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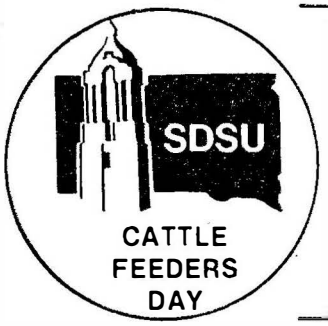


# EFFECTS OF SEX AND HORMONAL IMPLANT ON BEEF CARCASS CHARACTERISTICS AND PALATABILITY

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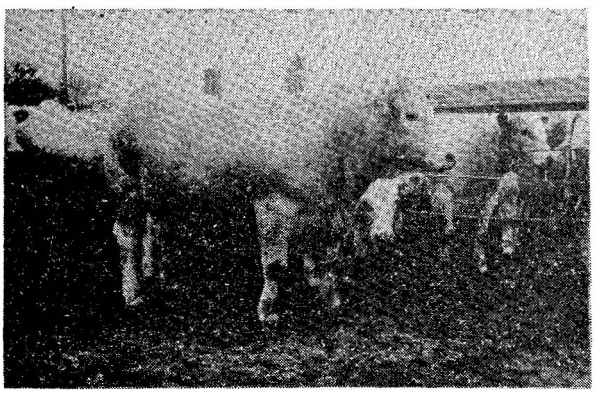
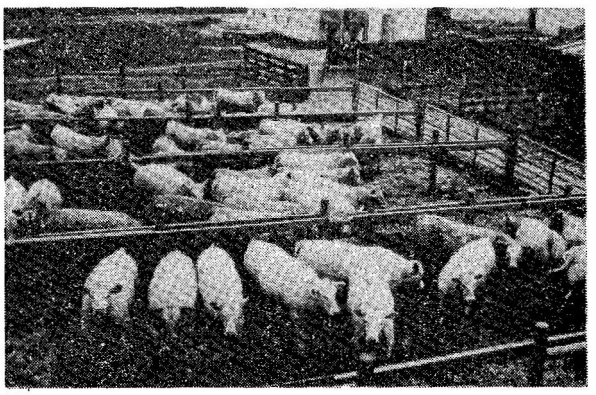
## Summary

A comparison of crossbred bulls, steers and heifers indicated that bulls have heavier carcasses, larger rib eyes and a more desirable yield grade. The USDA quality grade of the bulls was one-third of a grade lower than for the steers and heifers. The sensory and palatability characteristics showed no significant differences among sexes. Implanted bulls as compared to non-implanted bulls showed more desirable taste panel scores for tenderness, juiciness and overall panel desirability.

## Introduction

Today's calorie and price conscious American consumer is seeking trim, lean, competitively priced meat products. As grain becomes more scarce in an effort to feed worldwide populations and the demand for animal protein increases, it may become necessary to increase the amount of beef produced and at the same time increase production efficiency. The current increased demand for ground beef and processed meat items may encourage producers to look at some alternatives in beef production.





The Charolais crossbred cattle on feed at the Southeast South Dakota Experiment Farm.

## Procedure

Ninety-eight Charolais cross cattle were used to evaluate the effect of sex and implant on carcass characteristics and palatability. The cattle consisted of 24 bulls, 22 steers and 52 heifers all artificially sired by the same Charolais bull. All animals were raised under South Dakota conditions and given Ralgro implants twice during the preweaning period. Immediately postweaning all animals were divided by sex as nearly as possible into eight equal groups. One-half of the animals in each pen were randomly selected to be implanted with Synovex according to the required sex treatment on the label. The cattle were fed in outside concrete lots with fence-line bunks and cable fences.

The cattle were fed identical diets of 75% Cold-Flo ammonia-treated corn silage and 25% cracked shelled corn (as fed) plus a commercial supplement for the first 73 days. The cattle were then switched to a ration of 75% whole shelled corn and 25% of the same corn silage (as fed) plus supplement for the remainder of the trial. The cattle previously implanted were reimplanted at the start of the finishing phase.

At the conclusion of the feeding trial, the cattle were slaughtered at a commercial packing company. A USDA grader provided the quality and yield grade information at the packing plant. The wholesale rib from one side of each carcass was transported to the SDSU meat lab. The rib was used to provide detailed information regarding the fat, bone and lean content of the carcasses. In addition, samples were taken from the rib to provide for Warner-Bratzler shear, proximate analysis and taste panel evaluation.

## Results

The mean values for carcass characteristics according to sex are reported in table 1. Bulls and steers were significantly heavier and thus produced heavier carcasses than heifers. The bulls were about 1% higher in dressing percent than the other sexes. The rib eye size was largest for the bulls followed by the steers and heifers. Fat thickness showed no significant differences among sexes. The heifers had a significantly higher percentage of kidney, heart and pelvic fat. The marbling scores were highest for the heifers followed by the steers. The steers and heifers qualified for the USDA choice quality grade, while the bulls graded high good. Yield or cutability grade showed no significant differences among the sexes.

Table 2 shows the mean values for the separable lean, fat and bone components of the 9-10-11 rib. Previous research has indicated that the 9-10-11 rib components are highly ($P<.001$) related to corresponding tissue components of the total carcass. As indicated in table 2, bulls had a higher percentage bone than the steers or heifers. The bulls had significantly less subcutaneous, intermuscular and intramuscular fat as well as less total fat. Heifers and steers had about the same percent lean, whereas bulls had a significantly higher amount of lean. The data showed no significant differences for muscle-to-bone ratios among the sexes.

