ANTICOCCIDIAL EFFICACY OF DICLAZURIL* IN FATTENING RABBITS : COMPARATIVE FIELD TRIALS IN SPAIN AND BELGIUM

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Abstract - The anticoccidial diclazuril was tested on 5 different locations under practical use conditions in Spain and in Belgium. 7 grow outs were followed with in total 5,305 rabbits. Diclazuril at 1 ppm showed no adverse effects on the rabbit health. In all the trials there was superior coccidiosis control in comparison with robenidine or the combination meticlorpindol/methylbenzoquate, as was witnessed by the oocyst excretion. There was no negative influence on technical performance by the use of diclazuril. Diclazuril was able to control all present species: both the intestinal *E. magna, E. media and E. perforans,* and the hepatic *E. stiedae.*

INTRODUCTION

In laboratory tests diclazuril at 1 ppm has shown to be efficacious against coccidiosis in rabbits. The aim of the following studies was to evaluate the activity of diclazuril under real practical use conditions in Spain and in Belgium. Zootechnical performance and parasitological parameters were evaluated. In Spain 4 grow outs were followed on 2 different locations in comparison with other commonly used anticoccidials. In Belgium 3 grow-outs were followed on 3 different locations in a comparison with robenidine.

MATERIAL AND METHODS

Spain, Barcelona

140 rabbits, breed IRTA, 4 weeks old, housed per 5 in wire floored cages
- Treatment groups :
  Unmedicated Control : 7 x 5 rabbits
  diclazuril 1 ppm : 7 x 5 rabbits
  robenidine 66 ppm : 7 x 5 rabbits
  meticlorpindol -methylbenzoquate 220 ppm : 7 x 5 rabbits
- Medication from day +0 till day +30 of the fattening period
- Parameters : body weight, daily growth, feed consumption, feed conversion ratio, oocyst excretion, liver lesions, mortality
- Statistical analysis was done on body weight, growth, feed consumption, feed conversion rate and oocyst excretion by an Analysis of Variance.
- Timing : January-February, 1993

Spain, Zaragoza

- 2,696 rabbits of a commercial breed, 32 days old, were followed during 3 different grow-outs. They were housed in wire-floored cages with 8 rabbits each.
- treatment groups :
- grow-out 1 : diclazuril 1 ppm : 40 x 8 rabbits
  - Unmedicated Control : 20 x 8 rabbits
    robenidine 66 ppm : 20 x 8 rabbits
  - grow-out 2 : diclazuril 1 ppm : 70 x 8 rabbits
    Unmedicated Control : 51 x 8 rabbits

robenidine 66 ppm : 51 x 8 rabbits
- grow-out 3 : diclazuril 1 ppm : 34 x 8 rabbits
Unmedicated Control : 25 x 8 rabbits
robenidine 66 ppm : 26 x 8 rabbits
- medication from day +0 till day +25 of the fattening period, withdrawal feed from day +26 till day +30
- parameters: body weight, weight gain, feed consumption, feed conversion ratio, oocyst excretion, mortality.Measurements per treatment and per grow-out, not per cage.
- statistical analysis was done on weight gain, feed consumption, feed conversion rate, oocyst excretion, and mortality, using Analysis of Variance
- Timing : September, 1993-February, 1994

Belgium, 3 different locations

- A comparison between 1 ppm diclazuril and 66 ppm robenidine.
- Location 1: (Belœil) 600 rabbits on diclazuril and 600 rabbits on robenidine, 4 rabbits per cage, from 28 days old till slaughter.
Timing: July 8, 1993 till September 24, 1993.
- Location 2: (Deinze) 155 rabbits on diclazuril and 150 rabbits on robenidine, 5 rabbits per cage, from 28 days old till slaughter.
Timing: October 1, 1993 till November 19, 1993.
- Location 3: (Wetteren) 468 rabbits on diclazuril and 496 rabbits on robenidine, 6 rabbits per cage, from 28†days old till slaughter.
Timing: October 31, 1993 till January 5, 1994.
- Parameters: body weight gain, feed conversion ratio, mortality, oocyst excretion and species differentiation.
- Statistical analysis on OPG-values (count by oocyst per gramme) by a 2 x 2 contingency table.

RESULTS

The results for technical performance and oocyst excretion are summarized in tables 1 to 6.

