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Ruminally-Protected Lysine (SafeGain) Improves Performance of Growing Beef Cattle

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Abstract

Lysine frequently is cited as the first-limiting amino acid for cattle diets. Synthetic lysine, while routinely added to pig diets, is ineffective in fulfilling lysine requirements of cattle due to extensive degradation by microbes within the rumen. Lysine can be encapsulated with compounds, such as saturated fats, that minimize degradation by ruminal microbes, thereby assuring that a greater proportion of the amino acid is available for absorption post-rationally. The purpose of this experiment was to measure the impact of SafeGain (H.J. Baker & Bro. Inc., Little Rock, AR), an encapsulated form of lysine sulfate, on rate of gain and feed efficiency in backgrounding cattle.

Keywords

lysine, encapsulation, backgrounding

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Ruminally-Protected Lysine (SafeGain) Improves Performance of Growing Beef Cattle

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Introduction

Lysine frequently is cited as the first-limiting amino acid for cattle diets. Synthetic lysine, while routinely added to pig diets, is ineffective in fulfilling lysine requirements of cattle due to extensive degradation by microbes within the rumen. Lysine can be encapsulated with compounds, such as saturated fats, that minimize degradation by ruminal microbes, thereby assuring that a greater proportion of the amino acid is available for absorption post-ruminally. The purpose of this experiment was to measure the impact of SafeGain (H.J. Baker & Bro. Inc., Little Rock, AR), an encapsulated form of lysine sulfate, on rate of gain and feed efficiency in backgrounding cattle.

Key words: lysine, encapsulation, backgrounding

Experimental Procedures

A total of 448 crossbred heifers (632 ± 31 lb initial body weight) were used in a 112-d growth trial. Heifers were blocked by body weight and randomly allotted to 64 concrete-surfaced pens, with seven animals assigned to each pen. The study was conducted as a randomized complete block design with four dietary treatments and 16 replications per treatment. The experimental diets consisted of 0, 15, 30, or 45 grams per animal daily of SafeGain. SafeGain was incorporated directly into the total mixed ration (Table 1). All diets were fed ad libitum once daily for a period of 112 days. The experiment started July 30 when animals were implanted with Component[®] TE-200 with Tylan[®] (Elanco Animal Health, Indianapolis, IN), weighed, and randomly assigned to pens. Animals were weighed after 112 days; average daily gain, dry matter intake, and feed efficiency were determined for each pen. Data were analyzed as a mixed model using diet as the fixed effect, block as the random effect, and feedlot pen as the experimental unit. Linear and quadratic contrasts were used to evaluate effects of SafeGain on growth characteristics of heifers.

Results and Discussion

Growth performance of heifers is summarized in Table 2. Average daily feed intake decreased linearly ($P = 0.04$) with each incremental addition of SafeGain, decreasing by nearly 4% with the highest concentration of SafeGain when compared to the Control

group with no SafeGain. In spite of the decreased feed intake, average daily gain improved linearly with addition of SafeGain ($P = 0.05$). Feed efficiency also improved linearly ($P < 0.0001$) with increased SafeGain levels in the diet. Compared to cattle fed the control diet without added lysine, efficiencies improved by 5.3, 5.0, and 8.3% for cattle fed 15, 30, and 45 grams per day of SafeGain, respectively. In conclusion, addition of SafeGain, a ruminally protected lysine source, is an effective strategy for improving gain and feed efficiency of backgrounding cattle.

Implications

Average daily gain and feed efficiency of backgrounding cattle were improved with the addition of SafeGain, indicating that lysine was a limiting nutrient under conditions of our experiment.

Table 1. Composition of diets fed to heifers over a 112-day backgrounding period

Ingredient, percent of diet DM	SafeGain, grams/heifer daily			
	0	15	30	45
Brome hay, chopped	45.00	45.00	45.00	45.00
Wet corn gluten feed	25.00	25.00	25.00	25.00
Steam-flaked corn	25.44	25.41	25.39	25.37
Supplement ^a	2.13	2.13	2.13	2.13
Feed additive premix ^b	2.43	2.46	2.48	2.50
Nutrient composition (dry matter basis), calculated				
Crude protein, %	13.68	13.75	13.82	13.89
Non-protein nitrogen, %	1.45	1.45	1.45	1.45
Net energy maintenance, Mcal/100 lb	78.9	78.9	78.9	78.9
Net energy for gain, Mcal/100 lb	50.8	50.8	50.8	50.8
Neutral detergent fiber, %	41.46	41.45	41.44	41.43
Calcium, %	0.65	0.65	0.65	0.65
Phosphorus, %	0.48	0.48	0.48	0.48
Salt, %	0.25	0.25	0.25	0.25

