Effects of a Direct-fed Microbial to Steers Fed High Moisture Corn and Wet Distillers Grains

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BEEF BRIEF

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Numerous studies have been conducted that demonstrate a small but significant improvement in feed conversion efficiency when a direct-fed microbial product containing a combination of Lactobacillus acidophilus (strain LA51) and Propionibacterium freudenreichii (strain PF24) was added to conventional corn-based feedlot diets. The purpose of this study was to determine whether this direct-fed combination of bacteria would improve feed conversion efficiency when wet distillers' grains with solubles were added to the diet.

Methods

Two hundred eighty crossbred beef steers weighing 847 lb (mostly black-hided) were purchased from Kentucky and West Virginia. After arrival at Michigan State University Beef Cattle Teaching and Research Center (BCTRC), the steers were vaccinated for IBR, PI3, BVD, BRSV (Bovi-Shield Gold 5®) and 7-way Clostridium (Ultrabac® 7). Steers received a RFID ear tag for individual identification. At the first weigh period (28 d), steers were treated for parasites and given a Revalor®-S implant. The experimental design was a randomized complete block in which the steers were allocated to pens to assure homogeneous groups within and among pens. Cattle were allocated to pens based on the initial weight, purchase group, and hide color. The design included 4 treatments with 10 pen replications per treatment for a total of 40 slatted floor pens containing 7 animals each. Initial and final live weights were the average of two weights taken on consecutive days.

The direct-fed microbial treatments were combinations of Lactobacillus acidophilus (strain LA51) and Propionibacterium freudenreichii (strain PF24). The four dietary treatments were as follows: 1) control, no supplementation; 2) 109 cfu PF24 + 105 cfu LA51 per hd/d; 3) 109 cfu PF24 + 106 cfu LA51 per hd/d, and 4) 109 cfu PF24 + 107 cfu LA51 per hd/d. Feedlot staff were blinded to treatments during the trial. All four treatments were top-dressed. For each treatment, 35 lb of dry ground corn and a packet containing the assigned freeze-dried microbial treatment were blended in a cement mixer. Each steer, within a treatment, received 0.5 lb of this corn-microbial blend. For a pen of 7 steers, 3.5 lb of the resulting blend were placed onto the top of the daily feed delivery to the bunk and manually mixed. Feedlot diets were comprised

of 54% high moisture corn, 31% wet distillers' grains, 7% corn silage, 3% hay, and 4% protein-mineral supplement (Table 1).The diets were formulated to ensure the total diet provided adequate protein, vitamins and minerals as defined by NRC (1996). Diets contained 60.1% DM and 16% CP. Rumensin® was added to the supplement to provide 320 mg of monensin per lb of supplement.

The three treatments containing the combination of bacteria were pooled for this analysis. The average dose level for the pooled treatment was 1×109 cfu/hd/d of PF24 + 1×106 cfu/hd/d of LA51. Average daily dry matter consumption, average daily gain, and feed conversion efficiency were determined. Final performance results are reported on a shrunk live weight (4% shrink) and carcass-adjusted basis. Carcass-adjusted ADG was calculated from a final weight derived by division of hot carcass weight including the kidney knob by .625. Cattle were sent to the Tyson Fresh Meats, Inc., Joslin, IL harvest facility when visually estimated to grade 75% USDA Choice or greater. Post-harvest, hot carcass weight, backfat thickness, ribeye area, KPH, marbling, quality grade, and yield grade were recorded.

Table 1. Ingredient and nutrient composition of the ration

Ingredient	DM content of feedstuff, %	Crude protein content of feedstuff, % (DM basis)	Amount in ration, % (DM basis)
High moisture corn	71.57	8.53	54.4
Wet distiller's grains	50.04	32.55	30.8
Dry ground corn[a]	89.09	8.70	1.7
Corn silage	38.32	7.42	6.8
Hay	88.27	13.38	3.2
Limestone	100.00	---	2.2
TM Salt	100.00	---	.6
Urea	99.00	281.00	.24
Akey TM premix #4	100.00	---	.08
Vitamin E	100.00	---	.002
Rumensin 80[b]	100.00	---	.013

[a]Dry ground corn was used as a carrier for the direct-fed microbial
[b]Monensin added to diet at rate of 28 ppm

Results and Discussion

A greater number of animals were removed from the study because of joint swelling and lameness than is usually observed in this facility. Historically, one percent or less has been removed from studies due to lameness; in this study, 3.6% were removed because of lameness. Most of the lameness was from swollen joints. Diagnosis by Dr. Dan Grooms indicated three potential sources of the joint swelling, Mycoplasmam bovis (pneumonia followed by septicemia and septic arthritis), trauma (housed in closed confinement on concrete), or Histophilus somnus (septic arthritis). The potential sources of the joint swelling were not related to dietary treatments.

