TECHNICAL BULLETIN - MARCH 2022

COMPARISON OF MACROSYN® AND DRAXXIN® FOR CONTROL OF BOVINE RESPIRATORY DISEASE IN STEERS

KEY HIGHLIGHTS

1. The primary objective of this study was to compare Macrosyn and Draxxin used for the control of BRD in moderate- to high-risk feedlot cattle.

2. There were no significant differences between the two groups in measured health or performance outcomes.

3. Macrosyn can be used successfully on arrival as a BRD control strategy in moderate- to high-risk feedlot cattle.

ABSTRACT

Four thousand six hundred eighty-five (4,685) moderate- to high-risk steers were used in a randomized complete block design to compare Macrosyn[1] (tulathromycin injection) and Draxxin[2] (tulathromycin injection) for control of bovine respiratory disease (BRD). Twelve pen blocks were used, resulting in a total of 24 pens of steers averaging 664 lbs. on arrival (range of 652 to 707 lbs.). Steers were fed for an average of 206 days (range of 189 to 225 days). Percentage of steers pulled once for BRD from trial initiation to 45 days on feed was similar (P = 0.271); as was BRD first pulls during the entire feeding period (P = 0.090) for Draxxin compared to Macrosyn (28.2 and 30.7%, respectively). Febrile first BRD pulls (rectal temperature 104°F or greater), BRD relapses, and BRD case fatality rate were similar (P > 0.27) between the 2 metaphylaxis treatments. Likewise, death loss ($\bar{x}$ = 4.32%) and railers ($\bar{x}$ = 2.14%) were similar (P > 0.646) between steers receiving Macrosyn and Draxxin metaphylaxis. Final body weight (BW) on live and carcass basis were not different (P > 0.980) between treatments and averaged 1,406 lb. for both treatments. Dry matter intake and deads-in basis performance were not different (P > 0.447) for steers receiving Macrosyn and Draxxin metaphylaxis. Hot carcass weight, dressing percentage, and USDA Quality and Yield Grade distributions did not differ (P > 0.165) by metaphylactic treatment. The brand of tulathromycin used for control of BRD had little influence on death loss or performance in the population of steers managed under the conditions of this study.

INTRODUCTION

Bovine Respiratory Disease continues to be a significant health challenge for growing and finishing cattle, especially when cattle originate from multiple origins, arrive during the fall, are transported over long distances or are subjected to excessive stressors on or shortly after arrival (e.g., castration, dehorning). Perhaps the most common strategy to mitigating BRD in these cattle is the metaphylactic use of antimicrobials on arrival processing. Macrosyn is a new tulathromycin product approved for treatment and control (metaphylaxis) of BRD. Macrosyn was granted approval through an Abbreviated New Animal Drug Application (ANADA) as an alternative version of the Reference Listed New Animal Drug (RLNAD), Draxxin. Macrosyn is an injectable tulathromycin solution containing the same active ingredient in the same concentration and dosage form as Draxxin. Macrosyn contains no inactive ingredients that may significantly affect bioavailability of the active primary ingredient, tulathromycin. Accordingly, Macrosyn was granted biowaiver by the FDA, therefore providing a pathway for bypassing *in vivo* bioequivalence studies. To the best of our knowledge, no trials comparing Draxxin and alternative tulathromycin products have been conducted making this trial the first of its kind.

1 – 100 mg tulathromycin/mL, Bimeda US, Oakbrook Terrace, IL.
2 – 100 mg tulathromycin/mL, Zoetis, Kalamazoo, MI.

MATERIALS AND METHODS

CATTLE

Steers were used in a randomized complete block design study to compare the effects of tulathromycin via Macrosyn or Draxxin for control of BRD in moderate- to high-risk cattle when fed in a commercial feedyard in the northern High Plains.

Cattle were sourced from nine different states (AL, AR, CA, KS, MO, NE, NM, OK, TX) and arrived between May 14, 2021, and June 29, 2021. The average in-weight of enrolled cattle was 664 pounds.

RANDOMIZATION AND ARRIVAL PROCESSING

Steers were randomized to 1 of 2 experimental treatments as they passed through the squeeze chute at the time of initial processing:

TREATMENT GROUP 1 Macrosyn metaphylaxis
TREATMENT GROUP 2 Draxxin metaphylaxis

A chute side personal computer with a randomization schedule application was used to randomize experimental treatment to animals.

