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Treatment of Porcine Colonic Spirochaetosis caused by *Brachyspira pilosicoli*

"Take home" messages

Porcine Colonic Spirochaetosis (PCS), caused by *Brachyspira pilosicoli* (*B.p*), is being increasingly recognised as a significant cause of financial losses in grower pigs, particularly in countries where prescription free antibiotic growth promoters have been withdrawn.

B.p infections cause:

– lack of uniform weight gain;

– increased weight range within the groups;

– disruption of pig flow;

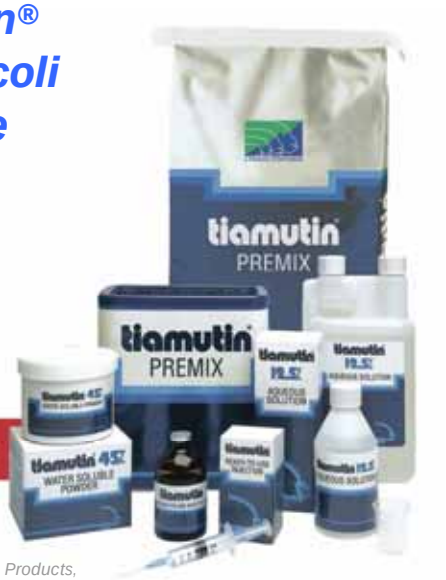
– extended finishing periods.

There appears to be widespread resistance to both tylosin and lincomycin among *B.p* isolates.

Tiamulin has been reported by independent investigators to have potent activity in vitro against *B.p* isolates.

The analysis of Tiamutin medication programmes used on farms with colitis infections indicate the economic benefit of using Tiamutin® Premix.

A benefit:cost ratio of using Tiamutin® Premix to control Brachyspira pilosicoli infection was recently reported to be approximately 9:1



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UNRELATED TO HUMAN USE ANTIBIOTICS • NOT USED IN HUMAN MEDICINE

NOVARTIS

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Porcine Colonic Spirochaetosis (PCS) – *B. pilosicoli* (*B.p*) infection

A) Update on in vitro sensitivity studies (1996-2004)

In vitro investigations reported from 1996-2004 with various antibiotics including tiamulin, tylosin and lincomycin against *B. pilosicoli* have been summarised by Prof. G. Duhamel of the University of Nebraska, Lincoln, USA. These are compiled in Tables 2, 3 and 4 below:

Table 1: Estimated "breakpoints" of tiamulin, tylosin and lincomycin against porcine B. pilosicoli

(Key to coloured numerals: Green = Susceptible Black = Intermediate Red = Resistant)

	Susceptible	Intermediate	Resistant
Tiamulin	**≤1.0**	**>1≤4**	**>4**
Tylosin	**≤1.0**	**>1≤4**	**>4**
Lincomycin	**≤4**	**>4≤36**	**>36**

(based on Ronne and Szancer 1990, data for *B. hyodysenteriae*)

Table 2: MIC values (µg/ml) **Tiamulin** *against porcine B. pilosicoli strains*

No. of isolates examined	MIC range (µg/ml)	MIC_{50}	MIC_{90}	Authors	Country
6	0.06-0.5	0.125	0.5	Fellström et al, 1996	Sweden
19	0.05-0.5	0.1	0.5	Duhamel et al, 1998	US
10	0.06-2.0	0.250	2.0	Cizek et al, 1998	Czech Rep.
4	<0.03-0.06	<0.03	0.06	Hommez et al, 1998	Belgium
12	0.031-0.5	0.067	-	Ripley,1998	UK
5	0.0156-0.0625	0.041	-	Ripley,1998	Denmark
51	<0.063-32.0	<0.063	0.125	Fossi et al, 1999	Finland
25	0.06-8.0	0.125	1.0	Kinyon et al, 2002	US
10	0.015 – 0.5	0.09	0.25	Mars, 2003	UK
33	0.03-8.0	0.125	1.0	Cizek et al, 2004	Czech Rep.

Table 3: MIC values (µg/ml) of **Tylosin** *against porcine B. pilosicoli strains*

No. of isolates examined	MIC range (µg/ml)	MIC_{50}	MIC_{90}	Authors	Country
6	8.0->16.0	16.0	>16.0	Fellström et al, 1996	Sweden
10	2.0->128.0	>128.0	>128.0	Cizek et al, 1998	Czech Rep.
4	128.0-128.0	128.0	128.0	Hommez et al, 1998	Belgium
12	10.0->200.0	31.6	-	Ripley,1998	UK
5	2.0->128.0	24.0	-	Ripley,1998	Denmark
25	<16.0->512.0	>512.0	>512.0	Kinyon et al, 2002	US

Table 4: MIC values (µg/ml) of **Lincomycin** *against porcine B. pilosicoli strains*

No. of isolates examined	MIC range (µg/ml)	MIC_{50}	MIC_{90}	Authors	Country
19	12.5->100.0	50.0	75.0	Duhamel et al, 1996	US
10	1.0-64.0	32.0	64.0	Cizek et al, 1998	Czech Rep.
4	8.0-32.0	32.0	32.0	Hommez et al, 1998	Belgium
12	0.25-12.5	4.32	-	Ripley,1998	UK
5	0.5-128.0	13.8	-	Ripley,1998	Denmark
25	4.0->128.0	32.0	64.0	Kinyon et al, 2002	US
33	0.5-128.0	16.0	64.0	Cizek et al, 2004	Czech Rep.

