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CARCASS YIELD AND MEAT QUALITY OF LOT-FED BULLS AND STEERS

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SUMMARY

Starting at the age of 8-9 months, Hereford bulls (54) and steers (59) were lot-fed for three months. Bulls and steers implanted with Synovex-S grew faster than unimplanted steers and no behavioural problems were encountered in the feedlot, during transport or in lairage. On all aspects of quantity and quality of meat recorded in the abattoir and in a retail store, the bulls appeared to be- at least as good as the steers; there is a commercial opportunity to produce high quality meat from young bulls.

INTRODUCTION

The objectives were to compare the growth and meat yield and quality of young bulls and steers in a commercial system in which calves were weaned from farm to feedlot, fed for three months and then sent direct to slaughter. More details of this work have been published by Yupardhi (1987).

MATERIALS AND METHODS

Hereford bulls (B) and steers (S) entered the feedlot in December, 1986 when they were aged 8-9 months and within the liveweight range 200-300 kg. At entry, half the bulls and half the steers (Table 1) were given a subcutaneous implant of Synovex-S. Each implant contained 20 mg of oestradiol benzoate and 200 mg of progesterone. The cattle were kept in three adjacent pens which contained, respectively, bulls (35), steers (39) and mixed bulls (19) and steers (20). The cattle *were* lot-fed for approximately three months being fed grain-based diets (80% barley during the first six weeks and 83–85% wheat during the remainder of the period). Ninety six were sent for slaughter (Table 2) in four consignments of 24 head, each one week apart. Consignments were balanced for bulls and steers. The cattle were selected by the feedlot operators as being ready for market in terms of weight and finish, The behaviour of the cattle in the feedlot was observed by the stockmen. During consignment by road to the abattoir (350 km journey taking 5 h) and in lairage, the behaviour of the cattle was recorded with a video camera. Within consignments and in lairage, the groups of cattle from the three pens were never mixed.

On the morning after arrival at the abattoir, the cattle were slaughtered, Each body was subjected to low voltage electrical stimulation before the hide was removed and carcasses *were* dressed according to commercial practice. Kidney and channel fat was removed before hot carcass weight (HCW) was obtained. A bruising score (Anderson and Horder 1979) was recorded for each carcass as soon as the hide had been removed. Subcutaneous fat thickness measurements were made on the hot carcasses using a Toland probe at sites P3 and P8 (Moon 1980). Length of carcass was measured from the point of suspension through the Achilles tendon, to the posterior edge of the first thoracic vertebra as exposed by the saw cut down the dorsal midline. A fat colour score (scale l-6, from 1 – creamy white to 6 – bright yellow, using a set of colored photographs), a fat score (scale l-5, from 1 – emaciated to 5 – grossly overfat), and a conformation score (scale l-5, from 1 – worst to 5 – best, adapted from the AUSMEAT Authority muscle score chart) were given to each carcass.

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Table 1 The number of cattle in each group, the mean live weights (kg) at the beginning and end of the experiment and mean growth rates (kg/day)

	Bulls		Steers	
Synovex	+	-	+	
Number	26	28	30	29
Live weight				
Start (± s.e.)	247 (5.6)	245 (6.1)	250 (8.3)	253 (7.5)
End (± s.e.)	402 (6.6)	392 (6.3)	403 (5.8)	395 (6.2)
Growth rate (± s.e.)	1.55 (0.4)	1.50 (0.03)	1.56 (0.04)	1.37*(0.03)

*P<0.05

After storage for 24 h at 8°C, each carcass was quartered at the 10-11th ribs. Meat colour was scored on the cut surface of the longissimus dorsi muscle (eye muscle) (scale 1-6, from 1 - palest to 6 - darkest, using photographs). Muscle pH was measured by inserting a probe into the cut surface of the eye muscle. The exposed cross-section was traced to measure eye muscle area; the surface was also used for marbling scores (scale 1-5, from 1 - no marbling to 5 - very heavy marbling). A dorso-ventral rib-cut, including the 11th rib and its attached vertebra, muscles and fat was taken from the right side of each carcass and stored at -10°C for two months after which the eye muscle was cooked and used for Warner-Bratzler shear measurements (as described by Currie *et al.* 1988).

