Effects of Feed Additives Fed to Sale Barn-Origin Calves During the Receiving Period: Animal Performance, Health and Medical Costs

C.R. Krehbiel, B.A. Berry, J.M. Reeves, D.R. Gill, R.A. Smith, D.L. Step, W.T. Choat and R.L. Ball

Story in Brief

Four hundred sixty-six newly-received calves from southern Oklahoma and northern Texas auction barns were received at the Willard Sparks Beef Research Center (WSBRC) in Stillwater, OK, in August and September 2000, and used to study the effects of supplementing feed additives (Agrarian Marketing Corporation, Middlebury, IN) during the receiving period. Treatments included: 1) no additive (control); 2) Prime Purge (.5 oz/hd/d); 3) Nutrisound (.5 oz/hd/d); and 4) Organo Pro (.5 lb/hd/d). These are a regimen of anti-microbial drugs prescribed by veterinary personnel was used when animals met specific criteria for morbidity. Detailed records of all incidences of disease and costs associated with anti-microbial drug treatment were maintained and analyzed by dietary treatments. In addition, calves on treatments 2, 3, or 4 received 15 mL of Convert Day One Calf Gel on d 1 of the experiment. Following d 1, every other calf pulled and treated received a second 15 mL of Calf Gel. In the first 14 d, Organo Pro reduced daily gain and gain/feed compared with the other treatments. However, cattle consuming Organo Pro compensated from d 15 to 42 so that overall daily gain and feed efficiency did not differ among treatments. Morbidity averaged 74.7% among all cattle, and did not differ among dietary treatments. Calves treated with Calf Gel during their first anti-microbial treatment were less likely to be treated a second time within 96 h. These data suggest that Calf Gel improves the recovery of morbid newly-received feedlot calves.

Key Words: Feed Additives, Stress, Shipping Fever, Antibiotics, Feedlot

Introduction

Maintaining health of newly received calves in the feedlot continues to be problematic for feedlot managers. In the 1994 USDA-APHIS survey (USDA-APHIS, 1994), death losses in feedlots with 100 to 1,000 cattle marketed annually ranged from 1.5 to 2.7 per 100 animals marketed. Obviously, management practices which decrease the incidence and (or) severity of morbidity in feedlot cattle are needed. Lightweight newly received cattle face two primary problems that contribute to a high incidence of morbidity (Galyean et al., 1999). First, stress associated with weaning and transportation has a negative effect on the immune system, and second, this stress occurs when the animal is exposed to a variety of infectious agents as a result of sale barn and shipping management procedures. Nutrition can compound these negative impacts as a result of pre-weaning nutritional deficiencies or through decreased feed intake associated with stress. Feed intake by stressed calves is low (Cole, 1996), averaging approximately 1.5% of BW during the first 2 wk after arrival. This low feed intake makes correction of nutritional deficiencies difficult, which could further compromise immune function and increase susceptibility to infection.

Feed additives and direct-fed microbials that can improve digestibility of the diet and(or) boost the immune system might be important for the overall health and performance of stressed beef cattle. In this experiment, we evaluated four feed additives varying in composition. Prime Purge™ contains a combination of digestive enzymes (amylase, protease, cellulase, and lipase) and L-form yeast culture (*Saccharomyces cerevisiae* and *Aspergillus oryzae*); Nutrisound™ contains thiamine (400 mg/lb) and citric acid (400 mg/lb); and Organo-Pro is a low pH, N-based liquid protein designed for mold inhibition. Convert Day One Calf Gel is a combination of direct-fed microorganisms, L-form microorganisms, and organic acids. Each 15 mL of Calf Gel contains 5 x 10^9 lactic acid producing bacteria (*Enterococcus faecium, Lactobacillus acidophilus, Bifidobacterium thermophilum,* and *B. longom*). The objective was to determine the efficacy of these products fed or administered to sale barn origin calves.

