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THE EFFECT OF CASTRATION AND VASECTOMY ON MALE ZEBUS WHICH GRAZED VELD UNDER TWO SYSTEMS OF MANAGEMENT

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OPSOMMING: DIE INVLOED VAN KASTRASIE EN VASEKTOMIE OP ZEBU BULLE OP GRASVELD ONDER TWEE BESTUURSTELSELS

Ses-en-dertig diere is gebruik om die invloed van kastrasie en vasektomie op die prestasie van bulle op grasveld onder twee bestuurstelsels te ondersoek. Gedurende die proef (proeftydperk 15.5.64 tot 28.12.66) was die daaglikse massatoename 0,29; 0,33 en 0,29 kg op die beter stelsel en 0.22;0,22 en 0,23 kg op die swakker stelsel vir bulle, gevasektomiseerde bulle en osse respektiewelik. Die diere is geslag op 'n ouderdom van 35–37 maande. Karkasse van die osse het meer onderhuidse vet as dié van die bulle of vasektomiseerde bulle gehad maar daar was geen ander merkbare verskille nie. Hierdie resultate dui aan dat die bemarking van bulle instede van osse van die veld af geen voordele inhou nie.

SUMMARY

Thirty-six animals were used to examine the effect of castration and vasectomy on performance of bulls which grazed veld under two systems of management. During the trial (which lasted from 15th May, 1964 to 28th December, 1966) rates of bodymass gain were 0,29; 0,33 and 0,29 kg/day on the better system of management and 0,22; and 0,23 kg/day on the poorer system for bulls, vasectomized bulls and steers respectively. Animals were slaughtered when 35–37 months old. Carcasses of steers had thicker back fat than did those of intact or vasectomized bulls, but no other differences were notable. These results indicate that no advantage arises from use of bulls rather than steers for beef production where animals grow slowly on veld.

The potentially superior growth rate and efficiency of food conversion of intact animals relative to castrates is though to be dependent upon the availability of adequate nutrients for normal growth and development (Palsson, 1955). In Central Africa, most beef cattle graze veld during a considerable part of, if not all, their lives. Thus it is important to know whether the plane of nutrition provided by veld is adequate to allow bulls to grow faster than steers.

With few exceptions, studies on the effect of castration of cattle reported in the literature to date have involved temperate breeds of cattle. It was not known whether these findings were applicable to breeds of cattle found in Central Africa.

Accordingly, a trial was designed to examine the effect of castration on locally available breeds of cattle which were maintained on veld for most of their lives under locally common systems of management.

The presence of intact bulls on veld raises several managerial problems, for example, uncontrolled breeding. This problem can be overcome by sterilization of males without disruption of the production of androgens by the testes. A group of animals which were vasectomized was included in the present study to examine the effect of this "partial castration".

Procedure

ANIMALS

On 14th May, 1964, thirty-six male calves (age 2–4 months) were available at the Central Veterinary Research Station, Mazabuka. Animals were a mixture of the Angoni, Barotse and Boran breeds and of various crosses between these breeds. All animals remained with their dams on pasture at Mazabuka until weaning (15 July, 1964) when all animals were transported to Mount Makulu Research Station.

TREATMENT

At weaning, bodymass of animals varied greatly. In an attempt to form treatment groups of reasonably similar mean bodymass, animals were classified into four bodymass categories, each of nine animals. Animals from each of these mass categories were allocated at random to the three castration treatment groups, each of which contained twelve animals. Animals in one treatment group were castrated by Burdizzo's forceps. Animals in a second group were vasectomized under chloral hydrate anaesthesia by excision of approximately 40 mm of the vas deferens via a postero-lateral incision through the scrotum and tunica vaginalis. The third group of animals remained intact. Animals were castrated or vasectomized at weaning.

