Pre-harvest Feeding, Feeding Duration, and Inclusion of a β-agonist on Market Dairy Cow Feedlot Performance and Carcass Characteristics

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Abstract

The objectives of this experiment were to evaluate the effects of pre-harvest feeding, feeding duration, and use of a beta agonist (zilpaterol hydrochloride) on market dairy cow feedlot performance and carcass characteristics.

The experiment was set up in a randomized block design, with pen as the experimental unit. A total of 160 lactating market dairy cows (already culled from herds) were used for the project. Cattle were assigned to one of the following five treatments: harvest immediately on day 0 (Con), feed for 70 days without zilpaterol (70no), feed for 70 days with zilpaterol from day 47 to day 67 (70zil), feed for 105 days without zilpaterol (105no), and feed for 105 days with zilpaterol from day 82 to day 102 (105zil).

Cattle were fed in a commercial feedlot in southern Idaho and received a high concentrate potato by-product-based ration. There was a feeding duration length × zilpaterol interaction ($P < 0.005$) for final body weight (BW). The 70no, 70zil, and 105no cows had greater ($P < 0.05$) final BW compared to control cows, while 105zil cows had greater ($P < 0.05$) final BW compared to control and all other fed treatments. The effect of zilpaterol supplementation on average daily gain (ADG) was inconsistent, since 105zil cows had a greater ($P < 0.05$) ADG vs. 105no cows, yet ADG was not different ($P > 0.10$) among 70no and 70zil cows. No differences were observed ($P > 0.10$) for the feed-to-gain ratio from the main effects of feeding length or zilpaterol supplementation. Final hot carcass weight (HCW) was greater ($P < 0.0001$) among fed compared to control cows, and cows receiving zilpaterol had greater ($P < 0.03$) HCW than cows not receiving a β-agonist. Measured ribeye area (REA) was greater among fed ($P < 0.001$) compared to control cows and also greater ($P < 0.01$) among cows receiving zilpaterol compared to no zilpaterol. The effects of feeding duration and zilpaterol supplementation on feedlot performance and carcass characteristics were inconsistent.

Résumé

Cette expérience visait à évaluer, du point de vue performance en parc d'engraissement des vaches laitières de réforme et caractéristiques de la carcasse, l'effet de l'engraissement avant la récolte, de la durée de cet engraissement et de l'apport d'un bêta-agoniste (hydrochlorure de zilpatérol).

L'expérience était disposée en blocs complètement aléatoires, dont les unités expérimentales étaient les enclos. L'étude a porté sur un total de 160 vaches laitières (déjà réformées par des fermes commerciales). Ces bovins ont été répartis dans l'un des cinq groupes de traitements suivants: récolte immédiate, au jour 0 (témoins), engraissement de 70 jours sans apport de zilpatérol (70 no), engraissement de 70 jours avec apport de zilpatérol entre les jours 47 et 67 (70 zil), engraissement de 105 jours sans zilpatérol (105 no) et engraissement de 105 jours avec apport de zilpatérol entre les jours 82 et 102 (105 zil).

Les bovins ont été engraissés dans un parc d'engraissement commercial du sud de l'Idaho, avec une ration concentrée à base de sous-produits de pommes de terre. Nous avons observé une interaction entre la durée d'engraissement et le zilpatérol ($P < 0,005$) en ce qui concerne le poids corporel final (BW). Les vaches des groupes 70 no, 70 zil et 105 no ont eu un poids corporel final plus élevé ($P < 0,05$) que les vaches témoins, tandis que les vaches du groupe 105 zil avaient un poids final plus élevé que celui des vaches témoins et de tous les autres groupes de vaches en engraissement. L'effet de l'apport de zilpatérol sur le gain moyen quotidien (GMQ) s'est montré peu cohérent, puisque les vaches 105 zil avaient un GMQ plus important ($P < 0,05$) que celui des vaches 105 no, alors que le GMQ n'a pas varié significativement ($P > 0,10$) entre les vaches 70 zil et 70 no. Les effets principaux «durée d'engraissement» et «apport de zilpatérol» n'ont pas causé de variation significative ($P > 0,10$) du point de vue de l'indice de conversion alimentaire. Le poids de la carcasse chaude s'est avéré plus élevé ($P < 0,0001$) chez les vaches en engraissement que chez les vaches témoins. Les vaches traitées au zilpatérol ont également affiché un poids de la carcasse chaude plus important ($P < 0,03$) que celui des vaches n'ayant reçu aucun β-agoniste. La noix de côte était plus grande ($P < 0,001$) chez les vaches engraissées que chez les vaches témoins, tout comme la noix de côte était plus grande ($P < 0,01$) chez les vaches traitées au zilpatérol. L'effet de la durée d'engraissement