Materials and Methods

Five truckloads of sale barn-origin calves (108 bulls and steers, initial BW = 391 lb; 358 heifers, initial BW = 547 lb; Table 1) were received at the Willard Sparks Beef Research Center (WSBRC) in Stillwater, OK, in August and September, 2000. Calves were purchased from numerous auction barns in south central Oklahoma and northern Texas, transported to a facility near Purcell, OK, and sorted into truckload lots. They were then transported approximately 90 miles to the WSBRC. On arrival, calves were allowed to co-mingle and rest for at least 1h in a return alley prior to pre-processing. This procedure included assessment of overall health, individual weight (INWT) of each calf, and application of a sequentially numbered identification tag. Calves were then maintained in holding pens for no more than 36 h before inception of the study. While in these holding pens, prairie hay (4 lb/hd) and the control diet (1% of BW; Table 2) were fed. On d 0, calves were processed at approximately 0600, prior to feeding. Processing included individual weight, vaccination for viral respiratory diseases (BRSV-Vac 4™, 2 mL IM); clostridial diseases (Vision-7™, 2 mL Sub-Q [heifers], or Covexin 8™, 5 mL Sub-Q [bulls and steers]), and treatment for internal and external parasites (Ivomec-Plus™, 1.0 ml/110 lb SubQ). In addition, one calf gel (15 mL) was administered to all cattle except control animals (see below).

Table 1. Origin, arrival date, number of head, sex, and arrival weight for each load of cattle

Load	Origin	Arrival date	No. of head	Sex	Arrival wt, lb
1	OK-TX	8-31-00	108	Steers/bulls	391
2	OK-TX	9-19-00	90	Heifers	534
3	OK-TX	9-21-00	90	Heifers	555
4	OK-TX	9-22-00	90	Heifers	550
5	OK-TX	9-24-00	88	Heifers	549

Table 2. Ingredients of control diet on a dry matter basis

Ingredient	%DM
Soybean hulls	33.0

Corn, whole shelled	26.5
Wheat middlings	16.9
Supplement[a]	13.6
Cottonseed hulls	10.0
[a]Supplement composition: Cottonseed meal 55.5%, soybean meal (47.5%) 31.5%, limestone 8.75%, pellet partner 5.0, salt 1.75%, vitamin A (30,000 IU/gm) .14%, vitamin E-50 adsorbate .02% (provides 125 I.U. vitamin E when included in the diet as described above), Rumensin 80™ .11% (formulated to contain 30 g/ton), selenium (0.02%) .08%	

Calves were stratified by INWT and randomly assigned to one of four dietary treatments. Treatments were randomly assigned to pens. Cattle from the first load (Table 1) were assigned to eight pens, whereas heifers from loads two through five were co-mingled and assigned to 24 pens. Treatments included: 1) no additive (control); 2) Prime Purge (.5 oz/hd/d); 3) Nutrisound (.5 oz/hd/d) and 4) Organo Pro (.5 lb/hd/d). Prime Purge and Nutrisound were top-dressed on the control ration after feed was delivered to the feed bunk, whereas Organo Pro was mixed with the control ration at the appropriate rate before being fed. After processing on d 1, calves were immediately taken to their assigned pens and fed 1% of BW of their respective treatment rations. Prairie hay offered was reduced by approximately .5 lb/hd/d and was fed for the first 7 d only. As the amount of hay in the diet was reduced and as calves became acclimated to the new environment and diets, feed was increased on an ad libitum basis. Pen size was uniform across all treatments (40' x 100') and alternating pens shared automatic waterers. Feed was delivered twice daily at approximately 0700 and 1500. Cattle were weighed on d 0, 14, 28, and 42 of the study; on d 41, calves received only one-half of the previous day's ration and were not permitted access to water from 1700 until after the final weight on d 42. Diet samples were collected, allowed to air dry, and ground in a Wiley mill to pass a 1-mm screen. Diet samples were analyzed for nutrient content (AOAC, 1990) and mycotoxin level by the College of Veterinary Medicine Diagnostic's Laboratory.

