



SHORT COMMUNICATION

Effects of Repeated Coitus on Luteinizing Hormone and Reproductive Performance In Doe Rabbits

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ABSTRACT

The study investigated the effect of number of coitus on luteinizing hormone and reproductive characteristics of rabbit doe. A total of 150 rabbit does were used. The animals were randomly assigned to three treatments of five replicates each. The BD₁, BD₂ and BD₃ rabbit does had one coitus only, two coitus, one hour apart and two coitus two hours apart respectively. The re-mating interval was seven days for all the three treatment groups. The luteinizing hormone (LH) level attained its peak at 90 minutes in all the treatment groups. The ovulation rate was significantly ($P < 0.05$) higher in BD₂ group than in the other two groups. The highest conception rate was found in BD₂ (82.5%), followed by BD₃ group (80%) and BD₁ group (77%) respectively. The mean litter size and litter weight were significantly ($P < 0.05$) higher in BD₂ group than those in BD₁ and BD₃ groups. The results suggest that the use of two coitus one hour apart result in better reproductive performance in rabbit production.

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INTRODUCTION

Ovulation in the doe rabbit is brought about by physical stimulation of the perineal, pudendal and vaginal areas that result in multiple, broad-based nerve stimuli to the hypothalamus. This results in the release of gonadotropin releasing hormone which causes the luteinizing hormone (LH) spike that actually initiates the ovulatory progress (Ahaotu *et al.* 2008). Lebas *et al.* 1997) showed that mating produced a marked rise in serum L.H of doe rabbits which peaked at 90 minutes after coitus, however, Hunter (2000) reported that the LH reached its peak two hours after coitus. The study was conducted to determine the effect of repeated coitus, at suitable time intervals, on the luteinizing hormone and the reproductive performance of doe rabbits.

MATERIALS AND METHODS

The research was carried out on in the sixth parity, aged 12-13 months. The does were divided into three groups, each group contained fifty does. The first group having one coitus only, the second group having two coitus one hour apart and the third group having two coitus two hours apart (each two coitus was with the same male). The remating interval was seven days for all three groups.

Study Location

The study was carried out at the Teaching and Research Farm of Imo State Polytechnic, Owerri, Nigeria. Imo State Polytechnic, Umuagwo, Nigeria is situated between longitudes 7° 0'06¹¹E and 7° 03' 00¹¹ and latitudes 5° 28' 00¹¹N and 5° 30' 00¹¹N in the humid tropical West Africa (Ofomata, 1975).

Experimental Animals

All animals were bred using high fertile bucks aged 15 months. The does and bucks were housed separately in individual galvanized wire hutches. Hutches for the does were provided with external nest boxes for kindling and nursing the young. The animals were all reared under similar environmental conditions. They were fed *ad libitum* on a commercial pelleted ration composed of 18% crude protein, 3% ether extract, 8% crude fibre, 2% mineral mixture (1% Ca, 0.7% P and 0.3% Na) and 63.0% soluble carbohydrates. The digestible energy was 2600 kcal/kg ration. Fresh water was provided continuously from automatic drinkers with nipples.

Data Collection

The data included gestation period, litter size, litter weight, bunny weight, stillbirths, pre-weaning mortality and remating interval.

Data collected at birth were recorded within 12 hours after kindling. All weights were recorded in grams. Bucks were allocated does on a random basis. The buck/doe ratio was low 1:4. Blood samples (2 ml) were collected into glass tubes from the marginal ear vein of each doe at 75, 90, 105, 120, 150, 165, 180, 195, 210 and 225 minutes just after first coitus. The blood samples were kept at 4°C for 12 hours in a refrigerator. Sera were separated by centrifugation for 20 minutes at 3,000 rpm and stored frozen at -20°C until analyzed. LH levels in the serum were determined using the radioimmunoassay kits according to Catt and Tregear (1968). Thirty does (10 does from each group) were slaughtered at 14 hours post coitus (after ovulation) according to Hafez (1980). The ovulated follicles were counted for each ovary. Determination of ovulation rate in early gestation was carried out by appearance of scars on the apical part of the follicle (by magnifying glass) corresponding to the rupture of the peripheral layers (Osinowo, 2006 and Bolet *et al.* 1992).

Data Analysis

Data analysis was done using analysis of variance technique of Steel and Torrie (1980) while significant differences in means were separated using the method of Duncan's Multiple Range Test as outlined by Gordon and Gordon (2004).

Ovulation rate (OR) was also calculated by:
 $OR = \text{No. of ovulated follicles} / \text{No. of total follicles} \times 100$

Statistical analysis was conducted according to Gordon and Gordon (2004).

RESULTS AND DISCUSSION

The LH levels at different time after one coitus, two coitus (one hour apart) and two coitus (2 hours apart) in female rabbits are presented in Table 1. The results indicated that the female rabbits reached its LH peak level at 90 minutes post coitus and the basal level at 75 minutes. The highest LH value recorded for all the female rabbits after 90 minutes of mating corresponds with the results of Lebas *et al.* (1997) but disagreed with Hunter

(2000) who reported 120 minutes as the time per LH surge in female rabbits.

Mean numbers of ovulated follicles of right ovary were significantly higher in group 2 than other groups. However, the mean numbers of non-ovulated follicles of left and both ovaries were significantly higher in 1 and 3 groups than 2. The mean ovulation rate of right, left and both ovaries were significantly higher in group 2 than in other groups (Table 2). The lowest percentage of non-ovulated does were found in group 2 then followed by group 3 and 1 respectively.

Table 1: Serum levels of LH (mIU/mL) in the doe rabbits having one or two coitus.

