THE EFFECTS OF ESCAPE PROTEIN ON HEALTH AND PERFORMANCE OF SHIPPING STRESSED CALVES

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Story in Brief

Four hundred and sixty six shipping-stressed steer, bull and heifer calves initially weighing an average of 490 pounds were received at the Pawhuska Research Station between October 1989 and April 1990. The objective of this study was to determine if proteins differing in type and quality can change animal health and performance. Calves were fed four protein supplements consisting of: soybean meal, soybean meal + bloodmeal, milo distillers dried grain plus solubles and milo distillers dried grain plus solubles + bloodmeal. All diets were formulated to be isocaloric (NEg 50 Mcal/cwt) and isonitrogenous (14.5% CP) while containing 28% roughage. Diets were limit fed for 28 days to produce a maximum daily gain of 2.0 pound. Daily gains overall and for sick cattle were not altered, but daily gains for cattle that were never treated for sickness were 19.5% greater (2.21 vs 1.78 pound) with diets containing soybean meal. Morbidity was similar (72%) for all treatments, but the percentage of cattle that recovered following treatment with the first drug was greater, incidence of being repulled for sickness was less, and the number of days calves required drug treatment declined with diets containing milo distillers dried grain plus solubles. Mortality tended to be less with supplemented bloodmeal in the diet. Increasing the percentage of escape protein in the receiving diet improved the health of shipping-stressed calves, but reduced the rate of gain of healthy calves.

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

Introduction

Transportation over long distances and the mixing of cattle in sale barns are both principal factors associated with the incidence of stress related disease. Newly received cattle are highly susceptible to shipping fever, otherwise known as bovine respiratory disease complex, which can lead to

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high rates of morbidity and mortality. Increasing the quantity of escape protein by feeding milo distillers dried grain plus solubles and improving the quality of amino acids reaching the lower gut by feeding bloodmeal may result in improved animal health and performance. The objective of this study was to determine if increasing the level of escape protein in receiving rations could improve animal health and performance.

Materials and Methods

Five truck loads of shipping-stressed steer, bull and heifer calves (n=466) weighing an average of 490 lbs were received at the Pawhuska Research Station between October 1989 and April 1990. After unloading, cattle were individually weighed, identified, and allowed free access to hay and water overnight. The following day all animals were vaccinated with IBR-PI3 (modified live virus; i.m.) and 7-way clostridial bacterin and dewormed with ivermectin.

After processing cattle were allotted to pens based on initial weights. Pens were then randomly allotted to one of four protein supplements. Protein supplements consisted of: soybean meal (SBM), SBM + bloodmeal (BM), milo distillers dried grain plus solubles (DDGS) and DDGS + BM. All diets (Table 1) were formulated to be isocaloric (NEg 50 Mcal/cwt) and isonitrogenous (14.5% CP) while containing 28% roughage. Cattle were adapted to diets over a 5-day period by sequentially decreasing the amount of hay fed. Diets were limit fed for 28 days to produce a maximum daily gain of 2.0 lb.

Cattle were visually monitored 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 was clinically appraised and recorded. Animals with rectal temperatures $>104^{\circ}F$ were considered sick. Sick animals were treated with antimicrobial drugs. If rectal temperature decreased within 48 hours, treatment was terminated. If no improvement in temperature or visual signs was apparent within 48 hours, a different antimicrobial drug was administered. This procedure was continued until a satisfactory improvement in health was observed.

Results and Discussion

The effects of escape protein on animal performance are illustrated in Table 2. Daily gains for all cattle and for cattle 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 diets. Waller et al.

Table 1. Composition of diets (dry matter basis).

