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Abstract

Because tenderness is considered the most desired eating characteristic in meat, more emphasis should be placed on this trait in evaluating beef quality in breeding and selection programs. Both tenderness and marbling are highly heritable traits (Heritability = approximately 0.6), therefore much improvement could be made through progeny testing of sires; however, this requires considerable time and expense. This consideration, plus an increasing interest in feeding young beef bulls for market, led to an interest in applying a biopsy technique to evaluate and predict meat quality in the live animal.

Keywords

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A Biopsy Technique to Predict Quality in the Live Beef Animal with Emphasis on Tenderness

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Because tenderness is considered the most desired eating characteristic in meat, more emphasis should be placed on this trait in evaluating beef quality in breeding and selection programs. Both tenderness and marbling are highly heritable traits (Heritability = approximately 0.6), therefore much improvement could be made through progeny testing of sires; however, this requires considerable time and expense. This consideration, plus an increasing interest in feeding young beef bulls for market, led to an interest in applying a biopsy technique to evaluate and predict meat quality in the live animal.

Twenty-one Hereford yearling bulls representing five sire groups, owned by South Dakota State University[I], were biopsied by personnel from Kansas State University[II]. The bulls had been fed a ration moderately high in roughage for optimum growth.

The bulls were injected with a tranquilizer and a muscle sample was surgically removed from the l. dorsi (loin eye) muscle between the 12th and 13th ribs. The samples were frozen in liquid nitrogen and transported to Kansas State. Salt extractable proteins were determined and, in addition, total protein, moisture and ether extract (fat) were determined from the biopsy sample. Histological evaluation was employed on other portions of the sample.

Three days after the operation the bulls were slaughtered. Carcass data were obtained 72 hr. post-mortem and the loins and ribs were transported to Kansas State. A steak was removed from the shortloin, cooked, and evaluated for both tenderness and acceptability.

Results and Discussion

There appeared to be no complications or serious impairment of the bulls after the operation other than some swelling and soreness of the area. Other researchers have reported no permanent impairment of the biopsied animals.

Tenderness and acceptability as judged by an experienced taste panel were quite acceptable and were comparable with those factors from steer and heifer steaks (evaluated in an earlier study).

I Appreciation is extended to the South Dakota State University Animal Science Department for their cooperation in this study.

II Dr. J.G.E. Vestweber, DVM, College of Veterinary Medicine, Kansas State University performed the biopsies.

In this earlier study ribs were selected from steer and heifer carcasses in a packing plant. They were chosen with a modest degree of marbling (avg. Choice) and tenderness and eating characteristics were evaluated as reported here (table 9). Steaks from the bulls required slightly greater shear force and were judged slightly less tender; however, their acceptability was essentially the same as steaks from steers and heifers. The grade advantage (avg. Choice vs. low Good) for steers and heifers resulted in only slight advantage in eating quality.

Protein solubility, ether extract, moisture percentage and muscle texture were only slightly related to tenderness. Thus, the prediction equation did not estimate tenderness accurately. In the earlier study of steers and heifers, a prediction equation was quite accurate for evaluating tenderness therefore it was thought that tenderness could be predicted in this study. The low relationships between the characteristics studied and tenderness can be partially explained by the fact that there was little tenderness variation in the bulls and failure of taste panel tenderness scores to correlate with Warner-Bratzler shear forces.

One very encouraging and important aspect of this study was that carcass grade could be predicted with high accuracy. A prediction equation accounted for 78% of the variation in carcass grade. The prediction equation used was: Y=11.67 + 1.32 (ether extract) + 7.19 (HEPES extractable protein fraction) + 0.15 (texture score) -0.15 (moisture percentage) + 0.67 (0.35 M KCl extractable protein fraction).

Table 9. Means of Warner-Bratzler shear force, taste panel evaluation, marbling score and U.S.D.A. grade.

	Warner-Bratzler[A] shear force (lb.)	Taste panel[B] tenderness	Taste panel[B] acceptability	Marbling score	U.S.D.A. Grade
Steaks from 21 Hereford Bulls	7.33	4.96	5.15	Slight-	Good-
Steaks from 20 Steers and Heifers	6.55	5.33	5.19	Modest	Choice

A Pounds of force required to shear through a ½ in. core of meat. A lower shear force= more tender.

B Score of 1=extremely undesirable, 2=undesirable, 3=moderately undesirable, 4=acceptable, 5=moderately desirable, 6=desirable, 7=extremely desirable.