Effect of Urea Inclusion in Diets Containing Distillers Grains on Feedlot Cattle Performance and Carcass Characteristics

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Distillers grains (DG) are a common feedstuff in many feedlot diets. Crude protein (CP) content of DG is high, ranging from 24 to 32%. Feedstuff CP can be estimated as the addition of undegradable and degradable intake protein (UIP and DIP, respectively). Degradable protein balance for the ruminant depends on DIP supply and DIP requirements. Degradable protein supply is a function of dry matter intake (DMI), dietary CP, and DIP as a percentage of CP. Conversely, DIP requirements for ruminal microorganisms can be estimated by total digestible nutrient (TDN) intake and microbial efficiency, which is the amount of bacterial CP produced per 100 g of TDN. Microbial efficiency is negatively affected by low ruminal pH and low rate of passage, the latter being associated with low quality diets and low intakes. Low ruminal pH reduces microbial efficiency because ruminal microorganisms expend a higher proportion of energy to maintain internal ion concentration thus reducing energy available for reproduction and microbial growth. On the other hand, low rate of passage decreases microbial efficiency because it increases the proportion of microorganisms maintained and recycled in the rumen, thus reducing the proportion of microbial protein reaching the small intestine which would be available for absorption and animal growth. In addition, low rate of passage does not contribute to selection of more efficient ruminal microorganisms that reproduce at higher rates prior to passage out of the rumen, therefore increasing microbial efficiency. The high proportion of UIP in DG could lead to a negative DIP balance. Consequently, the addition of a highly degradable N source to these diets could result in improvements in animal performance. An experiment was conducted to evaluate the effect of increasing DIP concentrations in finishing diets on feedlot cattle performance and carcass characteristics. Forty-two Angus and Angus-crossbred steers (942 ± 12 lb initial BW) were assigned randomly to one of three dietary treatments containing (DM basis) 0% (CON, projected DIP balance < 0), 0.4% (LU, projected DIP balance = 0), or 0.6% (HU, projected DIP balance > 0) urea. Balances of DIP were estimated using the NRC (2000) model. Treatments contained (DM basis): 52% dry-rolled corn, 12% high-moisture corn, 20% dried DG, 10% grass hay, and 6% dry supplement. Diets contained 0.594 Mcal NEg/lb and 0.22% S (DM basis). Measured dietary CP and estimated dietary DIP concentrations were 14.0, 15.1, and 15.6% and 6.4, 7.5 and 8.0% for CON, LU, and HU, respectively. Estimated dietary UIP concentration was the same for all treatments, and averaged 7.1%. Steers were fed *ad libitum* once daily at 0800 h using a Calan gate individual feeding system. On d 85, steers were harvested at a commercial abattoir, and carcass characteristics were measured. Group dressing percentage measured 60.6%; this value was used to adjust performance data to a common dressing percentage. Initial BW, carcass-adjusted final BW, and DMI were similar among treatments ($P \geq 0.58$) and averaged 963, 956, and 952 ± 36 lb, 1,323, 1,309, and 1,351 ± 43 lb and 27.7, 27.8, and 28.4 ± 1.7 lb/d for CON, LU, and HU, respectively. Carcass-adjusted ADG was greater ($P < 0.05$) for HU (4.67 ± 0.16 lb) compared with LU (4.13 ± 0.16 lb) and CON (4.21 ± 0.16 lb), and was similar ($P = 0.73$) between LU and CON. Carcass-adjusted feed:gain (analyzed as gain:feed) was lower ($P = 0.03$) for HU (6.06 ± 0.38) compared with LU (6.81 ± 0.38), tended ($P = 0.09$) to be lower for HU compared with CON (6.53 ± 0.38), and was similar ($P = 0.61$) between LU and CON. Hot carcass weight, 12th rib fat thickness, LM area, marbling score, USDA yield grade, and USDA quality grade were similar ($P \geq 0.34$) among treatments. Observed DIP requirements in the three treatments may have been higher than those predicted by the NRC model due to microbial efficiency being higher than predicted. A higher microbial efficiency may have been reflected by greater actual pH (measured in a concurrent rumen

fermentation study) than predicted pH and, possibly, to high intakes (2.5% of BW), which may have contributed to an increased rate of passage. Under the conditions of this experiment, increased DIP requirements appeared to be met by supplementing 0.6% urea to the diet, resulting in an improvement in performance compared with diets containing 0% or 0.4% urea. Performance improvement was not related to a higher intake but likely to increased degradable protein availability and better DIP balance.

Keywords: dried distillers grains, urea, beef cattle