With both tylosin and lincomycin there appears to be widespread resistance worldwide among *Brachyspira pilosicoli* isolates. Although it appears that there could be lower susceptibility among *B. pilosicoli* isolates to tiamulin in certain countries, e.g. Finland, trend studies incorporating data from several other studies did not confirm lower susceptibility of *B. pilosicoli* to tiamulin over the last decade. (Duhamel, G.E. 2005).

B) Cost/benefit analysis of treatment with Tiamutin® Premix

Although Porcine Colonic Spirochaetosis is an increasingly recognized problem in many countries, there have been few reported farm based trials to assess the precise costs of the disease and the cost/benefit of treatment and prevention programmes with antibiotics. An informative paper on the above was presented by Dr. Jill Thomson from UK at the recent 1st Novartis Animal Health Latam Swine Ileitis/Colitis Conference held in Iguacu, Brazil, April 2005 and at the recent 3rd International Conference on Colonic Spirochaetal Infections in Animals and Humans held in Parma, Italy, 5-7 June 2005.

Material and methods

A trial was conducted over a period of one year on a commercial grower unit where PCS had been a recurring problem. Pigs were produced within a minimal disease pyramid, which was free from all serious endemic diseases (PRRS, Enzootic Pneumonia, APP, Atrophic rhinitis, *S. suis II*, Swine Dysentery). In total 3690 pigs were involved in the study.

Pigs were delivered from the nursery unit at approximately 9 weeks of age (at approximately 25kg bwt) and remained at the trial farm for 6 weeks. Pigs were weighed on arrival and divided between 4 large straw bedded pens in one large shed. Pigs in 2 pens received Tiamutin® Premix medicated feed (100g tiamulin hydrogen fumarate per tonne finished feed in compliance with local dosage recommendations for SD) for the first 7-10 days and thereafter received non-medicated feed. All pigs were fed the same grower feed. After 6 weeks the pigs were weighed then transported to the finisher unit.

Between batches the building was emptied and cleaned giving a 'between batch' interval of 2 weeks. Six sequential batches of pigs were tested during the one year period of the trial. Tiamutin® Premix was used since preliminary laboratory studies showed that the *B.p* isolates from the unit showed good sensitivity to tiamulin.

Results

Overall the batches of Tiamutin®-treated pigs showed significantly higher average daily gain (+16.2%), improvement in feed conversion ratio (+13%) and less evidence of diarrhoea, in comparison with the un-medicated control pigs. The difference in mortality between the groups was not significant (see Tables 5 and 6). *Brachyspira pilosicoli* was confirmed in representative diarrhoeic pigs in the non-medicated pens from all batches during the trial.

Table 5: Comparative data for non-medicated controls and Tiamutin® medicated groups

Non-medicated controls				
Batch No.	**No. of pigs**	**ADG (g/day)**	**FCR**	**No. of deaths**
1	300	725	2.0	2
2	305	750	1.9	3
3	315	760	2.1	6
4	300	820	2.3	2
5	310	780	1.9	4
6	305	705	1.7	3
Tiamutin® medicated				
1	310	**840**	**1.8**	3
2	320	**838**	**1.7**	5
3	310	**920**	**1.8**	2
4	300	**950**	**1.9**	1
5	306	**810**	**1.7**	4
6	310	**920**	**1.7**	2

Table 6: Statistical comparison of treatments (using paired 't' test on batch means)

	Non-medicated controls	**Tiamutin® medicated**	**sem**	**Significance**
ADG (g/day)	757	**880 (+ 16.2%)**	25.7	p=0.005
FCE	2.03	**1.77 (+13%)**	0.033	p=<0.001
Mortality (%)	1.08	**0.91**	0.262	not significant

Benefit/Cost Analysis

The estimated costs arising from the failure to control *B.p* infection in an un-medicated group of 300 pigs were calculated as follows:

1. Additional feed cost

   $2.86 per pig or… $858.30 per batch

(grower feed cost = $300.59 per tonne)

2. Additional overhead cost for slower growth rate (additional 6 days to reach average end weight of Tiamutin medicated batches)

   $2.58 per pig or… $774 per batch

(using British Pig Executive (BPEX) figures of $0.43 per pig per day as overhead cost for grow-finish pigs in UK)

The calculation of the benefit/cost ratio of controlling the colitis infection by medication with Tiamutin® Premix was based on the additional costs per batch in the control group and the costs of Tiamutin medication per batch. The benefit/cost calculation is summarized in Table 7. These figures do not take into account the possible ongoing adverse effect of *B.p.* in the finisher unit, thus the cost of the disease up to finishing could be higher than indicated.

Table 7: Calculation of benefit/cost ratio – control of colitis infection by medication with Tiamutin®

Additional costs per batch in the control group (additional feed costs, 6 days longer to reach average end weight)	**1632.30 US $**
Costs of Tiamutin® per batch	**182.0 US $**
Benefit/Cost ratio of controlling colitis with Tiamutin®	**8.9 : 1**

Conclusions

- In vitro data confirm the high sensitivity of *Brachyspira pilosicoli* strains to tiamulin over the last decade.
- There is no trend of reduced sensitivity of *Brachyspira pilosicoli* strains to tiamulin.
- Data indicate pronounced resistance to tylosin and lincomycin.
- Analysis of Tiamutin® medication programmes used on farms with single PCS infections indicate the economic benefit of using Tiamutin® Premix.
- Using Tiamutin® Premix at the recommended dose level and over the appropriate application period a benefit:cost ratio of 8.9:1 was established.

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Further information on the Tiamutin® (tiamulin) range of products is available from the Pig Products Manager at Novartis Animal Health operations in over 50 countries worldwide.

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