

EFFECT OF EXOGENOUS GONADOTROPHIN-RELEASING HORMONE ON SEMEN CHARACTERISTICS AND LIBIDO OF RABBIT BUCKS

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ABSTRACT

Twenty-seven (27) New Zealand White rabbit bucks aged 6 – 8 were used to evaluate the effect of Ovaprim, an exogenous gonadotropin releasing hormone (GnRH), on their seminal characteristics and libido. The rabbits were randomly selected and assigned to three treatment groups designated as T₁, T₂ and T₃ in a completely randomized design (CRD). The exogenous hormone was administered by intramuscular injection at the rate of 0.00ml, 0.20ml and 0.40ml per kilogram body weight for T₁, T₂ and T₃ respectively, with T₁ serving as the control experiment. Semen samples were collected at the beginning of the experiment to determine the baseline and after 48 days of administration of the hormone. Libido was measured 3 hours after administering the GnRH. Results obtained from the baseline study showed no significant difference ($P>0.05$) in the various treatments for semen volume, mass motility, sperm concentration, live sperm proportion, number of spermatozoa per ejaculate, total viable spermatozoa, normal sperm proportion, semen viscosity, semen colour, libido score and reaction time. At the end of the study, semen volume, sperm concentration, live sperm proportion, number of spermatozoa per ejaculate, total viable sperm, semen viscosity and libido were found to differ significantly ($P<0.05$) between the treatments. It was concluded from this study that the administration of 0.2ml/kg exogenous GnRH (Ovaprim) used for this experiment led to enhanced reproductive performance with respect to libido and semen quality and had little or no deleterious effect on the rabbit bucks.

Keywords: Gonadotropin, exogenous, Libido, Spermatozoa, Hormone, Gonadal recrudescence

INTRODUCTION

Despite efforts by earlier researchers to improve libido and seminal characteristics rabbits, there is still evidence of poor libido and low fertility rates in rabbits raised in the country. Reproductive activities in farm animals are under the influence of hormones regulated by the hypothalamus and pituitary gland. Gonadotrophin releasing hormone (GnRH) is responsible for the proliferation of interstitial cells stimulating hormone ICSH (LH) from the anterior pituitary gland of farm animals (Hafez *et al.*, 2000). ICSH stimulates the release of testosterone by the interstitial cells of Leydig in the testes of animal. Circulating levels of testosterone are essential for the stimulation of spermatogenesis and enhancement of libido in farm animals (Hafez *et al.*, 2000). This study evaluated the effect of an exogenous gonadotropin releasing hormone analogue (GnRH), OvaprimTM on the reproductive physiology of male rabbits with emphasis on semen characteristics and sexual behaviour (libido). Ovaprim is a product containing Salmon

GnRH analogue and has been used extensively for inducing and boosting milt (sperm) production in the male; gonadal recrudescence and ovulation (spawning) in female fishes (Syndel, 2003).

MATERIALS AND METHODS

This experiment was conducted in the Rabbitry Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State. Umudike is located within the tropical rainforest zone, between latitude 050 29'N and longitude 070 33'E; the environment is characterized by an annual rainfall of 2177mm. (NRCRI, 2004)

Experimental animals and management

Twenty seven (27) New Zealand white rabbit bucks aged 6-8 months were used for this study. The animals were quarantined and allowed for a period of three (3) weeks to acclimatize to the new environment before commencement of the experiment. Prophylactic treatment against mange and coccidiosis were administered using Ivermectin injection and Embazin forte

respectively. They animals were housed in individual cells in wooden hutches and were fed balanced concentrate diet alongside forages consisting of a grass-legume mixture. Fresh clean water was provided *ad libitum*.

Experimental design and procedure.

The experiment was conducted using a completely randomized design (CRD). The rabbit bucks were randomly selected and assigned into three (3) treatment groups designated as T₁, T₂ and T₃, each treatment consisting nine (9) animals. The treatments were replicated three times; each replicate consisting 3 bucks. The hormonal treatments were administered at the rate of 0.0ml/kg body weight for T₁, 0.2ml/kg body weight for T₂ and 0.4ml/kg body weight for T₃ bucks. The hormone was administered by intramuscular injection at the thigh muscle. This was done during the early hours of the morning between 6 – 7am.

