Only 33 percent of the heifers had reached puberty by the time MGA feeding was started. However, 81.5 percent responded with a synchronized estrus. This suggests that if heifers are at an age and weight at which puberty should occur, its onset can be stimulated by the oral progestogen, MGA. Similar observations have been made in Hereford heifers fed medroxyprogesterone acetate (MAP).

No undesirable side effects of any sort were noted to be associated with the feeding of MGA. Therefore, the results obtained in this study indicates that melengestrol acetate is a safe and effective means of synchronizing estrus.

The Association Between Beef Carcass Conformation and Carcass Composition

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Story in Brief

Muscle development in slaughter cattle has become increasingly more important during recent years as the result of increased emphasis on high ratios of lean to fat and of lean to bone in retail cuts of beef by the consumer. These studies suggest that superior carcass conformation, as generally interpreted, is not closely related to percentage yields of the thick, high value muscle in the carcass. With one exception, lower conformation carcasses were found to be comparable to the higher conformation carcasses in the percentage yield of high value muscle.

The most striking differences between the carcass conformation grades were found to be in fat and bone percentages. Standard and Low Good conformation carcasses were observed to have more bone and less fat than Choice conformation carcasses. Since differences in muscle content (on a carcass basis) were quite small, the sum of percentage fat and percentage bone was observed to make up a rather constant percentage of the carcass weight among conformation groups.

From Oklahoma Agricultural Experiment Station Project Contributing to Southern Regional Research Project, SM-19.

Introduction

Beef carcass conformation appraisals have traditionally been associated with carcass value. The inclusion of carcass conformation in the U.S.D.A. Beef Carcass Grading Standards has been based on the belief that so-called superior carcass conformation (width and fullness in relation to length, etc.) is related to yield of the preferred cuts of beef.

Several studies have pointed out that fat tends to be a confounding factor when visual appraisals for beef carcass onformation are made. These studies further revealed the lack of positive and significant association between conformation and retail yield. On the other hand, some researchers have observed a positive association between percent carcass bone and retail yield. Since superior conformation has been assumed to reflect a high ratio of lean to bone, there appears to be a contradiction between what is commonly accepted as superior carcass conformation and measures of value based on muscle yields. The need to consider more fully the associations between carcass conformation and carcass composition (thick muscle, thin muscle, total muscle, fat and bone) formed the basis for this study.

Procedure

This research was conducted in two phases over a two-year period, 1966-1967. Phase I (1966) involved feeding two different types of feeder steers (Choice and Common). Forty feeder calves were utilized,—twenty of each type. Half of each type was fed a fattening type ration for 100 days, and the remaining steers were full fed for 140 days before slaughter. The ration fed was a conventional fattening ration consisting of approximately 65 percent concentrates and 35 percent roughage.

Phase II (1967) involved dry-lot feeding 15 Growthy Choice crossbred steers (Charolais X Angus), 15 Conventional Choice steers (Angus) and 13 Common feeder steers (Ayrshire) to a live weight, based on anticipated dressing percentage, that would result in 600 pound carcasses.

At the end of each respective feeding period (1966) or at the time proper live weight was reached (1967) the animals were weighed (after an overnight shrink) and trucked from the Ft. Reno Experiment Station to Oklahoma City for slaughter. Routine carcass information was collected in the cooler, and the right side of each carcass was shipped to the O.S.U. Meat Laboratory for further study and processing. The cutting method involved the determination of the yield of closely trimmed, boneless "thick" and "thin" muscles, fat and bone and expressed as a

percentage of the cold carcass weight. Briefly, thick muscles consisted of muscles and/or muscles systems from the carcass considered to be suitable for steak and roast (high value cuts). Thick muscles and/or muscle systems were as follows: strip loin, tenderloin, top-butt, knuckle, top round, bottom round, eye round, chuck roast and rib roast. Thin muscle included all of the lower value muscle from the underline cuts, bone trimmings, etc. This method differs from conventional retail cutting tests in that a more critical differentiation is made between high value thick muscle and lower value thin muscle.

