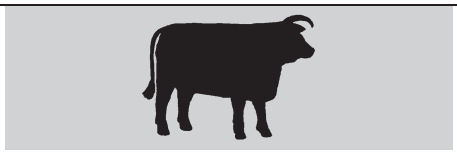
The Professional Animal Scientist 29 (2013):566–574



The effect of medicinal feed additive programs and dietary sulfur concentrations in steam-flaked corn diets containing wet distillers grains on performance and carcass merit in yearling feedlot steers[1,2,3]

E. M. Domby, PAS, J. S. Schutz, PAS, J. J. Wagner,[4] PAS, T. E. Engle, PAS, K. L. Neuhold, PAS, D. R. Woerner, and M. E. Branine,[5] PAS
Department of Animal Sciences, Colorado State University, Fort Collins 80523

ABSTRACT

A total of 432 crossbred yearling steers (329 ± 10.5 kg) were used in an unbalanced randomized block design to examine the effects of a medicinal feed additive (MFA) program and dietary sulfur (S) concentrations on feedlot performance and carcass merit. Treatments were arranged in a 2 × 2 factorial, with main factors being ionophore and antibiotic combination consisting of feed additive program monensin/tylosin or laidlomycin propionate/chlortetracycline and dietary S concentration [constant (CST) or variable (VAR)]. High-S diets (0.60% S) were fed on randomly assigned days to the VAR treatment, with low-S diets (0.48% S) fed on remaining days and to the CST treatment throughout the experiment. No interactions between S and MFA treatment were apparent for feedlot performance. Steers receiving VAR had greater (P < 0.05) BW than did CST-supplemented steers. Overall, DMI was greater (P < 0.05) for VAR than for the CST steers. Average daily gain and feed efficiency did not differ between CST and VAR. Steers receiving VAR diets had a mortality rate attributable to polioencephalomalacia 7.8 times greater (P < 0.02) than that of steers fed CST diets. Feedlot performance and carcass merit did not differ between the MFA treatments, and S treatment did not affect most carcass variables. The S × MFA interaction was significant (P < 0.05) for DP, such that S treatment had no effect on DP when monensin/tylosin was fed, but when steers were fed laidlomycin propionate/chlortetracycline, DP was decreased by 0.72% (P < 0.02) when VAR diets were fed. These results suggest that under our conditions, performance and carcass characteristics were not affected by MFA treatment. Furthermore, varying S concentration in finishing diets increased mortality rate; however, feedlot performance and carcass measurements were generally not affected by S treatment.

Key words: ionophore, laidlomycin, monensin, polioencephalomalacia, sulfur

[1] Use of trade names in this publication does not imply endorsement by Colorado State University or criticism of similar products not mentioned.
[2] Mention of a proprietary product does not constitute a guarantee or warranty of the products by Colorado State University or the authors and does not imply its approval to the exclusion of other products that may also be suitable.
[3] This research was supported in part by Zoetis Animal Health, Madison, New Jersey.
[4] Corresponding author: john.wagner@colostate.edu
[5] Current address: Zinpro Corp., 649 Pampas Ct., Cannon City, CO 81212.

INTRODUCTION

With the introduction of ethanol coproducts into feedlot diets, energy, roughage, and S concentrations have fluctuated, leaving questions about how to most effectively apply traditional technologies, such as providing medicinal feed additives (**MFA**), to current feedlot diets (DiLorenzo and Galyean, 2010). One of these coproducts, wet distillers grains, often contains variable S concentrations resulting from variation in the S concentration of the distillers solubles fraction. The S concentration in distillers solubles varies with the amounts of sulfuric acid used in the production and cleaning processes at the ethanol plant. Therefore, as wet distillers grains are used in the diet, S concentration can vary substantially among different loads, thereby leading to fluctuations in dietary S intake by feedlot cattle.

