Carcass Quality and Longissimus Tenderness of Calf-Fed Steers and Heifers Produced Using Alternative Growth-Management Strategies

Principal Investigators: J.D. Tatum, Ph.D. and D.R. Woerner, Colorado State University

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Background
The objective of this study was to determine the effects of alternative growth-management strategies for calf-fed steers and heifers, featuring a reduced number of growth-promoting implants, on feedlot performance, carcass quality and longissimus muscle tenderness.

Methodology
Crossbred, calf-fed steers (n=231) and heifers (n=146) were selected for the study and received no growth-enhancement technologies before placement into a feedlot. Weaned calves were weighed individually and randomly assigned to one of 4 growth management treatments. These treatments included: (1) 1X-DEL – a single (1X), delayed (DEL) implant program in which cattle received no initial implant, but were implanted with a terminal finishing implant on day 63 of the test; (2) 1X-RAC – a single implant program in which cattle received an initial implant at the beginning of the test and were supplemented with ractopamine hydrochloride (RAC; Elanco Animal Health, Greenfield, IN) at a daily inclusion rate of 200 mg/animal during the final 28 days of finishing; (3) 2X-CONV – a conventional, 2-implant program in which cattle received an initial implant at the beginning of the test and, then, were re-implanted on d 63 of the test; 4) 2X-RAC – a conventional 2-implant program, identical to Treatment 3, except that these cattle also were supplemented daily with RAC (200 mg/animal) during the final 28 d of finishing.

Approximately one month later, an on-test body weight was recorded for each animal and calves in treatment groups 2, 3 and 4 each received an initial implant. Steers received Revalor-IS initial implants (80 mg TBA and 16 mg E₂) and heifers received Revalor-H initial implants (80 mg TBA and 8 mg E₂). All cattle were reweighed two months later and animals in treatment groups 1, 3 and 4 received terminal implants.

At the beginning of the test period, cattle were receiving a 66% concentrate diet. A series of 5 step-up diets were used to gradually increase the concentrate level of the diet to approximately 90% over a 46-day period. Twenty eight days before each projected harvest date, individual body weight was recorded and the 28-day RAC supplementation period was initiated.

Carcass data was collected after harvest and measurements of longissimus muscle areas were obtained for each carcass using a video image analysis system (Computer Vision System; Research Management Systems, Inc., Fort Collins, CO). Additionally, objective color measurements were taken on the exposed longissimus (striploin) muscle at the 12th/13th rib interface.

Carcasses were fabricated and the striploin (IMPS #180) was collected from the right sides of each. On day three postmortem, each striploin was assigned to a sampling scheme that randomly specified anatomical locations of longissimus muscle sections that would be assigned to each of the five postmortem aging periods (3, 7, 14, 21 and 28 days). Sections were removed, vacuum-sealed, frozen and cut into steaks using band saw. Sections aged for 3 days were fabricated into 2 steaks randomly designated for either Warner-Bratzler shear force (WBSF) or Slice Shear Force (SSF). The other 4 sections were fabricated into one steak for WBSF tenderness determination.
Findings

The 2X-CONV strategy improved ADG 5% and increased carcass weight 26 pounds compared with the 1X-DEL strategy. However, the 1X-DEL strategy improved quality grade performance and resulted in fewer heavyweight carcasses. 2X-RAC cattle showed a 21 pound advantage in final live weight and a 9 pound advantage in carcass weight compared with 2X-CONV cattle.

Cattle that were implanted twice (2X-CONV and 2X-RAC) produced heavier carcasses than did cattle implanted once during finishing. A higher percentage of cattle that received 2 implants produced heavyweight carcasses. Also, 2X-RAC cattle produced carcasses with larger longissimus muscle areas, whereas longissimus muscle areas of 1X-RAC cattle were smaller. Cattle in the 1X-DEL group had longissimus muscle areas that were similar to those of 1X-RAC cattle, but smaller than longissimus areas of cattle in the 2X-RAC group. Carcass weight was the only carcass trait that differed between the two sex classes in the current study; steers produced heavier carcasses than did heifers.

Growth-management strategy influenced both 3-day longissimus muscle area SSF and WBSF. Neither single-implant treatment (1X-DEL, 1X-RAC) differed from the 2X-CONV treatment with respect to SSF or WBSF. However, combining RAC supplementation with the use of 2 finishing implants significantly reduced longissimus muscle tenderness. Cattle in the 2X-RAC group produced longissimus steaks that had higher values (less tender) for SSF and WBSF than steaks from cattle in all other treatment groups.

After 3 days of postmortem aging, longissimus steaks from heifers had higher WBSF values than did longissimus steaks produced by steers. However, longissimus WBSF did not differ between the sex classes when samples were aged 7, 14, 21 or 28 days postmortem.

Additional analysis were conducted to compare effects of the 4 growth-management strategies on beef carcass value characteristics and predicted consumer acceptance of longissimus steaks. None of the growth management strategies adversely affected predicted consumer acceptability of longissimus steaks. When steaks were aged for 14 days or more, the probability that a majority of consumers would experience a satisfactory eating experience was 0.68 or greater.

Implications

The 2X-CONV strategy improved ADG 5% and increased carcass weight 26 pounds compared with the 1X-DEL strategy. However, the 1X-DEL strategy improved quality grade performance and resulted in fewer heavyweight carcasses. 2X-RAC cattle showed a 21 pound advantage in final live weight and a 9 pound advantage in carcass weight, compared with 2X-CONV cattle.

Feeding Optaflexx to twice-implanted cattle did not affect quality grade performance; however, strip steak tenderness was reduced slightly. None of the growth-management strategies evaluated in the current study adversely affected predicted consumer acceptability of strip steaks.
For more information contact:
National Cattlemen's Beef Association
9110 East Nichols Avenue
Centennial, Colorado 80112-3450
(303) 694-0305