Between weaning and 9 September, 1964, all animals were penned and fed hay of poor quality *ad libitum* and 5 kg maize silage and 1 kg ranch cubes per day. On 9 September, 1964, each castration group was split into two nutritional groups. Six animals from each castration treatment group (Good Veld sub-groups) grazed lowland "dambo" pasture during the dry season (0,8 ha/animal) and upland veld (5,1 ha/animal) during the rains. During the dry season, Good Veld animals were offered a urea-protein lick (Shapco 50, Shapiro Milling Company, Lusaka) and 6,5 kg/head/day maize silage. The remaining animals in each group (Poor Veld sub-group) grazed dryland veld pasture (2,0 ha/animal) throughout the year. During the dry season, animals in the Good Veld groups grazed pasture which had been rested during the rains whereas animals in the Poor Veld groups grazed pasture

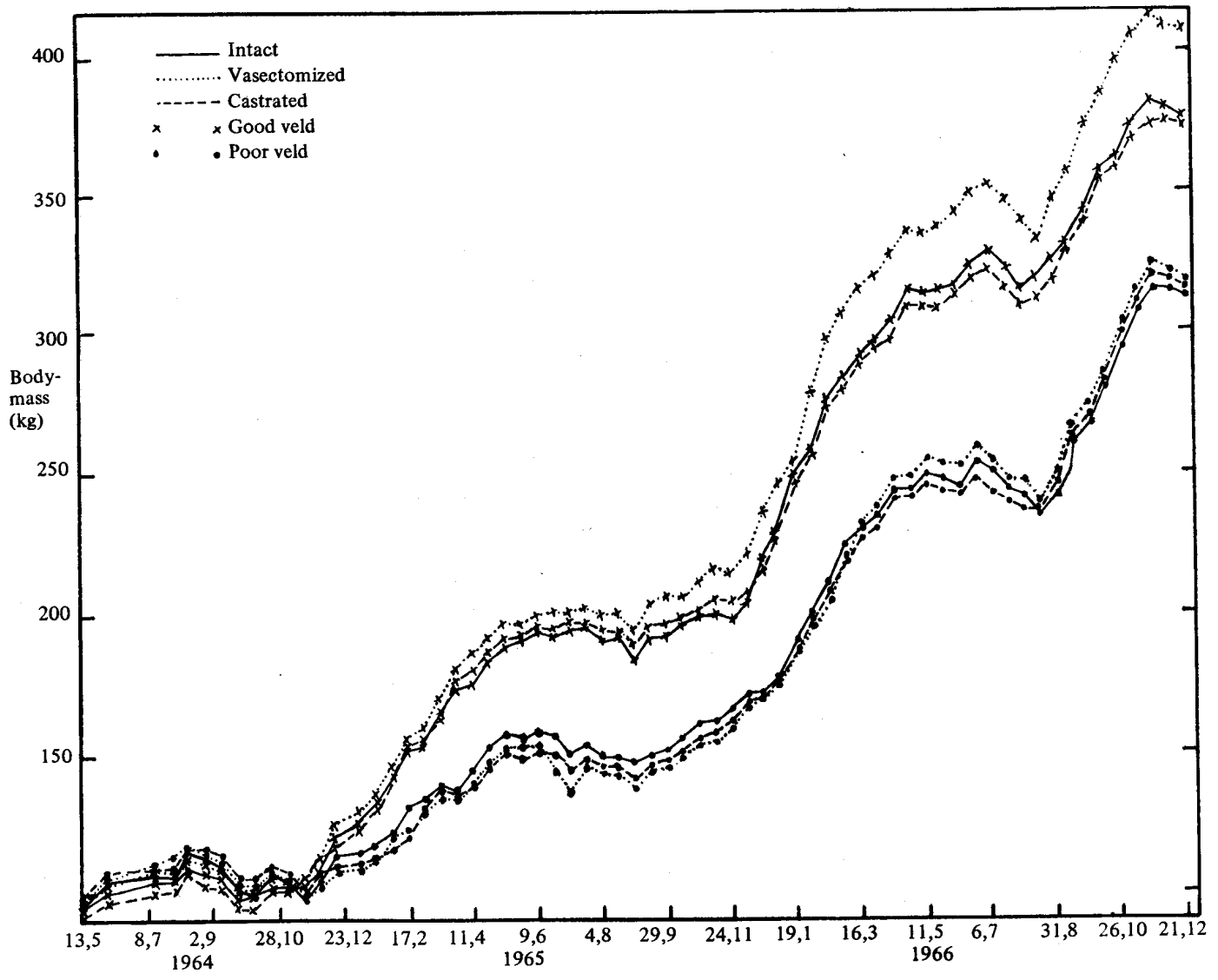

Fig. 1. – *Bodymass of intact, castrated and vasectomized male zebus which grazed veld of good or poor quality between 14 May, 1964 and 3rd August, 1966 and which were fed in a yard between 3 August, 1966 and 28 December, 1966*

which had been grazed heavily before and throughout the trial.

On 2 August, 1966, all animals were placed in an open yard and allowed access to 10,9 kg/head/day of a concentrate ration. Animals had free access to veld hay until 23 November, 1966. Since no further hay was available after this date and despite availability of concentrate ration *ad libitum*, animals lost bodymass until slaughter.

Bodymass was recorded at two-weekly intervals throughout the trial. Animals were penned at 1630 on the day before weighing and were deprived of food and water overnight. Animals were weighed at 0630. After slaughter on 28 December, 1966, various carcass measurements were noted as recommended by the Agricultural Research Council Beef Carcass Quality Group.

RATION

During the period when animals were fed in an open yard (2 August to 28 December, 1966) animals were fed a concentrate ration of the following composition:

20% Cotton seed meal
5% Fish meal
75% corn and cob meal

The ration had the following proximate chemical composition:

17,11% Crude protein
76,54% TDN
3,54% Ash
9,34% Fibre

Table 1

Mean bodymass and daily gains in bodymass of experimental groups

	Good veld			Poor veld			Overall Standard Error
	Intact	Vasect.	Castr.	Intact	Vasect.	Castr.	
Initial bodymass (kg) 14.5.1964	94,1	96,6	90,9	96,5	97,8	97,9	2,86
Final bodymass (kg)	378,9	410,8	377,4	314,3	318,6	320,7	3,53
Rate of increase in bodymass (kg/day)							
IN PENS 5.7.64–9.9.64	0,01	–0,05	0,03	0,07	0,00	0,03	0,015
1st DRY SEASON 9.9.64–19.11.64	–0,03	–0,02	–0,02	–0,14	–0,20	–0,18	0,013
1st WET SEASON 19.11.64–12.5.65	0,49	0,53	0,53	0,33	0,31	0,29	0,012
2nd DRY SEASON 12.5.65–10.11.65	0,08	0,09	0,06	0,03	0,02	0,06	0,007
2nd WET SEASON 10.11.66–6.7.66	0,54	0,59	0,51	0,39	0,42	0,36	0,009
FINAL FEEDING PERIOD 3.8.66–23.11.66	0,59	0,65	0,58	0,65	0,67	0,75	0,021

Results

1. *BODYMASS*

First Dry Season

Animals grew slowly between weaning and 9 September, 1964, when castration treatment groups were sub divided into nutritional subgroups (Fig. 1). During this period, the difference between rate of change of bodymass of vasectomized animals and that of other animals was significant ($P<0,05$) (Table 1). The loss of mass of the vasectomized group resulted probably from the stress associated with surgery.

Bodymass of all animals decreased between 9 September, 1964, and 19 November, 1964. Castration treatments did not influence rate of loss of bodymass.

First Wet Season

After the onset of the rains in November 1964, bodymass of all animals increased steadily until 12 May, 1965. Mean bodymass gains of castration treatment groups did not differ significantly within nutritional regimes.

Second Dry Season

Despite providing supplementary lick and silage to animals which grazed "dambo" these animals grew very little more rapidly than those on poor veld without supplementary lick.