et de l'apport en zilpatérol sur la performance en parc d'engraissement et sur les caractéristiques de la carcasse s'est montré peu cohérent.

Introduction

Approximately 8% of the beef produced in the US is generated via the harvest of market dairy cows (USDA, 1996). However, the overall quality of market dairy cows has not improved over the past several years, based on data from the 2007 National Market Cow and Bull Beef Quality Audit[5] (NMCBBQA) when compared to previous audits conducted in 1994.[10] It has been estimated that 50% of every cow carcass is used for a variety of wholesale whole-muscle cuts.

The percentage of market dairy cows that go directly to harvest after being culled from a dairy has been documented by USDA at over 95%,[12] suggesting that few dairies attempt to add value to market dairy cows prior to harvest, including pre-harvest feeding. However, during the NMCBBQA-2007, researchers documented that a higher percentage of each cow carcass was fabricated into whole-muscle cuts compared to previous audits,[5] indicating the potential trend for market dairy cow carcasses to increase in value.

In the NMCBBQA-1999 final report,[10] it was estimated that an average of $68.82 was lost for every market cow and bull harvested in the US due to the presence of various quality defects (Table 1). The majority of the economic losses came from traits that could be reversed or avoided by either culling cows earlier or by short duration pre-harvest feeding to increase marbling, change fat color from yellow to white, improve dressing percentage, and increase carcass weight and ribeye area (REA). By addressing the reasons for economic losses among market dairy cows, dairy producers could increase their annual revenue and increase profit from market dairy animals.

A limited amount of results involving a small number of dairy cows[11] fed in individual pens[1] have been published. Researchers have proven that the quality and value of market beef cows can be increased by feeding for a short period prior to harvest.[2,4,6] However, due to the limited amount of data on the pre-harvest feeding of large numbers of market dairy cows, the effect of feeding duration on market dairy cow performance and end-product quality is generally unknown.

Materials and Methods

Animals

All animal use and handling techniques described herein were approved by the University of Idaho Animal Care and Use Committee prior to initiation of the experiment. A total of 160 market dairy cows were acquired from four large dairies in southern Idaho (estimated mean ± SD lactating cows per dairy was 27,500 ± 23,629.1 cows) within a 37.3 mi (60 km) radius, and generously provided for use in this experiment through retained ownership agreements. All cows were delivered to a large commercial feedyard prior to being processed on day 0. At processing, all cows were weighed and given a cursory physical exam by a licensed veterinarian.

Treatments

During initial processing on day 0 in a completely randomized design, cows were randomly assigned to replicates and then to one of five treatments. Treatments included: 1) harvest on day 1 (CONTROL, n = 52); 2) feed for 70 days with zilpaterol hydrochloride[a] (70ZIL, n = 27); 3) feed for 70 days without zilpaterol (70NO, n = 27); 4) feed for 105 days with zilpaterol (105ZIL, n = 27); or 5) feed for 105 days without zilpaterol (105NO, n = 27). Cows assigned to the control treatment were separated immediately and shipped to be harvested the following morning (day 1) at a commercial abattoir.

Table 1. Estimated average value losses from market cows and bulls ($/hd).[1]

Item	Amount
Inadequate muscling	$18.77
Trim loss (arthritis, bruises, birdshot, injection sites)	$14.40
Excess external fat	$10.17
Condemnations (cattle, carcass, edible offal)	$ 8.63
Yellow external fat	$ 6.48
Hide value loss (brands, insects)	$ 6.20
Disabled cattle, dark cutters, antibiotic residue (handling/testing)	$ 2.89
Lightweight carcasses	$ 1.28
Total per head	$68.82

[1]1999 National Market Cow and Bull Beef Quality Audit.[10]

Cows assigned to any of the four "feeding" treatments were vaccinated, dewormed with doramectin, and administered a growth-promoting implant. Control cows were assigned to one of five replicates (10 to 11 cows per replicate). Cows to be fed out were assigned to three replicates (pens) per treatment (nine cows per replicate) and divided into 12 pens (experimental unit = replicate = pen). Each pen was 131.2 x 131.2 ft (40 × 40 m) with a concrete feed bunk and free access to water.

