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Effect of Tilmicosin Alone or in Combination with *Mannheimia haemolytica* Toxoid Administered at Initial Feedlot Processing on Morbidity and Mortality of High-risk Calves

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Abstract

A total of 3,996 high-risk steer calves were used to compare effects of metaphylactic treatment with tilmicosin (TIL) alone or in combination with an adjuvanted *Mannheimia haemolytica* toxoid (MHT) at feedyard arrival on health parameters and economic return in a commercial feedlot setting. Steers receiving TIL-MHT at processing had 17% fewer first time treatments for BRD (P=0.0002) than calves in the TIL group, and a 19% lower relapse rate (P=0.003). TIL-MHT calves had 22% less mortality (P=0.03) than calves in the TIL group. Calves receiving TIL-MHT had $1.37 ($P$<0.0001) and $13.14/head ($P$=0.03) lower therapy and mortality costs, respectively, than calves in the TIL group. In total, combined processing, therapy, railer (culls) and mortality costs for TIL-MHT calves were $14.77 lower ($P$=0.01) than TIL group calves.

Keywords: bovine, feedlot, BRD, tilmicosin, *Mannheimia haemolytica*

Résumé

Un total de 3996 bouvillons à haut risque ont été utilisés pour comparer l'effet d'un traitement métaphylactique à la tilmicosine, employée seule ou en combinaison avec une toxoïde de Mannheimia haemolytica adjuvantée à l'arrivée des animaux dans un parc d'engraissement, sur les paramètres de santé et le rendement économique dans un contexte d'engraissement commercial. Les bouvillons recevant la tilmicosine et la toxoïde adjuvantée (TIL-MHT) à leur arrivée avaient 17% moins de premiers traitements pour le BRD (P=0.0002) que les veaux traités à la tilmicosine (TIL) seule et avaient aussi un taux de rechute 19% moins élevé (P=0.003). La mortalité était 22% moins élevée dans le groupe TIL-MHT que dans le groupe TIL (P=0.03). La thérapie chez les veaux du groupe TIL-MHT par rapport aux veaux du groupe TIL coûtait 1.37$ moins par tête (P>0.0001) et la mortalité coûtait 13.14$ moins par tête (P=0.03). Il y avait en général une baisse des coûts de 14.77$ dans le groupe TIL-MHT par rapport au groupe TIL (P=0.01) en combinant les coûts de manipulation, de traitement, de réforme et de mortalité.

Introduction

High-risk cattle often provide significant health management challenges due to bovine respiratory disease (BRD). Losses due to BRD can significantly affect profits, and can impact morale and focus of feedlot health management crews. Many strategies are employed by veterinarians, nutritionists and feedlot personnel to mitigate health problems in high-risk cattle, including metaphylactic treatment with an antibiotic at arrival processing. Many studies have demonstrated that metaphylactic treatment with tilmicosin[a] reduces the morbidity rate due to BRD, and improves feeding performance as well.[2,3,4,5,9,10,11,12,13] Metaphylaxis is a common tool used to manage BRD in high-risk stocker and feedlot cattle.

We hypothesized that concurrent use of a *Mannheimia haemolytica* toxoid[b] and metaphylactic treatment with tilmicosin at arrival processing would decrease morbidity and mortality compared to using tilmicosin alone. In earlier studies, vaccination with a *Mannheimia haemolytica* bacterin-toxoid at feedlot ar-

rival reduced morbidity, relapse rate and mortality.[1,6,7,8] The purpose of this study was to compare metaphylactic treatment of high-risk feedlot cattle with tilmicosin alone or in combination with a *Mannheimia haemolytica* toxoid at arrival processing on morbidity, mortality and health costs in a commercial feedlot environment.

Materials and Methods

Cattle

A total of 3,996 steers were purchased from auction markets in Kentucky, Oklahoma, Kansas, Missouri, Tennessee, Arizona, Texas and California, and delivered to Colorado Beef near Lamar, Colorado from July 13 to August 30, 2004. The steers were English and Continental cross-breed types.

