Prophylactic tilmicosin medication of feedlot calves at arrival

Fritz J. Schumann, Eugene D. Janzen, John J. McKinnon

Abstract

The parenteral administration of the antibiotic tilmicosin given on arrival at a feedlot was evaluated in a group of 304 steer calves. These calves were allotted to 24 pens so that there were 12 replicates of both the control and medicated groups. The treatment rate was reduced significantly during the first five days ($p < 0.05$) and during the first month ($p < 0.01$) of the feeding period in the medicated group. The average days from arrival until first treatment for respiratory disease was increased to 21 days in the medicated group compared to 9 days ($p < 0.01$) for the controls. The medicated group had improved average daily gain ($p < 0.01$) and feed efficiency ($p < 0.01$) over the trial period when compared to the nonmedicated animals.

Résumé

Traitement prophylactique à l'arrivée de veaux de boucherie avec le tilmicosin

L'administration parentérale à l'arrivée d'un antibiotique, le tilmicosin, fut évaluée chez un groupe de 304 veaux de boucherie. Les veaux furent répartis dans 24 enclos pour ainsi obtenir 12 groupes témoins d'une part, et 12 groupes d'animaux traités, d'autre part. Le taux de traitement fut réduit considérablement durant les premiers cinq jours ($p < 0,05$) et durant le premier mois ($p < 0,01$) de la période d'engraissement dans le groupe d'animaux traités. Le nombre de jours moyen s'étendant de l'arrivée au premier traitement pour des maladies respiratoires fut accru de 21 jours dans les groupes traités, comparativement à 9 jours ($p < 0,01$) pour les groupes témoins. Les groupes traités ont présenté un gain de poids journalier moyen supérieur ($p < 0,01$) et une efficacité alimentaire accrue ($p < 0,01$) en comparaison avec les groupes témoins.

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Introduction

The occurrence of bovine respiratory disease (BRD) is a major problem in the finishing of calves in a feedlot (1,2). The epidemic curves for mortality and morbidity reach their peak levels in the first few weeks after calves arrive at the feedlot (1,3,4).

A high percentage of calves derived from auction markets may be incubating BRD or may already be sick on arrival at the feedlot (5). The prophylactic use of antimicrobials at processing may be one way to reduce the morbidity and/or mortality during the early feeding period in those calves incubating the disease. The effect of parenteral use of antibiotics "en masse" in the prevention and control of BRD has been studied and reported by various authors (3,4,6-10).

Our main objective in this study was to evaluate the efficacy of tilmicosin (Micotil, Elanco, Scarborough, Ontario) administered to calves at processing on the subsequent morbidity and mortality during the first five days and during the first 30 days of the 5 month feeding period. Data to measure the effect of tilmicosin on the average daily gain (ADG) and the feed efficiency during the first 30 d were available and therefore calculated.

Materials and methods

This study was conducted at the University of Saskatchewan's research feedlot in Saskatoon. On October 23, 1988, 85 steer calves and on October 30, 1988, another 224 calves arrived from Charolais — cross calf sales at the Swift Current auction market. The calves, weighing 218-337 kg at arrival, were processed within 2 h. During processing each calf was ear tagged with a unique number, weighed, given an injection of ivermectin (Ivomec, MSDAgvet, Kirkland, Quebec) and vaccinated against infectious bovine rhinotracheitis virus (IBR), parainfluenza-3 virus (PI3), and *Haemophilus somnus* (IBR-PI3/Somnugen, Boehringer Ingelheim, Burlington, Ontario) and against clostridial diseases (TASVAX — 8, Coopers Agropharm Inc, Ajax, Ontario). Three calves were surgically castrated during processing.

During processing, calves were systematically randomized into a treatment and a control group. The treatment group received tilmicosin once only at a dosage of 10 mg/kg bodyweight. The injection was given subcutaneously behind the shoulder. The control group received a saline placebo at the same volume and at the same site. Rectal temperatures were taken on all calves at processing and any calf with a temperature $\geq 40.5°C$ was not included in the trial. Four calves were thus excluded.

The control calves were placed into 12 outdoor feedlot pens and the treatment groups were placed into another 12 pens. Each pen was filled with 12 or 13 head except one which contained only eight calves in a random fashion. The allocation of the pens for each group was also random.

Calves were checked twice daily by the feedlot personnel for signs of disease. Calves that appeared depressed, gaunt, and distinctly different from their penmates were taken to the treatment chute. A diagnosis of BRD was made on the above criteria, an increased respiratory rate plus a rectal temperature $\geq 40°C$, and the absence of clinical signs attributable

Department of Herd Medicine and Theriogenology, Western College of Veterinary Medicine (Schumann, Janzen), Department of Animal Science (McKinnon), University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0.