Diets

Cows placed on feed were offered a starter ration (22.8% crude protein [CP], 68.8% total digestible nutrients [TDN]) for 13 days beginning on day 1, which was followed by an intermediate ration (15.2% CP, 74.9% TDN) provided for an additional 18 days. Cows were then fed a high concentrate potato by-product-based finishing ration (17.7% CP, 75.0% TDN) for the remainder of the feeding period for either 70 (70ZIL and 70NO) or 105 days (105ZIL and 105NO). During 21 of the last 24 days of the feeding period, half of the pens received zilpaterol in the finishing ration (70ZIL and 105ZIL cows) at a rate of 90 mg/hd/d provided via a micromachine.

During the feeding period, animals were evaluated once daily for any change in health status. Due to the low DM content of the diet, feed samples were collected and DM content was determined daily in a forced-air oven by drying overnight at 212°F (100°C). Each pen's feed bunk was scored daily using a 1 to 5 scoring system (1 = slick bunk with no feed, 5 = feed not touched) to determine if feed should be increased or decreased. Each pen was fed once daily at approximately 0900.

Cows were weighed individually on days 0, 45, 70, 80, and 105. Dry matter intake (DMI), average daily gain (ADG), and feed-to-gain ratio (F:G) were determined for the overall feeding period. Cattle were not fed on weigh dates until after body weight (BW) was recorded. At the conclusion of each feeding period (days 70 and 105), cows were harvested the following morning at a commercial abattoir on days 71 and 106, respectively.

Carcass traits

Carcass data were recorded on all carcasses approximately 24 hours after harvest. Hot carcass weight (HCW), dressing percent (DP), adjusted fat thickness (FAT) at the $12^{th}/13^{th}$ rib, percent kidney, pelvic, and heart fat (KPH), and REA measurements were determined by a USDA grader.

To compare the effects of feeding, feeding duration, and β-adrenergic agonist supplementation on HCW gain, an initial HCW was estimated for each fed animal using the average DP for all control cows harvested on day 1 and each fed cow's BW collected on day 0. Initial HCW (estimated) and final HCW (measured) were used to calculate the overall change in HCW to compare treatments.

Removal of animals

Rates for morbidity and animal removal (due to unthriftiness) during the feeding period, as well as whole-carcass condemnation at harvest, were much higher than anticipated. Of the 160 cows initially acquired for the experiment, five cows (3.1%) died during the feeding period due to reasons identified upon necropsy, including severe mastitis at arrival (n = 1), lymposarcoma (n = 1), chronic reticuloperitonitis (n = 1), peritonitis (n = 1), and an unknown cause during transport immediately prior to harvest (n = 1). During the harvest of control cows on day 1, three cows (1.9%) were condemned either postmortem due to peritonitis (n = 1) or pneumonia (n = 1), or antemortem due to non-ambulatory status (n = 1). In addition, two cows (1.3%) were removed from the trial during the feeding period since death or non-ambulatory status appeared to be imminent because cows were not observed to be consuming feed due to health problems diagnosed by a licensed veterinarian, which included severe lameness in multiple limbs (n = 1) and a displaced abomasum (n = 1). The combined total of animals whose data were removed from the study was 6.3%. All data from cows that died, were condemned, or were harvested early were removed from the dataset prior to analysis, except for the economic analysis portion of the experiment. Otherwise, no cows were removed from the trial regardless of weight loss. Since BW was highly variable for most cows throughout the feeding period, the accurate objective identification of cows consistently losing weight was extremely difficult.

