

Project Summary

Effects of Implanting and Feeding Zilpaterol® on Carcass Characteristics, Meat Yield and Value, and *longissimus* and Quadriceps Muscle Characteristics in Realimented Mature Cull Cows

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Background

The National Market Cow and Bull Audit of 1999 reported several challenges associated with cull cows including low dressing percentages and carcass meat yields. Feeding cull cows a high-energy diet for 50 to 70 days can improve performance and carcass characteristics and potentially improve value. Growth enhancement technologies can further improve performance and yield of fed cows.

The objectives for this project were to:

1. Investigate the influence of implanting and feeding zilpaterol on performance, carcass characteristics, predicted meat yield and value of realimented mature cull cows.
2. Investigate the influence of implanting and feeding zilpaterol on tenderness, color, fatty acid profiles and sensory properties of the quadriceps and *longissimus dorsi* muscles from fed mature cull cows.

Methodology

Fifty-three crossbred, mature cows were obtained in Kansas and stratified by weight and body condition score. They were then allotted to groups and a 70-day feeding period treatment consisting of: 1) grazing native grass pasture (G); 2) concentrate-fed (C); 3) concentrate-fed and implanted (CI); 4) concentrate-fed and fed zilpaterol (Zilmax, 106.25 mg/hd per day; Intervet, Millsboro, DE) beginning on day 38 of the feeding period (CZ); and 5) concentrate-fed, implanted and fed zilpaterol beginning on day 38 (CIZ). Implanted cows received Revalor-200 per the manufacturer's instructions in the right ear on day 0. Zilpaterol was fed during the final phase of the feeding period for 30 days with a 3-day withdrawal time prior to harvest. Cows were fed a concentrate diet containing sorghum silage and ground grain sorghum.

Hot carcass weights and all other carcass data were recorded after 48 hours postmortem. Subprimal weights were fabricated into IMPS numbers 112 (modified), 114, 116A PSO 1, 116B (modified), 120, 167A, 169B, 171B, 171C, 184, 185D, 190 and 193. A procedure developed by Hankins and Howe (1846) was used to remove the 9-10-11 rib section from the right side of each carcass at 3 days postmortem. At 14 days postmortem, strip loins and knuckles were cut into steaks. Subprimals were faced and the faced portion was retained for Thiobarbituric Acid Reactive Substances (TBARS) oxidation analysis. Five, inch-thick steaks were cut from the strip loin. The first steak was removed for retail display, the second steak was cut for trained sensory panel analysis, and the third, fourth and fifth steaks were randomly assigned to 14, 21 and 28 days of aging for Warner-Bratzler shear force (WBSF) tenderness analysis. Three inch-thick steaks were cut from the knuckle. The first steak was displayed, the second used for trained sensory panel analysis and the third for 14 day WBSF analysis.

Findings

Objective 1

Cows that were implanted and fed concentrate diets (CI and CIZ cows) had greater gains than those fed concentrates and not implanted. Live weight gains of cows fed zilpaterol were found not to be statistically different for the entire feeding period. Although implanting improved gains, the

combination of an implant and feeding zilpaterol further increased gains for the last 34 days of the feeding period.

Dressing percentages, hot carcass weight, *longissimus* muscle area, 9-10-11 rib cutout weight, and 9-10-11 rib soft tissue weight were greater for concentrate-fed cows than for G cows. Concentrate-fed cows had more kilograms of trimmed subprimals and 9-10-11 rib soft tissue weights. Implanted cows and cows fed zilpaterol had heavier hot carcass weight and higher dressing percentages than cows fed only concentrate and not implanted, but differences were not statistically significant.

CIS cows had the largest, and G cows had the smallest, *longissimus* muscle areas. Compared with concentrate-fed non-implanted cows, implanting alone resulted in numerical increases in *longissimus* muscle area. Subprimal weights were numerically greater for CIZ cows than for CI and CZ cows and statistically greater than C and G cows.

Subprimal value about initial purchase and feed costs indicate that implanting and feeding zilpaterol offers an opportunity to increase meat yield and potential for increased profit when feeding mature cows. These results indicate that maximum return was realized when implanting and feeding zilpaterol were used together. Implants and zilpaterol appeared to work together synergistically to increase hot carcass weight, *longissimus* muscle area and total subprimal weight.

Objective 2

Longissimus muscle steaks from the grass and CIZ treatments were among the visually darker steaks for 0 and 3 days of display. This was supported with lower L* values (darker). *Longissimus* steak a*values were lower for the CIZ and CZ treatments compared to the C and grass treatments.

While there were no differences in TBARS values on day 5 for *longissimus* steaks, knuckle steaks from G cows had lower TBARS values on day 5 than those from CI cows. Off-flavors detected by a sensory panel for *longissimus* steaks were greatest from cows than were grass-fed. The off-flavor descriptors used for this study were grassy and livery.

Longissimus steaks aged for 14 days from CI, C and G cows had similar tenderness as measured by a sensory panel and WBSF. However, after 28 days of aging, beef from CI and C cows was more tender than G cows. These steaks from G cows had the least improvement in WBSF tenderness due to aging from 14 to 28 days. The combined use of an implant and feeding zilpaterol resulted in *longissimus* steaks that had the highest WBSF and lowest sensory panel scores, indicating that these steaks were the toughest among the treatments. However, sensory panelists found the tenderness characteristics of steaks from CIZ and CZ not to be statistically different. Steaks from CIZ cows had the greatest improvement in WBSF due to aging.

While the *longissimus* and knuckle steaks had differing results for tenderness, the sensory panel and shear force values of these steaks from both muscles would indicate that they range from slightly tough to slightly tender. It is recommended that both muscles would need some type of postmortem tenderization technology applied to increase tenderness as aging alone did not improve tenderness enough.

Fatty acid profiles were minimally altered by treatment for either *longissimus* or knuckle steaks. The percentages of *n-6* fatty acids were higher and percentages of *n-3* were lower resulting in higher *n-*

6/*n*-3 ratios in muscle samples from concentrate-fed (CI, CIZ, CZ and C) cows compared with samples from G cows.

Implications

Feeding cull cows a concentrate diet improved weight gain, carcass weight, dressing percentages and subprimal yield compared with feeding cows a grass-based diet. When cows were fed a concentrate diet, implanting and feeding zilpaterol increased ribeye area and further increased subprimal yields. Feeding zilpaterol resulted in strip loin steaks, but not knuckle steaks, that were considered tougher as evaluated by Warner-Bratzler shear force and a trained sensory panel. However, postmortem tenderization techniques should be incorporated for both strip loin and knuckle steaks from fed cows to improve tenderness acceptability. Concentrate feeding, implanting and feeding zilpaterol during a short feeding period was able to increase meat yields of mature cows in this study.

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