Results: Phase I

Table 1 presents averages of certain of the production and carcass characteristics. The Common feeder steers were considerably lighter in weight when they were placed on feed, and they produced lighter weight carcasses than the Choice steers. While there were differences in initial weight on feed between the two groups, their ages were quite comparable. The thicker-fleshed choice steers were heavier for their age.

Choice steers had significantly higher dressing percentages, and the carcasses graded higher than those of the Common steers. The Choice carcasses graded, on the average, one and one-half U.S.D.A. conformation grades higher than the Common carcasses (high Choice versus low Good). On the average, Common carcasses had less fat thickness at the 12th rib. This may, in part, be a function of lighter average carcass weight. It is not known if this difference in fat thickness would have prevailed had the Common steers been fed to comparable Choice steer weights. Differences between the two types with respect to predicted U.S.D.A. cutability were small, however, the lighter weight Common car-

Table 1. Comparison of Some Average Production and Carcass Characteristics (1966)

Characteristic	Feeder Grade			
	Common Days on Feed		Choice Days on Feed	
	100	140	100	140
Number of steers	10	8	8	10
Initial weight, lbs.	430.5	423.8	565.0	555.5
Cold carcass weight, lbs.	406.4	456.1	520.6	575.7
Dressing percent	58.3	59.2	64.1	62.9
Marbling score	Slight	Small	Small	Modest
Conformation score	Good —	Good —	Choice +	Choice +
Final U.S.D.A. grade	Good —	Good +	Choice —	Choice
Average fat thickness 12th rib, inches	0.27	0.42	0.52	0.67
Rib eye area, sq. inches	8.84	9.06	10.55	10.86
Cutability, U.S.D.A. prediction	51.43	49.72	49.87	48.25

casses were slightly favored, primarily because of their lower fat measurements.

Major carcass component yields and ratios are summarized in Table 2. Thick muscle, thin muscle and total muscle yields were very similar between the two types—Common and Choice. Total muscle yields were slightly higher for the two groups of Common carcasses when expressed as percent of cold carcass weight. While little association was observed between differences in carcass conformation and muscle component yields, differences in fat and bone yields, on the other hand, were found to be associated with differences in conformation.

Lower conformation Common carcasses were observed to have less fat and more bone than the corresponding Choice groups. Increased bone percentages in carcasses from Common steers were offset by a lower percentage fat while lower bone percentage within the Choice carcasses were associated with higher percentages of fat. Thus, fat and bone combined were found to make up a relatively constant percentage of the carcass weight among conformation groups or "types".

Muscle-bone ratios were investigated and are presented in Table 2. The Choice feeder steers produced carcasses with much higher ratios of both thick and total muscle to bone than the lower conformation carcasses produced from the Common feeder steers. However, it should be pointed out that the ratios were higher within the higher conformation carcasses because of a smaller percentage of bone and not because of more muscle.

Table 2. Average Percentage Yields[1] of Carcass Components and Ratios (1966)

	Feeder Grade			
	Common Days on Feed		Choice Days on Feed	
Component	100	140	100	140
Thick muscle	30.99	29.92	30.30	28.41
Thin muscle	27.20	27.78	27.16	26.76
Total muscle[2]	58.19	57.70	57.46	55.17
Fat[3]	20.20	22.29	23.94	26.34
Bone	17.30	14.97	13.60	12.58
Fat + Bone	37.50	37.26	37.54	38.91
Ratio thick muscle/bone	1.80:1	2.00:1	2.23:1	2.26:1
Ratio total muscle/bone	3.38:1	3.87:1	4.23:1	4.40:1

[1] As percent of cold carcass weight
[2] Sum of thick and thin muscle yields
[3] Fat does not include *kidney, pelvic* and *heart fats*

Individual thick muscle and muscle system yield comparisons were made between the two carcass classifications, a summary of which is presented in Table 3. Again, results from the two types were strikingly similar. Within both types, the yields decreased with an increase in length of feeding period, which was expected since increased amounts of fat lower the muscle yields. Total thick muscle yields from the hind and fore quarters further suggested that muscle weight distribution was effected very little by carcass conformation.