Spain, Barcelona

Table 1 : Body weight, growth, feed consumption, feed conversion rate in a comparative trial with diclazuril, robenidine and meticlorpindol/methylbenzoquate

Treatments	Initial body weight in g	Final body weight in g	Daily growth in g	Daily feed consumption in g	Feed conversion ratio
Unmedicated control	663	1.936	42.4	124.7	2.939
Diclazuril 1 ppm	656	1.938	42.7	126.3	2.952
Robenidine 66 ppm	656	1.957	43.4	124.9	2.881
Meticlorpindol/ Methybenzoquate 220 ppm	659	1.942	42.7	123.3	2.885
Standard error	3	17	0.5	1.7	0.029
Pr < F	0.36 NS	0.81 NS	0.67 NS	0.69 NS	0.21 NS

NS = not significant
There were no significant differences between treatments in these zootechnical parameters.
There was no mortality in any of the groups in this trial.

Table 2 : Oocyst excretion in a comparative trial with diclazuril, robenidine and meticlorpindol/methylbenzoquate (average +SE)

Treatment	week 1	week 2	week 3	week 4
Unmed. Control	57,133 ± 26,740	11,533 ± 5,697	5,267 ± 2,167	6,467 ± 5,769
Diclazuril	1,067 ± 353	400 ± 115	0 ± 0	1,000 ± 643
Robenidine	56,133 ± 14,445	10,933 ± 7,533	1,800 ± 1,102	4,533 ± 3,762
Meticlorpindol/M	53,533 ± 23,108	4,200 ± 1,554	0 ± 0	4,800 ± 3,055

There was a significant influence of treatment (P=0.0079) and sampling date (P<0.0001). Interaction was almost significant (P=0.0732) after two way repeated measures Anova procedure using transformed data (square root of OPG). Diclazuril reduced significantly oocyst excretion compared to the unmedicated control, Robenidine and Meticlorpindol/methylbenzoquate when analyzed using Multiple Comparison procedures (Student-Newman-Keuls Method).
All animals were inspected at slaughter for liver lesions. No lesions were found in any group.

Spain, Zaragoza

Table 3 : Mortality, final body weight, body weight gain, feed consumption and feed conversion ratio in a comparative field trial with diclazuril and robenidine

Treatment	% Mortality	Final weight (kg)	Weight gain (kg)	Intake (kg)	Feed conversion ratio
Control	3,15	1,86	0,96	3,32	3,35
Diclazuril	2,13	1,91	1,04	3,27	3,09
Robenidine	5,03	1,94	1,03	3,26	3,00
Standard Error	1,18	0,04	0,04	0,13	0,12
Pr < F	NS	NS	NS	NS	NS

NS = not significant
Averages of three growouts.

There were no statistical differences between treatments in any of the parameters studied.
In each grow-out oocyst excretion was investigated at day +10. *E.magna* and *E.media* were found in the control and robenidine groups. The results are given in table 4.

Table 4 : Oocyst excretion of E.magna and E.media in a comparative field trial with diclazuril and robenidine

Treatment	OPG *E. magna*	OPG *E. media*	OPG Total
Control	4,200 ± 2,773	1,333 ± 1,333	5,533 ± 4,083
Diclazuril	0 ± 0	0 ± 0	0 ± 0
Robenidine	1,933 ± 982	0 ± 0	1,933 ± 982

Averages±SE of three growouts. There were no statistical differences between treatments after two way Anova procedure using transformed data.

There were no liver lesions.

Belgium, 3 different locations

Table 5: Body weight gain, feed conversion rate and mortality in a comparative multicentre field trial with diclazuril 1 ppm and robenidine 66 ppm.

Treatments	body weight gain in kg	feed conversion ratio	mortality in %
Location 1			
Diclazuril 1 ppm	1,601	3,48	7,70
Robenidine 66 ppm	1,610	3,54	9,00
Location 2			
Diclazuril 1 ppm	1,778	3,82	7,74
Robenidine 66 ppm	1,782	3,74	5,33
Location 3			
Diclazuril 1 ppm	1,979	4,10	9,62
Robenidine 66 ppm	2,050	3,51	6,05

The results for oocyst excretion are summarised in table 6 (see next page).

