EFFECT OF LAIDLOMYCIN PROPIONATE ON THE LIPID AND CHOLESTEROL CONTENT OF BEEF RIB STEAKS

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Story in Brief

Forty ribeye steaks from steers fed a high concentrate diet with or without the addition of laidlomycin propionate were used to evaluate the effect of this ionophore on the lipid and cholesterol content. The addition of laidlomycin propionate to the diet did not alter carcass composition or quality grade. Moisture, crude fat and total lipid concentrations of the longissimus muscle also did not differ between the treatments. The accumulation of total lipid in the longissimus muscle as storage reservoirs (triglycerides) or structural components (phospholipids) was not different with laidlomycin propionate addition. Cholesterol content was reduced 3.54 mg per 100 g muscle when laidlomycin propionate was added to the diet. This is a reduction of approximately seven percent in the cholesterol content of the longissimus muscle due to the incorporation of laidlomycin propionate into the feedlot diet.

(Key Words: Beef, Ionophore, Lipid, Cholesterol)

Introduction

Ionophores increase energetic efficiency by altering rumen fermentation to increase propionic acid while decreasing acetic acid and methane production. Additionally, ionophores are thought to inhibit the gram-positive bacteria (lactic acid producers) by facilitating the formation and transport across cell membranes of lipid-soluble complexes with various cations (Bergen and Bates, 1984).

Marmer and co-workers (1985) found that the fatty acid composition of the lipid in the longissimus muscle (LM) was modified with the addition of the ionophore, monensin. Slight decreases in saturated fatty acid concentration and

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increases in odd chain length and branched chain fatty acids were reported in the LM of monensin-fed steers. These results indicate that increases in propionate production along with inhibition of certain bacteria in the rumen of monensin-fed cattle lead to a decreased biohydrogenation in the rumen. This process allowed the passage of more unsaturated fatty acids into the small intestine along with the use of propionate for fatty acid synthesis.

Laidlomycin propionate was previously evaluated for its potential as an ionophore in a one hundred and forty head feedlot trial (Van Koevering, et al., 1991). The incorporation of laidlomycin propionate at 10g per ton to a high concentrate diet increased average daily gains 8.1% and feed efficiency 8.9%. Laidlomycin propionate is still under investigation for FDA approval and thus is not yet available for the commercial producer. To date, the cholesterol content of the LM from ionophore-fed cattle has not been reported. The objective of this study was to evaluate the effect of laidlomycin propionate on the lipid and cholesterol content of the LM.

Materials and Methods

One hundred and forty Angus x Hereford steers were fed according to Van Koevering et al. (1991). Forty ribeye steaks were selected equally from the control (basal diet) and laidlomycin propionate (10g/ton) treatments. After trimming of all exterior fat, the LM was pulverized in liquid nitrogen and stored at -20^{o}F until subsequent analyses. Moisture content was determined by drying at 216^{o}F for 24 hours. The dried samples were then extracted with petroleum ether for 8 hours to quantify crude fat content of the LM. Organic solvents were used to separate the neutral (mono-, di- , and triglycerides and cholesterol) and polar lipids (phospholipids). Total lipid content was determined gravimetrically on each fraction. Cholesterol (mg/100g tissue) was quantified using a gas chromatographic method (Duckett, et al., 1992). The General Linear Model of SAS was used to detect significant differences due to laidlomycin propionate addition.

Results and Discussion

Comparisons of the carcass characteristics (Table 1) indicate that the addition of laidlomycin propionate to the diet did not alter ($P>.05$) marbling scores, fat thickness, yield grade or ribeye area. Percent moisture, crude fat and total lipid content in the LM (Table 2) did not differ ($P<.05$) between the treatments. The accumulation of lipid in the LM as a storage reservoir in the form of triglycerides or as a structural component in the form of phospholipids was also unaffected ($P>.05$) when laidlomycin propionate was added. These results are in agreement with those reported for monensin-fed cattle (Marmer, et

Table 1. Carcass characteristics.

	Control	Laidlomycin	SEM
Carcass weight, lb.	718.25	720.15	9.20
Marbling[a]	463.0	457.5	21.20
Yield Grade	3.08	3.19	0.13
Fat Thickness, in.	0.52	0.55	0.03
Ribeye Area, in^2	12.32	12.32	0.24

[a] Marbling Score of 400-499 = Choice (small).

Table 2. Lipid and cholesterol content of beef rib steaks.

	Control	Laidlomycin	SEM
Moisture, %	73.35	73.50	0.29
Crude Fat, %	4.16	3.63	0.30
Total Lipid, %	5.29	4.66	0.33
Neutral Lipid, %	4.56	3.97	0.32
Polar Lipid, %	0.72	0.69	0.02
Cholesterol, mg/100g	45.21[a]	41.67[b]	1.39

[ab] Means with different superscripts in the same row differ (P<.10).

al. 1985) indicating that the addition of ionophores into the feedlot diets does not directly affect the total lipid content in the LM.

Suprisingly, the cholesterol content in the LM was lowered (P=.08) 3.54 mg per 100 g LM with the addition of laidlomycin propionate to the diet. This important difference represents approximately a 7% decrease in the cholesterol content of the LM from the laidlomycin-fed steers when compared to the controls. Since all 27 carbons of the cholesterol molecule are derived from acetate, the shift in rumen fermentation to increased propionate due to ionophore addition to the diet may reduce the blood acetate availability for cholesterol synthesis. This reduction in cholesterol synthesis could lead to decreased cholesterol in the tissues. Conversely, the addition of monensin to roughage diets was shown to increase plasma total cholesterol concentrations over that of controls (O'Kelley, et al., 1988). Further investigation into this reduced cholesterol content in the LM of the laidlomycin propionate-fed steers as shown in this study, is currently underway.

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