Ingredient	SBM	SBM+BM	DDGS	DDGS+BM
Ration		(%)		
Corn, rolled	51.88	54.49	40.18	46.18
Alfalfa hay, pelleted	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	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	.01	.01	.01	.01
Vitamin A	.02	.02	.02	.02
Vitamin E	.02	.02	.02	.02
Calculated escape protein	5.70	6.67	8.16	8.36

Average calculated composition of the ration:

Nutrients	Ration Composition DM %
NEm, Mcal/cwt	83.32
NEg, Mcal/cwt	50.00
Crude protein, %	14.50
Escape protein	7.22
Crude fiber, %	15.06
K, %	1.00
Ca, %	0.62
P, %	0.33

Table 2. Effect of escape protein on animal performance.[a]

Item	SBM	SBM+ BM	DDGS	DDGS+ BM	Significant (P<) SBM vs DDGS	BM vs 0
Animal, No.	117	114	119	116		
Pens	8	8	8	8		
Weights, lbs						
Arrival	497	490	484	489	.22	.90
Final[b]	542	530	517	528	.04	.97
Daily gains, lbs						
Overall	1.51	1.41	1.21	1.38	.16	.75
Never sick	2.33	2.09	1.78	1.78	.01	.43
Sick	1.04	.99	.95	1.30	.59	.38
Feed:Gain	6.3	7.1	7.8	6.5	.42	.69

[a]Expressed as least squares means.
[b]Significant interaction P<.10.

(1980) found, using a diet with equal amounts of corn silage and corn cobs, no difference in daily gains between SBM and DDGS diets. There was also no response in daily gains with the addition of urea to the DDGS diet. In a preliminary study comparing SBM and DDGS diets we found that ruminal ammonia was severely depressed with the DDGS diet which may have limited microbial protein synthesis.

The effects of escape protein on animal health parameters are presented in Table 3. Morbidity rate (the percentage of cattle becoming sick) was similar (72%) for all treatments. The percentage of cattle that recovered following treatment with the first drug was greater ($P<.02$), the incidence of cattle being repulled for sickness was less ($P<.01$), and the number of days cattle required drug treatment declined ($P<.04$) with diets containing DDGS. The lower daily gains with the DDGS diets were compensated for with significant increases in health parameters. The decreased number of repulls and sick days for cattle fed DDGS has definite advantages due to decreased drug and labor costs when compared to the 19.5% higher gains for a 28-day period with SBM diets. Mortality tended to be less with supplementation of BM in the diet.

Increasing the percentage of escape protein in the receiving diet improved the health of shipping-stressed calves. It can be suggested that the improvement in health observed in the DDGS diets is from increased amounts of dietary protein escaping rumen degradation and entering the small intestine where it may be utilized. Based on the ADG for calves that were never sick, the NEg value of DDGS appears to be lower than the 62 Mcal/cwt suggested by the 1984 Beef NRC. The decreased number of treatment days required by calves receiving DDGS diets and improved ADG with SBM diets would agree with findings by Lofgreen et al. (1975) if the energy levels of DDGS diets are lower then SBM rations. The addition of escape protein to receiving rations maybe a valuable tool for cattlemen who receive shipping-stressed calves.

Table 3. Effect of escape protein on animal health.

Item	SBM	SBM + BM	DDGS	DDGS + BM	Significant (P<) SBM vs DDGS	BM vs 0
Animal, No.	117	114	119	116		
Pens	8	8	8	8		
Morbidity, %	72.7	74.3	69.8	72.4	.48	.52
Mortality, %	3.0	.78	1.9	.69	.53	.09
Recovered, %	29.8	45.4	45.7	56.5	.02	.02
Repull, %	26.7	23.1	9.8	3.2	.01	.36
Retreat, %	37.0	21.9	27.0	26.5	.68	.26
Treatment days	6.1	5.5	5.0	5.0	.04	.41
Severity Score[a]						
First	2.61	2.63	2.68	2.68	.29	.92
Last	1.48	1.34	1.45	1.46	.50	.34
Average	2.02	1.91	1.95	1.89	.38	.08
Temperature						
First[b]	105.7	105.4	105.5	105.5	.47	.03
Last	102.9	103.0	102.7	102.8	.06	.13
Average	104.2	103.9	103.9	104.0	.12	.21

[a]First = day 1 of treatment; Last - final day of treatment.
[b]Significant interaction P<.10.

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