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Differences in Efficacy Between Gamithromycin, Tilmicosin, and Tulathromycin as Metaphylactic Treatments in High Risk Calves for Bovine Respiratory Disease

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Introduction

The cost of Bovine Respiratory Disease to the beef industry due to death, poorer conversions, and therapy is estimated to cost more than $3 billion per year. Identifying and mitigating Bovine Respiratory Disease in cattle can be difficult due to the increased susceptibility for Bovine Respiratory Disease in high risk cattle. One management option to minimize an outbreak of respiratory disease is the use of metaphylaxis, the mass treatment of a group of calves to reduce the incidence and adverse effects of respiratory disease on high risk animals. Criteria used to determine the necessity of metaphylactic treatment against Bovine Respiratory Disease in feedlots can be based on several factors depending on feedlot preference; however, the primary criteria often considered are: a known history of no previous vaccinations, overall appearance of cattle, source of cattle, Bovine Respiratory Disease in calves received from same source previously, long shipping distance, season of the year, and light arrival weight.

The objective of this study was to compare the efficacy of treating newly received, high-risk feedlot calves with gamithromycin, tulathromycin, and tilmicosin as metaphylactic treatments on health and performance characteristics.

Key words: bovine respiratory disease, cattle, metaphylactic treatment

Experimental Procedures

Cross-bred heifer calves (n = 572; initial body weight 404 ± 27.4 lb) were used in a randomized complete block design to evaluate the effects of three different metaphylactic treatments for Bovine Respiratory Disease in high risk calves upon arrival at the feedlot. Cattle originated from the Southeastern United States and were shipped approximately 700 mi. to the research center. Cattle were delivered in five individual loads over a 17-day period and were identified as high-risk due to being light-weight calves

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from a sale barn origin, co-mingled, and long truck haul (>8 hours on the truck). Each load (114 to 120 animals per load) was unloaded and heifers were weighed individually before being placed in an arrival pen. Cattle received free-choice long-stemmed hay, a minimal amount (<1.0 lb/head as fed) of starter ration, and *ad libitum* access to water for the first 24 to 48 hours.

After a 24 to 48 hour rest, heifers were individually weighed, vaccinated with Bovishield Gold 5, Inforce 3, and were given Dectomax (Zoetis Animal Health, Florham Park, NJ), Valbazen (Zoetis Animal Health, Florham Park, NJ), and Synovex C (Zoetis Animal Health, Florham Park, NJ). Horns (for heifers with horns) were tipped to approximately 1 in. diameter. Each animal received an individual identification ear tag and a tag identifying treatment assignment. Heifers were housed by treatment in soil-surfaced pens (40 × 115 ft, with 36 ft bunk line; 19 to 20 animals/pen) with approximately 22 in. of bunk space per animal. Water was supplied to each pen with a bunk line continuous flow water tank.

Within each arrival group, heifers in groups of three were randomly assigned to receive one of the three metaphylactic treatments during processing. Administrators of metaphylactic treatments were blinded to treatment. The selected antibiotic was injected subcutaneously in the neck per label dosage and site of administration recommendations. The treatments administered consisted of one of the three following antibiotics: 1) tulathromycin (1.13 mg/lb; 192 calves); 2) tilmicosin phosphate (5.99 mg/lb; 193 calves); or 3) gamithromycin (2.72 mg/lb; 194 calves). Cattle were randomized into 5 blocks with 3 treatment groups within each block and 10 replicates per treatment. Thirty pens were filled with approximately 19 to 20 heifers. Individual weights were recorded on day 0 and pen weights recorded at the end of the trial on days 56 to 60. Pen served as the experimental unit.

Heifers were initially fed a receiving diet composed of 20% dry-rolled corn, 57% wet corn gluten feed, 18% ground corn stalks, and 5% of a supplement containing decoquinate. Dietary energy concentrations were increased through day 28 using a 2-ration (starter diet and grower diet) transition system. The grower diet was composed of 30% ground corn, 52% wet corn gluten feed, 13% ground corn stalks, and 5% of a supplement containing lasalocid. Feed was delivered to the bunks twice daily by way of an auger mixer wagon. Throughout the feeding period, cattle were offered feed *ad libitum* with an attempt to minimize the amount of feed left over before the next feeding period.

Individual animal health was assessed daily throughout the study. Clinical monitoring of study heifers was performed at the same time each day by trained animal health personnel that were blinded to treatments. Any animal pulled with a combined score ≥ 3 and a rectal temperature ≥ 104°F was treated with ceftiofur crystalline free acid, according to label directions, with a 5-day post-treatment interval so that no retreatment was allowed until 5 days following the original treatment. Any animal removed from the pen for treatment with a combined score ≥ 3 and a rectal temperature < 104°F was treated with enrofloxacin, according to label directions, and a 3-day post-treatment moratorium. Any animal removed from the pen for treatment with a combined score < 3 was not treated and was returned to its home pen. Any animal removed from the pen

for treatment a second time was treated with ceftiofur crystalline free acid as the second treatment; however, if the animal received ceftiofur crystalline free acid as its first treatment, then enrofloxacin was used as the second treatment. Sick animals were returned to their home pen following treatment. Animals were removed from the study if severe clinical morbidity prior to expiration of the assigned moratorium occurred.

