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Impact of Ramaekers Immune Primer on Finishing Beef Cattle Performance and Liver Abscess Rate

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Summary with Implications

A feedlot study was conducted comparing a natural feed additive (Ramaekers Immune Primer) to Tylan or nothing on receiving and finishing performance. There were no differences for final BW, ADG, F:G, HCW, marbling, LM area, or fat thickness due to treatment. Liver abscess incidence and severity were reduced in steers fed Tylan, no differences were noted between Ramaekers Immune Primer and no additive. There was no difference in number of cattle treated for respiratory illness. Steers on the Ramaekers Immune Primer treatment had lower feed intake during the receiving period but had similar ADG and numerically better F:G at day 19 compared the control. These results suggest Ramaekers Immune Primer may be more beneficial, leading to increased performance, for younger, naive calves during the receiving phase.

Introduction

The veterinary feed directive requires a prescription for some antibiotics, such as tylosin, when used in feedlot diets for prevention of liver abscesses. To reduce the need for a veterinary approval, there is interest in natural alternatives for the prevention of liver abscesses, but these alternatives must be efficacious. Ramaekers Immune Primer (RAM) is a natural product that can be fed directly in the feed or given as a bolus. Formulated with a proprietary blend of vitamins and minerals with prebiotics and probiotics to give calves an immunity boost, RAM was designed to be given to newly received calves to bolster immunity.

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Table 1. Composition (% of diet DM) of dietary treatments fed to steers during the receiving period.

	Treatment[1]		
Ingredient	NEGCON	POSCON	RAM
Alfalfa Hay	31.67	31.67	31.67
Dry-rolled corn	31.67	31.67	31.67
Sweet Bran	31.67	31.67	31.67
Supplement[2]			
Fine Ground Corn	4.07	4.06	3.83
Limestone	0.67	0.67	0.67
RAM[3]	-	-	0.24
Tallow	0.125	0.125	0.125
Beef Trace Minerals Premix	0.05	0.05	0.05
Deccox[4] Premix	0.04	0.04	0.04
Rumensin[5] Premix (g/ton)	0.017	0.017	0.017
Vitamin A-D-E Premix	0.015	0.015	0.015
Tylosin[6] Premix (mg/d)	-	0.009	-

[1] Treatments included NEGCON-negative control without tylosin; POSCON-positive control with tylosin; RAM-Ramaekers Immune Primer.
[2] Supplement fed at 5% of dietary DM for all treatments.
[3] Formulated to supply Ramaekers Immune Primer (Ramaekers Nutrition LLC) at 14174.7 mg per steer daily.
[4] Formulated to supply Deccox® (Zoetis Services LLC) at 20 g per ton DM.
[5] Formulated to supply Rumensin-90® (Elanco Animal Health) at 30 g per ton DM.
[6] Formulated to supply Tylan-40® (Elanco Animal Health) at 90 mg per steer daily.

A few small clinical trials suggest that RAM lowers cortisol level and increases insulin in stressed calves leading to increased weight gain. Anecdotal evidence also suggests that calves fed RAM had lower morbidity and mortality compared to control cattle. A finishing study using Holstein calves reported a decrease in liver abscesses and an increase in feed efficiency with fewer days on feed (not published). However, limited work has been done to assess the effect of RAM in beef cattle finished in a feedlot in a controlled, randomized study. The objective of this study was to determine the impact of RAM on receiving and finishing beef cattle performance and liver abscess rate and animal health.

Procedure

A finishing experiment conducted at the Eastern Nebraska Research and Extension Center utilized 600 crossbred steers (initial shrunk BW 575 lb = ± 17.0 lb). Steers were blocked according to their arrival date with block 1 consisting of 150 head, block 2 with 150 head, and block 3 with 300 head. A total of 30 pens were used in the study with 20 steers per pen and 10 pens per treatment. Steers were assigned randomly to treatment upon arrival. Three treatments consisted of a negative control diet (NEGCON) without tylosin, a positive control diet (POSCON) with Tylan-40® (Elanco Animal Health), and a diet containing Ramaekers Immune Primer (RAM; Ramaekers Nutrition LLC). Rumensin-90® (Elanco Animal Health) was included at 30g/ton (DM basis) in all diets. Receiving diets (Table 1) were fed for the first 19 d which included Deccox® (Zoetis Animal Health) in the supplement for all treatments. Upon receiving, steers on the RAM treatment were administered two rumen boluses (½ oz.) during processing. Additionally, steers on the RAM treatment were fed ½ oz. of RAM in the supplement on days 1–19 of receiving. All steers received Bovi-Shield Gold One Shot®, Dectomax® injection, and

Table 2. Composition (% of diet DM) of dietary treatments fed to steers during the finishing period.