Weight gain and dry matter intake were similar among treatments (Table 2). Overall feed efficiency tended to be better for the direct-fed microbial treatments when expressed on a shrunk live weight ($P = 0.15$) basis. When expressed on a carcass gain basis (hot carcass weight/0.625), cattle fed the direct-fed microbial treatments were more efficient ($P = 0.06$). Ration energy values calculated from performance had a numerical advantage ($P < 0.16$) for the direct-fed treatment.

The effects of treatments on carcass characteristics are shown in Table 3. There was numerical advantage ($P=0.14$) for cattle fed the direct-fed microbial treatments to have larger ribeye areas than the control cattle. The other carcass traits were similar among treatments.

In summary, feeding a direct-fed microbial was beneficial in improving

feed efficiency (+2.8%) in this study. The responses to direct-fed microbials in diets containing 31% modified wet distillers' grains with solubles (DGS) were similar to the results reported in a seven trial summary utilizing the same microorganisms and traditional feedlot diets without DGS (McPeake et. al., 2002). It appears that feeding 1×105 or 1×106 cfu/hd/d of Lactobacillus acidophilus strain LA51 in combination with 1×109 cfu/hd/d of Propionibacterium freudenreichii (strain PF24) is the optimum level (data not shown). The dose to optimize performance in this study supports the results from other studies (D. R. Ware; Nutritional Physiology, Corp., personal communication). Feeding the direct-fed microbial containing a combination of Lactobacillus acidophilus and Propionibacterium freudenreichii has also been shown to reduce shedding of E. coli 0157:H7 in feedlot steers. D.R. Ware suggests it takes a higher dose to reduce shedding.

Table 2. Direct-fed microbial treatments affects on performance.

	Control[a]	Direct-fed[a]	Prob.	95 % Confidence Interval[b]
# Steers	68	201	---	---
# Pens	10	30	---	---
In wt., lb	847.1	846.7	.55	845.7-848.7
Out wt., lb	1339.7	1347.3	.51	1314.1-1360.4
Shunk ADG, lb	3.23	3.29	.47	3.05-3.37
Carc. Adj ADG, lb	3.53	3.59	.45	3.35-3.68
DMI, lb/d	22.24	22.03	.65	21.38-23.18
Shunk gain/feed	.1451	.1494	.15	.1383-.1503
Carc. Adj gain/feed	.1588	.1633	.06	.1531-.1623
Carc. Adj. feed/gain	6.17	6.00	.07	6.04-6.41
ME, Mcal/lb	1.57	1.60	.15	1.51- 1.60
NE_m, Mcal/lb	1.12	1.17	.15	1.05-1.18
NE_g, Mcal/lb	.71	.72	.16	.68-.73

[a]Control (no bacteria added to the diet); Direct-fed- average of three treatments which contained 1×10[9] cfu/hd/d of *Propionibacterium freudenreichi* strain PF24 and 1×10[6] cfu/hd/d of *Lactobacillus acidophilus* strain LA51

[b]95% Confidence Interval- means not within the range listed differ

Table 3. Direct-fed microbial treatments affects on carcass characteristics

	Control[a]	Direct-fed[a]		95 %[b] Confidence Interval
# Steers	68	201	---	---
Dress, %	62.0	61.9	.66	61.5-62.58
Shrunk dress, %	64.6	64.5	.66	64.08-65.2
Hot car. wt., lb	829.6	834.5	.48	814.1-842.5
Backfat, in.	.54	.54	.97	.49-.59
Ribeye area, in^2	13.22	13.47	.14	12.81-13.50
KPH, %	2.00	1.98	.40	1.96-2.05
Calc. YG	3.18	3.10	.42	3.01-3.37
Grader YG	2.74	2.72	.82	2.53-2.96
Marbling[c]	557.1	553.6	.77	533.2-582.8
Quality grade[d]	17.87	17.93	.74	17.8-18.1
CAB, %	26.4	21.0	.32	16.9-38.7
Choice & Prime, %	77.9	77.7	.98	65.4-90.4

[a]Control (no bacteria added to the diet); Direct-fed- average of three treatments which contained 1×10[9] cfu/hd/d of *Propionibacterium freudenreichi* strain PF24 and 1×10[6] cfu/hd/d of *Lactobacillus acidophilus* strain LA51

[b]95% Confidence Interval- means not within the range listed differ

[c]Marbling score: 500=small; 600=modest

[d]17=Select+; 18=Choice-