Table 1. Summary of the health indices in the tilmicosin and control groups

Variable	Tilmicosin	SD	Control	SD
Number of animals	151		154	
Number of pens	12		12	
Treatment rate for BRD, (%)[a]				
1st pulls — 1st 5 d	1	0.02	12	0.2[b]
— 1st mo	5	0.1	23	0.2[c]
relapses — 1st mo	0	0.0	3	0.1[b]
Treatment rate for all diseases (%)[a]				
— 1st mo	6	0.1	23	0.2[c]
Crude mortality rate, (%)[a]	0.6	0.02	0	0.0
Treatment duration for BRD (d)				
1st pulls — 1st mo	3	0.6	3	0.9
relapse — 1st mo	0	0.0	3	1.6[b]
overall — 1st mo	3	0.6	3	1.0
Time from arrival to 1st treatment (d)				
1st pulls — 1st mo for BRD	21	8.8	9	7.2[c]
1st pulls — 1st mo for all diseases	22	8.5	9	7.2[c]
Median day from arrival to 1st treatment	23.5		5	

[a] = mean calculated on a pen basis and multiplied by 100
[b] = significant ($p < 0.05$)
[c] = significant ($p < 0.01$)

to dysfunction of any other body system. The treatment protocol for BRD was penicillin (Ethacillin, rogar/STB Inc., London, Ontario) subcutaneously once a day at a dosage of 46,500 IU/kg (7 mL/45 kg) body weight for two consecutive days. If the rectal temperature dropped below 40°C and the animal appeared improved, the penicillin was continued for a further day. If no response was seen after 2 d with the primary drug, the animal was examined by a veterinarian and the second choice drug, trimethoprim — sulfadoxine (Trivetrin, Cooper's Agropharm Inc., Willowdale, Ontario) was used at a dosage of 3 mL/45 kg intramuscularly once a day. After treatment the calves were sent back to their home pens. An individual treatment card was kept for every sick calf. All calves that died were necropsied at the Western College of Veterinary Medicine.

On arrival, calves received long-stem hay plus a feedlot ration. Up to November 10, 1988, calves were fed *ad libitum* a 30% milled concentrate and a 70% silage ration giving total digestible nutrients of 28% and protein of 6.73%, with 57% moisture content. Thereafter calves received a 37% milled concentrate and a 63% silage ration at 12.3 kg/head/d consisting of 33% total digestible nutrients, 5.40% protein, and 51% moisture.

Records were maintained on disease, drugs utilized, mortality, weights, and the feed consumption per pen. The t-test was used to compare the mean weight, the average daily gain, and the feed efficiency between the treatment and the control groups. The unit of concern was a pen group because the feed efficiency was calculated by pen and because treated and control calves were housed in separate pens. The t-test was also used to calculate the treatment rate [(number treated per pen)/(number in each pen)] for BRD during the first 5 d, the treatment rate for BRD and all diseases during the first 30 d, the relapse rate within the first 30 d, and the crude mortality rate within the first 30 d. The t-test was used to analyze the mean days from arrival to treatment for BRD and the average days treated per head for BRD in the medicated and control groups of only animals that actually became diseased.

Results

Steers in the tilmicosin group exhibited various degrees of swelling at the injection site, however no short-term or long-term systemic effects were noticed.

The treatment rate for BRD during the first 5 d in the feedlot was significantly ($p < 0.05$) higher in the control animals than in the tilmicosin group. The treatment rate for BRD during the first month in the feedlot was also significantly ($p < 0.01$) different in the two groups of steers (Table 1). The data on the treatment rate for all diseases during the first month include a steer with otitis and one with an abscess over the loin. Both of these steers were in the tilmicosin group. One steer in the tilmicosin group died suddenly from frothy bloat.

No statistical difference ($p < 0.05$) was observed between the medicated and the control group in the average days treated for BRD during the first and all subsequent episodes. There was a significant difference ($p < 0.05$) in the average days treated for the relapses. There was a significant difference ($p < 0.01$) in the average days from arrival to first treatment for BRD and all diseases in the medicated and control group (Table 1, Figure 1).

Initial and final weights were not statistically different, but the ADG was significantly different ($p < 0.01$) between the medicated and the control groups over the short period measured (Table 2). Excluding diseased animals during the first 5 d or over the whole test period did not reduce the significant difference ($p < 0.01$) in the ADG. The feed efficiency measured over the test period was significantly different ($p < 0.01$) between the two groups.