Results: Phase II

Phase II differed from Phase I in that steers were fed until they reached a live weight that would produce 600 pound carcasses, rather than on a time constant basis, as in Phase I. This procedure was followed in order to reduce, as much as possible, carcass weight variation among the test groups. Table 4 presents certain of the average production and carcass characteristics. Average conformation grades ranged from high Standard (Common carcasses) to average Choice (Conventional Choice and Growthy Choice carcasses). Conventional Choice carcasses averaged 0.73 inches of fat at the 12th rib as compared to 0.50 and 0.42 for the Growthy Choice and Common carcasses respectively. Average predicted U.S.D.A. cutability percentages (weight of boneless, closely trimmed round, loin, rib and chuck expressed as a percent of the cold carcass weight) were similar for the Common and Conventional Choice carcasses (48.2 versus 48.9 respectively) while the Growthy Choice carcasses averaged 50.8 percent—approximately two percent higher.

Table 3. Mean Percentage Yields[1] of Individual Muscles and Muscle Systems (1966)

	Feeder Grade			
	Common Days on Feed		Choice Days on Feed	
Muscle	100	140	100	140
Hind Quarter				
Strip	2.47	2.33	2.36	2.22
Tender	1.19	1.11	1.16	1.17
Top butt	2.47	2.31	2.40	2.23
Knuckle	3.09	2.90	2.90	2.67
Top round	3.94	3.71	3.88	3.60
Bottom round	3.71	3.59	3.59	3.40
Eye round	1.32	1.25	1.37	1.31
Thick muscle, hind	18.19	17.20	17.66	16.60
Fore Quarter				
Rib roast	3.53	3.47	3.46	3.08
Chuck roast	9.25	9.24	9.17	8.73
Thick muscle, fore	12.78	12.71	12.63	11.81

[1] As percent of cold carcass weight

Table 4. Comparison of Some Average Production and Carcass Characteristics (1967)

Characteristic	Feeder Grade		
	Common	Conventional Choice	Growthy Choice
Number	13	15	15
Initial weight, lbs.	472	562	555
Cold carcass weight, lbs.	564	600	597
Dressing percent	57.5	61.9	61.1
Marbling score	Modest —	Modest +	Small +
Conformation score	Standard +	Choice	Choice
Final U.S.D.A. grade	Good	Choice	Choice —
Average fat thickness 12th rib, inches	0.42	0.73	0.50
Rib eye area, square inches	10.0	11.9	12.6
Cutability, U.S.D.A. prediction	48.2	48.9	50.8

Major carcass components and ratios are summarized in Table 5. The Growthy Choice carcasses excelled in all three categories of muscling,—thick, thin and total muscle yields. They averaged 61.0 percent total muscle as compared to 55.4 and 55.3 for the Common and Conventional Choice carcasses respectively. Further study revealed that the Growthy Choice carcasses excelled in muscling as compared to the Common and Conventional Choice carcasses because of less fat. Both the Common and Conventional Choice carcasses were fatter at approximately 600 pounds carcass weights; therefore muscle yields were lower.