Randomized cattle were sorted into one of pens as they exited the squeeze chute. A randomization function was used to allocate sort pens to home pens. Twelve pen blocks were used, resulting in a total of 24 pens containing 195 head/pen (range of 147 to 290 head/pen). In addition to the tulathromycin product received metaphylactically on arrival, all steers also received a 3-way modified live virus vaccine (IBR/BVDV1/BVDV2), 7-way clostridial vaccine, 1% ivermectin injection, oral benzimidazole drench dewormer, a long-acting combination implant and two dangle ear tags for identification.

PENS AND FEED MANAGEMENT

Pens within a statistical block provided similar square footage (278 ft^2/head; range of 262 to 336 ft^2/head) and bunk space (8.8″/head; range of 8.3 to 10.6″/head) and were oriented in the same direction and had the pen floor slope in the same direction. Cattle were fed a starter ration and were gradually adapted to a finish (top) ration using a single intermediate ration and a series of step-up feeding schedules. Monensin and tylosin were included in the top ration at a target concentration and dosage of 35 g/ton monensin/day and 90 mg tylosin/day, respectively. Steers were fed ractopamine hydrochloride at a target level of 280 mg ractopamine/day for 35 days followed by a 2-day withdrawal immediately before harvest; tylosin was not included in the diet containing beta-agonist.

ANIMAL HEALTH MANAGEMENT

Steers were observed daily for health by pen riders masked to treatment assignment. When possible, a single pen rider rode all pens within a block, and all pulls within a block were handled at the same hospital facility. Steers were eligible for BRD treatment following a 10-day post-metaphylactic interval; cattle demonstrating clinical signs associated with BRD (e.g., anorexia, dull eyes, depression, weakness, cough, nasal discharge, watery eyes, lack of fill, stiff gait, loose feces, increased respiratory rate) were trailed from their respective home pen to a hospital facility for further evaluation and treatment. First pull BRD treatment was given to animal dependent upon rectal temperature. If steers had a fever less than 104.0˚F they would receive oxytetracycline, steers with a rectal temperature above 104˚F, would receive florfenicol. Ceftiofur crystalline free acid was given for the second pull BRD treatment regardless of the animal's rectal temperature. All animals that required a third pull BRD treatment received danofloxacin. Animals that did not recover from BRD after receiving three BRD treatments in addition to the metaphylactic tulathromycin they received on arrival were not treated and they were removed from the study. All antimicrobial therapies used in BRD pulls 1-3 were administered in accordance with label instructions.

Standard protocols were used for treatment of diseases unrelated to BRD, and these protocols were consistent for all cattle enrolled in the study. Steers were allowed to convalesce in hospital pens for a minimum of 24 hours before returning to their respective home pen. Mortalities were subjected to a postmortem examination performed by a licensed veterinarian or by on-site trained personnel.

TRIAL COMPLETION

Steers were shipped, by statistical block, to a commercial packing plant as they became market-ready in December 2021 and January 2022.

STATISTICAL ANALYSIS

Data were analyzed as a randomized complete block design with a pen as the experimental unit. Continuous data (i.e., initial BW) were analyzed using a linear mixed model with experimental treatment as a fixed effect and block (i.e., replicate) as a random effect. Categorical data were analyzed using a generalized linear mixed model with the model effects described previously. Model estimation was performed using a logit scale to link responses to a binomial distribution. Estimates of treatment means and respective standard errors are reported on the data scale using an inverse link method.

RESULTS AND DISCUSSION

Bovine respiratory disease continues to be the most common and economically significant disease affecting the feedlot industry.[7] Metaphylaxis treatment to control BRD has shown a net return to the industry of $532 to $679 million.[8] The effects of tulathromycin metaphylaxis on steer health is shown in Table 1. No differences were found between Macrosyn and Draxxin. Growth performance and carcass performance are shown in Tables 2 and 3 respectively. No differences were found between the treatment groups.

CONCLUSIONS

No significant differences in measured health or performance outcomes were identified in groups of moderate- to high-risk beef steers that received Macrosyn or Draxxin metaphylactically for the control of BRD. Based on the findings of this study, Macrosyn is an effective antimicrobial for metaphylactic use in moderate- to high-risk populations of cattle, which represent a significant portion of cattle entering the feedlots in the United States.

TABLE 1: Influence of tulathromycin injection (Macrosyn or Draxxin) metaphylaxis on health of feedlot steers.