Statistical analyses

Statistical analysis was conducted using SAS version 9.2[b] with replicate (pen) as the experimental unit. The GLM procedure was used, and the LSMeans option was used to determine means. To determine the main effects of feeding, feeding duration, and zilpaterol supplementation, contrast statements were used to make the following comparisons: 1) fed (cows fed for 70 or 105 days) versus non-fed (control), 2) feeding length (70 versus 105 days), and 3) zilpaterol supplementation versus no zilpaterol supplementation. If there was a feeding duration × zilpaterol supplementation interaction, differences among the four means (70NO, 70ZIL, 105NO, 105ZIL) were identified with an α value of 0.05. When background variables were analyzed, initial BW (on day 0) was found to have a covariate effect, and therefore used as a covariate in the analysis of traits associated with BW.

Results and Discussion

Feedlot performance

Data for initial, final, and change in BW are reported in Table 2. Mean initial BW ± SD for all cows on

day 0 was 1,553.2 ± 239.33 lb (704.5 ± 108.56 kg), and was highly variable based on a coefficient of variation (CV) of 15.4%. No differences were observed ($P > 0.10$) between control and fed cattle for initial BW. However, there was a tendency ($P < 0.06$) for a feeding length × zilpaterol interaction, thus initial BW was used as a covariate for BW analysis. Initial BW for 105zil cows was lower ($P < 0.05$) than other fed treatments, but not different ($P > 0.10$) from controls.

Mean final BW ± SD was 1,795.2 ± 243.65 lb (814.3 ± 110.52 kg), with variation similar to that for initial BW (CV = 13.6%). There was a feeding length × zilpaterol interaction ($P < 0.005$) for final BW. The 70NO, 70ZIL, and 105NO cows had greater ($P < 0.05$) final BW compared to control cows, while 105ZIL cows had greater ($P < 0.05$) final BW compared to control and all other fed treatments. Similarly, there was a feeding length × zilpaterol interaction ($P < 0.005$) for overall change in BW. Cows in the 105ZIL treatment group had a greater ($P < 0.05$) change in BW compared to all other treatments while 70NO, 70ZIL, and 105NO cows had a greater ($P < 0.05$) change in BW than CONTROLS. Final BW and change in BW were not different ($P > 0.10$) among the 70NO and 70ZIL cows. Neill *et al*[8] reported greater BW gain in a 70-day feeding trial with market beef cows implanted and fed a concentrate-based diet compared to non-fed control cows. However, in that study there was no difference in total gain for cows receiving zilpaterol versus no zilpaterol.

The effect of feeding on final BW was consistent. However, it is unclear why there were inconsistent effects of zilpaterol and feeding length on final BW and BW change during the feeding period. Due to the large amount of variation inherent to these cows (BW, age, health status), documenting a relatively small effect of β-agonist supplementation on gain is unlikely. The substantial variation among cows on day 0 was likely due to several reasons, including source, hours since last milking, previous diet, and the amount of time since *ad libitum* water and/or feed was last available. Similar to the current study, Allen *et al*[1] reported an increase in BW with feeding, but they did not observe any effect of a β-agonist (ractopamine hydrochloride) on BW gain.

The main effects on overall ADG among fed cows are included in Table 3. The effect of zilpaterol supplementation on ADG was inconsistent, since 105ZIL cows had a greater ($P < 0.05$) ADG vs 105NO cows, yet ADG was not different ($P > 0.10$) among 70NO and 70ZIL cows. This inconsistency for ADG is likely related to the inconsistent effect of zilpaterol on final BW and change in BW that was reported in Table 3, and due to the highly variable nature of animals used in this experiment combined with the number of animals evaluated. Allen *et al*[1] reported no effect of ractopamine supplementation on ADG in market dairy cows fed for 90 days.

Feeding length influenced DMI, as evidenced by cows fed for 105 days having a lower DMI ($P < 0.02$) than cows fed for 70 days (Table 3). However, zilpaterol supplementation had no effect ($P > 0.10$) on overall DMI. Allen *et al*[1] observed elevated DMI values similar to the current study.

As seen in Table 3, F:G was highly undesirable and highly variable; however, no differences were observed ($P > 0.10$) for the main effects of feeding length or zilpaterol supplementation on F:G, which is comparable to Allen *et al*.[1] However, the current study was not consistent with Quinn *et al*[9] in which F:G was more desirable among cattle supplemented with 200 mg/hd/day of a β-agonist. Also, in market beef cows fed for 42 versus 84 days, Faulkner *et al*[3] reported an advantage of cows being fed for the shorter period of time in both F:G and ADG, which was not observed in the current study.