Processing and Feeding

Upon arrival at the feedyard, steers remained separated by truckload and source, and were placed in receiving pens. Hay and water were provided *ad libitum*, and steers were processed within 36 hours of arrival. At initial processing, cattle were administered the following:

- Serially numbered ear tag (used as individual animal identification)
- Lot tag
- Tilmicosin[a] alone (TIL) or in combination with a *Mannheimia haemolytica* toxoid[b] (TIL-MHT). Tilmicosin was administered at 1.5 mL/100 lb (45.4 kg) of bodyweight (BW) subcutaneously (SC) in the right neck. Dosage was based on the average weight of the group. The *M. haemolytica* toxoid (2 mL) was also administered SC in the right neck.
- Modified-live infectious bovine rhinotracheitis (IBR) virus – bovine viral diarrhea (BVD) virus vaccine[c] given in the muscle (IM) of the left neck (2 mL)
- Doramectin[d] (5 mL) administered SC in the left neck
- Growth promoting implant

Steers were administered a growth promoting implant at initial processing based on arrival weight. Two pens of steers received a progesterone-estradiol benzoate[e] implant followed by an intermediate-dose trenbolone acetate-estradiol implant[f] at first re-implant, and a high-dose trenbolone acetate-estradiol[g] product as a terminal implant. Two pens received a high-dose trenbolone acetate-estradiol[g] implant at arrival processing and were not re-implanted. The other 18 pens received an intermediate-dose trenbolone acetate-estradiol[f] implant at arrival processing, followed by a high-dose trenbolone acetate-estradiol[g] product as the terminal implant. All cattle were revaccinated with modified-live IBR-BVD vaccine[h] at each re-implant time. Cattle in 16 of 22 pens were revaccinated an additional time with IBR-BVD[h] prior to any re-implant to help control BRD morbidity.

Cattle were fed three times daily; diet and feedbunk management strategies were similar for all pens of cattle on trial. Monensin[i] and tylosin[j] were included in the ration during the entire feeding period.

Treatment Assignment

As the sequentially numbered ear tags were administered at processing, treatments were assigned within lot by the flip of a coin according to whether the sequential number was even or odd. Within lot, this resulted in treatment assignment in an every-other-animal fashion. Treatment cattle were commingled within lot into a total of 22 pens. As a result, each pen and hence each treatment had similar backgrounds, ages and arrival weights. Across all pens, average pen payweights ranged from 492 to 758 lb (224 to 345 kg).

Cattle Observation and Care

Cattle were checked daily for illness by pen riders on horseback. Pen riders and animal health technicians were masked to treatment and randomization schedule. Regardless of treatment assignment, all cattle that became sick were treated with the same regimen based on diagnosis and feedyard standard operating procedures (e.g. first- and second-line antimicrobial therapy). All steers were necropsied by a trained technician with 30 years of experience who was employed by the feedyard. The consulting veterinarian(s) participated in the examination when present.

Marketing and Economics

All steers within each of the 22 pens were marketed on the same day based on visual appraisal of the cattle and feed intake patterns routinely used by the feedyard. All steers were harvested from January 13 to May 05, 2005. Individual carcass data were not collected.

All economic data were standardized to common market conditions: \$110/100 lb (45.4 kg) bodyweight (BW) equivalent feeder steer price with a \$5/100 lb BW slide, e.g., the initial feeder calf price was adjusted by \$5/100 lb BW for each 100 lb above or below a 750 lb (341 kg) reference BW; \$54/100 lb BW railer salvage value price; and current treatment costs, which were calculated based on actual cost. Railer (cull) cost was determined as the net economic loss of a railed animal by subtracting the salvage value of the railed animal from the initial cost. The salvage value was calculated as \$54/100 lb BW multiplied by the average in-weight. Railer cost for each treatment was calculated as initial animal cost minus salvage value multiplied by the percent of animals that were railed. Dead costs were calcu-

lated as the value of an animal at arrival (standardized market value of $110/100 lb BW with a $5/100 lb slide to a 750-lb equivalent weight) multiplied by the percentage of steers in each treatment that died.

