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PERIPHERAL BLOOD CONCENTRATIONS OF PROGESTERONE AND OESTROGEN IN FEMALE CAMELS *(CAMELUS DROMEDARIUS)* DURING VARIOUS REPRODUCTIVE STAGES

(With 2 Tables and 2 Figures)

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قياس هرمون البروجسترون والاستروجين فى أنثى الجمل خلال مراحل التكاثر المختلفه

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أجريت هذه الدراسه للتعرف على مستوى هرمونى البروجسترون والاستروجين فى دم ٦ نوق خلال فترة الحمل ومرحلة بعد الولاده، وذلك بجمع عينات دم وتحليلها يوميا. وقد تم تلقيح النوق أولا بذكر غير بالغ (بدأ فى عمليات التلقيح) لاحداث التبويض ومن ثم بذكر ناضج. أظهرت النتائج افراز هرمون البروجسترون طوال فترة الحمل، كما أوضحت نتائج هرمون الاستروجين وجود نشاط لحويصلات جراف على المبيض خلال الحمل. أخيرا أوضحت النتائج أن نشاط المبيض فى الجمال يمر بمراحل ركود خلال الفتره ما بعد الولاده وقبل ظهور الموجات الحويصليه المعروفه والتى تعقبها شياع وقبول للذكر، وكان ذلك عند اليوم ٣٢ (٣٠-٣٤) بعد الولاده.

SUMMARY

Blood samples for the determination of plasma progesterone and oestrogens were collected from 6 she-camels through 3 consecutive years during pregnancy and post partum period. The females were served by a prepubertal male followed by a mature male. Progesterone profiles showed fluctuation throughout gestation but fell to minimum levels after parturition. The pattern of oestrogens release indicated follicular activity throughout pregnancy. There was a large increase in both hormones in the last few days before parturition, and could be associated with it. The pattern of progesterone and

oestrogens release during the post-partum period indicated that ovarian activity in camels passes through a specific period of inactivity post-partum followed by a new wave of follicular growth that initiates oestrus and receptivity of the male at about 32 days from parturition.

Key Words: Camels-Reproduction-Progesterone-Estrogen.

INTRODUCTION

The importance of camel as milk and meat producers is increasing in the Middle East and most countries in the area now believe that their economics can be strengthened by their proper utilization. Consequently studies for optimizing reproductive management and the application of advanced breeding techniques such as artificial insemination and embryo transfer have a high priority. However, for these techniques to the successful a better understanding of reproduction and endocrinology in the female camel is necessary.

Progesterone and oestrogen concentrations have been measured in blood collected at monthly intervals from 2 months post-mating until last months of gestation by Agarwal and Khanna (1990). Progesterone concentration was slightly higher in early pregnancy, and fluctuated between 4 and 5.5 ng/ml throughout gestation and was influenced by the age of the animals. Concentrations of oestrogen rome from 2 months genstation. Elias, Bedrak and Yagil (1984) found progesterone levels rising until the end of pregnancy.

Commencement of post-partum oestrus and the factors affecting its duration in the camel are not clearly established. Ovarian activity in the camel is characterized by multiple follicular growth followed after mating by ovulation, conception and corpora lutea development. At the time of maximum follicular size plasma oestradiol concentrations varies around 30 pg/ml but then drops to less than 20 pg/ml after ovulation (Marie and Anouassi, 1986, and Homeida, Khalil and Taha, 1988).

Levels of pituitary hormones and ovarian steroid hormones have been monitored in blood at various reproductive stages (Combarnous and Anouassi, 1994), and in milk (Abdel Rahim and El-Nazier, 1987). However, more endocrinological information is required before suceessful application of advanced breeding techniquues and frequent monitoring of relevant hormones is required during differnt reproductive stages, and especailly ovarian activity post-partum.

This paper reports a study to determine progesterone and oestrogen concentration in blood during pregnancy, at parturition and in the post-partum period and the relationship between concentrations of these hormones and fertility.

