Intermittent Feeding of Tylan Reduces Use of In-Feed Antibiotics While Still Controlling Incidence of Liver Abscesses in Finishing Steers

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Introduction

Liver abscesses are a cause of concern for many feedlots across the country as they lead to a decrease in feedlot performance of finishing cattle as well as a decrease in the final carcass value. Loss in carcass value is due to not only the abscessed liver being condemned, but also due to trim loss associated with the condemned liver. The macrolide drug tylosin phosphate is the drug of choice for metaphylactic treatment of liver abscesses in feedlot cattle. The Food and Drug Administration approved the drug for over-the-counter use, however, from January 2017 all medically important (used in human health) antibiotics that are to be fed in production animal diets will require a veterinary feed directive. The objective of the veterinary feed directive program is to decrease the use of medically important antibiotics in animal production. These veterinary feed directives are similar to a prescription and will encourage the use of the drug in accordance to FDA-guidelines associated with that drug. Macrolide antibiotics are considered medically important and will need a veterinary feed directive. Therefore, it is imperative to look at different methods to control liver abscesses in feedlot cattle. Various studies have noted that macrolide antibiotics (such as tylosin phosphate) are effective against pathogens for moderate to prolonged periods after initial use. The purpose of this study was to determine whether feeding tylosin phosphate periodically throughout the finishing period will have a comparable effect on decreasing liver abscesses as when we would feed tylosin phosphate continuously through the finishing period.

Key words: macrolide antibiotics, liver abscesses, feedlot cattle

Experimental Procedures

Three-hundred-twelve crossbred steers (908 ± 15 lb) were blocked according to their initial body weight in a randomized complete block design with 3 treatments and 8 replicates per treatment. These treatments included a negative control group where animals received a basal diet containing no tylosin phosphate throughout the trial period, a positive control group where animals were fed a basal diet containing tylosin phosphate throughout the trial period and a periodic group where animals were fed a basal diet containing tylosin phosphate for the transition period (first 21-day period) and then thereafter received tylosin phosphate for 1 week after a 2-week period without tylosin phosphate. This 1-week on, 2-week off pattern was repeated until the end of the feeding period. This feeding strategy also allowed for a 2-week withdrawal period of tylosin phosphate prior to the harvest date. Animals were randomly assigned to a treatment group within each block. Total mixed ration diets (Table 1) were fed once daily for a 119-day period. Steers were housed in one of 24 dirt-surfaced pens with each pen holding 13 animals. Twenty-four hours after arrival at the feedlot, steers were individually weighed, randomly assigned to pens, vaccinated with Ultrabac 7/Somnubac and Bovishield Gold 5 (Zoetis Animal Health, Florham Park, NJ), and received a pour-on treatment for parasites (Permectin CDS, Bayer, Leverkusen, Germany). At the start of the study, steers were implanted with Component TE-200 with Tylan (Elanco Animal Health, Indianapolis, IN). Pens were weighed after 119 days and average daily gain, dry matter intake and efficiency of gain were determined for each pen. After the 119-day feeding period steers were shipped approximately 280 miles to a commercial abattoir where liver abscess scores were assessed using the Elanco liver abscess scoring system. U.S. Department of Agriculture quality and yield grades, backfat thickness, ribeye area and marbling scores were obtained using camera images (VBG 2000, E+V Technology GmbH & Co. KG, Oranienburg, Germany) at the abattoir. Data were analyzed using the MIXED procedure of SAS version 9.2 (SAS Inst. Inc., Cary, NC) with treatment as a fixed effect, block as the random effect and pen as the experimental unit. The effect of the treatment on feedlot performance and carcass characteristics was evaluated using linear contrasts.

Results and Discussion

Feedlot performance and carcass performance are summarized in Tables 2 and 3, respectively. There were no differences ($P \geq 0.207$) observed in final body weight, average daily gain, dry matter intake or feed efficiency between the positive control, negative control and the periodic treatment group. Similarly, there were no differences ($P \geq 0.257$) between the groups with respect to hot carcass weight, dressed yield, ribeye area, backfat thickness, or quality and yield grades. However, there was a difference ($P = 0.022$) among treatments with respect to marbling scores when the positive control group was compared to the other 2 treatments. Percentage total liver abscesses ($P = 0.007$) was greater for the negative control group when compared to the positive control and periodic tylosin feeding groups (Figure 1). There was also a difference between the negative and positive control group for liver abscesses scored moderate ($P = 0.026$). However, there was no difference between the positive control group (continuous tylosin feeding) and the periodic feeding of tylosin for the total liver abscesses or any of the severity scores. This suggests that tylosin has a prolonged effect on liver abscess-causing pathogens after an initial dose, and therefore can be used for on-again off-again periods during the finishing phase and still reduce liver abscesses to the same extent as when feeding tylosin throughout the finishing period. By using this periodic feeding of tylosin we reduced the use of in-feed antibiotics by 60%.

Implications

Feeding tylosin phosphate during the transition period and then for a pattern of 1-week after a 2-week period without feeding tylosin, decreases the use of in-feed antibiotics by 60% while maintaining the same low incidence of liver abscesses as when tylosin is fed continuously throughout the finishing period.

