FEEDING PROTECTED FAT TO HOLSTEIN STEERS DURING THE LAST 3 WEEKS ON FEED TO ENHANCE MARBLING

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Story in Brief

Thirty-six Holstein steers (523 kg) were used in a study to determine whether adding 8% fat in a rumen-protected form for 22 days prior to slaughter would increase marbling. Fat supplementation had no effect on carcass traits, although gain and carcass weight were depressed in the cattle fed the protected fat source. Feed intake was depressed. Fat supplementation increased fecal fat excretion, but fecal ash and plasma non-esterified fatty acids were not altered. No increase in marbling score was detected.

(Key Words: Fat, Feedlot Cattle, Holsteins, Marbling.)

Introduction

Many cattle finished in U.S. feedlots are Holstein steers. Usually they are marketed with less external fat than other breeds, and thereby may have a lower marbling score and quality grade. Marbling is affected by age, weight, previous nutrition and genetics. Manipulating the diet during the late finishing period to enhance marbling has a tremendous impact on the value of cattle carcasses. Enhanced marbling also could reduce the practice of feeding cattle more days than needed in an attempt to have cattle reach the Choice grade.

Fat often is added to feedlot diets at levels of 1-3%, depending on economics. Typical fat sources fed at levels above 5% of the dietary dry matter, depress ruminal digestibility of certain feed components. Sources of rumen-protected fats (e.g., Booster Fat™, Megalac®) have been developed commercially that have less adverse effects in the rumen and will permit higher levels of fat to be fed to lactating dairy cows. The cost of these is about twice that of feed grade fats.

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Marbling (intramuscular fat) is the last fat depot to be filled in the body, after kidney/heart/pelvic, seam, and subcutaneous fat. Cattle feeders try to achieve an optimum level of subcutaneous fat to ensure that marbling is adequate. Because of this sequence of fat deposition, short-term dietary manipulation during the last weeks or months of feeding might affect marbling. Therefore, strategies such as feeding high levels of fat might prove economical.

The objective of this study was to alter the energy/protein ratio of the diet through fat supplementation and monitor responses in marbling. Holstein cattle were fed a ration containing up to 8% Booster Fat™ Dairy 95 (Balanced Energy Company, Omaha, NE) during their last 22 days on feed to assess the effect of fat on carcass composition and performance. In addition, blood non-esterified fatty acids (NEFA), fecal fat and fecal ash were measured.

Materials and Methods

Thirty six Holstein steers from the OSU dairy unit were started on feed at 705 lb. average weight. These cattle were adapted to a corn-based finishing diet by gradually decreasing the roughage level. When the cattle reached an average weight of 1152 lb., they were allocated to 12 pens, 3 cattle per pen. Six pens of cattle continued to receive the control ration, while six pens of cattle were fed the fat-supplemented (+FAT) diet in which fat was substituted for corn. All cattle had ad libitum access to feed in self-feeders.

The composition of diets is shown in Table 1. Feeds containing supplemental fat were mixed carefully in order to avoid damaging the protected fat beads. The fat was the last material added to the mix, and the diet was mixed for a minimum time. The +FAT cattle were fed a 4% fat diet for one week, and then switched to the 8% fat diet for the remaining 15 days prior to slaughter.

Blood samples were obtained from each animal in each pen 18 days after the start of the 22 day experiment. Two fresh fecal samples were obtained from each pen at 20 days.

The data were subjected to analysis of variance and treatment means were compared using the Duncan's Multiple Range Test.

Results and Discussion

Feed intake was depressed with the fat-supplemented diets. It would have been preferable to increase fat level by smaller increments, i.e. 0%,

Table 1. Composition of diets on an as-fed basis.

