

# **The Association of Beef Carcass Conformation and the Yield of Thick and Thin Meat**

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Many have believed for some time that beef cattle and beef carcasses described as more "desirable" in conformation actually yield more lean meat and have a higher ratio of lean to bone than those described as "inferior" in conformation. The "ideal beef carcass" has often been described as blocky, compact, straight-sided, smooth and yielding a high percentage of the higher value wholesale cuts (loin, rib and round).

Beef carcass composition studies have traditionally used such measures as total carcass fat, lean and bone; edible portion and the yield of trimmed, boneless retail cuts from the round, loin, rib and chuck as "end points" for use in characterizing the product. Research to date has failed to demonstrate a significant positive association between desirable conformation, as described above, and the yield of separable lean. Moreover, numerous studies have pointed to the rather marked influence of fat in confounding visual appraisals for "desirable" conformation in slaughter cattle as well as in carcass beef. The need to consider more fully a comparison of the yield of thick, high value muscle from carcasses differing in conformation formed the basis for this study.

## **Procedure**

These preliminary trials were conducted in an effort to study beef carcass conformation by a new method developed at this station during the past year. The method involves determination of the yield of closely trimmed, boneless "thick" and "thin" muscles, expressed as a percent of the streamlined carcass weight, defined later in this report.

In general, "thick" muscles consist of muscles and/or muscle systems from the carcass considered to be suitable for steaks and roasts (high value cuts). The remaining muscles are classified as "thin" muscles (lower value cuts). The thick muscles of the hind-quarter include closely trimmed, boneless muscles and/or muscle systems that were two inches or more in thickness. They are as follows: strip loin, tenderloin, top-butt, knuckle, top round, bottom round and eye of the round. Fore-quarter thick meats include closely trimmed, boneless muscles and/or muscle systems (free of excessive seam fat) that are three inches or more in thickness. These are classified as chuck and rib roasts.

Thin meats include all the lean tissues that do not meet the requirements for thick meats. Muscles and/or muscle systems are trimmed to the specified thickness requirements using a modified swine back-fat probe as a measure of muscle thickness.

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Ten pairs of high standard and low choice conformation steer carcasses, *carefully paired* for similar ribeye area, marbling score, fat thickness at 12th rib, maturity group, carcass weight and estimated percentage kidney, heart and pelvic fat were purchased from a meat packer for use in the study. A comparison of carcass characteristics by conformation grade is presented in Table 1.

A visual comparison of the differences in choice and standard conformation in the hind quarters is presented in Figure 1.

*Results and Discussion:* Table 2 presents the means of average percentage yields of thick and thin meats and total lean, fat and bone on an unadjusted and an adjusted basis.

The unadjusted mean difference (unadjusted for difference in separable fat between the two conformation groups) of 0.93 percent in yields of thick meat, 31.50 and 30.57 percent for choice and standard conforma-

Table 1. Comparison of Average Carcass Characteristics

	Conformation	
	Low Choice	High Standard
Carcass (no.)	10	10
Marbling score <sup>1</sup>	6.1	6.6
Fat thickness—12th rib (in.)	0.35	0.29
Ribeye area (sq. in.)	12.79	11.26
Carcass weight (lb.)	599.78	600.34
Kidney, pelvic and heart fat (lb.)	24.40	33.01

<sup>1</sup> Marbling was scored on a 1-12 number scale, 1—devoid and 12—extremely abundant.

Table 2. Means of Average Percentage Yields of "Thick and Thin Meats" and of Total Lean, Fat and Bone.

Trait <sup>1</sup>	Carcass Conformation			Carcass Conformation		
	Choice % Unadj. <sup>2</sup>	Standard % Unadj. <sup>2</sup>	Mean Diff. <sup>2</sup>	Choice % Adj. <sup>3</sup>	Standard % Adj. <sup>3</sup>	Mean Diff. <sup>3</sup>
"Thick meat"	31.50	30.57	0.93	31.80	30.28	1.52
"Thin meat"	34.61	35.43	0.82	35.16	34.88	0.28
Total lean <sup>4</sup>	66.11	66.00	0.11	66.92	65.21	1.71
Total fat	19.48	16.88	2.60			
Total bone	14.39	17.11	2.72			

<sup>1</sup> All traits are expressed as a percentage of the streamlined carcass weight (carcass weight minus kidney, heart and pelvic fat).

<sup>2</sup> Means are unadjusted for differences in fat between the two conformation groups.

<sup>3</sup> Means adjusted for differences in fat between the two conformation groups.

<sup>4</sup> The sum total of thick and thin meat.



tion groups respectively was statistically significant. Thus there was a small, but an apparent real advantage for choice conformation in terms of the yield of high value steak and roast meat (thick meat). The adjusted mean difference, of 1.52 percent, pointed to a more meaningful advantage for choice in this regard.

