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EFFECT OF POST-PARTUM MATING INTERVAL OF RABBITS ON PROGESTERONE LEVEL THROUGH PREGNANCY

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SUMMARY

Twenty four of each New Zealand White and California rabbits weighing 3.5-4.0 kg and aging 8 months were used in the present study. In accordance with post-partum mating does were mated immediately after parturition, 7 and 28 days post-partum in group 1, 2 and 3 respectively. Females were classified into 3 subgroups according to litter size. Low bunnies (2-5), intermediate bunnies (6-9) and high bunnies (10-13). Blood samples were withdrawn from the ear vein, directly before mating, 7, 14 and 21 days through pregnancy. Plasma progesterone (P4) was determined using RIA.

Progesterone concentration (ng/ml) was higher in group 2 and 3 than in group 1, however the differences were not statistically significant. Plasma p4 concentration increased ($p<0.01$) as litter size increased. A correlation coefficient between plasma p4 concentration and litter size during pregnancy was found to be +0.58 for California rabbit and +0.59 for New Zealand White rabbit. Level of p4 in plasma of New Zealand White females was higher ($p<0.01$) than that in California females. The trend of p4 level in plasma through pregnancy was presented as follows: Significant increase in hormone after coitus until 7 days. The peak of hormone was observed at 14 days, then the hormone decreased significantly until 21 days of pregnancy.

Keywords: Rabbit, progesterone, post-partum mating, litter size

INTRODUCTION

Intensive rabbit production requires good understanding of their behavior and physiological functions particularly in the field of reproduction. The number of bunnies which a doe should be allowed to give during the year is often a subject of argument. Commercial rabbit breeding aims at having more litters per year. If feeding and management are satisfactory then the frequent breeding is desirable and is of no harm on reproductive efficiency.

When does were mated just post-partum, the offsprings were subsequently weaned early, neither conception rate (Torres et al., 1977 and Lamb et al., 1991) nor litter size at birth (Surdeau et al., 1979) differed significantly from controls bred naturally after normal weaning. However, in earlier studies on the effect of the interval from parturition to mating on fertility and prolificacy, suckling was shown to have an adverse effect during the first 10 days, but not thereafter. There was also an adverse effect of suckling on implantation, which varied directly according to the number of suckling, and appeared to differ between strains, between environments, or both (Prud'horn et al., 1969; Harned and Casida, 1969; Partridge et al., 1984).

Progesterone hormone is the major agent which control success of pregnancy, litter size and effective lactation (Torres et al., 1977; Coppola et al., 1979; Lanman and Thau, 1979; Habeab and El-Masry, 1991).

The present study was designed for two purposes 1) to determine the effect of post-partum mating period on pregnancy in relation to progesterone hormone 2) to add information about the relation between litter size at birth and progesterone level of concentration in plasma domestic rabbits.

MATERIALS AND METHODS

This work was carried out in the rabbitary of El-Kanater Research station of the Agriculture Research center, Ministry of Agriculture and in the Physiology

Research Lab. of Animal Production Department, Faculty of Agriculture, Cairo University.

Animals

Twenty four does of each New Zealand White and California rabbits weighing 3.5-4.0 kg and aging 8 months were used in this study. Rabbits were housed in individual cages and fed commercial concentrate pellets ad. lib. Does were divided according to post-partum period of mating into 3 groups. Those in group 1 were mated immediately after parturition; females in group 2 were mated 7 days post-partum and does in group 3 were mated 28 days post-partum (after weaning). After parturition, the does were classified into 3 sup-groups according to their litter size at birth. Sub-group A (2-5); sub-group B (6-9) and sub-group C (10-13) bunnies. Pregnancy was induced by forced mating does twice to bucks of proven fertility.

Blood sampling

Blood samples were withdrawn from the ear vein into heparinized syringes directly before mating (0) then at 7, 14 and 21 days during pregnancy. Plasma samples were prepared by centrifugation (3000 rpm for 15 minutes) and stored at -18°C until progesterone hormone assay.