Table 2. Least squares means for initial, final, and change in body weight (BW) in market dairy cows harvested immediately or fed for 70 or 105 days with or without zilpaterol hydrochloride.

	Treatment[1]						$P <$[2]			
Variable:	CON	70NO	70ZIL	105NO	105ZIL	SEM	Feeding	Length	Zil.	Int.
Initial BW, lb	1545.9[ab]	1594.2[b]	1624.4[b]	1579.4[b]	1443.8[a]	49.93	0.70	0.03	0.21	0.06
Final BW, lb	1556.9[a]	1763.7[b]	1741.0[b]	1765.2[b]	1879.9[c]	21.78	0.0001	0.06	0.01	0.005
Change in BW, lb	0.79[a]	207.7[b]	185.0[b]	209.2[b]	323.9[c]	21.78	<0.0001	0.006	0.03	0.005

[1]Cows were either harvested immediately (CON) or fed for 70 or 105 days with or without zilpaterol hydrochloride (Zilmax, Intervet/Schering Plough Animal Health) at a rate of (1.52 mg/kg) of diet DM.

[2]*P*-values reported are for the main effects of feeding (control vs. fed treatments), feeding length (70 vs. 105 days), and zilpaterol supplementation (zilpaterol vs no zilpaterol), as well as the feeding length × zilpaterol interaction.

[a,b,c]Due to the presence of a feeding length × zilpaterol supplementation interaction ($P < 0.05$), means in a row without common superscripts are different ($P < 0.05$).

Carcass traits

Hot carcass weight performance of cows is included in Table 4. Initial HCW values (which were estimated for the four fed treatments in order to calculate change in HCW during the feeding period) tended ($P < 0.07$) to be greater for control versus fed cows. However, final HCW was greater ($P < 0.0001$) among fed versus control cows, and cows receiving zilpaterol had greater ($P < 0.03$) final HCW than cows not receiving a β-agonist. Consistent with these results, a greater change in HCW resulted from feeding ($P < 0.0001$) and zilpaterol supplementation ($P < 0.03$). Interestingly, HCW gain per day was greater ($P < 0.01$) among cows fed for 70 versus 105 days. Also, zilpaterol supplementation tended ($P < 0.09$) to increase HCW gain per day.

Quinn *et al*[9] reported no difference in HCW for fed cattle versus controls, or cattle receiving ractopamine. However, Allen *et al*[1] was consistent with the current study since they reported an increase in HCW from feeding, but no change in HCW among cows fed a β-agonist.

Fed cows had greater ($P < 0.0001$) measured HCW compared to control cows (Table 5), however feeding length did not have an effect ($P > 0.10$) on HCW, and cows receiving zilpaterol had greater HCW ($P < 0.03$) than cows not receiving zilpaterol. Interestingly, there were no main effects ($P > 0.010$) of feeding, feeding length, or zilpaterol on DP. This directly contrasts previous research in which pre-harvest feeding led to an improvement in DP.[1] Fat thickness was greater ($P < 0.0002$) in fed compared to control cows, but not different ($P > 0.10$) among 70 and 105-day cows or due to zilpaterol. Measured REA was greater among fed ($P < 0.001$) versus control cows, and also greater ($P < 0.01$) among cows

Table 3. Least squares means for average daily gain (ADG), dry matter intake (DMI), and overall feed-to-gain (F:G) in market dairy cows fed for 70 or 105 days with or without zilpaterol hydrochloride

	Treatment[1]					$P <$[2]		
Variable:	70NO	70ZIL	105NO	105ZIL	SEM	Length	Zil.	Int.
Overall ADG, lb/day	3.00[b]	2.71[b]	2.01[a]	2.95[b]	0.187	0.07	0.11	0.01
Overall DMI, lb/day	34.6	32.4	30.9	29.3	1.17	0.02	0.17	0.79
Overall F:G	28.1	17.3	15.5	10.1	8.56	0.28	0.37	0.76

[1]Cows were either harvested immediately (CON) or fed for 70 or 105 days with or without zilpaterol hydrochloride (Zilmax, Intervet/Schering Plough Animal Health) at a rate of (1.52 mg/kg) of diet DM.