Table 3 presents the sensory and palatability characteristics of bull, steer and heifer carcasses. There were no significant differences in any of the values reported in table 3 which indicates no major palatability differences among bulls, steers and heifers. The bulls showed a trend toward

Table 1. Carcass Characteristics of Crossbred Bulls, Steers and Heifers

| Trait | Bulls | Steers | Heifers |
|---|---|---|---|
| Live wt., lb.*** | 1271[a] | 1233[a] | 1127[b] |
| Carcass wt., lb.*** | 817[a] | 782[a] | 711[b] |
| Dressing percent | 64.3 | 63.4 | 63.1 |
| Rib eye area, sq. in.*** | 15.1[a] | 14.3[ab] | 13.7[b] |
| Fat thickness, in. | .20 | .21 | .24 |
| Kidney, heart and pelvic fat, %*** | 2.4[a] | 2.7[ab] | 3.2[b] |
| Marbling score** | Slight+[a] | Small+[b] | Small-[ab] |
| Quality grade** | Good+[a] | Choice-[b] | Choice-[ab] |
| Yield grade | 1.8 | 2.0 | 2.1 |
| Days of age*** | 441[a] | 441[a] | 430[b] |

* P<.05 level of significance.
** P<.01 level of significance.
*** P<.001 level of significance.
[a,b] Means with similar superscript letters do not differ significantly from each other (P<.01).

Table 2. Mean Values for Separable Components of 9-10-11 Rib By Sex

| | Sex classification | | |
|---|---|---|---|
| Trait | Bulls | Steers | Heifers |
| Bone, %* | 13.8[a] | 13.2[ab] | 12.9[b] |
| Fat, %** | 30.2[A] | 34.7[B] | 34.8[B] |
| Subcutaneous, %*** | 6.4[A] | 7.9[B] | 8.4[B] |
| Intermuscular, %*** | 21.6[A] | 24.4[B] | 23.4[B] |
| Intramuscular, %** | 1.4[A] | 1.5[AB] | 1.8[B] |
| Lean, %*** | 56.0[A] | 52.1[B] | 52.2[B] |
| Muscle-to-bone ratio | 4.1 | 4.0 | 4.1 |

* P<.05 level of significance.
** P<.01 level of significance.
*** P<.001 level of significance.
[a,b] Means with similar superscript letters do not differ significantly from each other (small letters = P<.05; capital letters = P<.01).

Table 3. Mean Values for Sensory and Palatability Characteristics by Sex

| Trait | Sex classification | | |
|---|---|---|---|
| | Bulls | Steers | Heifers |
| Juiciness[a] | 5.4 | 5.2 | 5.2 |
| Tenderness[b] | 5.3 | 5.8 | 5.5 |
| Connective tissue amount[c] | 4.8 | 5.2 | 5.2 |
| Flavor desirability[d] | 5.3 | 5.7 | 5.6 |
| Overall desirability[d] | 5.1 | 5.5 | 5.5 |
| Cooking loss, % | 28.3 | 30.3 | 29.9 |
| Shear, kg. | 4.7 | 4.0 | 4.3 |

[a] Extremely dry = 1, slightly juicy = 5, extremely juicy = 8.
[b] Extremely tough = 1, slightly tender = 5, extremely tender = 8.
[c] Abundant = 1, slight = 5, none = 8.
[d] Extremely desirable = 1, slightly desirable = 5, extremely desirable = 8.

decreased tenderness, slightly more connective tissue and less flavor desirability. However, the bulls showed a trend toward increased overall eating desirability and lower cooking losses.

Table 4 displays the mean values for sensory and palatability characteristics by sex and hormonal treatment. Significant differences were found with regard to tenderness, in that implanted bulls were more tender than their nonimplanted controls, while heifers and steers showed the reverse effect when implanted. Juiciness and the amount of connective tissue also followed the same trend. Overall eating desirability also indicated that implanted bulls were more desirable than the nonimplanted bulls. However, in the case of the steers and heifers, the nonimplanted cattle had higher overall desirability scores than the implanted cattle. These data suggest that implanted bulls may more closely resemble steer and heifer quality, palatability and sensory characteristics.

Table 4. Mean Values for Sensory and Palatability by Sex and Hormonal Treatment

| | Bulls | | Steers | | Heifers | |
|---|---|---|---|---|---|---|
| | Control | Implant | Control | Implant | Control | Implant |
| Juiciness* | $5.0_{A}$ | $5.7_{B}$ | $5.2_{B}$ | $5.2_{B}$ | $5.4_{B}$ | $5.1_{AB}$ |
| Tenderness*** | $4.7_{A}$ | $5.9_{B}$ | $5.9_{B}$ | $5.7_{B}$ | $6.0_{B}$ | $5.0_{AB}$ |
| Connective tissue amount | $4.6^{a}$ | $5.1^{ab}$ | $5.3^{b}$ | $5.1^{ab}$ | $5.5^{b}$ | $4.9^{ab}$ |
| Flavor desirability | $5.3_{A}$ | $5.4_{AB}$ | $5.8_{B}$ | $5.6_{AB}$ | $5.7_{B}$ | $5.2_{AB}$ |
| Overall desirability* | $4.8_{A}$ | $5.4_{AB}$ | $5.6_{B}$ | $5.4_{AB}$ | $5.7_{B}$ | $5.3_{AB}$ |
| Cooking loss, % | 29.4 | 27.2 | 30.6 | 30.0 | 29.6 | 30.2 |
| Shear, kg. | 4.9 | 4.6 | 3.7 | 4.2 | 3.8 | 4.8 |

* $P<.05$.
*** $P<.001$.
$^{a,b}$ Means with similar superscript letters do not differ significantly from each other (small letters = $P<.05$; capital letters = $P<.01$).