Table 1. Diet composition

Item	No Tylan	Tylan
Steam-flaked corn	57.68	57.67
Corn gluten feed	30.00	30.00
Corn silage	10.00	10.00
Supplement[1]	2.32	2.33
Nutrient composition (dry matter basis), calculated[2]		
Crude protein, %	14.37	14.37
Net energy maintenance, Mcal/lb	0.97	0.97
Net energy gain, Mcal/lb	0.67	0.67
Neutral detergent fiber, %	18.65	18.65
Calcium, %	0.71	0.71
Phosphorus, %	0.49	0.49
Salt, %	0.25	0.25
Tylosin, g/ton	0.00	9.00

[1]Contains limestone, salt, urea, trace mineral/vitamin premix to provide (on a total diet dry matter basis) 0.15 ppm cobalt, 10 ppm copper, 0.50 ppm iodine, 20 ppm manganese, 0.10 ppm selenium, 30 ppm zinc, 1000 IU/lb vitamin A and 7 IU/lb vitamin E, 30 g/ton Rumensin and, in the case of the Tylan diet, 9 g/ton Tylan.
[2]Calculated based of Nutrient Requirements of Beef Cattle (7th Revised Edition, 2000) values.

Table 2. Effect of tylosin feeding strategy on feedlot performance

	Treatment				
Item	No Tylan	Tylan	Intermittent Tylan	SEM[1]	P-value
Initial body weight, lb	904.40	908.19	908.04	14.79	0.401
Final body weight, lb	1383.16	1397.62	1379.21	10.69	0.229
Average daily gain, lb	4.51	4.61	4.43	0.18	0.207
Dry matter intake, lb/day	23.99	24.69	23.92	1.15	0.278
Gain:feed	0.188	0.186	0.186	0.003	0.752
Feed:gain	5.32	5.38	5.38	0.003	0.752

[1]SEM=standard error of the mean.

Table 3. Effect of Tylosin feeding strategy on carcass characteristics

	Treatment				
Item	No Tylan	Tylan	Intermittent Tylan	SEM[1]	P-value
Hot carcass weight, lb	836.63	843.51	836.74	6.11	0.512
Dressed yield, %	60.48	60.30	60.67	0.21	0.257
Backfat thickness, in.	0.49	0.50	0.49	0.03	0.860
Ribeye area, $in.^2$	13.75	13.84	13.81	0.20	0.921
Marbling score[2]	455	429	458	12	0.022
USDA Prime, %	0.97	0	1.92	1.37	0.377
High choice, %	27.25	16.66	23.03	5.76	0.182
Low choice, %	47.73	56.76	53.72	6.91	0.413
Select, %	24.27	25.74	18.27	5.90	0.401
Sub-select[3], %	0	0	0.97	0.80	0.373
Overall USDA yield grade	2.56	2.60	2.54	0.11	0.847
Yield grade 1, %	4.85	1.97	3.85	2.86	0.595
Yield grade 2, %	39.81	40.59	43.27	6.92	0.870
Yield grade 3, %	49.52	52.46	48.08	7.36	0.831
Yield grade 4, %	5.83	4.95	4.81	3.12	0.939

[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). Small (400-499).
[3]Consists of carcasses grading standard and commercial carcasses.

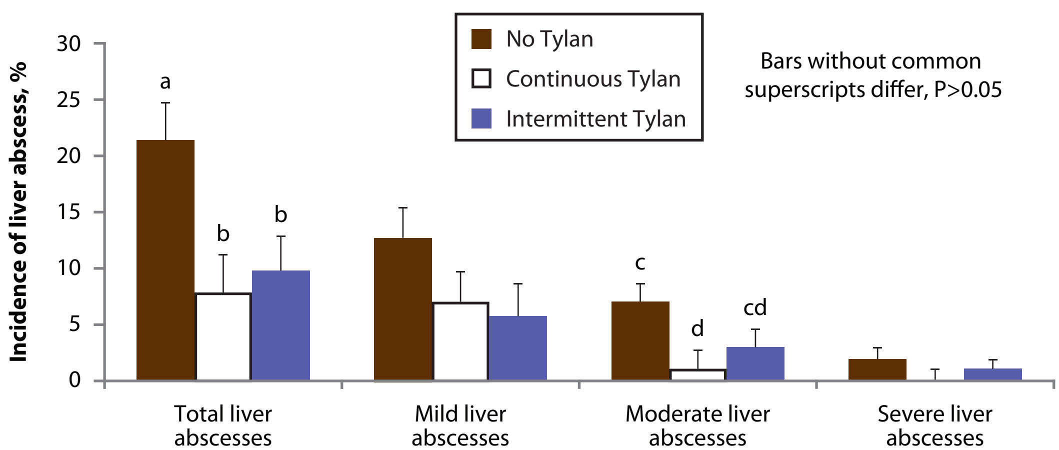

Figure 1. Tylan feeding strategy and incidence of liver abscesses.