[2]*P*-values reported are for the main effects of feeding (control vs fed treatments), feeding length (70 vs 105 days), and zilpaterol supplementation (zilpaterol vs no zilpaterol), as well as the feeding length × zilpaterol interaction.

[a,b]Due to the presence of a feeding length × zilpaterol supplementation interaction ($P < 0.05$), means in a row without common superscripts are different ($P < 0.05$).

Table 4. Least squares means for initial, final, and change in hot carcass weight among market dairy cows harvested immediately or fed for 70 or 105 days with or without zilpaterol hydrochloride.

	Treatment[1]						$P <$[2]			
Variable:	CON	70NO	70ZIL	105NO	105ZIL	SEM	Feed.	Length	Zil.	Int.
Initial HCW (calculated), lb[3]	823.2	798.3	815.5	813.3	806.2	10.08	0.07	0.77	0.55	0.21
Final HCW (actual), lb	823.2	925.7	958.3	913.8	971.1	21.36	0.0001	0.98	0.03	0.54
Change in HCW, lb	0.0	+111.8	+143.1	+108.2	+161.8	19.97	0.0001	0.70	0.03	0.55
HCW gain/day^{-1}, lb	0.0	+1.85	+2.09	+0.97	+1.52	2.16	<0.0001	0.01	0.09	0.48

[1]Cows were either harvested immediately (CON) or fed for 70 or 105 days with or without zilpaterol hydrochloride (Zilmax, Intervet/Schering Ploug Animal Health) at a rate of (1.52 mg/kg) of diet DM.

[2]*P*-values reported are for the main effects of feeding (control vs fed treatments), feeding length (70 vs 105 days), and zilpaterol supplementation (zilpaterol vs no zilpaterol), as well as the feeding length × zilpaterol interaction.

[3]Initial HCW values were calculated for the fed treatments based on the mean dressing percent of the control cows on day 1 (52.1%) and the initial BW values for fed cows.

Table 5. Least squares means for carcass traits of market dairy cows harvested immediately or fed for 70 or 105 d with or without zilpaterol hydrochloride

	Treatment[1]						$P <$[2]			
Variable:[3]	CON	70NO	70ZIL	105NO	105ZIL	SEM	Feed.	Length	Zil.	Int.
Actual HCW, lb	823.2	925.7	958.3	913.8	971.1	21.36	0.0001	0.98	0.03	0.54
DP, %	52.1	52.1	54.6	52.3	52.1	1.19	0.46	0.34	0.28	0.24
Fat thickness, in	0.24	0.35	0.34	0.43	0.37	0.034	0.0002	0.11	0.34	0.44
REA, in^2	11.92	12.14	13.36	13.04	13.70	0.36	0.001	0.10	0.01	0.41
REA per HCW ($in^2 \cdot 100^{-1}$ lb)	1.45	1.31	1.39	1.43	1.41	0.001	0.06	0.02	0.17	0.51
KPH, %	1.36	2.25	1.62	1.86	2.14	0.384	0.05	0.87	0.59	0.22

[1]Cows were either harvested immediately (CON) or fed for 70 or 105 days with or without zilpaterol hydrochloride (Zilmax, Intervet/Schering Plough Animal Health) at a rate of (1.52 mg/kg) of diet DM.

[2]*P*-values reported are for the main effects of feeding (control vs fed treatments), feeding length (70 vs 105 days), and zilpaterol supplementation (zilpaterol vs no zilpaterol), as well as the feeding length × zilpaterol interaction.

[3]DP = dressing percent, REA = ribeye area; KPH = kidney, pelvic, and heart fat.

receiving zilpaterol compared to no zilpaterol. There was a tendency ($P < 0.10$) for cows fed for 105 days to have a greater REA than cows fed for 70 days.

When analyzing REA per 100 lb (45.45 kg) of HCW, fed cows tended ($P < 0.06$) to have less REA per HCW than controls, while 105-day cows had greater REA per HCW than 70-day cows. There was no effect ($P > 0.10$) of zilpaterol supplementation on REA per HCW. Fed cows had greater ($P < 0.05$) KPH than control cows. However, neither feeding length nor zilpaterol inclusion had an effect ($P > 0.10$) on KPH.