Statistical Analyses

All categorical data such as morbidity and mortality were analyzed using a chi-squared analysis in SAS[k] with animal as the experimental unit.

Results and Discussion

The average temperature of steers when first pulled for BRD was 104.7°F (40.4°C) in the TIL group, and 104.5°F in the TIL-MHT group (P=0.03). Days-on-feed when calves were first pulled for illness averaged 19 and 22 (P=0.01) for the TIL and TIL-MHT groups, respectively (data not shown).

Calves in the TIL-MHT group had 17% fewer first-time treatments for BRD than those in the TIL group (P=0.0002; Table 1, Figure 1). In addition, steers given TIL-MHT at processing had a 19% lower relapse rate (P=0.003) than those receiving TIL alone (Table 1).

Table 1. Effect of tilmicosin alone or in combination with a *Mannheimia haemolytica* toxoid on morbidity, mortality and railer rates of high-risk feedlot steers (LS means).

Item	Tilmicosin[a]	Tilmicosin plus *M. haemolytica* toxoid[b]	P-value
No. animals	1,999	1,997	
BRD morbidity,[c] %	33.2	27.7	0.0002
BRD relapse,[d] %	17.7	14.3	0.003
BRD railer,[e] %	1.45	0.90	0.11
BRD mortality,[f] %	6.50	4.66	0.01
Overall railer,[g] %	2.05	1.50	0.19
Overall mortality,[h] %	8.15	6.36	0.03

[a]Micotil, Elanco Animal Health, Indianapolis, IN
[b]Presponse SQ, Fort Dodge Animal Health, Overland Park, KS
[c]Cattle that were treated for the first time for bovine respiratory disease (BRD).
[d]Cattle that were pulled and treated again for BRD regardless of location after already being treated. An animal that relapsed more than one time was only counted once.
[e]Cattle that were treated for BRD and subsequently marketed early due to unsatisfactory response to treatment for BRD.
[f]Cattle that died and were diagnosed with respiratory disease at necropsy.
[g]Cattle that were treated for respiratory disease and subsequently railed (culled) due to any ailment.
[h]Total mortality—all causes.

Mortality due to BRD was significantly (P=0.01) lower in steers in the TIL-MHT group as compared to those receiving TIL alone, 4.66 vs 6.50%, respectively. Likewise, overall mortality was lower (P=0.03) in the TIL-MHT steers (Table 1, Figure 2). The railer rate did not differ (P=0.19) between treatment groups.

The case fatality rates (not shown), mortality rates due to BRD and the overall mortality rates were high in both treatment groups. During the timespan this study was conducted, the feedyard modified the manner that cattle were stepped-up on ration. Specifically, cattle were given less time to adapt to ration changes before transition to a higher level of concentrate in the diet. Cattle across the feedyard experienced higher morbidity and mortality rates during this period, and case fatality rates commonly exceeded the 5-10% range seen both before and after the change in feeding management.

Response to use of TIL-MHT may have been greater than measured and reported here if calves in the two treatment groups had not been commingled within pen. It is possible that having both treatments within a pen reduced the risk of sickness in the TIL cattle, and increased risk in the TIL-MHT group.

Daily gain and feed conversion for calves within each treatment group could not be measured because of commingling. This information would be useful, and should be determined in future studies.

There were significant economic advantages to using TIL-MHT at processing compared to TIL alone (Table 2). Treatment costs were $1.37/head less in the

Table 2. Effect of tilmicosin alone or in combination with a *Mannheimia haemolytica* toxoid on processing, therapy, railer and mortality costs (LS means).

