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CATTLEMEN'S DAY 2017

Antioxidant Feeding Does Not Impact Incidence or Severity of Liver Abscesses

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Introduction

Liver abscesses are a large source of economic loss in feedlot cattle. Not only do liver abscesses lead to a decrease in feedlot performance, but these livers are condemned in the abattoir and can also lead to a further decrease in carcass value due to trim loss. Tylosin phosphate is a metaphylactic macrolide drug that effectively decreases the occurrence of liver abscesses. The drug is approved by the Food and Drug Administration for over-the-counter use. However, in January 2017 the FDA will require a veterinary feed directive for medically important antibiotics (antibiotics that are used in human health) used in production animal feed. Macrolides are one class of antibiotic that will require a veterinary feed directive. A drug that is accompanied by a veterinary feed directive will require it to be used within the regulations that the FDA has set for the specific drug. This new directive is to encourage the animal production industry to use less medically important antibiotics. It is therefore important to look at alternatives to control liver abscesses in feedlot cattle. Various studies have shown that α-tocopherol acetate increases the humoral response and that ascorbate increases mononuclear lymphocyte counts. These antioxidants are also known to maintain the integrity and structure of ruminal papillae, thereby inhibiting pathogenic bacteria that lead to the formation of liver abscesses from gaining access to the portal blood and then eventually the liver. The objective of this study was to evaluate the impact of antioxidants on feedlot performance, carcass characteristics, and incidence and severity of liver abscesses in finishing heifers.

Key words: antioxidant, liver abscesses, feedlot cattle

Experimental Procedures

A total of 392 crossbred heifers (1,060 ± 20.81 lb) were blocked by previous treatment in a randomized complete block design with 2 treatments and 14 replicates per treatment. Heifers were randomly assigned to one of 2 treatments. These treatments included a negative control group that contained 10 IU/lb α-tocopherol acetate, and a treatment group that contained 100 IU/lb vitamin E and 0.25 g/lb vitamin C. On the first day of the trial heifers were individually weighed and assigned to one of 28 dirt-surfaced pens with 14 animals per pen. They were vaccinated with Bovishield Gold 5 (Zoetis Animal Health, Florham Park, NJ) and Ultrabac 7 Somnubac (Zoetis), implanted with Component TE-200 with Tylan (Elanco Animal Health, Indianapolis, IN), and received Standguard (Elanco) as a pour-on treatment. Total mixed ration diets (Table

1) were provided and animals were fed once daily for 95 days. Animals were weighed after 95 days and average daily gain, dry matter intake, and efficiency of gain was determined for the feeding period. Animals were then shipped approximately 276 mi. to a commercial abattoir for harvest. At the abattoir, hot carcass weight, ribeye area, backfat thickness, U.S. Department of Agriculture quality and yield, and marbling scores were obtained using a camera images. Liver abscesses were scored using the Elanco liver abscess scoring system. Data were analyzed using the MIXED procedure of SAS version 9.2 (SAS Inst. Inc., Cary, NC) with treatment, previous treatment, and interaction as fixed effects. There was no interaction between the backgrounding treatment and the finishing treatment. Pen was the experimental unit and block as random effect. A significant effect was declared when P value < 0.05.

Results and Discussion

Feedlot performance and carcass performance are summarized in Tables 2 and 3, respectively. No differences were observed between the 2 treatments for final body weight or average daily gain. There was, however, a tendency (P=0.083) for a decrease in dry matter intake when the antioxidant group was compared to the control group and this translated into a tendency for an improvement in feed efficiency (P=0.074). The only differences that were observed between treatments with respect to carcass characteristics were that the control group had a greater percentage of carcasses that had a yield grade of 1 (P=0.016) and the antioxidant group had a greater percentage of carcasses that had a yield grade of 3 (P=0.024). There were no differences observed for incidence and severity of liver abscesses between the 2 groups (Figure 1).

Implications

Feeding antioxidants tend to improve the efficiency of gain, however, feeding antioxidants did not affect the incidence and severity of liver abscesses.

