EFFECTS OF CASTRATION ON GROWTH RATE, BODY AND VISCERAL ORGAN WEIGHTS OF PIGS.

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ABSTRACT

Effects of castration on growth rate, body and visceral organ weights of pigs were investigated using data from intact males, intact females of Large White pigs full or half castrated at 2, 4, or 6 weeks of age. Body weights and feed intake were recorded to the nearest 0.1kg at weekly intervals from birth, while weights of abdominal and thoracic organs were taken at slaughter.

Results show that age at castration significantly affected weaning weights and weights at 2 months of age ($P < 0.05$), but did not affect the weights of visceral organs and the average daily weight gain ($P > 0.05$). Castration significantly affected weaning weights ($P < 0.05$) average daily gain ($P < 0.01$), body weights at 4 months ($P < 0.05$), but not the weights of the visceral organs ($P > 0.05$)

Intact females and intact males significantly differed in body weights at 4 months and in average daily weight gain ($P < 0.05$). Comparisons between full castrates and intact males showed significant differences in all the measured parameters except the weights of visceral organs. Full castrates and intact females did not differ, significantly ($P > 0.05$) in any of the traits measured.

INTRODUCTION

The effects of castration on body weights, growth rate and other economic traits in farm animals have been studied by several workers (McClaugherty *et al.* 1959, Mulley and English 1985 and Chiboka, 1986). Studies by Bradford and Spurlock (1964), Kemp *et. al.* (1970), and Makarechain *et. al.* (1978), indicated that bulls gain more rapidly, convert feed more efficiently and have less waste fat than steers. However. Macfarlane (1966) found no significant differences between the weights of bulls and their contemporary steers when weighed at four-week intervals from 24 weeks to 52 weeks of age. From studies in goats, (Sidhar *et al.*, 1978) concluded that castration in goat bucks produces significant increases in body weight. They however did not elucidate if this increase in body weight was due to normal growth or ordinary fat deposition in the castrated animals.

On the other hand, Thoraton (1981) reported the superiority of intact boars to barrows and gilts in such traits as body weights at slaughter, weaning weights and conversion of feed to lean meat. This observation which contradicts earlier reports by Macfarlane (1966), Mully and English (1978) and Makarechain *et al.* (1978), went on to conclude that where feed is freely available, a castrate may eat sufficiently to grow at the same rate as or faster than intact boars or female pigs. But in such circumstances the carcass of the castrate will be very much fatter.

There is therefore, no consensus on the absolute effects of castration on various economic traits of farm animals. Although the additional fat deposited by castrates may have some insulatory advantage especially in cold climates, it is not clear if this is desirable for farm animals in warm tropical climates. The objective of this study therefore, is to investigate the effects of castration on body weight gains, growth rate and

weights of visceral organs and to examine if the results could be beneficially incorporated into a package of recommendations for pig production, especially in the tropics.

MATERIALS AND METHODS

These studies were carried out on Large White pigs at the Swine Research Farm of the Federal University of Technology, Owerri (5°27N,, 7°02E) in the tropical rain forest belt of South Eastern Nigeria. Fifty-two litter mate piglets of similar weights were selected at 4 days old. They were randomly assigned to four treatment groups comprising 13 full castrates (FC), 13 half castrates (HC) as test animals, 13 intact males (IM) and 13 intact females (IF) as controls.

Castration was carried out at 2, 4 and 6 weeks of age. The piglets were first of all injected with 5ml novocain (2 percent) as local anesthesia and then the testes were exposed through an incision made on the posterior part of the scrotum from which the testes were removed after tying up the cord. The incision was then dressed with terramycin powder to prevent infection. In half castrates only the right testes were removed.

All piglets were reared similarly and fed commercial pig ration with nutrient composition as shown in table 1. Body weights and feed intake were recorded to the nearest 0.1kg at weekly intervals from birth. Animals were housed in pens with concrete floor-runs, in buildings which allowed free air flow. Water was supplied *ad libitum* and piglets were weaned at 28 days of age, slaughtered at 4 months of age and their carcasses dressed according to standard practice. After removing the abdominal and thoracic organs, they were weighed and recorded

Data were analysed by analysis of variance procedures. Mean separation was by Duncan's Multiple range test and comparisons between treatment means by methods of orthogonal contrast

TABLE 1.