Average daily gain, average daily feed intake, morbidity, and mortality measurements were evaluated on a pen means basis as a randomized complete block design and analyzed using the PROC MIXED procedure of SAS (SAS Institute, Inc., Cary, NC). Treatment was included in the model as a fixed effect; pen was the experimental unit for all measures. Average daily gain and feed efficiency were calculated on both deads in and deads out basis across treatment groups. Means were generated with the LSMEANS statement and separated using the PDIFF function when the F-statistic was significant ($P<0.05$). Morbidity, mortality, and retreatments were analyzed as percentage of the pen using a Wilcoxon Rank-Sum Test.

Results and Discussion

A total of 7 animals were removed from the study: two were removed due to lameness, three were removed due to animal welfare concerns based on severe clinical morbidity prior to expiration of the assigned moratorium, and two were removed due to suspected neurological symptoms.

Heifer performance results are presented in Table 1. There were no differences between treatments for dry matter intake or feed:gain ($P>0.05$) during the experimental period. Heifers administered tulathromycin had greater average daily gain compared to gamithromycin treated heifers. There were no differences in average daily gain between gamithromycin and tilmicosin treated heifers ($P>0.05$). There were no differences in average daily gain or dry matter intake between the tulathromycin and tilmicosin treated heifers.

Calves that received tulathromycin had reduced ($P<0.05$) morbidity rates compared to those that received tilmicosin and gamithromycin (Table 2). No differences were found in morbidity between tilmicosin-treated calves and gamithromycin-treated calves ($P>0.05$). Mortality rates were low across all treatment groups and there were no treatment differences ($P>0.05$) for mortality or second treatment rate. Calves treated with tulathromycin were 0.36 and 0.40 times as likely to get sick compared to tilmicosin-treated calves and gamithromycin-treated calves, respectively.

Implications

There are differences between antimicrobials with respect to effectiveness in suppressing bovine respiratory disease when used as a mass medication immediately upon arrival.

Table 1. Least squares means illustrating the effects of metaphylactic treatments on newly received, high-risk feedlot calves on animal performance

	Treatment[1]			
Item[2]	Tulathromycin[3]	Tilmicosin[3]	Gamithromycin[3]	SEM[4]
Initial weight, lb	403.5	402.7	405.1	3.295
Final weight, lb	553.0	544.3	540.1	8.283
Dry matter intake, lb	12.52	12.28	11.99	0.198
Average daily gain, lb				
Deads in	2.54[a,x]	2.36[a,b,y]	2.25[b,x,y]	0.105
Deads out	2.62[a]	2.48[a,b]	2.36[b]	0.089
Feed:gain				
Deads in	4.96	5.29	5.43	0.257
Deads out	4.82	5.01	5.10	0.165

[1]Tulathromycin (1.13 mg/lb); Tilmicosin (5.99 mg/lb); and Gamithromycin (2.72 mg/lb).
[2]Least squares treatment means.
[3]Means within a row without a common superscript of a,b,c are different (P<0.05) or a common superscript of x, y, or z have a tendency (P<0.10).
[4]Standard error of the least squares mean.

Table 2. Comparative health effects of metaphylactic treatments on newly received, high-risk feedlot calves on mortality, morbidity, and retreatments

	Treatment[1]				95% confidence	
Item	Tulathromycin	Tilmicosin	Gamithromycin	Risk ratio	interval	P-value
Number of cattle	192	193	194			
Mortality	2 (1.0%)		3 (1.5%)	0.67	-3.34-2.34	0.72
	2 (1.0%)	3 (1.6%)		0.67	-3.36-2.31	0.71
		3 (1.6%)	3 (1.5%)	1.01	-2.81-2.86	0.99
Morbidity						
1st treatment	10 (5.2%)		25 (12.8%)	0.40	9.30-19.95	0.05
	10 (5.2%)	28 (14.6%)		0.36	-0.17-10.48	0.02
		28 (14.6%)	25 (12.8%)	1.13	7.47-18.11	0.62
2nd treatment	0 (0.0%)		3 (1.5%)	-	-3.79-0.79	0.19
	0 (0.0%)	5 (2.6%)		-	-4.85-0.27	0.03
		5 (2.6%)	3 (1.5%)	1.68	-1.23-3.35	0.35

[1]Tulathromycin (1.13 mg/lb), Tilmicosin (5.99 mg/lb), and Gamithromycin (2.72 mg/lb).