Nigerian Veterinary Journal
Vol 34 (2) 760-764

Effect of Exogenous Progesterone on Growth Rate of Large White Piglets in a Humid Environment

***LADOKUN, A.O.**

*Dept of Animal Physiology Federal University of Agriculture Abeokuta. Correspondence: e-mail address: bimboladox@gmail.com, bimoladox@yahoo.co.uk

SUMMARY

A total of 48 large white piglets were used in an experiment to investigate the use of exogenous progesterone on growth of pigs. The pigs were randomly selected as day old piglets and balanced for weight with equal number for each sex. The grouping was into two (2) for progesterone injection (test group) or blank injection (control group) with corn oil as the vehicle. Injections were administered intra muscularly based on live weight once weekly for 24 weeks. The dose rate was 1.0mg progesterone per kg body weight. The parameters measured include weight gain (TWG), average daily gain (ADG), average feed intake (ADFI) and feed conversion ratio(FCR) was calculated. The results obtained showed that exogenous progesterone increased weight gain significantly ($p<0.05$) in both sexes than their respective controls. The same trend of result were observed for feed intake and feed conversion. Exogenous progesterone also indicated pronounced sex effect on the pigs in this study with males having significantly ($p<0.05$) higher values than females. It can be concluded from this study that exogenous progesterone can be used to accelerate growth thereby finishing the pigs early.

Keywords: exogenous, progesterone, pigs, humid ,

INTRODUCTION

Pig keeping contributes to human development from the immediate provision of pig meat (pork) for human consumption as a practical means by which the animal protein intake of the average Nigerian can be increased within a short time. The advantages of pig production over other livestock species have been well documented (Dafwang, 2010). The most outstanding advantages are those of prolific fecundity and its omnivorous feeding habit which enables it to survive with a very wide range of feedstuffs. It is estimated that over 90% of the pig population of 3,410,000 (FLDPCS, 1991) are found in rural and semi-urban centres of the country. Despite these seemingly outstanding qualities of swine, there is a further need for development that will enhance swine production in the tropics.

Progesterone, is a 21-carbon natural progestin derived from cholesterol. It is secreted by the corpus luteum (10-20mg/day) in the later half of oestrous cycle under the influence of Luteinizing Hormone (LH) (Tripatthi, 1999). Progesterone production declines a few days before commencement of next cycle except if the ovum gets fertilized and implants – in which case it immediately starts producing chorionic gonadotropin which is absorbed and sustains the corpus luteum in early pregnancy (Ganong 2005). Placenta starts secreting lot of oestrogen and progesterone from 2nd trimester till term. Man produces 1-5mg progesterone

per day from adrenals and testes-its role if any in males is not known. Progesterone is used primarily as adjustments to oestrogens, hormone, replacement therapy (HRT), threatened abortion and endometriosis (Tripatthi, 1999). The main function of progesterone is preparation of uterus for and maintenance of pregnancy. High circulating concentration of progesterone appears to have a sedative effect (Tripatthi, 1999) . It also causes a slight (0.5°C) rise in body temperature by resetting hypothalamic thermostat and increasing heat production (Ganong, 2005). Unlike other steroid receptors, the progesterone receptor has a limited distribution in the body; confined mostly to the female genital tract, breast, central nervous system (CNS) and pituitary. However, similar to other steroidal hormones, progesterone binds to specific receptors in its target cells (Hafez and Hafez, 2000) .

Oestrogens have been shown to increase progesterone receptor protein, whereas progesterone represses oestrogen receptor and induces local degradation of oestradiol (Tripatthi, 1999). The effect of progesterone is short and phased. That is, it has short t1/2 (half-life)(Ganjam, Kenny and Flickinger, 1975). It is mostly completely degraded in the liver-major product is pregnadiol which is excreted in urine as glucoronide and sulfate conjugates. Progesterone is used for diagnosis of pregnancy and as contraceptives (Jainudeen and Hafez, 2000).

Progesterone may lead to rise in blood sugar (Tripatthi 1999). This study was designed to establish the effect of progesterone on pigs from day old to puberty on body weight gain, and harness it for improvement of swine production in the tropics.

MATERIALS and METHODS

The experiment was carried out at the Piggery unit (physiology) Teaching and Research Farm, University of Ibadan, Ibadan.

A total of 48 large white piglets were used for this experiment consisting of 24 males and 24 females. Half the numbers of each sex (12) were used as experimental control with Corn oil as vehicle. At birth the piglets were weighed and randomly divided into control and treatment groups identification was by use of permanent colour markers to inscribe treatment or experimental codes and numbers for example. PMI is for male piglet number 1 injected with Progesterone. The hormone injections were obtained from Veterinary Pharmacy shops located in Ibadan. The injections were given by deep intra-muscular injections Dosage: Progesterone: 1.0mg/kg body weight intramuscularly. Progesterone purchased were presented in 25mg/ml ampoule (produced by Shanghai Pharmaceutical Company, China) was used and administered to pigs at the rate of 1mg per kg body weight from day old and once weekly to 24 weeks of age. .