^aConsisted of limestone, salt, urea, trace mineral premix, vitamin A premix, and vitamin E premix, to provide (total diet dry matter) 0.10 ppm cobalt as cobalt carbonate; 10 ppm copper as copper sulfate; 0.6 ppm iodine as ethylenediamine dihydriodide; 60 ppm manganese as manganous sulfate; 0.15 ppm selenium as sodium selenite; 60 ppm zinc as zinc sulfate; 1,000 IU/lb vitamin A; and 7 IU/lb vitamin E.

^bProvided 300 mg/day monensin (Rumensin[®]; Elanco Animal Health, Greenfield, IN); 0.40 mg/day melengestrol acetate (Heifermaxx[®]; Elanco Animal Health); and 0, 15, 30, or 45 g/d of ruminally-protected lysine (SafeGain; H.J. Baker & Bro. Inc., Little Rock, AR).

Table 2. Effects of SafeGain on growth performance of heifers over a 112-day backgrounding period

Item	SafeGain, grams/heifer daily				SEM	F-test	P-values	
	0	15	30	45			Linear	Quadratic
Dry matter intake, lb/day	21.14	21.06	20.85	20.31	0.359	0.18	0.04	0.43
Average daily gain, lb	2.80	2.94	2.90	2.93	0.052	0.06	0.05	0.20
Feed:gain	7.56 ^a	7.16 ^{b,c}	7.18 ^b	6.93 ^c	0.092	<0.001	<0.0001	0.52

^{a,b,c} Means with a common superscript letter are not different, P > 0.05.

SafeGain is a fat-encapsulated, ruminally-protected form of lysine sulfate (H.J. Baker & Bro. Inc., Little Rock, AR).

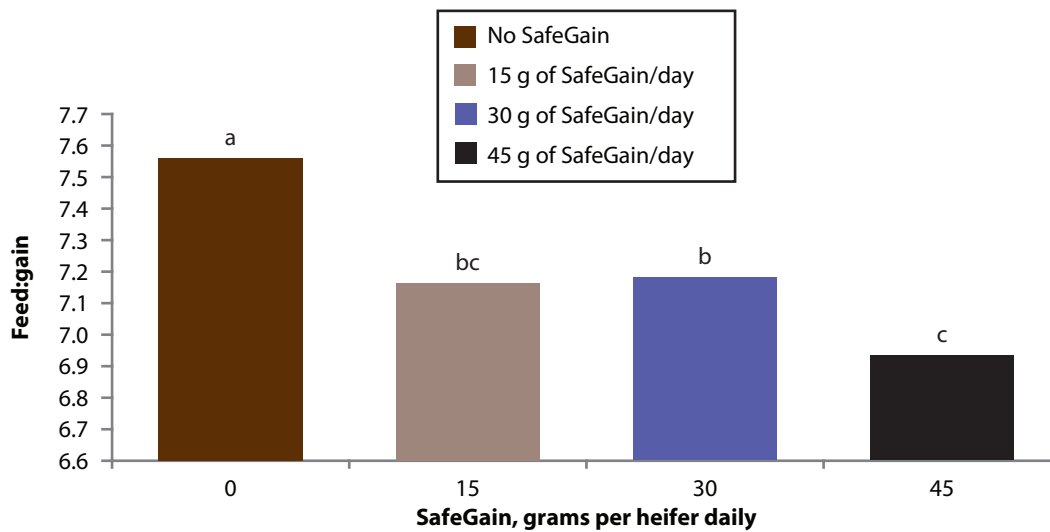


Figure 1. Feed efficiency was significantly improved by adding SafeGain to diet.

SafeGain is a fat-encapsulated, ruminally-protected form of lysine sulfate (H.J. Baker & Bro. Inc., Little Rock, AR).

Bars with a common superscript letter are not different, P > 0.05.