Time	Group 1 (One coitus only)	Group 2 (two coitus one hour apart)	Group 3 (two coitus two hours apart)
0 min	(1 st coitus)	(1 st coitus)	(1 st coitus)
60 min	--	(2 nd coitus)	-
75 min	20.3 ± 2.6	22.6 ± 2.8	21.2 ± 2.1
90 min	43.8 ± 4.8	45.6 ± 2.3	45.3 ± 1.9
105 min	30.7 ± 3.8	31.4 ± 2.4	31.2 ± 1.3
120 min	26.6 ± 1.6	25.8 ± 2.3	27.6 ± 1.8 (2 nd Coitus)
150 min	23.8 ± 1.9 ^a	39.1 ± 1.8 ^b	25.6 ± 2.6 ^a
165 min	25.3 ± 1.5 ^a	26.3 ± 4.6 ^b	23.1 ± 3.0 ^a
180 min	30.4 ± 2.3	28.6 ± 3.1	29.2 ± 2.8
195 min	31.3 ± 3.2	32.6 ± 2.9	33.2 ± 2.9
210 min	28.6 ± 1.9	27.8 ± 2.8	29.6 ± 3.1
225 min	33.8 ± 1.7	31.8 ± 3.6	34.0 ± 2.8

^{ab} Means along the same row with different superscripts are significantly (P<0.05) different.

Table 2 shows the effect of number of coitus on reproductive performance of female rabbits. The highest conception rate was found in group 2, followed by groups 3 and 1 respectively. The mean litter size and litter weight were significantly (P<0.05) higher in group 2 than in other two groups. The mean gestation period, bunny weight, percentage of stillbirths, pre-weaning mortality, total mortality and remating interval were similar (P>0.05) among the groups. The first coitus in all groups produced a marked rise in serum LH of does, which peaked at 90 minutes. Similar results were achieved by Dufy-Barbe *et al.*, (1973) and Diaz *et al.* (1987). The second coitus in group 2 caused another peak of the LH level, which may

Table 2: No. of ovulated and non-ovulated follicles as well as ovulation rate in doe rabbits, having one or two coitus at 13 hours post coitus²

Time	Group 1 (One coitus only)		Group 2 (two coitus one hour apart)		Group 3 (two coitus two hours apart)	
	R	L	R	L	R	L
Mean no of follicles(L3)	8.67±1.01	6.16±0.81	10.00±1.03	4.77±0.40	9.38±0.92	5.75±0.46
Number of ovulated follicles (L)	6.83±0.60 ^a	3.5±0.33 ^a	9.11±0.60 ^b	4.66±0.41	7.5±0.82 ^a	3.5±0.46
Mean no of ovulated follicle	10.66±0.83	1.83±0.22	13.77±0.89 ^a	0.88±0.60	10.9±0.77 ^a	1.87±0.09
Number of non-ovulated (R) follicles	2.66±0.38 ^a	3.99±0.81 ^a	0.11±0.02 ^a	0.99±0.16 ^a	2.25±0.38 ^b	3.42±1.20
Mean no of Non ovulated follicles (R and L)	78.77±6.1 ^a	56.8±3.1 ^b	91.1±6.5	97.69±7.8 ^c	79.95±6.8 ^a	60.86±7.3 ^a
Ovulation (R and L) rate	69.65±4.8 ^a	93.23±6.9 ^b	10(1/10)	20(2/10)		
Mean Ovulation rate						
Non-ovulated does %						

^{ab}Mean along the same row with different superscripts are significantly (P<0.05) different; R- right and L – left.

Table 3: Comparison between Dutch does have one or two coitus in reproductive performance traits at sixth party⁴.

Parameter	Group ₁ (One coitus only)	Group ₂ (two coitus one hour apart)	Group ₃ (two coitus two hours apart)
No of does	40	40	40
Conception rate	77.0 (31/40)	82.5 (33/40)	80.0(32/40)
Mean gestation period	31.1 ± 0.9	30.6 ± 0.8	31.3 ± 0.9
Mean litter size(gm)	7.4 ± 1.1 ^a	10.2 ± 2.6 ^b	7.3 ± 1.9 ^a
Mean litter weights (gm)	437.36 ± 21.8 ^a	604.86 ± 23.6 ^b	459.90 ± 19.2
Mean bunny Weights (gm)	61.6 ± 5.6	59.3 ± 3.2	63.0 ± 4.1
Stillbirths (%)	56 (19.71)	71 917.400	58 (19.8)
Pre-weaning mortality (%)	35 (12.32)	46 (11.27)	31 (10.16)
Total mortality (%)	91 (32.04)	117 (28.67)	89 (30.47)
Remating interval (Days)	7.2 ± 0.42	7.4 ± 0.62	7.3 ± 0.53

be due to the effect of recurrent physical stimulation of the perineal and pudendal areas before the beginning of the first surge of LH. Causes rupture of the remaining follicles after the first surge and this leads to an increase in the ovulation rate as well as an increased litter size (approximately 2.8 pups). However, these results not being obtained in group 3 may be due to the second coitus already having occurred after the beginning of the first surge of LH.

The increase in the conception rate in group 2 and 3 must be the due to successful ovulation brought about by the stimulation of the second coitus when ovulation did not occur after the first coitus stimuli only, as in group 1 which experienced one coitus only. The increased litter size at birth in group 2 may be due to the increased ovulation rate caused by the second surge of LH, leading to the rupture of the remaining follicles after the first ovulation (or first surge of LH).

Conclusion

The result of this trial suggested that the conception rate in groups two and three of rabbit does were successful due to the second coitus observed. Besides, the increased litter size at birth recorded in group two was due to increased ovulation rate caused by the second surge of luteinizing hormone.

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