Statistical Model: $Yij + \mu + \beta i + Tj + \epsilon ij$

where: Yij = individual observation for the jth treatment in the ith block

μ = general mean

βi = effect of the ith block

Tj = effect of the jth treatment (progesterone injection)

ϵij = experimental error

The sex factor was the blocking factor.(SAS, 2001)

RESULTS and DISCUSSION

Table 1 shows the growth performance of pigs injected with progesterone. The parameter indicated include total weight gain (TWG), Average Daily Gain (ADG), Average Daily Feed intake (ADFI) and Feed Conversion Ratio (FCR). For both sexes and their controls were balanced for live weight at birth. At weaning, 10 weeks, 20 and 24 weeks of age, both sexes for progesterone injected pigs had significantly higher TWG than the control($P<0.05$). Sex effect was pronounced for TWG with males having significantly higher($P<0.05$) birth weight than females. At weaning, 20 and 24 weeks, male pigs had higher TWG than

females. However at 10 weeks female had higher TWG than males. The same trend as observed for TWG was indicated for ADG .For ADFI, at weaning ADFI was similar with females having a higher but not significant ADFI than males. At 10 weeks 20 and 24 weeks, male and female progesterone injected pigs had higher ADFI than their counter part controls. FCR, progesterone injected pigs had better feed conversion than the controls with no significant sex differences for treated pigs.

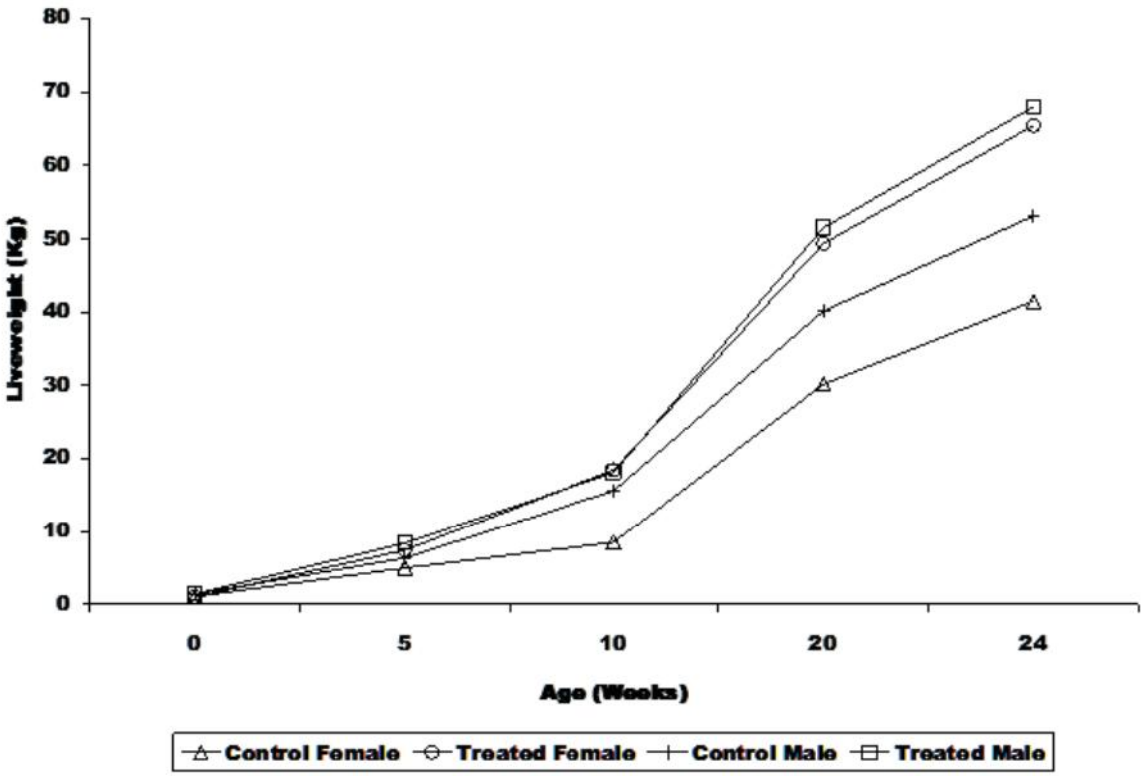

Fig.1: Periodic Live weight changes in Progesterone injected pigs

Figure 1 shows the periodic live weight changes in progesterone injected pigs. This figure shows clearly the rate of growth in the piglets graphically.