Data collection

Semen samples were collected from the rabbit bucks at the onset of the experiment, before administration of the GnRH for baseline studies and 48 days after administration of the GnRH. Semen collection was achieved with the aid of an artificial vagina design and fabricated for the purpose of this study; guided by the procedures described by Herbert and Adejumo (1995). The semen sample were analyzed for semen volume, sperm motility, live sperm proportion, sperm concentration, number of spermatozoa per ejaculate, abnormal sperm proportion, semen colour and consistency. Libido and reaction time were measured 3 hour after administration of the hormone. Reaction time was measured using a stop watch and libido was subjectively scored on a scale of 1 - 5 according to the scoring pattern by Chibundu (2005). Semen colour and semen consistency were scored on a graded scale of 1 – 3 and 1 – 4 respectively.

Data analysis

Data generated was subjected to Analysis of variance (ANOVA) according to Steel and Torrie (1980). Significant means were separated using Duncan's multiple range Test (1955).

RESULT AND DISCUSSION

The results obtain from the study on the effect of the GnRH administration of libido and semen characteristics are presented in Tables 1 and 2. The results obtained for semen volume at the

start (baseline) of the experiment showed no significant difference ($P>0.05$) between T₁ (0.57ml), T₂ (0.60ml) and T₃ (0.57ml). However, at the end of the experiment, T₂ (0.69) was observed to be significantly higher ($P<0.05$) than T₁ (0.55ml) while T₃ (0.63ml) did not differ significantly ($P>0.05$) from T₁ and T₂. Semen samples collected from T₂ animals were observed to contain a relatively higher proportion of gel plug, which suggests that the exogenous hormone administered may have influenced the secretory function of the vesicular gland by increasing the level of testosterone in the bucks. The gel plug from the rabbit semen originates in the vesicular gland (Holtz and Foote, 1978; Del-Nino *et al*, 1997) and it is androgen dependent (Bell and Mitchell, 1984).

Values obtained for sperm motility were 82.34, 80.17 and 80.75 % for T₁, T₂ and T₃ respectively. There were no significant differences ($P>0.05$) between the treatments for this parameter. Sperm Concentration at the end of the study was statistically similar in T₂ (126.06×10^6) and T₃ (125.49×10^6). T₂ and T₃ however, were found to be significantly ($P<0.05$) higher than the control group, T₁ (113.18×10^6), with T₂ having the highest value. The exogenous GnRH administered to T₂ and T₃ bucks is suspected to have triggered the spermatogenic activities of the sertoli cells of the testes by stimulating the pulsatile secretion of Interstitial Cells Stimulating Hormone from the anterior pituitary bringing about the production of sperm cells; leading to the significant difference observed in these two treatment groups.

Total spermatozoa per ejaculate was similar ($P>0.05$) in T₂ (87.34×10^6) and T₃ (79.35×10^6). These treated groups were observed to be significantly higher than T₁ (62.71×10^6), the control group. The range of values obtained in this experiment was higher than the range of $54 \pm 3 \times 10^6$ to $78 \pm 2 \times 10^6$ reported by Herbert *et al* (2005). Live sperm proportion was significantly different ($P>0.05$) in T₂ and T₃. The control group T₁, was found to be significantly ($P<0.05$) lower than the treated groups T₂ and T₃; with T₂ recording the highest value. The values obtained in this study were higher than 79.41 % and 82.57 % recorded by Herbert and Ukar (2008). Abnormal sperm proportion at the end of the experiment did not differ significantly ($P>$

0.05) across the various treatment groups: T₁ (1.82), T₂ (1.81) and T₃ (1.92). The values obtained were very low; implying that the GnRH administered had little or no deleterious effect on spermatogenesis in the rabbit bucks. The range for abnormal sperm recorded in this study was lower than 10.30 % to 22.99 % recorded by Ogbuwu (2008) and 8.92 % to 9.17 % reported by Herbert and Ukar (2008). Semen viscosity was significantly higher ($P < 0.05$) in T₂ (3.00) than in T₁ (2.33) and T₃ (2.67). The lowest score was recorded in T₁. Semen colour was not significantly different ($P > 0.05$) between T₁ (2.00, 2.33), T₂ (2.00, 2.33) and T₃ (2.33, 2.67). Scores recorded in all the treatments fall within a range considered as good. Reaction time (an important measure for libido) at the start of experiment; measured 3 hours following injection of the GnRH was found to be statistically similar ($P > 0.05$) among T₂ (4.38) and T₃ (4.29). These treatments however were significantly ($P < 0.05$) lower than T₁ (8.01). The reduction in reaction time observed in T₂ and T₃ believed to be associated with an increase in the circulating levels of testosterone. The exogenous hormone is believed to have influenced this parameter by stimulating the synthesis and secretion of testosterone by the interstitial cells of the testis of the rabbit bucks.