Hormonal assay

Radioimmuno assay technique was used for progesterone assessment. Ready antibody coated tubes kits were used (Orion Diagnostica, Finland). According to the manufacturers information, antiserum has at 50% displacement, values of cross reaction of 100% with progesterone, while the reaction is less than 3.9% with pregnenolone and less than 1% with any of the other steroids. The standard curve of progesterone ranged between 0.0 and 40.0 ng/ml. Sensitivity value when assaying 100 ml of plasma is about 0.08 ng/ml.

Statistical analysis

Data were statistically analyzed using using ANOVA procedure of SAS (1982) as a 4x4 factorial arrangement of treatments with the model including effects of breed (California and New Zealand), Post-partum mating date (0, 7,and 28 day), days through pregnancy (0,7,14 and 21) and litter size (2-5, 6-9 and 10-13) and residual

since the interactions were not significant. Duncan's multiple range test was used to separate means whenever, the main effects were significant.

RESULTS

Data presented in Table (1) and (3) show that plasma progesterone concentration (ng/ml) in New Zealand rabbits was higher ($p<0.01$) than California rabbit by 27.7% (Fig. 1).

Table 1. Progesterone concentration (ng/ml) in plasma as affected by post-partum period of mating and litter size in New Zealand rabbits

Days of pregnancy	Litter size	Post-partum mating date, day		
		0	7	28
0		0.5c	0.7c	0.4d
7		8.2ab	9.6bc	6.4cd
14	(2-5)	12.3a	13.7b	14.9abc
21		10.2ab	9.4bc	9.7abcd
0		0.5c	0.8c	0.4d
7		12.9a	14.1b	7.1bcd
14	(6-9)	13.6a	16.1b	18.1d
21		12.9a	13.6b	10.6bcd
0		0.5c	0.8c	0.5d
7		17.6a	16.3b	16.6ab
14	(10-13)	16.8a	26.5a	19.2a
21		12.3a	14.9b	11.1abc
SE		3.1	3.1	3.1

a,b,c,d
Means in the same column bearing different superscripts differ significantly ($P<0.05$)

Progesterone concentration was higher in post-partum mating for groups 2 and 3 than that for group 1, however the differences were not statistically significant (Table 3).

Table 2. Progesterone concentration (ng/ml) in plasma as affected by post-partum period of mating and litter size in California rabbits

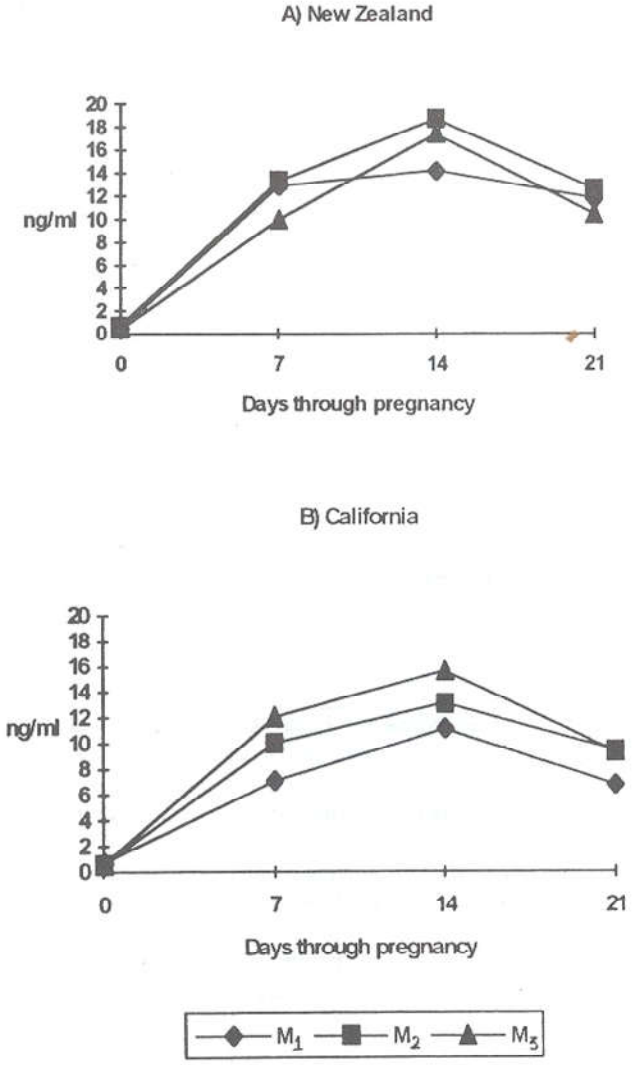
Days of pregnancy	Litter size	Post-partum mating date, day		
		0	7	28
0		0.7b	0.6c	0.7c
7		4.1ab	6.5bc	10.8ab
14	(2-5)	6.3ab	10.5abc	13.2ab
21		4.5ab	5.6bc	9.7abc
0		0.7b	0.7c	0.6c
7		8.7ab	10.0abc	10.4abc
14	(6-9)	12.9a	11.6ab	15.6ab
21		6.5ab	9.8abc	7.0bc
0		0.7b	0.6c	0.6c
7		8.5ab	13.7ab	15.0ab
14	(10-13)	14.2a	17.2a	18.2a
21		9.3ab	13.0ab	11.4ab
SE		3.8	3.1	3.1

