 0.05$) using a one-way analysis of variance (ANOVA) and multiple comparisons of means were done using Tukey's least significant difference test.

RESULTS AND DISCUSSION

The pre- and post-treatment geometric mean strongyle EPG counts, the standard deviation of the mean (S.D.) and the FECR data for all the treatment groups are summarized in Tab. 1.

On days 0 and 45, statistically significant differences could not be detected between the three experimental groups.

The post-treatment mean strongyle EPG counts of the horses treated with the combination of pyrantel pamoate (13.2 mg/kg) plus trichlorfon (30 mg/kg) and pyrantel pamoate alone (13.2 mg/kg) did not differ significantly during the course of the experiment. Although each treatment group had failed to eliminate parasite eggs completely, even from the first fecal sample after treatment, both groups reduced strongyle egg output by almost 100% on day 7 and they still exhibited an FECR of > 90% between day 7 and 21. Otherwise, for the majority of the treated horses, egg counts began to increase slightly between day 28 and day 35, tending to rebound on day 45 after treatment, when the geometric mean strongyle EPG counts approached or exceeded the pre-treatment values. Adverse reactions were not observed to any of the treatments. Our findings are in general agreement with the reports of several researchers[1,2,3,4,7,8,9,12,13,15,16], which demonstrated that pyrantel preparations, independent of the salt used or method of administration, are highly effective (90 to 100% effective) against lumen cyathostomes. In addition, the results of this study showed that of all cases of positive EPG counts pre- and post-treatment only cyathostome larvae with eight intestinal cells were found in the pooled fecal cultures. This is not surprising considering that small strongyles normally contribute at least 95% of the egg output[12], greatly outnumbering the large strongyles (subfamily Strongylinae) both in number of species and specimens. Consequently, it is reasonable to consider that all eggs were small strongyles. Add to that, observed fluctuations of EPG counts in the untreated group were consistent with variation in egg production, by cyathostomes. The absence of large strongyles from the fecal cultures may be attributed to the widespread use of benzimidazoles during recent years. According to TAYLOR; HUNT[18] (1989), where resistance is present the larvae are usually of one species or genus, therefore the emergence of a degree of benzimidazole resistance in a segment of the small strongyles in this population is suggested by the data from the present trial and from our previous experience.

Until recent years, all formulations of pyrantel salts were effective against benzimidazole-resistant cyathostomes. How-

TABLE 1

Geometric mean pre- and post-treatment strongyle EPG and FECR in groups of horses treated with pyrantel pamoate plus trichlorfon and pyrantel pamoate alone. São Paulo, 1992

TREATMENT GROUP	N° OF HORSES	DAY 0	TIME POST-TREATMENT (DAYS)					
			7	14	21	28	35	45
G₁ - 13.2 mg/kg of pyrantel pamoate 30 mg/kg of trichlorfon	8	852.4 ± 2.0^a $(400 - 2050)^2$	2.1 ± 6.5^a $(0 - 100)$ $[99.8]^3$	16.3 ± 9.0^a $(0 - 150)$ $[99.1]$	42.9 ± 6.9^a $(0 - 250)$ $[97.9]$	209.4 ± 2.8^a $(50 - 750)$ $[88.7]$	297.1 ± 2.4^a $(100 - 850)$ $[76.2]$	716.6 ± 1.6^a $(450 - 1600)$ $[44.8]$
G₂ - 13.2 mg/kg of pyrantel pamoate	8	901.6 ± 2.4^a $(400 - 4650)$	4.1 ± 9.1^a $(0 - 100)$ $[99.7]$	35.1 ± 6.1^a $(0 - 150)$ $[98.0]$	164.7 ± 2.0^a $(50 - 400)$ $[92.2]$	277.2 ± 1.9^a $(100 - 550)$ $[85.0]$	425.6 ± 1.3^a $(350 - 750)$ $[65.9]$	962.6 ± 1.3^a $(700 - 1550)$ $[25.9]$
G₃ - Untreated control	8	853.1 ± 2.7^a $(200 - 2850)$	1424.6 ± 1.8^b $(650-3500)$	1793.3 ± 1.5^b $(800 - 2600)$	2120.8 ± 1.5^b $(1150 - 4950)$	1850.3 ± 1.3^b $(1300 - 2500)$	1250.1 ± 2.4^b $(300 - 3900)$	1298.4 ± 2.2^a $(500 - 3900)$

1 = Geometric mean ± S.D. based on the transformation $\log_{10} (x + 10)$. Different superscript letters within columns indicate that the mean values differ significantly at the $P \leq 0.05$ level.

2 = EPG counts (minimum - maximum).

3 = FECR

ever, quite recently, there have been reports of small strongyles populations that are also resistant to pyrantels[6,11]. This emergent problem demonstrate that an attempt should be made to delay the development of widespread pyrantel resistance and the importance of the examination of fecal samples to monitor the effectiveness of equine anthelmintic programmes.

In our trial, it is confirmed that in cases of proven benzimidazole resistance of small strongyles, pyrantel pamoate is still an effective compound available at present, that should be used judiciously as part of a complete parasite control programme involving several different drug groups. According to HERD[10] (1990), a slow rotation of chemically unrelated anthelmintics is recommended at yearly intervals and no single drug should be used year after year. As indicated by HERD[10] (1990), if it is feasible to implement a pasture hygiene programme, treatments can be reduced, thus increasing grazing area, reducing the need for supplementary feed and improving the appearance of the horse farm.

RESUMO

Através de estudo comparativo, objetivou-se avaliar a eficiência anti-helmíntica de pamoato de pirantel, isolado ou associado ao triclorfon, no controle de estrongilídeos de eqüinos da raça Puro Sangue Inglês. As coproculturas realizadas antes e após os tratamentos levaram consistentemente ao encontro de populações puras de ciatostomíneos com oito células intestinais. As reduções de ovos por grama de fezes foram avaliadas do 7º ao 45º dias pós-tratamento. Comparando os valores médios de OPG dos eqüinos tratados com pamoato de pirantel (13,2 mg/kg) associado ao triclorfon (30 mg/kg) e com pamoato de pirantel isolado (13,2 mg/kg), observou-se diferença não significante (P≤0,05) ao longo do experimento, verificando-se, 7 dias após o tratamento, reduções médias de OPG de quase 100% e, do 7º ao 20º dias, reduções ainda superiores a 90%. Os resultados indicam que os dois produtos são eficazes na redução de ovos por grama de fezes de ciatostomíneos de eqüinos mantidos sob condições a campo.

UNITERMOS: Anti-helmínticos; Pamoato de pirantel; Triclorfon; Ciatostomíneos; Equidae

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