Table 1. Diet composition (dry matter basis)

Item	Percentage of dry matter
Steam-flaked corn	60.10
Wet corn gluten feed	30.00
Alfalfa hay	8.00
Supplement[1]	1.90
Nutrient composition (dry matter basis), calculated[2]	
Crude protein, %	14.12
Neutral detergent fiber, %	19.44
Calcium, %	0.70
Phosphorus, %	0.48
Potassium, %	0.70
Net energy for maintenance, Mcal/lb	0.97
Net energy for gain, Mcal/lb	0.67

[1]Formulated to provide the following added nutrient levels: 0.3% salt, 1.49% limestone, 0.05% potassium chloride, 2200 IU/kg vitamin A, 22 IU/kg α-tocopherol acetate, 0.15 mg/kg vobalt, 10 mg/kg copper, 20 mg/kg manganese, 30 mg/kg zinc, 0.10 mg/kg selenium, and 300 mg/d monensin. α-tocopherol acetate was added to the supplement to provide 220 IU/kg α-tocopherol acetate and crystalline ascorbic acid was added to the supplement at a rate of 550 mg/kg for the antioxidant treatment.
[2]Calculated based on Nutrient Requirements of Beef Cattle (7th Revised Edition, 2000) values.

Table 2. Feedlot performance of heifers fed different levels of antioxidants

	Treatment			
Item	Control	Antioxidant	SEM[1]	P-value
Initial body weight, lb	1060	1062	20.94	0.831
Final body weight, lb	1324	1327	16.98	0.663
Average daily gain, lb	2.82	2.89	0.17	0.702
Dry matter intake, lb/day	23.50	22.73	1.06	0.083
Gain:feed	0.120	0.126	0.003	0.074
Feed:gain	8.33	7.94	---	0.074

[1]SEM = standard error of the mean.

Table 3. Carcass performance of finishing steers fed different levels of antioxidants

	Treatment			
Item	Control	Antioxidant	SEM[1]	P-value
Hot carcass weight, lb	828.94	828.94	13.47	0.603
Dressed yield, %	62.82	62.91	0.300	0.643
Backfat thickness, in.	0.58	0.61	0.03	0.284
Ribeye area, in.[2]	14.58	14.49	0.13	0.604
Marbling score[2]	508	506	11	0.831
USDA Prime, %	9.56	7.28	2.18	0.346
High Choice, %	31.61	35.04	4.78	0.474
Low Choice, %	35.70	38.96	5.59	0.559
Select, %	18.12	13.18	4.29	0.145
Sub-select[3], %	5.65	8.13	1.50	0.466
Overall USDA yield grade	2.48	2.56	0.06	0.306
Yield grade 1, %	12.26	3.37	3.06	0.016
Yield grade 2, %	38.83	42.20	3.89	0.538
Yield grade 3, %	36.79	47.40	4.90	0.024
Yield grade 4, %	10.61	6.40	2.29	0.074
Yield grade 5, %	0.89	0	0.43	0.162

[1]SEM = standard error of the mean.
[2]Marbling score determined by computer imaging system (VBG 2000, E+V Technology GmbH & Co. KG, Oranienburg, Germany). Modest (500-599).
[3]Consists of carcasses grading standard and commercial carcasses.

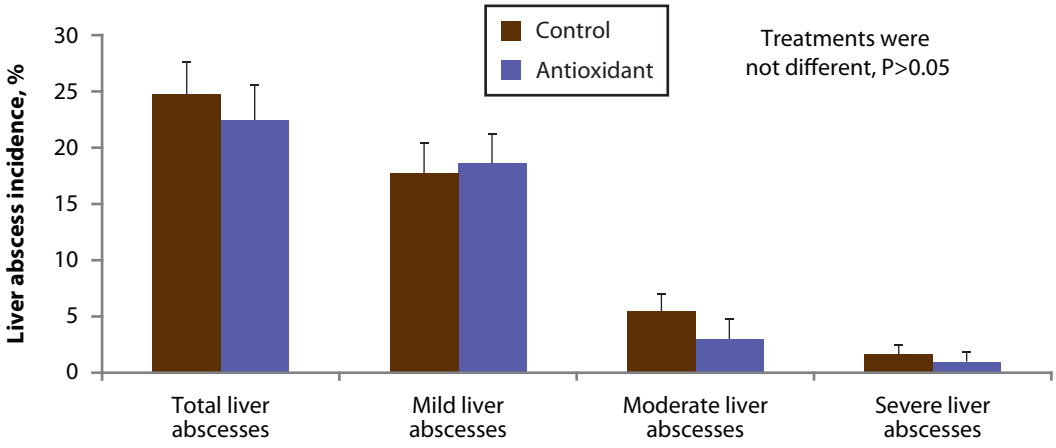

Figure 1. Effect of antioxidants on liver abscess incidence.