Item	Tilmicosin[a]	Tilmicosin plus *M. haemolytica* toxoid[b]	P-value
Processing cost, $/hd	$15.03	$16.88	<0.0001
Therapy cost,[c] $/hd	$6.79	$5.42	<0.0001
Railer cost,[d] $/hd	$7.86	$5.75	0.19
Mortality cost,[e] $/hd	$55.91	$42.77	0.03
All costs,[f] $/hd	$85.59	$70.82	0.01

[a]Micotil, Elanco Animal Health, Indianapolis, IN
[b]Presponse SQ, Fort Dodge Animal Health, Overland Park, KS
[c]Only includes medicine costs and does not include a chute charge.
[d]Calculated as the net cost from the initial animal cost minus the potential salvage value multiplied by the percent that were railed.
[e]Calculated as the initial cost of the animals multiplied by the percent that died.
[f]All costs including processing, therapy, railer and mortality.
All values are calculated as a per-head basis across the entire treatment.

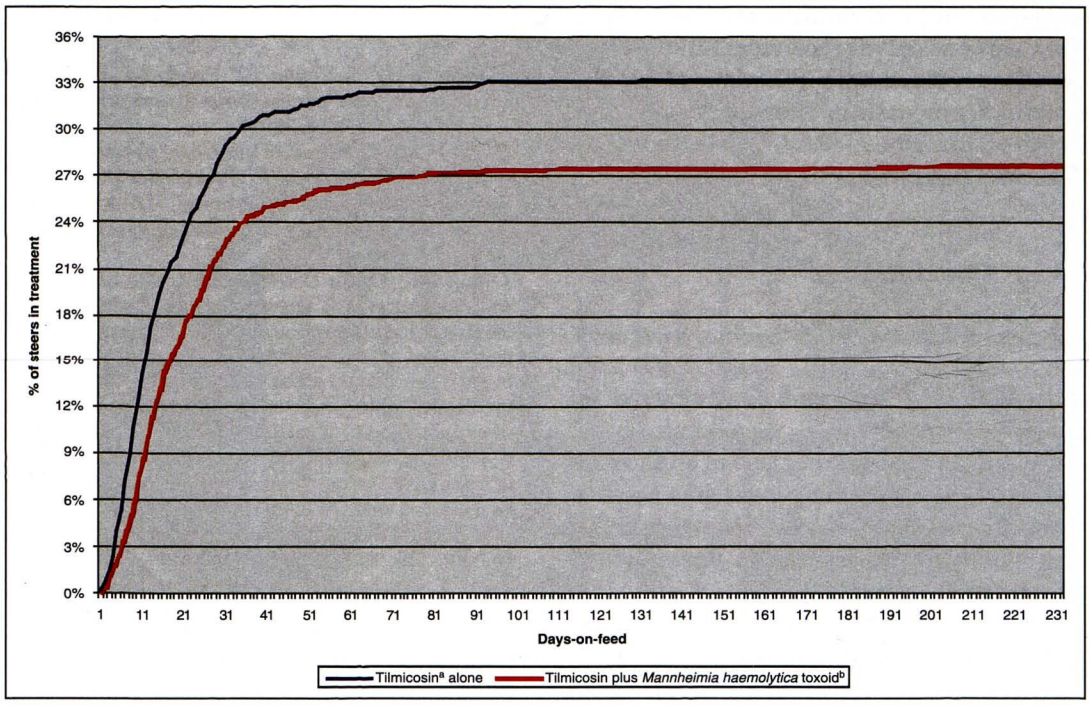

Figure 1. Cumulative morbidity (%) due to BRD (first treatment only) in steers treated at processing with tilmicosin[a] alone or in combination with a *Mannheimia haemolytica* toxoid.[b]

[a]Micotil, Elanco Animal Health, Indianapolis, IN
[b]Presponse SQ, Fort Dodge Animal Health, Overland Park, KS