Results of the most recent NMCBBQA reported averages for market dairy cows that included 650.1 lb (294.9 kg) HCW, 0.22 in (0.56 cm) fat, 24.6 in^2 (62.6 cm^2) REA, and 1.1% KPH.[5] Generally, the carcasses generated in the current study were heavier, fatter, and more muscular than the average of carcasses evaluated during the NMCBBQA-2007.

Conclusions

Due to the interaction of feeding length × zilpaterol supplementation, the main effects of feeding length and β-agonist supplementation on BW could not be determined. All fed treatments gained an average of 2.0 lb per day (0.9 kg/day) or more during the feeding period, but feed intake was at least 29 lb per day (13 kg/day), leading to undesirable feed-to-gain conversion ratios. Feeding, as well as β-agonist supplementation, had a positive effect on carcass gain, fat thickness, and REA compared to control animals. Overall, feeding market dairy cows improved live and carcass traits associated with carcass weight and yield; however, the effects of zilpaterol supplementation and feeding duration were inconsistent.

Endnotes

[a]Zilmax®, Intervet Inc., Millsboro, DE
[b]SAS Inst., Inc, Cary, NC

References

1. Allen JD, Ahola JK, Chahine M, Szasz JI, Hunt CW, Schneider CS, Murdoch GK, Hill RA: Effect of preslaughter feeding and ractopamine hydrochloride supplementation on growth performance, carcass characteristics, and end product quality in market dairy cows. *J Anim Sci* 87:2400-2408, 2009.
2. Apple JK, Davis JC, Stephenson J, Hankins JE, Davis JR, Beaty SL: Influence of body condition score on carcass characteristics and subprimal yield from cull beef cows. *J Anim Sci* 77:2660-2669, 1999.
3. Faulkner DB, McKeith FK, Berger LL, Kesler DJ, Parrett DF: Effect of trenbolone acetate on performance and carcass characteristics of heifers and cows. *J Anim Sci* 67:1907-1915, 1989.
4. Funston R N, Paterson JA, Williams KE, Roberts AJ: Effects of body condition, initial weight, and implant on feedlot and carcass characteristics of cull cows. *Prof Anim Sci* 19:233-238, 2003.
5. Hale DS, Savell JW, Delmore RJ, Johnson DD, Pringle TD, Henning WR, Maddock RJ, Lawrence TE, Nicholson JDW: *National Market Cow and Bull Beef Quality Audit-2007: A Survey of Producer-Related Defects*. Final Report to the National Cattlemen's Beef Association, Englewood, CO, 2007.
6. Jones SDM: Tissue growth in young and mature cull Holstein cows fed a high energy diet. *J Anim Sci* 56:64-70, 1983.
7. NCBA: *Executive Summary of the 1994 National Non-Fed Beef Quality Audit*. National Cattlemen's Beef Association, Englewood, CO, 1994.
8. Neill S, Unruh JA, Marston TT, Jaeger JR, Hunt MC, Higgins JJ: Effects of implanting and feeding zilpaterol hydrochloride on performance, carcass characteristics, and subprimal beef yields of fed cows. *J Anim Sci* 87:704-710, 2009.

9. Quinn MJ, Reinhardt CD, Loe ER, Depenbusch BE, Corrigan ME, May ML, Drouillard JS: The effects of ractopamine-hydrogen chloride (Optaflexx) on performance, carcass characteristics, and meat quality of finishing feedlot heifers. *J Anim Sci* 86:902-908, 2008.
10. Roeber DL, Belk KE, Smith GC, Tatum JD, Field TG, Scanga JA, Smith CD, Mies PD, Foster HA, Kennedy TK, Moore BR, Hodge SG: Improving the consistency and competitiveness of market cow and bull beef; and, improving the value of market cows and bulls. *The Final Report of the National Market Cow and Bull Beef Quality Audit – 1999*. National Cattlemen's Beef Association, Englewood, CO, 2000.
11. Schnell TD, Belk KE, Tatum JD, Miller RK, Smith GC: Performance, carcass, and palatability traits of cull cows fed high-energy diets for 0, 12, 28, and 56 days. *J Anim Sci* 75:1195-1202, 1997.
12. USDA: Economic opportunities for dairy cow culling management options. USDA-APHIS Info Sheet N205.696, May 1996.