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CLAYTON LIVESTOCK RESEARCH CENTER

PROGRESS REPORT

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Effects of urea concentration in the receiving diet on health and performance of newly received beef steers[1]

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Several dietary factors deserve consideration when formulating diets for newly received, highly stressed beef cattle. Galyean and Duff (1998) reported that newly received beef cattle have a low capacity for protein deposition during the first week or two after arrival because of low feed intake. Furthermore, they suggested that protein source is not a factor as long as a natural source of supplemental protein is used. Nonetheless, using non-protein nitrogen sources like urea might be one means to decrease protein costs. Cole (1996) suggested that intake of urea be limited to less than 30 g per day during the first 2 wk after arrival. At the typical feed intakes observed during the receiving period, this level calculates to be less than 1% urea in the receiving diet. We conducted an experiment to determine the effects of urea level on performance and health of newly received beef cattle.

Two loads of cattle (99 and 98 animals for Loads 1 and 2, respectively) were purchased from an order buyer in southwestern Arkansas. Cattle from this order buyer are typically purchased from auction barns in southwestern Arkansas and east Texas from Wednesday through Saturday and are held in common pens at the order buyer's facility and fed grass hay until shipment. Both loads of cattle were shipped on Sunday at approximately 1830 (CDST) and received at the Clayton Livestock Research Center on Monday morning at approximately 0730 (MDST; 630 miles; 13.75 h in transit). Cattle in Load 1 experienced a 5.3% shrink from a pay weight of 436 pounds, whereas cattle in Load 2 experienced a 5.7% shrink from a pay weight of 437 pounds. Cattle were processed immediately, including individual weight and identification, branding, castration (51.5 and 53.1% for Load 1 and 2, respectively) and horn tipping as needed (35.4 and 37.8% for Load 1 and 2, respectively), vaccination with a clostridial antigen (Ultrabac-7; Pfizer Animal Health; Exton, PA), and an IBR-PI_3-BRD-BRSV vaccine (Bovishield-4; Pfizer Animal Health; Exton, PA) treatment for internal (oxfendazole; Synanthic; Ft Dodge Animal Health; Overland Park, KS) and external (fenthion; Tiguvon; Bayer Animal Health; Shawnee Mission, KS) parasites, and injection with vitamin A/D_3 (AgriLabs, St. Joseph, MO). Treatments included (DM basis): 1) 0% urea, 2) 0.5% urea, and 3) 1.0% urea in the receiving diet. Treatments were assigned randomly to individual animals based on processing order. In addition, pens were assigned randomly to treatments (three pens per treatment per load). After processing, steers were placed in their respective pens, offered sorghum-sudangrass hay (1st wk only) and a 70% concentrate receiving diet (Table 1) in quantities sufficient for ad libitum consumption during the first 14-d of the receiving period, then switched to a 75% concentrate diet (Table 1) for d 14 to 28. Cattle were monitored daily for signs of BRD (nasal or ocular discharge, labored breathing, lethargy and[or] emaciated body condition). Cattle displaying signs were removed from their pens, taken to a processing facility, and their rectal temperature was measured. When rectal temperature was greater than 103.5° F, tilmicosin phosphate (Micotil; Elanco Animal Health, Indianapolis, IN) and 10 mL penicillin were given as therapeutic antibiotics, after which the animals were returned to their respective feedlot pens. All cattle were weighed on d 14 and 28, at which time feed bunks were swept and any feed remaining was weighed and sampled for DM determination. Bunk samples were obtained at weekly intervals during the study and dried at 100°C for approximately 22 h. Dietary ingredient samples were obtained every 2 wk for DM determination.

Performance data were analyzed using GLM procedures of SAS (SAS Inst. Inc., Cary NC). Pen was the experimental unit. The model included effects for urea level, block (Load), urea level x block, and pen within urea level x block. Orthogonal contrasts were used to test linear and quadratic effects of urea levels. Morbidity data were analyzed using non-parametric procedures (Chi-square) of SAS with individual calves as the experimental unit.

No differences ($P > 0.10$) were noted among treatments for daily gain (Table 2) during d 0 to 14, 14 to 28, or for the 28-d receiving period. Likewise, no differences ($P > 0.10$) were noted in DM intake of hay and total DM intake for d 0 to 14, or for the overall 28-d receiving period. However, there were quadratic effects of urea level on DM intake of concentrate ($P < 0.10$) from d 0 to 14 and DM intake from d 14 to 28 ($P < 0.05$). No differences were noted in the feed:gain ratio for d 0 to 14; however, quadratic effects ($P < 0.10$) of urea level on feed:gain ratio were evident during d 14 to 28 and for the overall 28-d receiving period. No differences were noted among treatments for the percentage of calves treated for BRD (average of 57.3% treated) during the experiment (Table 2).

