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Abstract

The purpose of this experiment was to determine the effects of Zilmax (Merck Animal Health, Summit, NJ) on changes in blood metabolites. Zilmax is a feed additive designed to improve production efficiency in cattle when fed during the last phase at the feedlot. Zilmax works by redirecting the energy use in the body to form more lean muscle at the expense of fat deposition. The blood metabolites measured in our experiment were glucose and lactate, which are the energy sources for various body functions including muscle growth. Plasma urea nitrogen was measured as an indicator of protein catabolism. Non-esterified fatty acids also were measured as they were released into the bloodstream with the breakdown of adipose tissue.

Keywords

Cattlemen's Day, 2012; Kansas Agricultural Experiment Station contribution; no. 12-231-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1065; Beef Cattle Research, 2012 is known as Cattlemen's Day, 2012; Beef; Zilmax; Finishing cattle; Blood

Zilmax Alters Blood Constituents of Finishing Cattle

C.L. Van Bibber and J.S. Drouillard

Introduction

The purpose of this experiment was to determine the effects of Zilmax (Merck Animal Health, Summit, NJ) on changes in blood metabolites. Zilmax is a feed additive designed to improve production efficiency in cattle when fed during the last phase at the feedlot. Zilmax works by redirecting the energy use in the body to form more lean muscle at the expense of fat deposition. The blood metabolites measured in our experiment were glucose and lactate, which are the energy sources for various body functions including muscle growth. Plasma urea nitrogen was measured as an indicator of protein catabolism. Non-esterified fatty acids also were measured as they were released into the bloodstream with the breakdown of adipose tissue.

Experimental Procedures

Treatments consisted of diets with and without Zilmax administered for 23 days prior to harvest with a 3-day withdrawal period. Steers (n = 18) were stratified by initial body weight and randomly assigned, within strata, to the 2 treatment groups. Cattle were then allotted to individual, partially covered feeding pens equipped with concrete floors, fence line feed bunks, and automatic water fountains. Steers were identified with ear tags displaying a number unique to each study animal.

Feed intakes were monitored daily, and unconsumed feed was removed from the bunk, weighed, and dried at weekly intervals or as needed to determine actual feed intake. Body weights were captured for each steer at 7-day intervals and again on the day of harvest. Blood was drawn from each steer via jugular venipuncture prior to feeding on days 0, 7, 14, and 21. A small amount of whole blood was used to determine concentrations of glucose and lactate, and the remaining sample was centrifuged immediately to recover plasma. Plasma was stored in microcentrifuge tubes and subsequently analyzed to determine concentrations of plasma urea nitrogen, non-esterified fatty acids, glucose, and lactate.

At the end of the finishing phase, cattle were weighed, loaded onto a truck, and transported to a commercial abattoir in Holcomb, KS. Harvest data were collected, including incidence and severity of liver abscesses; carcass weight; USDA yield grade; USDA quality grade; marbling score; 12th-rib fat thickness; loin-eye area; percentage kidney, pelvic, and heart fat; and incidence and severity of dark cutting beef.

Results and Discussion

Feeding Zilmax decreased dry matter intake by 8% ($P < 0.10$) but did not affect live weight gain or efficiency ($P > 0.10$; Table 1). Feeding Zilmax resulted in greater carcass weights, increased dressing percentage, and greater ribeye area ($P < 0.10$; Table 2). Zilmax numerically decreased marbling score and yield grade but did not influence other carcass traits ($P > 0.10$). Zilmax decreased glucose as well as plasma urea nitrogen

concentrations ($P < 0.10$) in whole blood (Table 3). A Zilmax × day interaction also was observed ($P < 0.10$) for plasma urea nitrogen. Plasma concentrations of lactate, non-esterified fatty acids, and beta hydroxyl butyrate were unaffected ($P > 0.10$) by addition of Zilmax to the diet.

Implications

Zilmax decreased circulating concentrations of plasma urea nitrogen, suggesting that protein catabolism was at least partially inhibited.

Table 1. Feedlot performance of steers fed diets with or without Zilmax

Item	Control	Zilmax	SEM	*P*-value
Dry matter intake, lb	26.12	24.12	1.01	0.02
Average daily gain, lb	4.22	4.21	0.75	0.99
Gain:feed	6.19	5.73	1.12	0.78
Initial body weight, lb	1407	1411	27.98	0.21
Final body weight, lb	1510	1517	31.61	0.72

Table 2. Carcass characteristics of steers fed diets with or without Zilmax

Item	Control	Zilmax	SEM	*P*-value
Hot carcass weight, lb	915	946	19.80	0.02
Dressed yield, %	63.1	65.0	0.68	0.08
Liver abscesses, %	0	0	-	-
Average yield grade	2.63	2.00	0.26	0.12
Marbling score[a]	408	378	28.53	0.47
Prime, %	0	0	-	-
Premium Choice, %	0	0	-	-
Choice, %	26.1	44.4	17.59	0.44
Select, %	73.9	55.6	17.59	0.44
12th-rib fat depth, in.	0.36	0.33	0.04	0.63
Kidney, pelvic, and heart fat, %	2.062	2.056	0.17	0.98
Ribeye area, in.^{2}	13.7	15.4	0.55	0.07

[a] Marbling scores were obtained by a USDA certified grader; slight = 300–399, small = 400–499, modest = 500–599.

Table 3. Blood components on days 0, 7, 14, 21 for steers fed diets with or without Zilmax

	Day 0		Day 7		Day 14		Day 21			*P*-value	
Item, mM	Control	Zilmax	Control	Zilmax	Control	Zilmax	Control	Zilmax	SEM	Zilmax	Zilmax × day
Whole blood glucose	3.32	3.39	3.33	3.01	3.48	3.12	3.48	3.09	0.24	0.42	0.06
Whole blood lactate	2.83	2.80	2.45	1.43	2.37	1.37	2.16	1.54	0.48	0.17	0.31
Plasma glucose	5.17	5.21	5.33	4.77	5.23	4.96	5.38	5.10	0.36	0.52	0.37
Plasma lactate	3.58	3.93	3.21	2.22	3.28	2.17	2.85	2.52	0.20	0.22	0.19
Non-esterified fatty acids	126	175	172	192	164	184	140	174	36.0	0.25	0.97
Beta hydroxyl butyrate	0.01	0.08	0.02	0.07	0.01	0.06	0.02	0.06	0.83	0.20	0.72
Plasma urea nitrogen	4.18	3.74	4.51	3.36	4.94	3.30	4.47	3.26	0.24	<0.10	0.06