	Treatment[1]		
Ingredient	NEGCON	POSCON	RAM
Dry-rolled corn	26.4	26.4	26.4
High-moisture corn	39.6	39.6	39.6
WDGS[2]	25.0	25.0	25.0
Wheat Straw	5.0	5.0	5.0
Supplement[3]			
Limestone	1.71	1.71	1.71
Fine Ground Corn	1.56	1.47	1.33
Salt	0.30	0.30	0.30
Urea	0.25	0.25	0.25
RAM[4]	-	-	0.21
Tallow	0.10	0.10	0.10
Beef Trace Minerals Premix	0.05	0.05	0.05
Water[5]	-	-	0.021
Rumensin Premix (g/ton)[6]	0.017	0.017	0.017
Vitamin A-D-E Premix	0.015	0.015	0.015
Tylosin Premix (mg/d)[7]	-	0.009	-
FD & C Blue Dye[8]	-	-	0.002

[1] Treatments included NEGCON-negative control without tylosin; POSCON-positive control with tylosin; RAM-Ramaekers Immune Primer.
[2] WDGS: Wet distillers grains plus solubles.
[3] Supplement fed at 4% of dietary DM for all treatments.
[4] Formulated to supply Ramaekers Immune Primer (Ramaekers Nutrition LLC) at 14174.7 mg per steer daily, fed once per week.
[5] Water added on as-is basis to mix FD & C Blue Dye
[6] Formulated to supply Rumensin-90® (Elanco Animal Health) at 30 g per ton DM.
[7] Formulated to supply Tylan-40® (Elanco Animal Health) at 90 mg per steer daily.
[8] FD & C Blue Dye: water-soluble artificial blue dye allowed by the FDA for use in foods was used to identify correct supplement delivery.

Table 3. Live performance and morbidity of newly received calves during the 19 day receiving period of a feedlot study

	Treatment[1]				
Item	NEGCON	POSCON	RAM	SEM	*P*-value
Live Performance					
Initial BW, lb	577	578	571	5.69	0.65
Ending BW, lb[2]	625	622	623	4.23	0.80
DMI, lb/d	12.4[b]	11.3[a]	11.7[a]	0.26	0.02
ADG, lb	2.56	2.41	2.79	0.23	0.48
F:G	5.13	5.74	4.54	0.72	0.48
Morbidity					
Pulls, n	62	54	56	-	-
First Pull, %[3]	30.1	35.3	28.3	8.5	0.37
Second Pull %[4]	0.05	1.0	4.0	1.4	0.064

[a,b] Means with different superscripts differ ($P < 0.05$).
[1] Treatments included NEGCON-negative control without tylosin; POSCON-positive control with tylosin; RAM-Ramaekers Immune Primer.
[2] Ending BW is the average pen weight shrunk 4.0%, Subsequent ADG and F:G are calculated from 4.0% shrunk EBW.
[3] Percentage of steers treated one or more times as a percent of total steers within the pen.
[4] Percentage of steers treated two or more times as a percent of total steers within the pen.

Somubac® (Zoetis Animal Health).

On day 19, during revaccination, individual weights were taken and steers were implanted with Revalor-XS (Merck Animal Health). Steers on the RAM treatment were given a second administration of 2 boluses with RAM. After day 19, RAM steers were pulse dosed with Ramaekers Immune Primer once weekly with dosage provided in the supplement which included a food-grade dye for visual inspection of correct delivery. Steers were adapted to their respective finishing diets during a 5-step process over 28 days where Sweet Bran and alfalfa were replaced with high-moisture corn (HMC) and wet distillers grains plus solubles (WDGS; Table 2).