The average birth weights of the male pigs were higher than for the females. At 5 weeks, treated pigs (male and female) had gained more weight than the control group, with males still having higher live weight than females. At 10 weeks, 20 weeks and 24 weeks same trend was maintained. It is worthy to note that during these periods, (10^{th}, 20^{th} and 24^{th} weeks) the live weight changes for treated male and treated female were not significantly different($P<0.05$)) . Pigs administered progesterone had significance higher growth rate than their controls (without injection of progesterone)($P<0.05$) . This agrees partially with the report of Tripatthi (1999) and Sejrsen et al (1982, 1983) who stated that prolonged use of progesterone may result in increased body weight in females. But the authors further stated that its action on males was not known. The results of this study indicate that progesterone is anabolic in male and female pigs.

TABLE 1: Effect of Progesterone injection on Growth Performance of Pigs

SEX	Treatment	Parameter	Weeks				
			0 (*Birth)	5 (Weaning)	10	20	24
F	C	TWG (kg)	1.08± 0.04	5.00± 0.08^{b}	8.51± 0.04^{b}	30.22± 0.27^{b}	41.53± 0.21^{b}
		ADFI (gm)	-	-	364 ± 43	1414 ± 61.0	1721 ± 47.0
		FCR	-	-	1.5	3.3	2.3
		ADG (kg)		0.143 ± 0.02	0.243 ± 0.24	0.431 ± 0.41	0.742 ± 0.29
	P	TWG (kg)	1.05± 0.04	7.43± 0.06^{a}	18.50± 0.05^{a}	49.38± 0.07^{a}	65.45± 0.11^{a}
		ADFI (gm)	-	-	750 ± 29	1700 ± 49.62	2014 ± 58.00
		FCR	-	-	1.4	2.4	1.7
		ADG (kg)		0.212 ± 0.04	0.529 ± 43	0.705 ± 29.0	1.17
M	C	TWG (kg)	1.40±0.00	6.39± 0.04^{b}	15.64± 0.04^{b}	40.17^{b}± 0.03	53.08^{b}± 0.09
		ADFI (gm)	-	-	687 ± 42	1600 ± 42	2762 ± 48
		FCR	-	-	1.5	2.8	2.9
		ADG (kg)		0.183 ± 0.02	0.447 ± 0.43	0.574 ± 29	0.948 ± 0.61
	P	TWG (kg)	1.40± 0.03	8.44± 0.03^{a}	18.11± 0.03^{a}	51.50^{a}± 0.12	68.02^{a}± 0.04
		ADFI (gm)	-	-	737	1714	3120
		FCR	-	-	1.4	2.3	2.6
		ADG (kg)		0.241	0.517 ± 0.40	0.736 ± 0.29	1.215 ± 0.48
	PF	TWG (kg)	1.05^{b}± 0.04	7.43^{b}± 0.06	18.50^{b}± 0.05	49.38^{b}± 0.07	65.45^{b}± 0.11
		AWG (kg)		1.49	3.70	4.94	8.18
		ADG (kg)		0.212 ± 0.03	0.529 ± 0.30	0.705 ± 29.0	1.17
Both Sexes	PM	TWG (kg)	1.40^{a}± 0.03	8.44^{c}± 0.03	18.11^{b}± 0.03	51.50^{a}± 0.12	68.02^{a}± 0.04
		AWG (kg)		1.69	3.62	5.15	8.50
		ADG (kg)		0.241 ± 0.02	0.517 ± 0.16	0.736 ± 0.2	1.22 ± 0.40

abc: means in the same column within each sex group with different superscripts are significantly different ($P < 0.05$). F=Female, PF: Progesterone Injected Female, M=Male, PM: Progesterone Injected Male, C=Control, CF: Blank injection Female, CM: Blank Injection Male, P=Progesterone injected pigs, TWG: Total Weight Gain; ADG: Average Daily Gain; ADFI: Average Daily Feed Intake; FCR: Feed Conversion Ratio

* No TWG for Birth (0 weeks) value represents average birth weight

REFERENCES

BENDER, J. M., SEE, M. T., HANSON, D. J., LAWRENCE, T. E. and CASSADY, J. P. (2006). Correlated responses in growth, carcass, and meat quality traits to divergent selection for testosterone production in pigs. *J Anim Sci*. Vol. **84** (6) 1331-1337.

CASSADY, J. P., ROBISON, O. W. JOHNSON, R. K. MABRY, J. W., CHRISTIAN, L. L., TOKACH, M. D., MILLER, R. K. and GOODWIN, R. N. (*2004*). National pork producers, council maternal line genetic evaluation: A comparison of growth and carcass traits in terminal progeny. *J. Anim. Sci.* ***82***:*3482*–3485.