Nutrient Composition of the Commercial Pig Ration

Nutrients	*Amounts*	*Nutrients*	*Amounts*
Digestible Energy (Kcal)	3125	Threonine (%)	0.50
Crude Protein (%)	18	Tryptophan (%)	0.15
Calcium (%)	0.75	Valine (%)	0.55
Phosphorous (%)	0.60	Iron (mg/kg)	135
Sodium (%)	0.10	Zinc (mg/kg)	100
Chlorine (%)	0.12	Manganese (mg/kg)	4.0
Potassium (%)	0.28	Copper (mg/kg)	5.5
Magnessium (%)	0.08	Iodine (mg/kg)	0.13
Lysine (%)	0.80	Vitamin A (I.U)	2000
Arginine (%)	0.20	Vitamin B_6 (mg)	1.50
Histidine (%)	0.20	Vitamin B_{12} (ug)	20.0
Isoleucine (%)	0.60	Vitamin D (I.U)	200
Leucine (%)	0.75	Vitamin E (I.U.)	12
Methionine (%)	0.55	Riboflavin (mg)	2.5
Phenylalanine (%)	0.85	Thiamin (mg)	1.2

(Snedecor and Cochran, 1969).

RESULTS AND DISCUSSION

Least-square means for average dail, gain, body weights at weaning and at 2 months and 4 months of age, are presented in table 2. Average weaning weights for intact males and females were 12.1 and 11.8kg respectively. However, for pigs castrated at either 2 or 4 weeks of age, the weaning weights dropped to 10.8 and 11.1kg respectively for half castrates and 10.5 and 11.2kg for full castrates. Analysis of variance (table 3) showed that castration and age at castration significantly ($P < 0.05$) affected the weaning weights. The above results agree with experiments on bulls by Bradford and Spurlock (1964), Makarechain *et al.* (1978). However, Macfarlane (1966) castrated bulls at 24 weeks of age and weighed them at 4 week intervals and reported no significant differences in weaning weights at 36 weeks of age, for both bulls and their contemporary steers. Results of other castration studies in swine (Charette, 1961; Thornton, 1981) reported superiority of intact boards to gilts and castrates for weaning weights. Experiments in sheep (Macclaugherty *et al.* 1959) also showed superior weaning weights of intact ram lambs to wethers and ewes.

Average body weights at 2 and 4 months of age were 32.3 and 58.4kg respectively for intact males and 28.1 and 51.1kg for intact females. However, for pigs fully castrated at 2, 4 or 6 weeks of age, the body weights were 25.6, 24.1 and 21.9kg respectively at 2 months of age and 49.7, 48.3 and 49.5kg respectively at 4 months of age. For pigs half castrated at 2, 4 and 6 weeks of age, the body weights were 26.1, 25.3kg and 25.1kg respectively at 2 months of age and 50.5, 51.3 and 49.8kg respectively at 4 months of age.

In both full and half castrates, age at castration significantly ($P<0.05$) affected average body weights at 2 months of age, but had no significant effects ($P>0.05$)

TABLE 2.

Least - Squares means for Growth Rate, Body and Visceral Organ Weights in Castrated and Uncastrated Pigs.

Treatment	*Age at Castration (Wk).*	[1] *Weaning weight (kg)*	*Weight at 2 months (kg)*	[2] *Weight at 4 months (kg)*	[3] *ADG kg/day*	*Visceral organ wt (kg)*		
						Kidney	*Liver*	*Heart*
Full Castrate (FC)	2	10.5 ±0.84	25.6 ±1.37	49.7 ±1.24	0.51 ±.04	1.21 ±.03	0.21 ±.03	0.26 ±0.05
	4	11.2 ±0.79	24.1 ±1.28	48.3 ±1.21	0.52 ±0.2	0.29 ±.02	1.24 ±.01	0.27 ±.04
	6	–	21.9 ±1.31	49.5 ±1.31	0.53 ±.04	0.31 ±.03	1.20 ±.02	0.26 ±.03
Half Castrate (HC)	2	10.8 ±0.77	26.1 ±1.27	50.5 ±1.33	0.54 ±.04	0.32 ±.03	1.24 ±.05	0.28 ±.04
	4	11.1 ±0.72	25.3 ±1.31	51.3 ±1.26	0.56 ±.02	0.28 ±.02	1.28 ±.02	0.27 ±.02
	6	–	25.1 ±1.26	49.8 ±1.28	0.54 ±.03	0.29 ±.02	1.29 ±.01	0.27 ±.03
Intact Male (IM)	–	12.1 ±0.78	32.3 ±1.26	58.4 ±1.33	0.69 ±.03	0.31 ±.03	1.32 ±.04	0.29 ±.02
Intact Female (IF)	–	11.8 ±0.63	28.1 ±1.18	51.1 ±1.45	0.61 ±04	0.28 ±.02	1.28 ±.04	0.27 ±.02

