METHODS OF STERILISATION IN RELATION TO GROWTH AND CARCASS CHARACTERISTICS OF MALE FRIESIAN CATTLE

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Summary

Bulls, steers and induced cryptorchids were compared under pen conditions. The bulls and cryptorchids grew faster and had a greater efficiency of feed utilization than steers. There were only small differences between animal types in terms of carcass composition and there were no detectable differences in meat quality.

I. INTRODUCTION

It has been established that castration depresses growth rate and reduces the feed conversion efficiency (Turton 1962; Robertson 1966). Hemicastrate teaser rams produced by Dun's (1960) method grew more rapidly than wethers (Pattie, Godlee and Bouton 1964), but the technique is not always successful in maintaining sterility (Van Rensburg, McFarlane and Van Rensburg 1963).

Bulls castrated by the Baiburtcjan (1963) method varied considerably for growth rate and sexual activity (Aliseihov 1966) and in some cases regeneration of the parenchyma and spermatogenesis has occurred (Grigurescu et *al.* 1962; Robertson, Wilson and Morris 1967).

Hudson ***et al.*** (1968) induced cryptorchidism in male sheep. The induced cryptorchids grew significantly faster than wethers and at a similar rate to rams

Moore and Oslund (1924) demonstrated that induced cryptorchidism effectively sterilised a male sheep.

This paper reports on the effect of induced cryptorchidism on growth and carcass characteristics of male Friesian cattle.

II. MATERIALS AND METHODS

(a) Animals and Management

Eighteen male, Friesian calves aged four to five months were allotted to three treatment groups balanced for initial weight. One group was left as bulls, cryptorchidism was induced in another group using the method of Hudson et ***al.*** (1968), and the third group was castrated with elastrator rings to impose a stress similar to that imposed on induced cryptorchids.

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Animals were kept in individual pens indoors and taken out weekly for weighing and periodic spraying with "Gammexane" for lice control.

Between approximately 170 and 370 kg Iiveweight, animals were fed at various levels from ***ad libitum*** to 68% ***ad libitum,*** in relation to metabolic body size. Details of this aspect of the experiment are being published separately.

(b) Diet

Throughout the experiment, animals were fed a concentrate ration consisting of 85 per cent rolled barley, 14 per cent meat meal and 1 per cent salt. No roughage was provided. Vitamins A, D and E (1,000,000; 150,000, and 100 I.U. respectively) were given by intra-muscular injection every three months.

(c) Antemortem Measurements and Carcass Evaluation

Just prior to slaughter, leg length to the tip of the tuber coxae and wither height were measured with calipers, after which the animals were fasted for 24 h before recording the final liveweight. Following slaughter at a commercial abattoir, the head, hide, thymus, heart and testes were weighed.

Carcass composition was estimated from the fat thickness over the 10th rib, using the mean of Yeates' (1952) X and Y measurements, and from the weights of muscle and bone in the shin joints, applying Butterfield's (1965) equations.

Carcasses were jointed in a manner similar to the procedure outlined by Johnston (1961), and all joints weighed. The area of the ***M.*** *longissimus* ***dorsi*** at the 11 th rib was measured with a planimeter and fat and lean colour were estimated using the Tintometer apparatus recommended by the U.K. Agricultural Research Council (1965). Intra-muscular fat in the ***M.*** *longissimus* ***dorsi*** from the 9th rib was estimated by chloroform extraction. Water holding capacity was estimated on samples of the ***M. longissimus dorsi*** from the 10th rib using a pressure of 3,000 lb/in² for one minute.

Rolled ribs (9th and 1 lth) were prepared for taste panel evaluation by ageing for six days and then storing at — 15°C until required. After thawing, the joints were cooked to an internal temperature of 71 °C. Meat tenderness was measured on 1 cm diameter cores of ***M.*** *longissimus* ***dorsi*** from the 9th and 11 th rib using a Warner-Bratzler shear. A panel of six untrained tasters was presented with three 4 mm thick whole joint slices of cold, cooked meat at each of four sittings, using an incomplete block design. They recorded that each sample was either acceptable, above average or below average for the properties of tenderness, juiciness, flavour and degree of cooking.

III. RESULTS AND DISCUSSION

(a) Growth Rate and Feed Conversion Efficiency

The data in Table 1 confirm that steers grow slowly and less efficiently than bulls under intensive management. The induced cryptorchids were intermediate between bulls and steers but not significantly different from bulls in terms of growth rate and feed conversion efficiency.

(b) Conformation

The final liveweight of cryptorchids was intermediate between those of the bulls and steers, but leg length was significantly greater than that of steers and bulls (Table 2). This observation was unexpected in view of the modifying

TABLE 1

Growth rate and feed conversion efficiency

	Bulls	Cryptorchids	Steers	
Liveweight gain (kg/day)	1.14	0.99	0.80	**B C S
Relative growth rate	100	87	70	
Feed conversion efficiency (kg feed/kg gain)	4.46	4.94	6.18	**S C B
Relative feed efficiency	100	90	72	

** $P<0.01$

Letters not underlined differ significantly

influence of androgens on the growth of long bones (Silberberg and Silberberg 1956).