CHUNG, C. S., ETHERTON, T. D. and WIGGINGS, J. P. (1985). Stimulation of Swine growth by Porcine growth hormone. *J. Anim.Sci*.**60**:118.

DAFWANG (2010). Keynote speaker 1st Nigeria international Poultry Summit held at Ibadan. October 2010. dairy and dual-purpose heifers. *Acta Agric. Scand*. **28**:41-46.

DELIGEORGIS S G, ENGLISH P R, LODGE G A and FOXCROFT G R (1985). Inter relationship between growth, gonadotrophin secretion and sexual maturation in gilts reared in different litter sizes. *Animal Production* **41**: 393-401

DEWILDE, R. O., and LAUWERS, H. (1984).

The effect of parenteral use of estradiol, progesterone, testosterone and trenbolone on growth and carcass composition in pigs. *J. Anim. Sci.* **59**:1501–1509.

DYCK, G W and SWIESTRA E E (1983). Growth of the Reproductive tract of the Gilt from birth to Puberty. *Cananadian Journal of Animal Science* **63**(1): 81-87

ETHERTONE, T. D., WIGGINS, J. P., CHUNG, C.S., EVOCK, C. M., REBLIAN, J.F and WALTON, P. E. (1986). Stimulation of pig growth performance by Porcine Growth Hormone and Growth Hormone Releasing Factor. *J. Anim. Sci.* **63**:1389.

EUSEBIO, J. A. *Pig production in the tropics*. Longman Group Ltd., 1980.

FLDPCS, (1991). Federal Livestock Department and Pest Control Services Annual report.

GANJAM V. K., KENNEY, R. M. and FLICKERINGER, G. 1975. Effect of exogenous progesterone on its endogenous levels: biological half-life of Progesterone and lack of progesterone binding in mares. *J. Reproduction and Fertility* **23**:183-188

GANONG W F (2005). Review of Medical Physiology. 22nd Edition. McGraw Hill Publishers. Pp 912

HAFEZ, E.S. E and HAFEZ, B. 2000. Reproduction in Farm Animals. 7th Edition Lippincott Wilkins and Wilkins. New York .Pp. 505

JAINUDEEN, M R and HAFEZ, E S E 2000. In: Reproduction in Farm Animals. 7th Edition Lippincott Wilkins and Wilkins. New York .Pp. 395-404

LADOKUN A O (2006). Exogenous hormonal regulation of growth rate, blood chemistry and fertility in pigs. PhD Thesis University of Ibadan, Ibadan.

LUBRITZ, D., JOHNSON, B. and ROBISON, O. W. (1991). Genetic parameters for testosterone production in boars. *J. Anim. Sci.* **69**:3220–3224.

MACHLIN, L. J. (1972). Effect of Porcine Growth Hormone on growth and carcass composition of the pig. *J. Anim. Sci.* **35**:794.

MADUBUIKE, F. N. "Bridging the animal protein gap for rural development in Nigeria. The potential of pigs." *Journal of Agriculture and Rural Development* 5.1 (1992): 5-12.

MONTGOMERY, T. H., DEW, P. F., and BROWN, M. S. (2001). Optimizing carcass value and the use of anabolic implants in beef cattle. *J. Anim. Sci.* **79**(E. Suppl.):E296–E306.

ROBISON, O. W., LUBRITZ, D. and JOHNSON, B. (1994). Realized heritability estimates in boars divergently selected for testosterone levels. *J. Anim. Breed. Genet.* **111**:35–42.

SCHINCKEL, A. P., JOHNSON, R. K. and. KITTOK, R. J. (1984). Testicular development and endocrine characteristics of boars selected for either high or low testis size. *J. Anim. Sci.* **58**:675–685.

SEJRSEN, K. (1978). Mammary development and milk yield in relation to growth rate in mammary development in pre- and post-pubertal heifers. *J. Dairy Sci.* **65**:793-800

SEJRSEN, K. and S. PURUP. (1997). Influence of pre-pubertal feeding level on milk yield potential of dairy heifers: a review. *J. Anim. Sci.* **75**:828-835

SEJRSEN, K., J. T. HUBER, and H. A. TUCKER. (1983). Influence of amount fed on hormone concentrations and their relationship to mammary growth in heifers. *J Dairy Sci* **66**:845-855.

SEJRSEN, K., J. T. HUBER, H. A. TUCKER, and R. M. AKERS. (1982). Influence of nutrition of

TRIPATHI K D (1999). Essentials of Medical Pharmacology. Jaypee Brothers Medical Publishers 6th edition. Pp504.