Species differentiation : on all 3 locations *E. perforans, E. media* and *E. magna* were detected.
E. perforans output was high in the beginning of the trial, then came an *E. magna* peak followed by *E. media.* Towards the end of the grow-out there was again an increase in *E. perforans* output.

Table 6: Oocyst excretion (OPG = oocyst per g faeces) in a comparative multicentre field trial with diclazu

Date of sampling	Location 1 (*1)		Date of sampling	Location 2 (*2)		Dat of sampl
	Diclazuril 1 ppm (D1)	Robenidine 66 ppm (R1)		Diclazuril 1 ppm (D2)	Robenidine 66 ppm (R2)	
14/07/93	13,600	14,600	05/10/93	21,900	38,800	31/10
16/07/93	3,600	12,400	12/10/93	2,800	26,100	08/11
20/07/93	1,600	9,000	15/10/93	3,200	34,800	14/11
23/07/93	200	3,600	19/10/93	3,600	26,900	18/11
27/07/93	1,000	1,800	26/10/93	1,000	21,000	21/11
30/07/93	400	2,600	02/11/93	<100	11,600	26/11
03/08/93	1,600	15,000	09/11/93	1,100	35,300	29/11
06/08/93	600	4,400	16/11/93	900	23,400	05/12
10/08/93	<100	7,200				12/12
13/08/93	<100	3,800				16/12
18/08/93	<100	2,200				19/12
20/08/93	<100	2,200				28/12
24/08/93	<100	3,200				
27/08/93	800	1,200				
31/08/93	200	5,000				
06/09/93	<100	2,000				
09/09/93	<100	54,400				
13/09/93	<100	8,400				
15/09/93	800	2,600				
22/09/93	3,200	31,600				

*1 In a 2x2 contingency table the OPG values of D1 are significantly lower than R1 (P<0,001).
*2 In a 2x2 contingency table the OPG values of D2 are significantly lower than R2 (P<0,001).
*3 In a 2x2 contingency table the OPG values of D3 are significantly lower than R3 (P<0,001).

A few *E. stiedae* oocysts were found in locations 2 and 3. In location 3 there were very small quantities of *E. intestinalis* and *E. irresidua* towards the end of the trial in the robenidine treated group.
Species differentiation was performed at the N.I.D.O.-I.N.R.V. (National Institute for Veterinary Research) in Brussels as a percentage of the species detected in the OPG-count. In average the proportion of the 4 most prevalent species was : 31,7 % *E. perforans*, 23,5 % *E. media*, 42,2 % *E. magna* and 2,2 % *E. stiedae*.

DISCUSSION

Spain, Barcelona

Liver coccidiosis was absent in this trial. Neither robenidine nor diclazuril nor meticlorpindol/methylbenzoquate influenced the zootechnical performance in a negative or a positive way. Although coccidiosis incidence was low, diclazuril at 1 ppm had a superior efficacy in reducing the oocyst excretion in comparison to robenidine 66 ppm and meticlorpindol/methylbenzoquate 220 ppm.

Spain, Zaragoza

Coccidiosis was low in this trial. Neither diclazuril, nor robenidine adversely affected the technical performance. Diclazuril completely inhibited oocyst excretion, whereas in the control and robenidine group *E.magna* and/or *E.media* were found.
In this trial diclazuril demonstrated a superior efficacy in controlling oocyst excretion by *E.magna* in comparison to robenidine. There was also a complete control of *E.media* which was present in the unmedicated control group.

Belgium, 3 different locations

On the 3 different locations diclazuril at 1ppm gave better coccidiosis control than robenidine at 66 ppm. This was demonstrated by significantly lower OPG-counts.
On the one location were no other diseases than coccidiosis were present, the better coccidiosis control resulted in better technical performance, shown by a lower feed conversion in the diclazuril treated group. Diclazuril at the concentration of 1 ppm was capable of controlling all present species, also *E. magna* and *E. media*, known to be the most common and pathogenic species on industrial rabbit farms.

CONCLUSIONS

Diclazuril at 1 ppm showed a very high efficacy on the control of rabbit coccidiosis compared to negative control and other anticoccidial feed additives like robenidine 66 ppm or meticlorpindol/methylbenzoquate 220 ppm. Diclazuril at 1 ppm does not inhibit growth or influence any of the zootechnical parameters.

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