Muscle bone ratios are also presented in Table 5. Thick muscle and total muscle to bone ratios were similar and not significantly different for the Conventional Choice and Growthy Choice carcass. However, since the Growthy Choice carcasses had a higher average bone percentage

Table 5. Average Percentage Yields[1] of Carcass Components and Ratios (1967)

Component	Feeder Grade		
	Common	Conventional Choice	Growthy Choice
Thick muscle	28.9	29.2	32.5
Thin muscle	26.5	26.1	28.2
Total muscle[2]	55.4	55.3	61.0
Fat[3]	23.2	27.7	21.5
Bone	14.7	11.6	12.9
Fat + Bone	37.9	39.3	34.4
Ratio thick muscle/bone	1.98:1	2.54:1	2.53:1
Ratio total muscle/bone	3.79:1	4.81:1	4.72:1

[1] As percent of cold carcass weight
[2] Sum of thick and thin muscle yields
[3] Fat does not include *kidney, pelvic* and *heart fats*

Table 6. Mean Percentage Yields[1] of Individual Muscles and Muscle Systems(1967)

Muscle	Feeder Grade		
	Common	Conventional Choice	Growthy Choice
Hind Quarter			
Strip	2.11	2.34	2.52
Tender	1.13	1.09	1.24
Top Butt	2.23	2.27	2.58
Knuckle	2.94	2.70	3.11
Top round	3.41	3.64	4.05
Bottom round	3.15	3.41	3.75
Eye round	1.08	1.29	1.45
Thick muscle hind	16.05	16.74	18.70
Fore Quarter			
Rib roast	3.45	3.43	3.62
Chuck roast	9.34	9.19	10.17
Thick muscle-fore	12.79	12.62	13.79

[1] As percent of cold carcass weight

than the Conventional Choice carcasses, they had a higher average percentage muscle yield.

It is of further interest to note that the Common and Conventional Choice carcasses were similar with respect to thick muscle and total muscle yields but had significantly different muscle bone ratios resulting from a higher average bone percentage within the lower conformation Common carcasses. Therefore, these data would suggest that carcass conformation is associated with muscle-bone ratios,—the higher the conformation grade the higher the muscle to bone ratio. Furthermore, this data suggests that muscle bone ratios do not adequately evaluate carcasses and that percentage yield knowledge of one of the components is necessary before ratios of muscle to bone are meaningful—an example being the Conventional Choice and Growthy Choice carcasses.

Individual thick muscle and muscle systems yield comparisons were made among the three types—a summary of which is presented in Table 6. Without exception the Growthy Choice carcasses excelled when these muscles were expressed as a percent of cold carcass weight. On the other hand, the Common and Conventional Choice carcasses produced very similar muscle yields even though there was a difference of one and one-half of U.S.D.A. conformation grades between the two types.

The Growthy Choice carcasses studied in Phase II were found to be superior in muscling (i.e. thick and thin as well as total muscle) to other conformation groups (types). It is theorized that, with such cattle as have heavier mature weights, these animals were still growing muscle at the time of slaughter, whereas, cattle from the smaller, earlier maturing

groups had perhaps gone past the period of maximum muscle growth and, hence, were laying down more fat. If this be true, the question of the most desirable mature size and growth characteristics in feedlot cattle becomes an important consideration (insofar as muscling is concerned).

Analysis of a Breed Herd Classification Program[1]

James E. Tanner, Joe V. Whiteman, Richard L. Willham and Dwight F. Stephens

Story in Brief

Official breed classifiers scored the same cows during the spring and fall for two years. There was a general trend for increased agreement between different classifiers from the first to fourth classification. Classifiers agreed more closely with each other on scores for older cows than for scores on cows which were 2 years old when first classified.

Individual classifiers were able to repeat scores at different times on older cows with more accuracy than on younger cows. Correlations between scores at different times on younger cows were generally low. Differences in the correlations between scores at different times indicated differences in individual classifiers' abilities to repeat scores on the same animals. Interactions between cows, seasons and classifiers were more important in younger cows.

Correlations of spring scores near the time the cows were calving with calf weaning weights and grades were near zero for 2 and 3 year old cows but were positive for older cows. Correlations of fall scores after weaning with calf weaning weights and grades were essentially zero for 3 and 4 year old cows but were negative for 2 year old cows. Correlations between scores of slaughter cattle and hot carcass weight, fat

[1] This study was supported by a grant from the American Angus Association, headquarters, St. Joseph, Missouri.