a,b,c Means in the same column bearing different superscripts differ significantly (P<0.05).

Table 3. Least square means of breed, post-partum mating period, days of pregnancy and litter size on progesterone concentration in plasma of California and New Zealand rabbits

Breed		Post-partum mating, day		Days of pregnancy		Litter size	
Californian	8.06a	(0)	8.15	(0)	0.62c	(2-5)	7.05c
New Zealand	10.29b	(7)	9.84	(7)	10.92b	(6-9)	8.99b
		(28)	9.54	(14)	15.08a	(10-13)	11.48a
				(21)	10.08b		
SE	0.52		0.64		0.74		0.64

a,b,c Means in the same column within each trait bearing different superscripts differ significantly (P<0.05).



M1 Mating immedietely after parturition
M2 Mating at 7 days post-partum
M3 Mating at 28 days post-partum

Fig. 1. Effect of post-partum mating interval on plasma progesterone in rabbits

In New Zealand rabbits (Table 1) progesterone levels increased in 7 out of 9 pregnancy cases when post-partum mating was delayed to 7 days post-partum. While, when post-partum mating was executed at 28 days progesterone levels slightly increased from that at 0 time only in 3 cases of pregnancy stages.

California rabbits showed successively increased concentration of progestrone level during pregnancy with extended mating period post-partum from 0 to 7 to 28 days except only one case (Table 2).

Progesterone levels increased significantly ($p<0.01$) as litter size increased in the two breeds (Table 1, 2 and 3). The increase was 27.5% when litter size increased from (2-5) to (6-9), and from (6-9) to (10-13) bunnies.

A correlation coefficient between plasma P4 and litter size during pregnancy was found to be + 0.58 for California rabbit and + 0.59 for New Zealand rabbits.

It is noticeable that progesterone level increased significantly at the 7th day of gestation and rose steadily to a peak at day 14 then decreased significantly at the 21 st day of gestation reaching levels that were still significantly higher than those recorded in the rabbits before mating (Fig. 1 and Table 3).

DISCUSSION

The present results showed that there were differences in progesterone concentration (ng/ml) when females were mated at different periods post-partum. This may be due to the action of the high level of prolactin hormone in lactating rabbits which promote the function of corpora lutea in progesterone secretion. This was evident, particularly, when mating was executed at 7 days post-partum with the maximum milk production expected to coincide with high concentration of prolactin. Coppola et al. (1979); Daniel et al. (1984) and Younglai (1986) reported that prolactin is essential for progesterone secretion from corpora lutea and acts as an essential hormone in the rabbit uterine response to progesterone by modulation of p4 receptor activity foraintenance of pregnancy.