Within 48 h of slaughter, left half-carcasses were moved to a retail outlet where we weighed parts, trimmed by butchers, from the following commercial joints: rumps, loins, sets of ribs. The sets of ribs were prepared either as: ribs I (standing rib roast, fat trim, mince and bone) or ribs II (Scotch fillet, fat trim, mince and bone).

Where measurements and scores not significantly correlated with live weight or carcass weight (fat colour,fat depth at P8, meat colour, muscle pH, bruising score and growth rate) an analysis of variance (ANOVA) was used. Where a significant difference was found, it was isolated by a test for a least significant difference. The other measurements and scores (length of carcass, fatness score, fat depth, marbling score, eye muscle area, conformaton score, weights of meat cuts) were analysed using an analysis of covariance (ANCOVA) with HCW as the independent variable, with tests for differences between slopes and adjusted means; only the adjusted means are presented.

RESULTS

Whether kept separately or mixed, the bulls and steers in the feedlot were quiet and required no special management. During transport and in lairage (as indicated by the video-tapes), the cattle remained quiet. There *were* no pen effects on growth rates and these results are not included. Mean live weights of cattle entering and leaving the feedlot, growth rates and effects of the Synovex implants are shown in Table 1. Unimplanted steers grew significantly slower than the bulls and implanted steers. In all other measurements and *scores,* no significant effect of Synovex was recorded and, for the rest of this report, Synovex effects have been ignored.

Measurements and scores at slaughter (Table 2) show that the bulls had less fat, darker meat, less marbling and larger eye muscle areas than the steers but there *were* no other significant differences. In Table 3 the mean weights of the joints for bulls and steers, adjusted to the same HCWs, respectively, are shown together with the mean weights of trimmed components for the rump and the loin, adjusted to the same respective joint weights. There were no significant differences between bulls and steers in the components of the sets of ribs and these details have been omitted. Table 3 indicates that, at the same carcass weight, rumps and loins were significantly lighter in bulls than in steers. However, when comparisons were made by adjusting to the same joint weight, there was more steak and less fat in the joints from the bulls than from the steers.

Table 2 Measurements and scores. Part a: means (± s.e.) from the ANOVA. Part b: means (± s.e.) from the ANCOVA adjusted to the common HCW of 215.5 kg

	Bulls	(s.e.)	Steers	(s.e.)
Part a				
Number of cattle	48		48	
HCW (kg)	214	(2.0)	217	(1.8)
Dressing %+	54	(0.2)	54	(0.2)
Fat depth at P8 (mm)	7.8*	(0.04)	10.6	(0.03)
Fat colour score	2.0	(0.1)	2.2	(0.1)
Meat colour score	5.4*	(0.1)	4.9	(0.1)
Muscle pH	5.5	(0.01)	5.5	(0.01)
Bruise score	3.9	(0.7)	5.8	(1.1)
Part b				
Fat depth at P3 (mm)	5.1*	(0.02)	7.3	(0.02)
Fatness score	2.4*	(0.1)	3.1	(0.1)
Marbling score	0.6*	(0.1)	1.1	(0.1)
Length carcass (cm)	171	(0.7)	172	(0.5)
Conformation score	3.2	(0.1)	3.1	(0.1)
Eye muscle area (cm^2)	59.1*	(0.8)	54.5	(0.8)
Warner-Bratzler shear (kg)	4.6	(0.01)	4.6	(0.01)

+ Dressing % from HCW and live weight at the feedlot 24 h before slaughter
* P<0.05

DISCUSSION

Under the conditions of this experiment, the behaviour of bulls was not a problem either when they were alone or mixed with steers. This view is supported by the low bruising scores recorded; the bruises were generally small and superficial. No doubt, the avoidance of saleyards and of mixing strange groups of cattle in transit, contributed to the low bruising scores and the low muscle pH measurements. The increased growth rate of Synovex implanted steers and the failure of a response by bulls is well supported in the literature (Buttery *et al.* 1978).