Block 1 and 2 were fed for 221 and 222 days, respectively. Block 3 was fed for 230 days. Steers were shipped to Greater Omaha for slaughter, and carcass data were recorded. On day of harvest, hot carcass weight and liver score were collected. Following a 48-hour chill, USDA marbling score, longissimus muscle (LM) area, and 12th rib fat thickness were recorded. Carcass-adjusted performance was calculated using final body weight (BW), based on hot carcass weight (HCW) divided by a common dressing percentage of 63.

Carcass and performance data were analyzed using the MIXED procedure of SAS (SAS Institute, Inc. Cary, N.C.) where pen was the experimental unit. Liver abscess incidence, morbidity, and mortality were analyzed using PROC GLIMMIX of SAS with the outcome of interest as the number of animals affected out of the total number of animals within the pen as binomial variables. Animals treated four times were removed from the study. Yield grade, quality grade, and liver abscess severity were analyzed using PROC GLIMMIX of SAS using a multinomial distribution to evaluate distribution differences due to treatment. Treatment differences were declared significant for all statistical analysis at $P \leq 0.05$.

Results

During the first 19 days (receiving period), there were no differences observed in ending BW, average daily gain (ADG), or feed to gain (F:G; Table 3). However, there was a significant difference for DMI ($P \geq 0.020$) where POSCON and RAM treatments had lower dry matter intake (DMI)

Table 4. Performance, carcass characteristics, morbidity and mortality of steers fed a finishing diet with Tylan, Ramaekers Immune Primer, or no liver abscess control.

	Treatment[1]				
Item	NEGCON	POSCON	RAM	SEM	*P*-value
Carcass-Adjusted Performance[2]					
Initial BW, lb	577	578	571	5.69	0.65
Final BW, lb[3]	1349	1362	1359	7.29	0.43
Average Days on feed, n	224	224	224	-	-
DMI, lb/d	19.6	19.7	19.6	0.21	0.97
ADG, lb	3.44	3.50	3.52	0.03	0.19
F:G	5.69	5.63	5.58	0.074	0.53
Carcass Characteristics					
HCW, lb	850	858	856	4.6	0.41
Marbling[4]	491	481	483	8.1	0.61
LM area, in^2	12.6	12.8	12.8	0.08	0.25
12th rib fat, in	0.65	0.63	0.64	0.01	0.66
Liver Abscesses, %[5]	21.3[b]	7.7[a]	20.3[b]	0.039	0.002
Calculated Yield Grade[6]	3.81	3.74	3.76	0.05	0.61
Morbidity					
Pulls, n	96	100	89	-	-
First Pull, %[7]	40.2	42.0	38.7	7.90	0.81
Second Pull, %[8]	5.71	6.13	3.56	1.69	0.48
Third Pull, %[9]	2.08	1.03	1.53	0.88	0.71
More than 3 Pulls, %[10]	3.17	1.15	1.15	0.90	0.19
Respiratory Treatments, n	82	92	82	-	-
Respiratory Treatments, %[11]	85.4	92.0	92.1	3.60	0.24
Mortality					
Dead, n	8	3	3	-	-
Dead, %[12]	3.17	1.15	1.15	1.98	0.19

[a,b] Means with different superscripts differ ($P < 0.05$).
[1] Treatments included NEGCON-negative control without tylosin; POSCON-positive control with tylosin; RAM-Ramaekers Immune Primer.
[2] Finishing performance was calculated with dead animals removed from the analysis.
[3] Calculated from HCW divided by a common dressing percent (63%).
[4] Marbling Score 300 = Slight, 400 = Small, 500 = Modest, etc.
[5] Calculated as a percent of total animals; dead animals removed
[6] CYG: Calculated Yield Grade; Calculated using 2.50 + (2.50 * fat thickness, in) + (0.2 * 2.5 [KPH]) + (0.0038 * HCW, lb)-(0.32 * LM area, in2).
[7] Percentage of steers treated one or more times as a percent of total steers within the pen.
[8] Percentage of steers treated two or more times as a percent of total steers within the pen.
[9] Percentage of steers treated three or more times as a percent of total steers within the pen.
[10] Percentage of steers treated more times as a percent of total steers within the pen.
[11] Percentage of steers treated for respiratory as a percent of total steers treated.
[12] Percentage of steers dead as a percent of total steers within the pen.