Ingredient	Ration composition, %[a]	
	0	+ Fat
Rolled corn	80.87	72.87
Alfalfa pellets	3.91	3.91
Cottonseed hulls	4.88	4.88
Supplement[a]	6.24	6.24
Molasses	4.10	4.10
Booster Fat™ Dairy 95		8.00

[a] Supplement composition: soybean meal 44.88%, cottonseed meal 31.26%, calcium carbonate 11.73%, salt 4.36%, urea 5.76%, Vitamin A, Vitamin E, Rumensin and Tylan.

2.5%, 5.0%, then 7.5% of the total diet. Cattle ate the diet well after the initial adjustment period, although irregular feed intake may have persisted in some individual animals. Each time the dietary fat was increased by 4%, the cattle reduced their feed consumption for about a week, and then tended to rebound and eat somewhat more feed. Dietary fat additions similarly depress feed intake of feedlot steers. Major animal to animal variation in intake probably explains why gain ranged from -65 lbs. to +75 lb. in the +FAT cattle.

Intakes averaged 31.2 lb. (as-fed) for the control steers versus 26.2 lb. for the +FAT steers. The control steers gained 3.33 lbs. per day compared to only 1.30 lb. per day for the +FAT steers so that total gain ranged from 45 to 115 lb. for controls, (with one animal losing 25 lb.), versus -65 lb. to 75 lb. for the +FAT steers, with 4 +FAT cattle losing weight during the study.

Associated with reduced intake, final weight and carcass weight were lower in the +FAT group. The +FAT cattle tended to be leaner with a smaller ribeye area and lower marbling score, as might be expected with the lower carcass weights.

Fecal fat concentration was higher ($P<.001$) in feces from +FAT steers (22.9% versus 10.4%). Apparently, some of the added fat was not digested in the +FAT animals. This may have been excreted in the form of calcium or magnesium soaps, and could explain the trend towards an increased fecal ash concentration. Assuming that the basal diet was 80% digested, the added fat calculates to have an apparent digestibility of 69%. Zinn (1989) found that

Table 2. Effects of fat supplementation on steer performance.

Item	Treatment[a] 0	+ Fat
No. of pens	6	6
No. of animals	18	18
Days fed	22	22
Weight, lb		
Initial	1158	1147
Final	1232[c]	1175[d]
Gain, lb/day	3.33[c]	1.30[d]
Intake, lb/day[b]	31.2[c]	26.2[d]
Gain/feed	.106[c]	.048[d]

[a] 0 = Control diet; + Fat = Diet supplemented with protected fat.
[b] As-fed basis.
[cd] Means in the same row with the same superscript are different (P<.05).

Table 3. Effects of protected fat on carcass characteristics.

	Treatment 0	+ Fat
Carcass wt, lb	712[c]	689[d]
Dressing percentage	57.8	58.6
Fat thickness, in.		
Measured	.23	.19
Adjusted	.28	.25
KPH, %[a]	2.18	2.03
Marbling score[b]	11.31	10.83
USDA yield grade	2.73	2.67
Choice, %	44.4	33.3

[a] KPH = kidney, heart and pelvic fat.
[b] Slight minus = 10; small minus = 13; modest minus = 16.
[cd] Means in the same row with different superscripts are different (P<.05).

Table 4. Effects of feeding protected fat on fecal fat and ash and on plasma non-esterified fatty acids (NEFA).

Item	Treatment	
	0	+ Fat
Fecal fat, % dry matter	10.4[a]	22.9[b]
Fecal ash, % dry matter	6.6	7.1
Plasma NEFA, u Eq/l	510	544

a Means in the same row with different superscripts are different ($P<.05$).

true digestibility of added fat at 4% and 8% levels of supplementation averaged 80.1% and 69.3%, respectively.

This study did not succeed in increasing marbling, probably due to the depression in feed intake. Compared to non-protected fats, rumen-protected fats may allow the feeding of higher dietary fat levels without depressing performance, but the importance of increasing dietary fat gradually appears just as critical.

Literature Cited

Zinn, R.A. 1989. Influence of level and source of dietary fat on its comparative feeding value in finishing diets for steers: feedlot cattle growth and performance. J. Anim. Sci. 67:1029.