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Number of coitus, luteinizing hormone and reproductive performance relationships in doe rabbits

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1 Introduction

Ovulation in the doe rabbit is brought about by physical stimulation of the perineal, pudendal and/or vaginal areas of the doe that result in multiple, broad-based nerve stimuli to the hypothalamus. This results in the release of gonadotropin releasing hormone which causes the LH spike that actually initiates the ovulatory process (RAMIREZ and BEYER, 1988). DUFY-BARBE et al. (1973) and DIAZ et al. (1987) showed that mating produced a marked rise in serum LH of doe rabbits which peaked at 90 minutes after coitus, however, McNITT (1992) reported that the LH reached its peak two hours after coitus. The present study was conducted to determine the effect of repeated coitus, at suitable time intervals, on the ovulation rate and the reproductive performance of doe rabbits.

2 Materials and methods

The present investigation was carried out on one hundred and fifty Bauscat does 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. The study was carried out in San El-Hagar Agricultural Company Farm, San El-Hagar area, Sharkeya Province, Egypt from December 1992 to March 1993. All animals were bred using high fertile bucks aged 15 months. The does and bucks were housed separately in individual galvanized wire batteries. Batteries for 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

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ration composed of 18 % crude protein, 3 % ether extract, 14 % 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. 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 3000 rpm and stored frozen at -20 °C until analysed. LH levels in the serum were determined using the radioimmunoassay kits produced by Diagnostic Products Corporation (Los Angeles) according to CATT and TREGEAR (1968). Thirty does (10 does from each group) were sacrified 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 (KATZ, 1988 and BOLET et al 1992). O.R. was calculated by

$$\text{O.R.} = \frac{\text{No. of ovulated follicles}}{\text{No. of total follicles}} \times 100$$

Statistical analysis was conducted according to SNEDECOR and COCHRAN (1982).

3 Results and discussion

Table 1 below summarises the LH levels at different time after one and two coitus in doe rabbits .

LH reached peak levels at 90 minutes after the first coitus in group 1 having one coitus only as well as in groups 2 and 3 having two coitus. However, LH peak level returned at 90 minutes after the second coitus only in group 2 - having two coitus one hour apart. (Figure 1).

Mean numbers of ovulated follicles of right and total ovaries per ovulated doe were significantly higher in group 2 than in other groups. However, the mean numbers of non-ovulated follicles left and total ovaries per ovulated doe were significantly higher in both groups 1 and 3 than in group 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 groups 3 and 1 respectively.

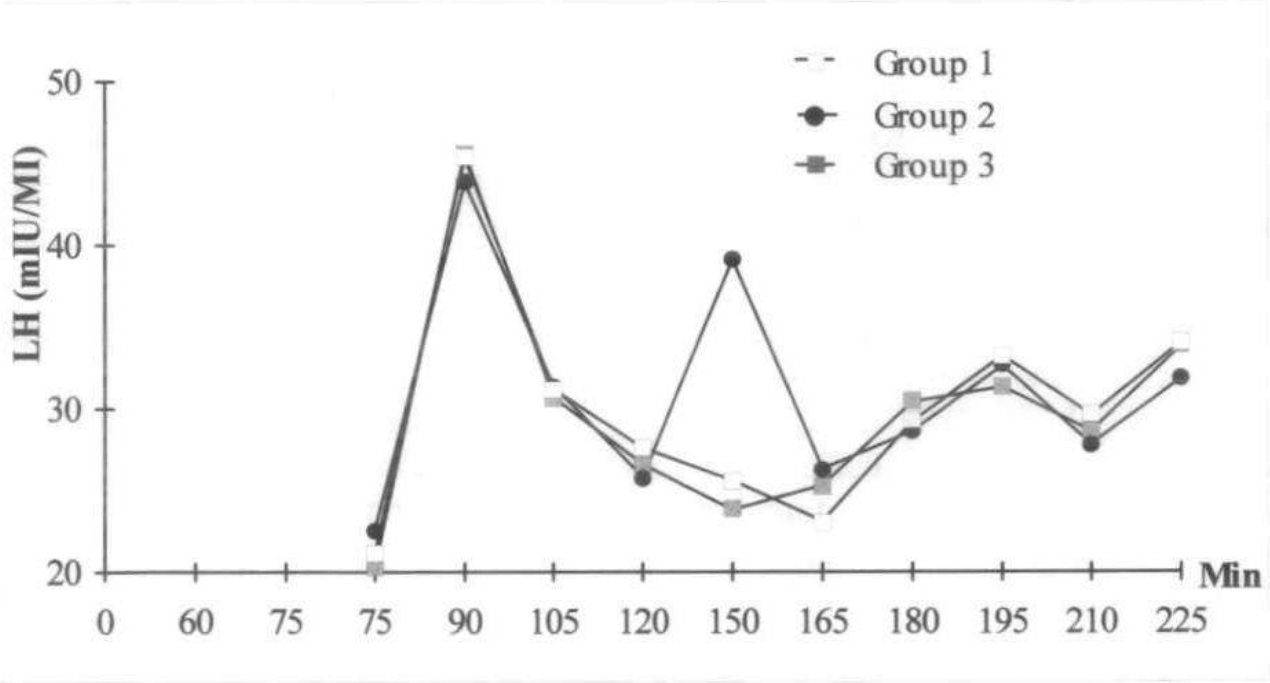

Figure 1: Comparison between serum levels of LH in doe rabbits having one (Group 1) or two coitus (Group 2 one hour apart and Group 3 two hours apart)

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

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	45.6 ± 4.8	43.8 ± 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

[1] Means in the same raw having the same letters did not differ significantly, otherwise they differ ($P < 0.01$)

Table 3 below summarises the reproductive performance for all three groups.