Standard conformation carcasses were observed to have a slightly higher percentage of thin meat than choice conformation carcasses. Total lean yields were found to be almost identical between the two groups. Thus, the lean content of these beef carcasses, differing in conformation, but of similar weights, was relatively constant and fat and bone were the major variables. The choice conformation carcasses had on the average 2.72 percent less bone than the standard carcasses.

Muscles and muscle system yield comparisons from the hind-quarters were made between the two groups, a summary of which is presented in Table 3.

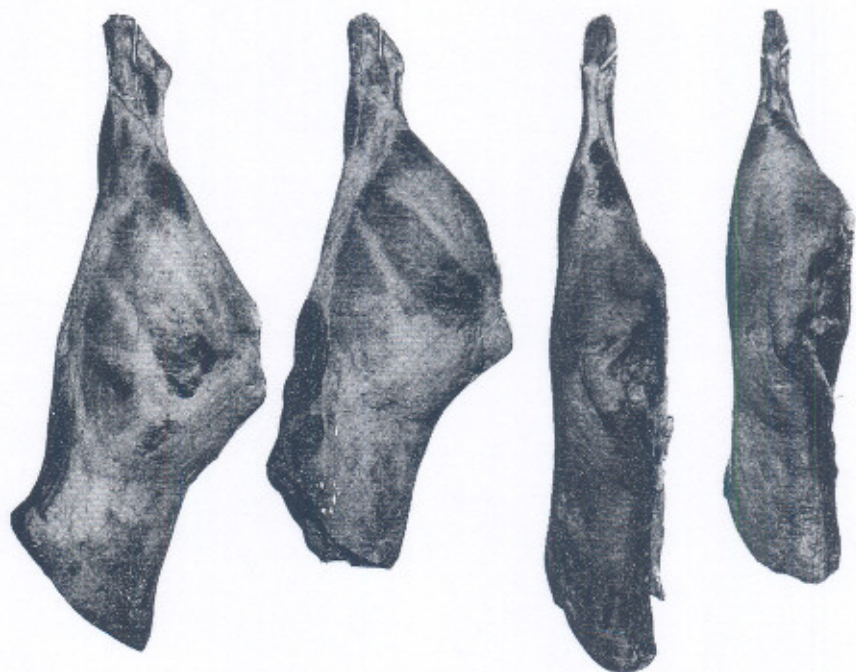


Figure 1. Lateral (left pair) and Dorsal (right pair) views showing a comparison of standard and choice hind-quarter conformation.

Table 3. Percentage Yield Mean Values and Mean Differences for Individual Hind-Quarter Muscles and Muscle Systems.

Muscle or Muscle System <sup>1</sup>	Carcass Conformation		Mean Difference (%)
	Choice (%)	Standard (%)	
Tender loin	0.97	1.03	-0.06
Strip loin	2.68	2.56	0.12
Top-butt	2.69	2.49	0.20
Knuckle	3.16	3.19	-0.03
Top round	3.75	3.75	0.00
Bottom round	2.87	2.46	0.41
Eye round	1.33	1.31	0.02

<sup>1</sup> All muscle and muscle systems are expressed as a percentage of the streamlined carcass weight.

Choice conformation carcasses were found to have higher percentage yields of all muscles studied except two, the tenderloin and knuckle. Choice carcasses had significantly more top-butt and bottom round. This is of special interest since the top-butt (sirloin) and the bottom (outside) round are two muscle systems that are viewed directly when one makes a visual appraisal for conformation in the hind quarter. These results suggest that perhaps these two muscles have more influence on conformation appraisals than some of the other muscles in the hind quarter.

Differences in length, width and depth measurements of muscles and muscle systems were quite pronounced. In general, the standard conformation carcasses produced longer, wider, thinner muscles and muscle systems than the choice carcasses. However, most of the standard muscles lost the advantage of greater length and width when these were trimmed to meet the specifications for thick meat (high value cuts). Without exception, muscles of choice carcasses were thicker than those from standard conformation.

The ratio of lean to bone is a commonly used comparison, often employed by those engaged in the evaluation of beef carcasses to indicate carcass desirability with reference to these components. In this study, the choice conformation carcasses had an average ratio (fat adjusted) of thick meat to bone of 2.17:1 as compared to 1.83:1 for the standard carcasses. Similarly, adjusted ratio values of 4.55:1 and 3.90:1 were obtained for total lean to bone in choice and standard carcasses, respectively.

Thus, from these data, it appears that differences in total lean in carcasses of similar weight, but of different conformation may, indeed, be very small. Consistent and statistically significant advantages for choice conformation were observed in the yield of thick, high value meat. This advantage for choice, however, is not as great as many have believed. The most striking advantages for choice conformation were found to be in the ratio of total lean to bone and thick high value meat to bone. Standard conformation carcasses, on the other hand, were observed to have appreciably more bone and less fat.