[1] *Weaning age = 28 days:* [2] *Slaughter age = 4 months:* [3] *ADG = Average dailv gain.*

TABLE 3

Analysis of variance for Growth Rate, Body and Visceral Organ Weights from Castrated and Uncastrated Pigs.

		MEANS SQUARES						
SOURCE	*df*	*Weaning wt*	*wt at 2 mths.*	*wt at 4 mths*	*ADG*	*Kidney wt*	*Liver wt*	*Heart wt.*
Age	2	264.4*	321.7*	301.2	76.3	54.4	48.3	60.4
Treatment	3	342.1**	224.4	5118 .8**	91.4*	50.6	41.4	58.7
IF X IM	1	202.4	301.2	388. 1*	115.3	71.3	53.1	77.7
FC X IM	1	275.3*	389.7*	390.3*	123.2*	68.9	49.2	72.5
FC X IF	1	197.8	211.3	311.8	92.8	70.3	50.7	69.3
Residual	17	58.4	77.7	84.8	24.3	18.3	17.1	20.6

IF = Intact Females; IM = Intact Males; FC = Full castrates
** = (P<0.05) ** = (P < 0.01).*

on body weights at 4 months of age. Castration significantly (P< 0.05) affected body weights at 4 months of age, but not body weights at 2 months of age. These results agree with observation made by Sidher *et al.* (1978) from studies on goats in which mature body weights of intact males castrates and females were reported as 15.1, 11.2 and 12.8kg respectively. Average daily weight gain (ADG) for intact males and females were 0.69 and 0.61kg respectively. However, for pigs castrated at either 2, 4 and 6 weeks of age, the ADG dropped to 0.51, 0.52kg, 0.53kg for full castrates and 0.54, 0.56 and 0.64 kg. respectively for half castrates. Analysis of variance showed that age at castration had no significant (P> 0.05) effect on ADG. These results are similar to earlier reports by Charette (1964) in which the average daily weight gain of intact boars were higher than those of both females and castrates. They are also in agreement with the result of castration studies in goat (Sidhar et *al.*, 1978); in sheep (Chiboka, 1986); and in deer (Mulley and English, 1985), but conflicts with observations of Macfarlane (1966), where both bulls and their contemporary steers had the same average daily weight again of 0.23kg from 52 weeks of age till slaughter at 4 years of age.

Weights of visceral organs (kidney, liver and heart) were 0.31, 1.32 and 0.29 kg for intact males and 0.28, 1.28 and 0.27 kg for intact females respectively. Pigs castrated at 2, 4 or 6 weeks of age had average organ weights of 0.31 1.21 and 0.26 for full castrates and 0.32, 1.24 and 0.28 kg respectively for half castrates. Castrations did not significantly affect (P> 0.05) the visceral organ weights of these animals. There is however a paucity of information in the literature on the effects of castration on visceral organ development in the pigs.

When treatment means were compared by orthogonal contrast (table 3), intact females and intact males differed

significantly only in body weight at 4 months of age and average daily weight gain ($P < 0.05$). Full castrates and intact males differed significantly in all traits except in weights of visceral organs. Full castrates and intact females did not differ significantly in any of the measured parameters. There were no significant differences ($P < 0.05$) between half castrats and full castrates of all the traits measured, so mean separation and orthogonal comparisons using half castrates were not done.

From the above observations, and from similar works earlier cited, there exist a a superiority of intact boars to gilts and barrows in terms of average daily gains, body weight at weaning and at 4 months of age. It has been postulated by Sidhar *et al.* (1978) that since testestorone increases nitrogen retention and consequently the growth of muscular tissues, it is possible that the presence of the testes in the intact males accounted for their better performance in growth rate, and weaning weights when compared to their castrated or female contemporaries. If slaughtered at 4 months of age, the use of intact boars as a meat source is recommended, because at this age the meat is free from the undesirable sex odours normally associated with intact mature boars.

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