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These results suggest that the optimum level of urea to feed to newly received beef cattle fed a high-concentrate, processed grain receiving diet is approximately 0.5% of the DM for maximum feed efficiency. Results might differ with higher crude protein levels than fed in the current experiment (14%) and with different types of receiving diets (e.g., higher roughage levels).

Literature Cited

Galyean, M. L., and G. C. Duff. 1998. Feeding growing and finishing beef cattle. In: Kellems, R. O., and D. C. Church (Eds.). Livestock Feeds and Feeding (4th Ed.). pp 262-280. Prentice Hall, Upper Saddle River, NJ.

Cole, N. A. 1996. Review of bovine respiratory disease: Nutrition and disease interactions. In: R. Smith (Ed.). Schering-Plough Animal Health - Review of Bovine Respiratory Disease. pp 57-74. Veterinary Learning Systems. Trenton, NJ

SAS. 1987. SAS/STAT® Guide for Personal Computers (Version 6th Ed.). SAS Inst. Inc., Cary, NC.

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Table 1. Ingredient composition of 70 and 75% concentrate diets with different urea levels fed to newly received beef calves

	% Urea, DM basis					
	0		.5		1.0	
Ingredient/Item	70%	75%	70%	75%	70%	75%
Sorghum sudangrass hay	29.93	24.91	29.88	24.87	29.83	24.82
Whole corn	9.39	9.37	9.36	9.35	9.35	9.34
Steam-flaked corn	41.76	46.40	44.80	49.36	47.75	52.40
Soybean meal	9.52	9.93	6.09	6.56	2.73	3.11
Molasses	4.70	4.69	4.69	4.69	4.69	4.69
Fat (yellow grease)	1.98	1.98	1.97	1.97	1.97	1.97
Limestone	0.74	0.74	0.74	0.73	0.73	0.73
Dicalcium phosphate	0.49	0.49	0.49	0.49	0.49	0.49
Salt	0.30	0.30	0.30	0.30	0.30	0.29
Urea	-	-	0.49	0.49	0.97	0.97
Ammonium sulfate	0.24	0.24	0.24	0.24	0.24	0.24
Premix[a]	0.95	0.95	0.95	0.95	0.95	0.95

[a]Premix contained (DM basis): wheat midds (83.11%), vitamin A - 30,000 IU/g (.66%), vitamin E - 500 IU/g (1.98%), Rumensin-80 (1.125%), Tylan-40 (1.125%), and trace mineral package (12%). Trace mineral package contained (DM basis): calcium iodate (.269%), cobalt carbonate (.362%), copper sulfate (3.268%), ferrous sulfate (19.445%), magnesium oxide (29.762%), manganous oxide (6.944%), zinc sulfate (28.169%), wheat midds (7.831%), and mineral oil (3.95%).

Table 2 Effects of dietary urea levels on performance and health of newly received beef cattle[a]

Item	Urea levels, % of DM 0	.5	1.0	SE[b]	Contrast[c]
No. of cattle	66	65	66	-	-
Initial body weight, lb	410.0	416.0	414.2	3.43	-
Day-28 body weight, lb	486.2	493.5	491.2	5.43	NS
Daily gain, lb					
Days 0 to 14	2.31	2.26	2.46	0.22	NS
Days 14 to 28	3.17	3.26	3.04	0.12	NS
Days 0 to 28	2.74	2.76	2.75	0.12	NS
Daily DM intake, lb					
Days 0 to 14					
Hay	4.83	4.73	4.92	0.09	NS
Concentrate	5.16	4.72	5.34	0.23	Q (.10)
Total	9.98	9.46	10.26	0.24	NS
Days 14 to 28	12.51	12.18	12.58	0.41	Q (.05)
Days 0 to 28	11.25	10.82	11.42	0.30	NS
Feed:gain					
Days 0 to 14	4.39	4.41	4.47	0.35	NS
Days 14 to 28	3.95	3.73	4.19	0.14	Q (.10)
Days 0 to 28	4.10	3.94	4.18	0.09	Q (.10)
Morbidity, %	56.1	53.8	62.1	-	NS

[a]No treatment x block (load) interactions were detected (P > .10). Therefore, data were analyzed across loads.
[b]Pooled standard error of treatment means, n = six pens per treatment.
[c]Observed significance level (in parentheses) for quadratic (Q) contrast. NS = non-significant (P > .10)