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 higher in group 2 than in other groups. The mean gestation period, bunny weight, percentage of stillbirths, pre-weaning mortality, total mortality and remating interval were insignificantly affected by the number of coitus.

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, this result may be due to the effect of recurrent physical stimulation of the perineal and pudendal areas before the beginning of the first surge of LH. The second 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.

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 coitus[2]

Items	Group 1 (one coitus only)		Group 2 (two coitus one hour apart)		Group 3 (two coitus two hours apart)	
	R	L[3]	R	L	R	L
Mean No. of follicles	8.67 ± 1.01	6.16 ± 0.81	10.00 ± 1.03	4.77 ± 0.40	9.38 ± 0.92	5.75 ± 1.01
Mean No. of ovulated follicles	6.83 ± 0.60^a	3.5 ± 0.33	9.11 ± 0.60^b	4.66 ± 0.41	7.5 ± 0.82^a	3.5 ± 0.46
Both R and L	10.66 ± 0.83^a		13.77 ± 0.89^b		10.9 ± 0.77^a	
Mean No. of non-ovulated follicles	1.83 ± 0.22	2.66 ± 0.38^d	0.88 ± 0.60	0.11 ± 0.02^b	1.87 ± 0.09	2.25 ± 0.38^a
Both R and L	3.99 ± 0.81^a		0.99 ± 0.16^b		3.42 ± 1.20^a	
Ovulation rate	78.77 ± 6.1^d	56.8 ± 3.1^b	91.1 ± 6.5^c	97.69 ± 7.8^c	79.95 ± 6.8^a	60.86 ± 7.3^b
Both R and L	69.65 ± 4.8^a		93.23 ± 6.9^b		72.78 ± 9.1	
Non-ovulated does %	40 (4/10)		10 (1/10)		20 (2/10)	

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2 Means in the same raw having the same letters did not differ significantly, otherwise they differ ($P < 0.01$)

3 R and L = right and left ovaries.

The increase in the conception rate in group 2 or 3 must be due to successful ovulation brought about by the stimulation of the second coitus where 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).

Table 3: Comparison between Bauscat does have one or tow coitus in reproductive performance traits at sixth parity[4]

Items	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	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[a]
Mean bunny weights (gm)	61.6 ± 5.6	59.3 ± 3.2	63.0 ± 4.1
Stillbirths (%)	56 (19.71)	71 (17.40)	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

4 Summary

The study was carried out on 50 does of Bauscat rabbits in three groups. Luteinizing hormone (LH) reached peak level at 90 minutes after the first coitus in group 1 (having one coitus only), group 2 (having two coitus one hour apart) as well as group 3 (having

[4] Means in the sam raw having the same letters did not differ significantly, otherwise they differ ($P < 0.01$)

two coitus two hours apart). However, LH peak level returned at 90 minutes after the second coitus in group 2 only. Therefore, the ovulation rate (O.R.) was significantly higher in group 2 than in other groups. The highest conception rate was found in group 2, then followed groups 3 and 1 respectively. The mean litter size and litter weight were significantly higher in group 2 than other groups.

Zusammenfassung

Beziehungen zwischen der Anzahl der Bedeckungen und dem Luteinisierenden Hormon sowie der Reproduktionsleistung von Häsinnen

In Ägypten wurden 150 Bauscat-Häsinnen auf die Beziehungen zwischen der Anzahl der Bedeckungen zum 6. Wurf zur Bildung von Luteinisierendem Hormon (LH) sowie zur Reproduktionsleistung in 3 Gruppen unterschiedlicher Bedeckungsart untersucht. Die LH-Bildung erreichte ihren Gipfelpunkt 90 Minuten nach der ersten Bedeckung in Gruppe 1 (nur eine Bedeckung), in Gruppe 2 (in der eine zweite Bedeckung eine Stunde nach der ersten erfolgte) sowie in Gruppe 3 (in welcher eine zweite Bedeckung 2 Stunden nach der ersten stattfand). Nach weiteren 90 Minuten stieg das Gipfelniveau des Serum-LH lediglich nach der zweiten Bedeckung in Gruppe 2 erneut an. Dementsprechend war die Ovulationsrate in Gruppe 2 signifikant höher als in den anderen Gruppen. Die höchste Konzeptionsrate wurde ebenfalls in Gruppe 2 gefunden, gefolgt von Gruppe 3 und Gruppe 1. Die mittleren Werte der Wurfgröße und der Wurfmasse waren gleichfalls in Gruppe 2 höher als in den anderen Gruppen.

Relaciones entre la cantidad de coitos, la hormona luteinizante y el rendimiento reproductivo de liebres

En Egipto se investigó con 150 liebres Bauscat las relaciones entre la cantidad de coitos para la sexta camada, para la formación de la hormona luteinizante (HL) y para el rendimiento reproductivo en 3 grupos con diferentes tipos de coitos. La formación de HL alcanzó su punto culminante 90 minutos después del primer coito en el grupo 1 (sólo un coito), en el grupo 2 (en el cual tuvo lugar un segundo coito una hora después del primero) asi como en el grupo 3 (en el cual tuvo lugar un segundo coito dos horas después del primero). Después de los siquientes 90 minutos aumentó el nivel culminante del suero HL sólo luego del segundo coito en el grupo 2. Por consiquiente, la cuota de ovulación en el grupo 2 fué significantemente mayor que en los otros grupos. La mayor cuota conceptiva se presentó también en el grupo 2, seguido de los grupos 3 y 1. También los valores medios del tamaño y del peso de la camada fueron mayores en el grupo 2 en comparación con los otros grupos.

5 References

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