THE EFFECTS OF TYPES AND QUALITY OF PROTEIN ON HEALTH AND PERFORMANCE OF SHIPPING-STRESSED CALVES

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Story in Brief

Over a two year period, nine truck loads of cattle totalling 848 shipping-stressed steer, bull and heifer calves initially weighing an average of 474 pounds were received at the Pawhuska Research Station, in Pawhuska, OK. During the first year, calves were fed four protein supplements. These consisted of soybean meal, soybean meal + bloodmeal, milo distillers dried grain plus solubles and milo distillers dried grain plus solubles + bloodmeal. During the second year, protein supplements similar to those first year were fed except that bloodmeal in the soybean meal + bloodmeal diet was increased, and urea was added to the milo distillers dried grain plus solubles + bloodmeal supplement. Daily gains overall were greater for calves fed soybean meal. Daily gains for sick cattle were not altered, but daily gains for cattle that were never treated for sickness were 18.9% greater (1.69 vs 1.37 lb) when cattle were fed diets containing soybean meal. Morbidity was equal for all treatments, but the percentage of cattle that recovered following treatment with the first drug was greater, and the incidence of being repulled for sickness was less with diets containing milo distillers dried grain plus solubles. Although performance may be depressed when distillers grains or bloodmeal replaced soybean meal in the diet, bypass protein sources improved health status.

(Key Words: Escape Protein, Shipping Stressed Calves, Bloodmeal.)

Introduction

Transportation over long distances and the mixing of cattle in sale barns are principal stresses related to disease. Newly received cattle are highly susceptible to shipping fever or bovine respiratory disease complex (BRD). This can lead to high rates of morbidity and mortality. Increasing the quantity of escape protein by feeding distillers grain and improving the

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quality of amino acids reaching the lower gut by feeding bloodmeal may improve animal health. The objective of this study was to determine if protein type, [highly fermentable soybean meal (SBM) vs high bypass low quality distillers grain (DDG)], or high quality bypass protein [bloodmeal (BM)] in receiving diets would improve animal health and performance.

Materials and Methods

Over a two year period, nine truck loads, totalling 848 steer, bull and heifer calves, initially weighing an average of 474 pounds were received at the Pawhuska Research Station. During the first year, calves were fed four protein supplements. These consisted of: soybean meal (SBM), SBM + bloodmeal (BM), milo distillers dried grain plus solubles (DDG) and DDG+BM. During the second year protein supplements fed were similar to those in the first year with the exception 1) of an increased amount of BM in the SBM+BM diet to attain the same bypass protein content of the DDG+BM, and 2) urea (U) was added to the DDG+BM supplement to increase the supply of ruminal ammonia. Diets the first year were formulated to be isocaloric (NEg 50 Mcal/cwt) and isonitrogenous (14.5% CP) while containing 28% roughage. Diets the second year were formulated to contain the same amount of bypass protein (except for the SBM diet). The CP content of the SBM and DDG + BM diets remained at 14.5% while the SBM+BM (year 2) and DDG+BM+U diets were elevated to 16.2% to attain the desired amount of bypass protein. Diets the second year were isocaloric (NEg 50 Mcal/cwt) and contained 28% roughage.

After unloading, calves were individually weighed, identified, and given free access to hay and water overnight. The following day, all animals were vaccinated with IBR-PI3 (modified live virus; i.m.) and a 7 way clostridial bacterin and dewormed with ivermectin. After processing, calves were allotted to pens in order to obtain equal mean initial weights. Pens were randomly allotted to one of four protein supplements. Cattle were adapted to diets over a 5 day period by sequentially decreasing the amount of hay being fed. Diets were limit fed for 28 days to produce a maximum daily gain of 2.0 lb. On day 28 cattle were locked in the alley between pens overnight to remove feed and water. Animals were then weighed the following morning to obtain final weights.

Cattle were monitored visually twice daily for signs of sickness. Animals displaying visual signs of depressed activity and feed intake were moved to the processing area where rectal temperatures and severity of illness were clinically appraised and recorded. Animals with rectal temperatures above 104^{o}F were considered sick. Sick animals were treated with antimicrobial

Table 1. Composition of diets in year 1 (DM basis).

Ingredient	SBM	SBM+BM	DDG	DDG+BM
Ration	----------	---------- (%)	----------	----------
Corn, rolled	51.88	54.49	40.18	46.18
Alfalfa hay,	8.00	8.00	8.00	8.00
Cottonseed hulls	20.00	20.00	20.00	20.00
Molasses, cane	3.80	3.80	3.80	3.80
Pelleted supplement	16.32	13.71	28.02	22.02
Supplement				
Soybean meal	14.47	9.88	0.00	0.00
Milo distillers grain	0.00	0.00	26.29	18.04
Bloodmeal	0.00	2.30	0.00	2.30
Dicalcium phosphate	.24	.33	.06	.21
Calcium carbonate	1.16	.63	.99	.74
Potassium chloride	.08	.20	.30	.36
Salt	.30	.30	.30	.30
Bovatec 68	.02	.02	.02	.02
Trace mineral mix	.01	.01	.01	.01
Vitamin A	.02	.02	.02	.02
Vitamin E	.02	.02	.02	.02
Escape protein[a]	5.70	6.67	8.16	8.36
NEm, Mcal/cwt		83.32		
NEg, Mcal/cwt		50.00		
Crude protein, %		14.50		
Crude fiber, %		15.06		
K, %		1.00		
Ca, %		0.62		
P, %		0.33		

[a] Calculated from NRC (1984) estimates.

Table 2. Composition of diets in year 2 (DM basis).