CONCLUSION AND RECOMENDATION

The quality of any semen is characterized primarily by its volume, concentration of sperm cells, sperm motility, live sperm proportion and the percentage of normal spermatozoa. The physiological processes leading to the production and secretion of good quality semen and a high libido are under the control of gonadotropic and steroid hormones released by the anterior pituitary gland and the gonads under the influence of releasing factors in the hypothalamus. Observations made and results obtained in this study suggest that the exogenous GnRH used, to a great extent influenced the sexual behaviour and semen characteristics of the rabbit bucks. Semen characteristics such as: semen volume, sperm concentration, total number of spermatozoa per ejaculate, live sperm proportion and total viable spermatozoa as well as libido show an enhanced performance following an intramuscular injection of 0.20 and 0.40ml/kg weight of the animal; with 0.20ml/kg

giving a relatively better result. Furthermore, no deleterious results were recorded in the bucks during the study; implying that the exogenous GnRH administered had little or no harmful effect on the bucks. It is concluded from this study that the administration of exogenous GnRH – OvaprimTM to rabbit bucks at the rate of 0.2 ml/kg body weight can enhance sex drive and semen quality leading to a better reproductive performance.

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Table 1: Semen Characteristics and Libido of experimental bucks at the start of the experiment (Baseline study).

PARAMETERS	T ₁ (0.00ml/kg)	T ₂ (0.20ml/kg)	T ₃ (0.40ml/kg)	SEM
Semen Volume (ml)	0.57	0.60	0.57	0.02
Mass Motility (%)	83.95	84.50	84.57	0.37
Sperm Concentration (x10 ⁶)	112.00	112.83	113.67	0.56
Live Sperm Proportion (%)	84.10	87.74	84.51	1.25
Total Sperm per Ejaculate (x10 ⁶)	63.47	63.67	64.43	1.82
Total Viable Spermatozoa (x10 ⁹)	521.95	526.75	529.39	15.53
Percentage Normal sperm (%)	97.84 ^a	97.93 ^a	97.22 ^b	0.19
Percentage Abnormal Sperm (%)	2.16 ^b	2.07 ^b	2.78 ^a	0.19
Semen Viscosity (1-4)	3.00	3.00	2.67	0.11
Semen Colour (1-3)	2.00	2.00	2.33	0.11
Libido Score (1-5)	3.67 ^b	5.00 ^a	4.67 ^a	0.33
Reaction Time (s)	8.01 ^a	4.38 ^b	4.29 ^b	0.64

abc: Means with different superscripts within a row are significantly different (P<0.05). SEM: Standard Error of Mean.

Table 2: Semen characteristics and Libido of experimental bucks at the end of the study (48 days).

PARAMETERS	T ₁	T ₂	T ₃	SEM
Semen Volume (ml)	0.55 ^b	0.69 ^a	0.63 ^{ab}	0.03
Mass Motility (%)	82.34	80.17	80.75	1.48
Sperm Concentration (x10 ⁶)	113.18 ^b	126.06 ^a	125.49 ^a	2.48
Live Sperm Proportion (%)	85.83 ^b	93.65 ^a	91.18 ^a	1.69
Total Sperm per Ejaculate (x10 ⁶)	62.71 ^b	87.34 ^a	79.35 ^a	4.54
Total Viable Spermatozoa (x10 ⁹)	508.63 ^b	684.02 ^a	628.17 ^b	33.14
Percentage Normal Sperm (%)	98.18	98.19	98.08	0.07
Percentage Abnormal Sperm (%)	1.82	1.81	1.92	0.07
Semen Viscosity (1-4)	2.33 ^b	3.00 ^a	2.67 ^{ab}	0.17
Semen Colour (1-3)	2.33	2.33	2.67	1.18
Libido Score (1-5)	3.67 ^b	4.33 ^a	4.00 ^{ab}	0.17
Reaction Time (s)	10.55	8.93	9.25	1.11

abc: means with different superscripts within a row are significantly different (P<0.05). SEM: Standard Error of Mean.