ITEM	MACROSYN	DRAXXIN	STANDARD ERROR	*P*-VALUE[§]
Pens (Head Enrolled)	12 (2,343)	12 (2,342)	-	-
Days on Feed	206	206		
BRD First Pulls, % of Enrolled[a,b]				
Febrile[c]			-	-
0 to 45 Days on Feed	14.6	13.8	2.29	0.455
0 to Close	25.7	24.3	2.46	0.292
Total				
0 to 45 Days on Feed	17.2	15.9	2.47	0.271
0 to Close	30.7	28.2	2.73	0.090
Total Morbidity, % of Enrolled	32.3	30.4	2.62	0.175
BRD Relapses, % of First[d]	35.9	36.8	2.16	0.716
BRD Case Fatality Rate, %[e]	5.80	5.71	0.897	0.945
Deathloss, % of Enrolled				
BRD	1.69	1.53	0.360	0.665
Total	4.24	4.16	0.589	0.891
Railers, % of Enrolled				
BRD	0.87	0.95	0.228	0.767
Total	2.26	2.00	0.331	0.558
Outs, % of Enrolled[f]	6.45	6.12	0.774	0.646

[§]P-value associated with the effect of metaphylaxis antibiotic. Data were analyzed using a generalized linear mixed model.
[a]Bovine Respiratory Disease (BRD).
[b]Cattle were eligible to be pulled following a 10-day post-metaphylactic interval.
[c]Rectal temperatures greater than or equal to 104°F
[d]Cattle receiving 2 or more treatments for BRD.
[e]Cattle treated for BRD and subsequently died of BRD.
[f]Deathloss and railers.

7 – Theurer et al.: Bovine respiratory disease mid-feeding period. Applied Animal Science 2021 37:52-58
8 – Dennis et al: Kansas State University Department of Agricultural Economics Extension Publication 21 June 2019

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TABLE 2: Influence of tulathromycin injection (Macrosyn or Draxxin) metaphylaxis on growth performance of feedlot steers.

ITEM	MACROSYN	DRAXXIN	STANDARD ERROR	P-VALUE[§]
Pens (Head Enrolled)	12 (2,343)	12 (2,342)	–	–
Live Body Weight				
Initial, lb	676	675	4.01	0.762
Final, lb[a]	1,408	1,404	11.3	0.376
Dry Matter Intake, lb	19.8	19.7	0.27	0.748
Deads-In Based Performance				
Average Daily Gain, lb	3.32	3.34	0.074	0.565
Dry Feed Conversion	5.96	5.92	0.062	0.447
Deads-Out Based Performance				
Average Daily Gain, lb	3.48	3.49	0.061	0.671
Dry Feed Conversion	5.69	5.67	0.039	0.542

[§]P-value associated with the effect of metaphylaxis antibiotic. Data were analyzed using a linear mixed model.
[a]A 4% "pencil shrink" was applied. Includes all cattle that were marketed.

TABLE 3: Influence of tulathromycin injection (Macrosyn or Draxxin) metaphylaxis on carcass performance of feedlot steers.

ITEM	MACROSYN	DRAXXIN	STANDARD ERROR	P-VALUE[§]
Pens (Head Enrolled)	12 (2,343)	12 (2,342)	-	-
Hot Carcass Weight, lb	899	899	6.3	0.980
Carcass-Based Performance				
Final Body Weight, lb[a]	1,406	1,406	9.9	0.980
Average Daily Gain, lb[b]	2.48	2.49	0.035	0.629
Dry Feed Conversion	7.96	7.94	0.050	0.550
Dressing Percentage	63.8	64.0	0.17	0.350
USDA Prime, %	2.58	1.98	0.723	0.165
USDA Choice and Prime, %	75.7	76.5	2.83	0.527
USDA Select, %	23.4	22.4	2.87	0.459
USDA Sub-Select, %	0.78	0.89	0.274	0.666
USDA Yield Grade 1 and 2, %	32.2	30.5	2.80	0.269
USDA Yield Grade 3, %	54.9	56.6	2.39	0.281
USDA Yield Grade 4 and 5, %	12.0	11.9	1.40	0.949

[§]P-value associated with the effect of metaphylaxis antibiotic. Data were analyzed using a linear mixed model (continuous data) or a generalized linear mixed model (categorical data).
[a]Hot carcass weight ÷ dressing percentage.
[b]Based on initial hot carcass weight (kg) calculated as: 0.2598*(initial BW ^ 1.1378); Tatum et al. (2012).