(c) Body Composition

Significant differences in head weights between animal types (Table 2) were not wholly accounted for by differences in final liveweight, whereas differences in hide weights were not significant when adjusted for differences in final liveweight.

The weight of the thymus gland was similar in bulls and cryptorchids, but significantly lighter than in steers (Table 2). Gonadal secretions are known to have a moderating influence on thymus growth rate (Dougherty 1952) and, therefore, these observations provide indirect evidence for active secretion by the cryptorchid testes. Analyses for androgens in blood plasma and testes are being carried out and will be published separately.

The mean carcass weight of cryptorchids was intermediate between those of the bulls and steers, and these differences were largely accounted for by differences in final liveweights (Table 2). The predicted carcass composition was similar for the three animal types, the bulls being slightly fatter than the cryptorchids. This result was unusual in that steers are almost invariably fatter than bulls of similar weight (Turton 1962; Robertson 1966). The possibility of bias in the predictions due to applying one set of equations to the three types of animal, cannot be excluded.

There were no significant differences between animal types in terms of the proportions of commercial joints, with the exception of the chuck joint which was a significantly ($P<0.01$) higher proportion of the carcass in bulls (13.2 per cent, 12.2 per cent and 11.5 per cent for bulls, cryptorchids and steers respectively). However, the proportions of high price joints were 29.0 per cent, 29.1 per cent and 29.7 per cent for bulls, cryptorchids and steers respectively, these differences being non-significant.

(d) Meat Evaluation

The objective evaluations (Table 3) indicate that there were no significant differences between animal types.

Analyses of the taste panel records showed that the tasters were unable to

TABLE 2

Pre- and post-slaughter measurements on bulls, cryptorchids and steers

	Bulls	Cryptorchids	Steers	
Pre-slaughter measurements				
Final liveweight (kg)	401.0	375.3	349.8	**B C S
Leg length (cm)	48.3	50.7	47.3	* C B S
Wither height (cm)	118.8	119.8	116.4	N.S.
Non-carcass components				
Head weight (kg)	15.9	15.5	12.9	**B C S
Adjusted head weight (kg) †	15.0	15.0	13.0	* B C S
Hide weight (kg)	31.7	29.9	24.2	* B C S
Heart weight (g)	1475	1327	1310	* B C S
Thymus weight (g)	593	553	784	* B C S
Testes weight (g)	286	76	—	***
Carcass components				
Carcass weight (kg)	221.3	202.7	188.4	* B C S
Adjusted carcass weight (kg) †	203.8	202.8	200.4	N.S.
Dressing percentage ‡	55.2	53 9	53.9	N.S.
Side length (cm)	122.2	119.1	116.5	* B C S
Shin muscle weight (g)	1893	1810	1685	N.S.
Radius + ulna weight (g)	1151	1137	1072	N.S.
Fat thickness (cm)	1.89	1.35	2.14	* S B C
Predicated % muscle §	65.1	66.4	66.4	N.S.
„ % fat	12.0	10.8	11.2	* B S C
„ % bone	17.8	19.5	19.7	N.S.

† Adjusted by covariance to the mean liveweight

‡ $\frac{\text{Cold carcass weight}}{\text{24 h starved liveweight}} \times 100$

§ Predicated using Butterfield's (1965) equations

* $P<0.05$

** $P<0.01$

*** $P<0.001$

N.S. Non-significant

Letters not underlined differ significantly at the level indicated.

distinguish between meat samples from bulls, cryptorchids and steers. With all three types of meat there was no significant deviation from being acceptable in terms of flavour, juiciness, tenderness and degree of cooking. These data indicate that there would be no commercial justification for discriminating against these types of meat.

IV. CONCLUSIONS

These results show that because of the much greater growth rate and efficiency of feed utilization by bulls and an absence of detectable differences in

TABLE 3

Meat evaluation data

	Bulls	Cryptorchids	Steers
M. longiscimus dorsi (area cm^2)	48.7	50.6	42.9 N.S.
Fat colour score †	0	0	0 N.S.
Lean colour score ‡	3.67	2.67	3.17 N.S.
Intra-muscular fat %	10.6	9.8	12.5 N.S.
Warner-Bratzler Value 9th rib (lb)	5.64	4.84	4.69 N.S.
Warner-Bratzler Value 11th rib (lb)	4.29	4.08	4.38 N.S.

† O is the whitest shade of fat colour
‡ 1-9 from pale pink to cherry red
N.S. Non-significant

meat quality between bulls and steers, there is no justification for castrating cattle kept in pens and slaughtered before 12 months of age.

The induced cryptorchids were significantly superior to steers in terms of growth rate and feed conversion efficiency. In an investigation to be reported separately, it was established that these animals were sterile. Therefore, if the differences in growth rate are maintained under grazing conditions, the technique could become a profitable alternative to castration. Grazing studies with bulls, cryptorchids and steers are now being conducted.

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