Progesterone concentration was significantly higher in does giving greater litter number than in does with

intermediate and low litter size. Results indicated that ovarian secretion of p4 between 7-21 days of pregnancy was correlated with the number of corpora lutea (Hilliard et al., 1974).

Corpora lutea are essential for the continued production of P4. In addition, Janson et al (1981) found that progesterone levels in ovarian venous blood have been reported to be parallel to the number and size of corpus luteum between 8 and 14 days of pregnancy. Lanman and Thau (1979) reported that p4 is of a particular interest and its role in the histological and biochemical differentiation of endometrium for successful establishment of pregnancy is well known. Moreover, May and Kathleen (1975) reported that progesterone influences blastocysts spacing in uterus and control number of implants between the 5th and 7th days post coitum.

The high levels of progesterone at the 7th day which continued to 14 day of pregnancy plays an important role in the preparation of the uterus for implantation of the fertilized ovum and inhibition of uterine contractions during the first few days of pregnancy (Bryand-Green et al., 1982). In addition, Sharma (1979) declared that high progesterone shut off the luteinizing hormone release from pituitary gland and prevent induced ovulation during pregnancy in rabbits. Moreover, progesterone suppresses the imunological rejection of the fetuses (Daniel et al., 1984). In the present study the progesterone concentration (ng/ml) remained high until the 21 st day of pregnancy. The present data are in good agreement with the findings of Challis et al., (1973); Hillard et al. (1974); Habeeb and El-Masry (1991); Saeed, (1994). They found that progesterone output of femele rabbits rapidly increased after implantation on day 7-8 post-coitum to reach peak values between days 14-18 of pregnancy and thereafter remained high until the final week of gestation.

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تأثير فاصل التلقيح بعد الولادة على مستوى البروجستيرون فى الارانب خلال فترة الحمل

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استخدم فى هذا البحث عدد ٢٤ ارنبة من كل من النيوزيلاندى الابيض والكاليفورنيا التى يترواح وزنها ما بين ٣,٥ الى ٤ كجم ويبلغ عمرها ثمانية شهور٠ قسمت الاناث طبقا لفاصل التلقيح بعد الولادة الى ثلاثة مجاميع كالتالى: المجموعة الاولى لقحت بعد الولادة مباشرة والمجموعة الثانية لقحت بعد ٧ ايام من الولادة والمجموعة الثالثة لقحت بعد ٢٨ يوم من الولادة (وبعد الفطام)٠ بعد الولادة قسمت الاناث الى ثلاثة اقسام تحت كل مجموعة طبقا لعدد الخلفات كالاتى : اناث يترواح عدد خلفتها من (٢-٥) والثانية من (٦-٩) اما الثالثة كان عدد خلفتها من ١٠-١٣ خلفة٠ اخذت من الاناث عينات دم على فترات هى قبل التلقيح مباشرة ٧ ،١٤ ،٢١ يوم خلال فترة الحمل لتقدير هرمون البروجستيرون فى البلازما و أوضحت النتائج ان تركيز البروجستيرون (نانوجرام /مل) كان مرتفعا فى المجموعة الثانية والثالثة بالمقارنة بالمجموعة الاولى ولكن الفروق كانت غير معنوية ٠ كما لوحظ أن تركيز البرجستيرون يزداد فى البلازما كلما زاد عدد الخلفات فى فى البطن وكان معامل الإرتباط بين تركيز البروجستيرون وعدد الخلفات فى النيوزلاندى الأبيض +٠,٥٩ وفى الكاليفورنيا +٠,٥٨ وكان مستوى البروجستيرون فى إناث النيوزلاندى الأبيض أعلى من الكاليفورنيا. وظهر مستوى البرجستيرون فى البلازما اثناء الحمل على شكل منحنى كالتالى : زيادة معنوية فى تركيز الهرمون بعد التلقيح وحتى ٧ ايام من الحمل ثم كان اعلى مستوى للهرمون عند ١٤ يوم من الحمل ثم انخفض معنويا عند ٢١ يوم من الحمل ٠