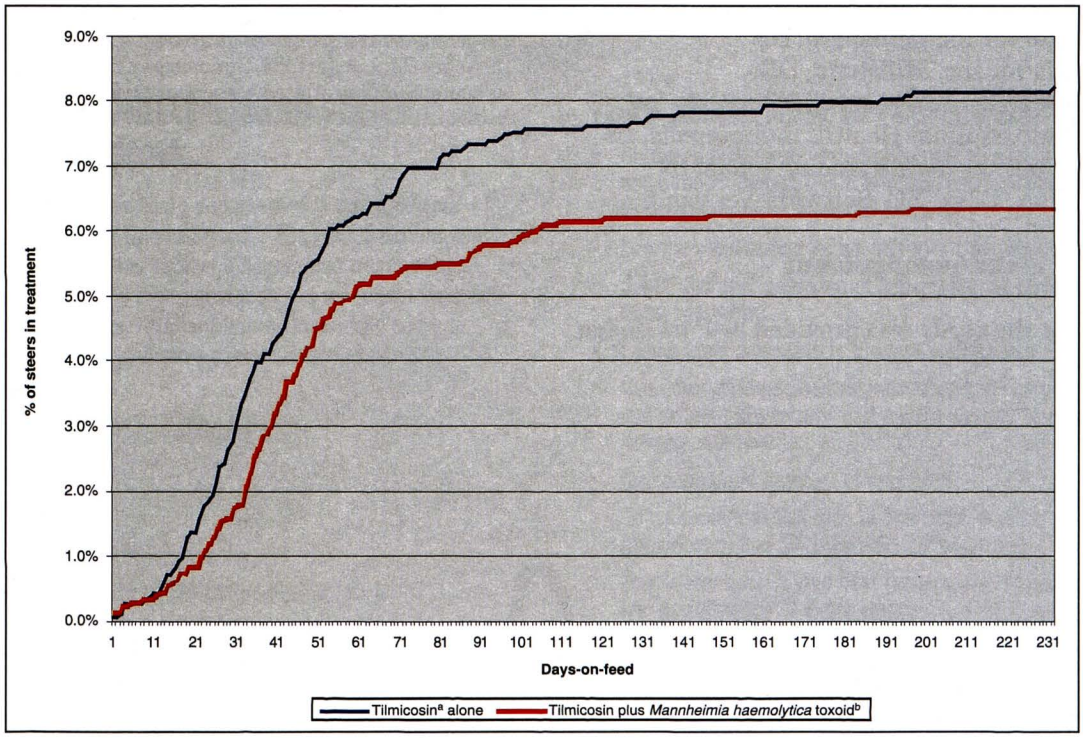

Figure 2. Cumulative overall mortality (%) in feedlot steers treated at processing with tilmicosin[a] alone or in combination with a *Mannheimia haemolytica* toxoid.[b]

[a]Micotil, Elanco Animal Health, Indianapolis, IN
[b]Presponse SQ, Fort Dodge Animal Health, Overland Park, KS

TIL-MHT group ($P<0.0001$). Similarly, mortality costs were \$13.14/head lower in calves receiving TIL-MHT at processing than those treated with TIL alone ($P=0.03$). Altogether, combined processing, therapy, railer and mortality costs were \$14.77/head less ($P=0.01$) in calves administered TIL-MHT at processing than those receiving TIL alone.

Conclusions

Combined use of *Mannheimia haemolytica* toxoid and tilmicosin reduced morbidity due to BRD and mortality rate in high-risk steer calves compared to metaphylactic use of tilmicosin alone. As a result, there was a \$14.77 advantage to concurrent use of tilmicosin and *M. haemolytica* toxoid. Further research is needed to determine if there are gain, feed-efficiency or carcass trait advantages when tilmicosin and *M. haemolytica* toxoid are used concurrently.

Endnotes

[a]Micotil®, Elanco Animal Health, Indianapolis, IN
[b]Presponse® SQ, Fort Dodge Animal Health, Overland Park, KS
[c]Bovi-Shield Gold® IBR-BVD, Pfizer Animal Health, New York, NY
[d]Dectomax®, Pfizer Animal Health, New York, NY
[e]Component® E-C, VetLife, West Des Moines, IA
[f]Revalor®-IS, Intervet Inc, Millsboro, DE
[g]Revalor®-S, Intervet Inc, Millsboro, DE
[h]Titanium® 3, Agrilabs, St. Joseph, MO
[i]Rumensin®, Elanco Animal Health, Indianapolis, IN
[j]Tylan®, Elanco Animal Health, Indianapolis, IN
[k]SAS Institute Inc., Cary, NC, Software Version 8

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