Second Wet Season

Vasectomized animals grew more rapidly than did either intact or castrated animals ($P<0,1$). Castrated animals grew more slowly than the other two groups ($P<0,1$) (Table 1). The difference between the increase in bodymass of vasectomized animals and that of the other groups was greater on the higher plane of nutrition than on the lower plane ($P<0,01$). Other interactions between nutrition and castration treatments were not significant statistically.

Final Feeding Period

Mean rate of increase in bodymass of castrated animals from the Poor Veld group was 29,2% greater than that of castrated animals from the Good Veld group. Corresponding figures for intact and vasectomized animals were 11,2% and 5,1% respectively. However, this interaction was not significant statistically.

Vasectomized animals which had grazed good quality veld tended to grow more rapidly than either of the other two groups ($P<0,01$). However, because bodymass was very variable, final bodymass of vasectomized animals did not differ significantly from that of the other groups (Table 2.)

2. *BEHAVIOUR*

While animals grazed veld, the behaviour of intact and vasectomized bulls did not affect management. However, when animals were brought into a yard for feeding until slaughter, male aggressiveness and homosexual activity became prevalent. This behaviour tended to decrease with time, but was still evident at the end of the trial. This activity seemed to be confined to four or five animals which tended to dominate the other animals.

TABLE 2

Slaughter characteristics expressed as a percentage of final live mass of intact, vasectomized and castrated male zebus which grazed veld of poor or good quality

Treatment	Good veld			Poor veld			Overall standard error
	Intact	Vasect.	Castr.	Intact	Vasect.	Castr.	
Carcass	59,65	59,86	57,88	57,41	57,63	56,88	1,10
Head	4,52	4,37	4,28	4,72	4,34	4,32	0,12
Hide	10,94	10,16	8,76	11,59	12,29	10,16	0,56
Feet	1,55	1,59	1,58	1,80	1,75	1,71	0,09
Spleen	0,23	0,24	0,20	0,20	0,19	0,17	0,12
Gut	5,55	5,81	5,78	6,54	6,52	6,60	0,17
Gut contents	9,95	9,54	10,08	10,63	9,57	12,69	1,94

TABLE 3

Carcass characteristics of intact, vasectomized and castrated male zebus which grazed veld of poor or good quality

	Good veld			Poor veld			Overall Standard error
	Intact.	Vasect.	Castr.	Intact.	Vasect.	Castr.	
Mass hindqtr. (kg)	54,62	58,02	54,57	42,22	42,31	43,13	1,29
Hindqtr. as % side	48,10	47,40	49,24	46,57	46,37	46,83	0,21
Length leg (mm)	771	801	777	754	757	742	0,21
Length side (mm)	1145	1186	1153	1062	1051	1080	1,12
Thickness flank (mm)	21	22	23	20	19	21	0,07
Width eye muscle (A) (mm)	134	143	134	124	125	124	0,17
Depth eye muscle (B) (mm)	99	98	95	90	80	94	0,13
Depth back fat (mm)	1,0	1,0	2,4	0,9	1,3	3,0	0,02

3. *SLAUGHTER CHARACTERISTICS*

In general, castration treatments influenced slaughter characteristics less than did plane of nutrition (Table 2).

On the high plane of nutrition, carcass mass of vasectomized animals exceeded that of the other two groups, although this difference was not statistically significant. Heads of intact and vasectomized animals tended to weigh more than those of castrates. Hide of intact and vasectomized animals weighed more absolutely ($P < 0,05$) and when expressed in relation to final bodymass ($P < 0,01$) than did those of castrated animals. Castration did not influence mass of feet, spleen and gut. Mass of gut contents was extremely variable (range 16,5 kg to 65,8 kg.

4. *CARCASS CHARACTERISTICS*

Date on carcass conformation are shown in Table 3. Mass of hindquarters did not differ between castration treatment groups, but mass of hindquarters of castrated animals comprised a great proportion (%) of mass of side ($P < 0,1$) than hindquarters of animals from the other groups. Castration treatment did not influence length of carcass.