Table 2. Summary of the production variables over the first 30 days of the feeding period in the medicated and the control groups

Variable	Tilmicosin	SD	Control	SD
Number of animals	151		154	
Number of pens	12		12	
Initial weight (kg)[a]	271	5	272	5
Final weight (kg)[b]	310	8	304	8
ADG (kg/day)[c]	1.19	0.10	0.98	0.09[g]
ADG (kg/day)[d]	1.19	0.10	1.01	0.09[g]
ADG (kg/day)[e]	1.21	0.10	1.05	0.11[g]
Feed efficiency[f]	9	0.9	11	1.2[g]

[a] = weight on arrival on October 24, (85 steers) and October 30, 1988 (220 steers)
[b] = weight on November 30, 1988
[c] = average daily gain measured over period from arrival till November 30, 1988
[d] = average daily gain measured as in c but excluding all animals diseased during the first five days of the feeding period
[e] = average daily gain measured as in c but excluding all animals diseased during the whole test period
[f] = feed efficiency is calculated as kg of feed utilized per kg of gain from arrival until November 30, 1988
[g] = significant ($p < 0.01$)

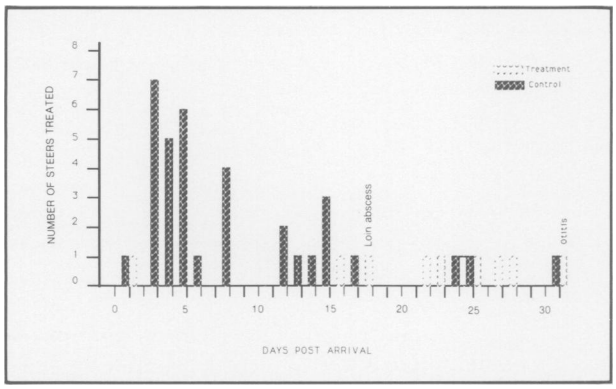

Figure 1. First pull treatment of steers in the first month after arrival.

Discussion

Previous trials have shown beneficial effects of administration of parenteral antibiotics at processing (3,4,6–10). In this trial, tilmicosin, a long-acting macrolide antibiotic, significantly reduced the treatment rate for BRD during the first 5 d as well as during the first month of the feeding period. The relapse rate and the treatment rate for all diseases during the first month of feeding were also significantly reduced. Only five steers in the control group had a relapse of BRD and therefore the number of animals is too small to draw any conclusions.

The onset of losses due to respiratory disease usually occurs early in the feeding period (1,3,4). At that time, calves are most susceptible to respiratory disease because they are exposed to a new macroenvironment and microenvironment. In the first few weeks, pen checkers have a more difficult time selecting sick calves because calves may be depressed due to disease or, because in new surroundings, they are not used to the watering and feeding places. The prophylactic use of an antibiotic may protect some undetected sick calves or some calves incubating BRD. In this trial, the average days from arrival to first treatment increased from 9 d in the control group to 21 d in the medicated group. A similar increase was also observed by Bennett (9). It may be that the prophylactic use of an antibiotic only shifts the peak of the treatment rate further away from the arrival date. On the other hand, after three weeks in the feedlot the calves are much better adapted to the feed and the feeding system and therefore better able to withstand an infectious insult to the respiratory system.

Others have reported similarly significant increases in ADG in medicated groups compared to controls as were seen in this trial (4,7,9–11). The two groups were not precisely balanced for individual weights, but they were statistically indistinguishable. Balancing the weights in the two groups would have been difficult because of variation in "shrink" (fluid and ingesta loss) during travel from the auction yard to the feedlot. The increased ADG over this short time period may be lost over the total period steers would spend in the feedlot because of compensatory gains in the calves with the lower initial ADG (1). The increased ADG may have represented better adaptation to the feedlot surroundings. The medicated group had a significant difference ($p < 0.01$) in the ADG compared to the controls whether or not sick calves during the first 5 d of the trial or over the whole test period were excluded from the calculations. This might have indicated a true subclinical disease effect and needs to be further investigated.

The feed efficiency was significantly different ($p < 0.01$) between the two groups. Treated calves utilized less feed per unit of body weight gain over the test period. The control calves probably lost weight after arrival and had to use more feed to return to their initial weight. It is possible that the difference in feed utilization between the two groups would be lost over the entire feeding period. The design of this trial made

it impossible to measure the feed efficiency of the two groups when diseased animals were excluded.

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