Cattle were closely observed each morning at approximately 0630 by experienced veterinary personnel (OSU College of Veterinary Medicine) for signs of respiratory and other diseases. Two or more clinical signs of disease (depression, lack of fill, occasional soft cough, physical weakness or altered gait, and ocular or nasal discharge) were required to designate a calf as "sick" or morbid and made the calf eligible for further clinical review and therapeutic antibiotic treatment. Once pulled, the calf was returned to the processing area, weighed, and rectal temperature assessed. If rectal temperature was greater than 104ºF, a regimen of antibiotic treatment therapy followed (Table 3). In addition, one calf gel (15 mL) was administered to every other pulled calf on the first pull from Treatments 2, 3, and 4. All information was recorded on an individual sick card and filed by pen.

Table 3. Therapeutic treatment and anti-microbial drug protocol[a]

Pull	Severity score[b]	Rectal temp	Drug therapy[c]
First	Mild or >	>104° F	Micotil™
No further treatment for at least 48 h			

Second	Mild or >	>104° F	NuFlor™
No further treatment for at least 72 h			
Third	Mild or >	>104° F	Excenel™
Repeat in 48 h regardless of severity score or rectal temperature			
[a]All anti-microbial drugs were given under the supervision of a veterinarian [b]Subjective scores indicating severity of disease [c]All anti-microbial drugs given at recommended label dosages and routes of administration.			

Statistical Analysis. Data were analyzed as a split-plot in a randomized block design (RBD) where loads were blocks, dietary treatment was the whole plot factor, and gel was the subplot factor. The error term used when testing dietary treatment was the interaction of treatment and load. Residual error was used when variables were tested for gel and its interaction with dietary treatment. For variables related to animal performance (daily gain, dry matter intake, and gain:feed), pen served as the experimental unit. For variables related to animal health (pulls, animals treated, treatment costs, etc.), animal was used as the experimental unit. The model was analyzed using MIXED procedures of SAS (SAS Inst. Inc., Cary, NC). Chi-square analyses (SAS) was used to evaluate the effects of dietary treatment and calf gel on morbidity and percentage of calves treated once, twice, or three times.

Results and Discussion

Dietary nutrient composition (DM basis) averaged 94.9, 94.2, 93.9, and 94.8% OM, 45.4, 47.6, 47.4, and 44.2% NDF, 26.5, 26.5, 26.9, and 24.3% ADF, and 13.6, 13.2, 13.9, and 18.2% CP for control, Prime Purge, Nutrisound, and Organo Pro treatments, respectively. Vomitoxin, aflatoxin, and zearalenone concentrations were .06, .25, .05, and .71 ppm, 7, 5, 4, and 10 ppb, and 96.6, 32.5, 65.2, and 53.3 ppb for control, Prime Purge, Nutrisound, and Organo-Pro treatments, respectively. All dietary mycotoxin concentrations were below the threshold recommended for ruminants.

Results of animal performance response by treatment are shown in Table 4. From d 0 to 14, daily gain and gain/feed were reduced ($P<.05$) in calves fed Organo-Pro compared with the other treatments. In contrast, daily gain ($P=.26$) and gain/feed ($P=.05$) were 19.4 and 24.6% greater, respectively, from d 15 to 42 for calves fed Organo-Pro compared with calves fed control, Prime Purge, or Nutrisound. Over the entire 42-d experiment, no differences ($P>.10$) among dietary treatments were observed. Poorer performance for calves fed Organo-Pro most likely resulted from lower intake. Data for animal health response are shown in Table 5. No differences ($P>.10$) were observed among dietary treatments. Morbidity and mortality averaged 74.7 and 2.4%, respectively, across all treatments.

Daily gain did not differ ($P>.50$) among calves receiving Calf Gel vs no Calf Gel (Table 6). All calves used in the comparison of Calf Gel had been pulled and treated with Micotil™; therefore, morbidity was 100%. Calves treated with Calf Gel during their first anti-microbial treatment were less likely ($P=.06$) to be treated a second time within 96 h. In addition, the number of calves treated twice tended (P=.12) to be lower for calves administered Calf Gel compared with calves not receiving calf gel. These data suggest that Calf Gel, a combination of direct-fed microorganisms, L-form bacteria, and enzymes, might improve the recovery of morbid newly-received feedlot calves.