High dietary S intake can present several management challenges for producers because of detrimental effects on performance and carcass merit. Loneragan et al. (2001) reported decreased G:F and ADG when water sulfate concentration was greater than 583 mg/L. Zinn et al. (1997) also noted linear decreases in final BW, DMI, and LM area when feeding yearling heifers diets containing 0.15 to 0.25% S. Moreover, increased ruminal sulfide production and incidence of polioencephalomalacia (**PEM**) can be attributed to high S intake (Gould, 1998). Owens et al. (1998) indicated ionophores can have a strong effect on reducing subclinical acidosis. Medicinal feed additives may also alter ruminal hydrogen sulfide production (Kung et al., 2000). Determining the effects of high and variable dietary S concentration and MFA program on feedlot performance and carcass merit may allow a high level of production efficiency without compromising animal health. Our objectives were to evaluate the effect of MFA programs and variation in S intake on feedlot performance and carcass measurements in finishing beef steers.

MATERIALS AND METHODS

Animal use, handling, and sampling techniques described herein were approved by the Colorado State University Animal Care and Use Committee. This experiment was part of a larger experiment designed to evaluate the effect of dietary S and MFA programs on ruminal fluid pH and rumen gas cap hydrogen sulfide concentration of yearling steers.

A total of 528 crossbred yearling steers from 5 different locations in Kansas were transported to the Southeast Colorado Research Center, located near Lamar, Colorado, over 3 d. On arrival, long-stemmed grass hay and water were available ad libitum. Steers were then fed a 38% roughage receiving diet until processing the following day. Processing procedures included individual BW measurement, breed-type scoring, application of lot tags and electronic identification tags, vaccination for bovine rhinotracheitis virus and bovine virus diarrhea types 1 and 2 (Express 3; Boehringer Ingelheim, St. Joseph, MO), injection with ivermectin (Noromectin; Norbrook Laboratories Limited, Newry, Co. Down, Northern Ireland), treatment down the backline with permethrin (Permectin CDS; KMG Bernuth Inc., Houston, TX), an oral drench with fenbendazole (Safe-Guard, Merck Animal Health, Summit, NJ) to control internal parasites, and implantion with Revalor-XS (200 mg of trenbolone acetate and 40 mg estradiol, Merck Animal Health).

Following processing, steers were ranked by BW. Individuals with BW greater than ±2 SD from the mean were eliminated from consideration for use in the experiment, as were steers with health issues or breed scores suggesting high Brahman, Longhorn, or dairy-breed influence. The remaining individuals were assigned a random number from 1 to 1,000 using the random number function in a spreadsheet (Excel 2007; Microsoft Inc., Redmond, WA). The steers with the lowest random numbers were removed from consideration until 432 steers (329 ± 10.5 kg) remained. These steers were ranked by BW within breed type and assigned to 8 BW block replicates. Within each breed type–by–BW block, each successive group of 6 ranked steers were assigned to 1 of 6 treatments using the lowest to highest random number, respectively. A total of 48 pens of 9 steers each were individually weighed and tagged with identifying experiment number, treatment, BW block replicate, and the individual steer number within the pen after which they were sorted into correlating pens on d 0. The pens were soil surfaced, measured 6.1 × 18.3 m, and had a 3.7-m-deep feeding apron adjacent to 3.7 m of bunk space per pen.

Steers were observed daily by experienced technicians to monitor health status. Steers exhibiting symptoms of disease or other abnormality were removed from the pen and examined closely, and if warranted, the appropriate treatment was administered according to Southeast Colorado Research Center standard operating procedures. Pulled steers were then returned to their home pen and given a chance to recover. Steers that died during the experiment were necropsied by a licensed veterinarian, and if PEM was suspected as the cause of death, the brain of the steer was removed from the skull, fixed in formalin, and shipped to the CSU diagnostic laboratory for histopathological confirmation of cerebral lesions under UV light (Radostits et al., 2007).

Treatments

The experiment was originally designed as a balanced randomized block with a 2 × 3 factorial arrangement of treatments; however, because of equipment problems that compromised water supply, the experiment was conducted as an unbalanced randomized block using a 2 × 2 factorial arrangement of treatments. Therefore, treatments consisted of 1) constant S (**CST**) with monensin/tylosin (**MT**; Rumensin/Tylan, Elanco Animal Health, Greenfield, IN); 2) variable S