than the NEGCON. Steers fed RAM had a 16% improvement in F:G compared to NEGCON due to numerically greater ADG and significantly lower DMI. Because 19 days is a small number of days on feed, the variation for ADG is larger than it would be with more days on feed. This could explain why there was a large improvement in the receiving period but was not detected statistically. There were no differences in percent of animals pulled once in the first 19 days ($P \geq 0.34$) However, there was a tendency ($P = 0.064$) for steers pulls, where more steers in the RAM treatment were pulled twice in the first 19 days compared to the other two treatments.

No differences ($P \geq 0.19$) were observed in any of the performance variables measured for the entire feeding period from receiving through finish, including final BW, DMI, ADG, or F:G for finished cattle. Similarly, there were no differences in hot carcass weight (HCW), marbling, LM area, 12th rib fat or calculated yield grade ($P \geq 0.25$). Morbidity and mortality percentages were not different for all three treatments ($P \geq 0.19$. Steers were treated for respiratory, foot rot, toe abscesses, lameness and injury, bloat, and diphtheria. Total animals pulled 1, 2, or 3 times were not different ($P \geq 0.19$). There were no differences in percent of cattle pulled for respiratory treatments ($P > 0.24$). There were no differences in number of dead animals ($P > 0.19$). Removal reasons included crippled or injured animals, chronic animals (treated 3 times or more), kidney infection, and pneumonia. There was no significant difference in yield grade or quality grade distributions ($P \geq 0.44$). Liver abscess incidence was significantly impacted by treatment ($P < 0.002$), with a lower percentage of liver abscesses in the POSCON treatment compared to both RAM and NEGCON ($P < 0.01$; Table 4). There was a significant difference in liver abscess severity distribution ($P > 0.011$; Table 5). Similarly, liver scores from the POSCON treatment had lower incidence across all severity types (A-, A and A+) compared to the other two treatments.

Results suggest that feeding Tylan successfully reduced incidence of liver abscess and severity compared to cattle fed no antibiotic or Ramaekers Immune Primer. There were no treatment effects for morbidity and mortality suggesting no statistical effects on animal health. There were no differences in performance and carcass characteristics for the receiving period or through finishing. However, there was a decrease in feed intake for steers fed the Ramaekers Immune Primer during the receiving period (first 19 days) and a 16% numerical improvement in F:G during receiving. This suggests that Ramaekers Immune Primer might be more effective in less mature cattle early in the feeding period.

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Table 5. Carcass quality and liver score distributions of finished steers fed Tylan, Ramaekers Immune Primer, or no liver abscess control.

	Treatment[1]		
Item	NEGCON	POSCON	RAM
Calculated Yield Grade[4,5,6]			
1	0.00	0.51	0.51
2	8.33	8.72	9.69
3	43.8	48.7	41.3
4	42.7	35.9	42.9
> 4	3.65	3.59	4.08
Quality Grade[4,5,7]			
Prime	2.08	2.56	1.02
Upper 2/3 Choice	38.0	30.3	35.7
Lower 1/3 Choice	45.8	47.2	44.9
Select	12.5	19.5	17.9
< Select	0.00	0.00	0.00
Liver Scores[5,8]			
0	77.6	91.8	78.6
A-	11.5	5.64	13.8
A	3.65	1.54	2.55
A+	7.29	1.03	5.10

[1] Treatments included NEGCON-negative control without tylosin; POSCON-positive control with tylosin; RAM-Ramaekers Immune Primer.
[2] Final BW is the average pen weight from block 3 and a treatment average for blocks 1 and 2, shrunk 4.0% (not statistically analyzed).
[3] Dressing Percent is calculated from HCW divided by live BW; with a 4% pencil shrink applied.
[4] Calculated yield grade and quality grade are based on the marbling score (300 to 399 Select, 400 to 499 low choice, 500 to 699 upper choice, and >700 as prime).
[5] All numbers are expressed as percentages of total animals within pen.
[6] Treatments differences were not significant ($P = 0.440$).
[7] Treatments differences were not significant ($P = 0.492$).
[8] Treatments differences were significant ($P = 0.011$).