Table 4. Results of animal performance response by dietary treatment

Parameter	Control (n = 8)	Prime Purge (n = 8)	Nutrisound (n = 8)	Organo Pro (n = 8)	SEM	Pr > F
Daily gain, lb						
d 0 – 14	.64[a]	.74[a]	.52[a]	-.70[b]	.47	.009
d 15 – 42	2.40	2.42	2.58	2.95	.31	.26
d 0 – 42	1.82	1.85	1.86	1.71	.20	.84
Intake, lb						
d 0 – 14	7.49	7.75	7.53	6.67	1.26	.20
d 15 – 42	13.65	13.65	13.25	12.33	.74	.29
d 0 – 42	12.61	12.40	12.81	11.35	.98	.10
G/F[c]						
d 0 – 14	.090[a]	.102[a]	.071[a]	-.111[b]	.077	.01
d 15 – 42	.178[a]	.183[a]	.200[ab]	.233[b]	.029	.05
d 0 – 42	.149	.148	.155	.156	.025	.86

[a,b]Means within a row are different (P<.05).

[c]Gain to feed ratio calculated as total lb gained per pen divided by total dry matter intake per pen.

Table 5. Results of animal health response by dietary treatment

Parameter	Control (n = 117)	Prime Purge (n = 114)	Nutrisound (n = 116)	Organo Pro (n = 115)	SEM	Prob
Morbidity, %[a]	79.5	76.3	71.6	71.3	--	.41
Mortality, %[a]	3.4	4.4	.9	.9	--	.19
Times pulled	1.66	2.00	2.05	1.76	.34	.52
Times treated[b]	1.64	1.68	1.57	1.51	.39	.64
Treated once, %[a]	77.8	74.6	70.7	71.3	--	.59
Retreated, %[a]	9.4	14.7	20.5	14.8	--	.26
Treated twice, %[a]	10.3	16.7	11.2	9.6	--	.33
Retreated, %[a]	2.6	2.6	2.6	.9	--	.54
Treated thrice, %[a]	.0	2.6	2.6	.9	--	.27
Days on feed						
Treatment 1	8.7	4.5	4.3	4.1	2.2	.19

Treatment 2	14.2	11.4	12.8	11.5	4.3	.86
Treatment 3	NE[c]	16.7	25.9	23.2	7.2	.47
Treatment cost, $[d]	14.71	14.42	13.38	12.97	3.79	.57

[a]Analyzed using Chi-Square analysis.

[b]Anti-microbial treatments required per sick animal according to protocol described in Table 3.

[c]Non-estimable means.

[d]Medical costs associated with anti-microbial drugs shown as dollars per treated animal.

Table 6. Results of animal performance and health response by gel treatment

Parameter	No Gel (n =212)	Gel (n = 85)	SEM	Prob
Daily gain, lb				
d 0 – 14	1.17	1.09	.53	.86
d 15 - 42	1.81	1.79	.42	.93
d 0 - 42	1.57	1.55	.28	.92
Morbidity, %[a]	100.0	100.0	--	--
Mortality, %[a]	1.4	.0	--	.27
Times pulled	1.99	1.75	.30	.15
Times treated[b]	1.63	1.57	.27	.76
Treated once, %[a]	100.0	100.0	--	--
Retreated, %[a]	25.5	12.9	--	.06
Treated twice, %[a]	20.8	12.9	--	.12
Retreated, %[a]	4.3	1.2	--	.39
Severity score	1.42	1.21	.18	.13
Treated thrice, %[a]	2.4	2.4	--	.99
Days on feed				
Treatment 1	4.2	6.6	1.5	.02
Treatment 2	11.1	13.8	3.1	.27
Treatment 3	20.1	N/E[c]	--	--
Treatment cost, $[d]	14.02	13.73	2.81	.86

[a]Analyzed using Chi-Square analysis.

[b]Anti-microbial treatments required per sick animal according to protocol described in Table 3.

[c]Non-estimable means.

[d]Medical costs associated with anti-microbial drugs shown as dollars per treated animal.

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