Similar dressing percentages for bulls and steers have also been reported by others (Cahill *et al.* 1956, Carroll *et al.* 1975). The lower fat content and darker meat of bulls as compared with steers is well documented (Carroll *et al.* 1975). However, in the young bulls, the slightly darker colour was no disadvantage (the cattle were 11-12 months of age at slaughter). In fact, the steers were slightly too fat to be ideal for their intended Melbourne supermarket. In spite of these differences, all the scores and measurements in Table 2 indicate that the carcasses from both bulls and *steers* were excellent in quality. The lower weights for the rumps and loins in bulls than in steers at the same HCW indicates that the bulls were proportionately heavier in other -parts of the carcass. (Mukhoty and Berg (1973) showed that muscles of-the neck and thorax were heavier in young bulls than in steers). However, when compared at the same joint weights for rump and loin, bulls had significantly higher proportions of the expensive cuts which were largely due to the joints from the steers having more fat trim. When adjusted to the same HCW, the amount of saleable meat from these joints, from both steers and bulls, was similar.

Young bulls produced under systems of management and pre-slaughter handling like the ones used here, are likely to be at least as profitable as steers to breeders, feedlot operators and to retailers. There is an opportunity to produce high quality beef from young bulls; such a development would also have the advantage that animal welfare aspects of castration would no longer be a consideration.

Table 3 Mean weights (kg ± s.e.) of joints and their components

	HCW	Bulls		Steers	
		n#	Weight	n	Weight
Rump	215	28	8.27* (0.14)	28	8.80 (0.17)
Loin	214	19	9.26* (0.17)	21	9.96 (0.25)
Ribs I	213	22	7.52 (0.20)	11	7.19 (0.30)
Ribs II	213	14	8.24 (0.40)	17	8.19 (0.24)
Components	Adjd. wt.				
Rump	8.52	28		28	
Fillet steak			0.69* (0.02)		0.64 (0.02)
Rump steak			3.39* (0.07)		3.07 (0.07)
Mince			1.72 (0.07)		1.66 (0.07)
Bone			1.56 (0.02)		1.48 (0.02)
Fat			1.18* (0.04)		1.64 (0.04)
Loin	9.62	19		21	
Porterhouse steak			2.05* (0.06)		1.86 (0.05)
T-bone steak			4.08 (0.21)		3.78 (0.20)
Mince			1.30 (0.08)		1.23 (0.08)
Bone			1.21 (0.05)		1.28 (0.04)
Fat			0.97* (0.05)		1.49 (0.05)

Number of joints * P<0.05

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REFERENCES

ANDERSON, B. and HORDER, J.C. (1979). Queensland Agric. J. 105 : 281.
BUTTERY, P.J., VERMOND, B.G., and PEARSON, J.T., (1978). Proc. Nutr. Soc. 37: 281.
CAHILL, V.R., KUNKLE, L.E., KLOSTERMAN, E.W., DEATHERAGE, F.E. and WIERBICKI, E. (1956). J. Anim. Sci. 15 : 701.
CARROLL, F.D, ROLLINS, W.C., WAGNON, K.A. and LOY, R.G. (1975). J. Anim. Sci. 41: 1008.
CURRIE, J.R., GAUNT, G.M., WARNER, R.D., MORAN, J.B., MORRIS, D.C., and TAYLOR, J.W. (1988). Proc. Aust. Soc. Anim. Prod. 17: 166.
MOON, J.B.(1980). Thesis submitted to the Queensland Dept Primary Industries, Brisbane.
MUKHOTY, H. and BERG, R.T. (1973). J. Agric. Sci., Camb. 81 : 317.
YUPARDHI, W.S. (1987). M.Agr.S. Thesis, University of Melbourne.