	SBM	SBM+BM	DDG+BM+U	DDG+BM
Ingredients	----------	---------- (%)	----------	----------
Corn, rolled	51.88	52.23	47.49	46.18
Alfalfa hay	8.00	8.00	8.00	8.00
Cottonseed hulls	20.00	20.00	20.00	20.00
Molasses, cane	3.80	3.80	3.80	3.80
Pelleted supplement	16.32	15.97	20.71	22.02
Supplement				
Soybean meal	14.47	8.78	0.00	0.00
Milo distillers	0.00	0.00	15.37	18.04
Bloodmeal	0.00	5.07	3.00	2.30
Dicalcium phosphate	.24	.37	.27	.21
Calcium carbonate	1.16	1.13	.70	.74
Potassium chloride	.08	.25	.38	.36
Salt	.30	.30	.30	.30
Bovatec 68	.02	.02	.02	.02
Trace mineral	.01	.01	.01	.01
Vitamin A	.02	.02	.02	.02
Vitamin E	.02	.02	.02	.02
Escape protein[a]	5.70	8.36	8.36	8.36

NEm, Mcal/cwt	82.83
NEg, Mcal/cwt	50.00
Crude protein, %	15.34
Crude fiber, %	14.56
K, %	1.00
Ca, %	0.65
P, %	0.33

[a] Calculated from NRC (1984) values.

drugs. If rectal temperature decreased within 48 hour, treatment was continued with the same drug for two consecutive days. If no improvement was apparent within 48 hour, a different antimicrobial drug was administered. This procedure was continued until health was restored.

These data were analyzed on an individual animal basis using the general linear model of SAS. Contrasts were obtained for the main effects of year, protein, bloodmeal, and urea. When year and year by protein source effects were nonsignificant, results were averaged across years for presentation in tables. Least squares means are reported.

Results and Discussion

The effects of escape protein on animal performance are illustrated in Table 3. Daily gains overall were increased ($P<.01$) for calves fed SBM (1.53 vs 1.35) diets. Daily gains for calves classified as sick were not altered by dietary treatment; however, daily gains of cattle that were never treated for sickness were greater ($P<.01$) with SBM (1.69 vs 1.37) diets and in diets that contained no bloodmeal (1.70 vs 1.44). This is in contrast to the findings of Fluharty and Loerch (1990), who reported that animal performance improved when BM replaced SBM in receiving diets. Waller et al. (1980),

Table 3. Effect of escape protein on animal performance.

	Protein		Bloodmeal		Urea	
Item	SBM	DDG	0	BM	0	U
Animal, No.	422	426	331	517	752	96
Weights, lbs						
Arrival	474	474	478	471	475	465
Final	517	511	518	511	516	500
Daily gains, lbs						
Overall	1.53[a]	1.35[b]	1.47	1.42	1.46	1.27
Never sick	1.69[a]	1.37[b]	1.70[c]	1.44[d]	1.58	1.29
Sick	1.29	1.32	1.21	1.38	1.31	1.12
Feed intake, lb	11.37	11.39	11.31	11.42	11.36	11.49
Feed:Gain	7.43	8.43	7.69	8.04	7.78	9.05

[a,b] Means within a category with differing superscripts differ $P<.01$
[c,d] Means within a category with differing superscripts differ $P<.10$

using a diet with equal amounts of corn silage and corn cobs, found no difference in daily gains between cattle fed SBM and those fed DDG diets. No response in daily gains was detected from the addition of urea to the DDG diet. In a companion study, we found that ruminal ammonia was lower with the DDG than SBM diet. Although low ruminal ammonia may have limited microbial protein synthesis, addition of urea to DDG diets was not beneficial.

The effects of escape protein on animal health parameters are presented in Table 4. Morbidity (the percentage of cattle becoming sick at anytime during the trial) was equal for all treatments. The percentage of cattle that recovered following treatment with the first drug was greater ($P<.01$) for calves fed BM. The incidence of cattle being repulled for sickness also was less ($P<.01$) with diets containing DDG or BM. The improved health of shipping-stressed calves observed when the percentage of escape protein in the receiving diet may be a result of an increased amount of dietary protein or specific amino acids reaching the small intestine.

Although daily gains with the DDG diets were 11.8% lower, this was compensated by improved health. Decreasing the number of repulls markedly decreases drug and labor costs. Mortality tended to be reduced with supplementation of DDG and BM in the diet. Results indicate that substituting DDG for SBM in a receiving diet, although not reducing the

Table 4. Effect of escape protein on animal health.

	Protein		Bloodmeal		Urea	
Item	SBM	DDG	0	BM	0	U
Animal, No.	422	426	331	517	752	96
Morbidity[e], %	41.9	38.9	48.6	35.2	44.2	10.4
Repull[f], %	11.3[a]	2.5[b]	10.8[c]	4.4[d]	7.7	1.0
Retreat[g], %	9.0	8.4	12.0	6.5	9.7	1.0
Respond[h], %	62.7[a]	88.7[b]	67.1[a]	82.0[b]	74.7	88.8
Mortality, %	1.4	.9	1.8	.7	1.3	0

[a,b] Means within a category with differing superscripts differ $P<.01$
[c,d] Means within a category with differing superscripts differ $P<.05$
[e] Animals that were sick between day 0-28.
[f] Animals that were treated for illness a second time.
[g] Animals treated with a second drug during the initial drug treatment.
[h] Animals that stayed healthy after initial drug treatment.

initial incidence of sickness, will reduce the incidence of relapse in shipping-stressed calves.

Literature Cited

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