Whereas castration or vasectomy of animals which had grazed poor veld did not affect depth of eye muscle, castration of animals which had grazed good veld led to decrease in depth of eye muscle ($P < 0,05$). Eye muscle measurements were slightly greater in animals which had grazed good veld than those which had grazed poor veld ($P < 0,01$) for A; $P < 0,01$ for B.

Castration of animals led to an increase in thickness of back fat under both management systems ($P < 0,01$). This effect was particularly noticeable in animals which had grazed poor veld and the interaction between castration and type of veld grazing was significant ($P < 0,01$).

Discussion

The lack of difference between the rate of increase in bodymass of intact animals and that of castrates which

grazed veld in the present trial might be ascribed to either the management system, the low and fluctuating plane of nutrition and consequent low growth rates or to the breed characteristics of the animals used in this study.

In the present trial, during the summer months animals in the good veld groups gained 0,5–0,6 kg/day, but intact animals grew no faster than castrates. This is in agreement with the findings of Homb (1961) and Tylecek (1957) who found that growth rates of bulls and steers at pasture did not differ at this rate of increase in bodymass. Migda & Mocalovskii (1959) found that when animals were fed in pens, bulls did grow faster than steers when rates of increase in bodymass were approximately 0,5 kg/day. The possibility that method of management might influence the potential superority of bulls over steers is substantiated by the results of Cobic, Bacvanski, Vucetic, Slojanovic & Filipovic (1962). These workers found that the difference in rate of growth between bulls and steers was greater when animals were tethered than when animals were untethered. However, Robertson & Laing (1965) did not observe this effect of restriction.

The pattern of growth exhibited by animals in the present trial was characterized by small gains in mass or even losses in mass during the dry seasons (Fig. 1), followed by period of more rapid growth during and after the rains and when animals were fed in an open yard. This pattern might influence the response of growth rate to castration. In this respect, it is of interest that Wilson & Osborne (1960) and Palsson (1955) concluded that a period of undernutrition would affect more severely animals with high growth potential than animals with lesser growth potential. Thus, in the present trial, manifestation of any greater growth potential of bulls relative to that of steers may have been prevented by the seasonal periods of undernutrition.

The finding that vasectomized animals grew more rapidly than either castrated or intact animals when on good veld is of considerable interest. Similar findings were reported by Cobic, Maslovaric, Bacvanski, Ognjanovic & Vucetic (1966). Here, vasectomized bulls grew slightly more rapidly than did intact bulls which growth rates were approximately 1,0 kg/day. Mann (1966) noted an increase in seminal fructose and citric acid after vasectomy. Thus, the superior performance of bulls after vasectomy might be explained by enhanced androgenic secretion by the testes. However, other workers have been unable to substantiate Mann's result (Gassner & Hopwood, 1953). In the absence of more detailed information the present findings vannot be explained satisfactorily.

Differences between the slaughter characteristics of intact vasectomized and castrated animals were small and predictions are unreliable. In terms of the findings of Tuma, Dinkel, Minyard & Briedenstein (1967) the greater eye muscle area and, in the Good Veld groups, carcass weight of vasectomized animals indicated that carcasses of these animals contained more meat than those of intact and castrated animals. The most notable effect of castration was to increase the depth of back fat at the 11th rib. This is in agreement with frequent reports that bulls have leaner carcasses than steers (e.g. Prescott & Lamming, 1964).

The hindquarters of castrated animals comprised a greater proportion (%) of the carcass. As the higher-priced cuts of meat are located in the hindquarters, this indicates that the quality of carcasses of intact and vasectomized bulls may have been inferior to that of steer carcasses on both planes of nutrition.

In general, results of the present trial indicate that when animals grow slowly on veld, there is little advantage in the use of intact or vasectomized bulls in stead of steers for beef production. The possibility that vasectomized animals might have produced carcasses with a higher content of meat is offset by the inferior carcass conformation of these animals relative to castrates.

Results of the present trial emphasize the necessity for a study of the effect of castration on animals of indigenous breed reared under more intensive systems of management.

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