MATERIALS and METHODS

Animals and Treatments:

Six multiparous Najdi she-camels were used in this study as replicates for 3 consecutive years. They were kept at the Camel Research Unit within the College of Agriculture and Veterinary Medicine Research Centre. All the animals were in good health and fed a ration of alfalfa and barley grain. One mature male of proven fertility was penned in close vicinity to the females and used for service when they were in oestrus. A young pre pubertal male that had exihibited libido was kept in a separate pen at a distance from the mature one and was used to investigate the effect of coitus on ovulation and hormone release. The females were cheked daily for oestrus, which was assessed by observing the following signs; acceptance of the male and adopting in a sitting position willingly; mucus discharge from the swollen vulva; curling the tail and raising it upward when the male approached. The female in oestrus was taken to the male and served. The female was served by the young male first observed oestrus and then mature male at the following oestrus. All services were recorded and the females kept under close observation when pregnancy was confirmed by rectal palpation and the observation of tail raising behaviour (Abdel Rahim and El-Nazier, 1992).

Blood samples from each animal were collected at 0.800 hr throughout gestation and the post-partum period until first oestrus was observed and the female mated. Up to 10 ml of blood were withdrawn into a heparnised syringe from the jugular vein. The samples were immediately frozen at -20°C until hormonal assay.

The Elisa technique was used for progesterone and oestrogen assays as reported by Abdel Rahim and El-Nazier (1994). The Elisa kits were supplied by Bio Merieux Marcy -1 Etoile, France and were used according to the manufacturer's instructions. There was no cross-reactivity with other steroids as demonstrated by the manufacturers and substantiated by Wood et al. (1985). Progesterone and oestrogen content of the samples was estimated quantitatively by comparing the intensity of the colour change in the collected samples against that test standards supplied by Bio Merieux.

Hormone assay results were pre-programmed to be read on a Micro computer screen connected to the photometer and a print-out produced.

RESULTS

The mean plasma concentrations of progesterone and oestrogen during 12 pregnancies in the six female camels are presented in Table I. The data for the first and last months of gestation are presented weekly while the remaining period is presented every four weeks. Progesterone levels increased gradually during the first week to peak at maximum luteal function. There was fluctuation in progesterone concentration throughout gestation but no falls to basal levels occurred. There was a significant increase during the last week of gestation. Table II shows plasma concentrations of progesterone and oestrogen during pre and post-partum period. However, there was a decline in progesterone concentration in peripheral plasma immediately following parturition which represnted mean level for the 6 camels. Following parturition progesterone continued low throughout the post-partum period until the female showed oestrus and was served by the pre-pubertal male when it increased indicating ovulation and formation of a corpus luteum (Fig. I). However, progesterone concentration fell after about 7 days indicating regression of the CL. due to failure of conception.

Oestrogen concentration varied greatly between individual animals during the gestation and post-partum period. However, a significant increase ($P<0.001$) of the hormone was noticed during the last week of gestation similar to that of progesterone. Furtheromre, a significant decrease ($P<0.001$) in oestrogen level was noticed after parturition. Plasma oestrogen profile for the 6 she-camels is shown in Fig II.

There was variation in the number of palpable follicles in the ovaries of the she-camels and regression of those follicles was paralleled by low oestrogen concentratation. During oestrus, as indicated by interest of the male and the female siting willingly for service. Plasma oestrogens levels increased parallel to the size and nubmer of the follicles. The first post-partum ovarian activity (acceptance of the male) was around day 32 (range 30-34).

DISCUSSION

The availability of the Elisa technique for measuring progesterone and oestrogen in plasma enables examination of ovarian changes during pregnancy and post-partum period in the camel. Frequent collection of blood

and monitoring progesterone concentrations indicated that progesterone is necessary for maintenance of pregnancy throughout gestation period. This indicates that CL persists throughout pregnancy and could be the main source for the hormone (El Wishy, 1987). Progesterone concentration increases following service and ovulation but decreases when a CL is not present. Concentrations of over 1.0 ng/ml from the second week after mating is suggestive of pregnancy (Yagil, 1985, and Agrawal et al. 1987). An increase in progesterone value as early as 36 hr after mating has often been designated as the thres hold value for early pregnancy diagnosis in this species (Elias et al, 1984; Abdel Rahim and El Nazier, 1987). However, it has been reported by Agrawal and Khanna, (1990) that progesterone concentration can remain very low during early gestation in some individual animals.

The pattern of oestrogen concentration indicates follicular activity during pregnancy in the camel, although no signs of sexual receptivity were seen. It is possible that oestrogen is synergistic with progesterone in maintenance of pregnancy. Oestrogens are genrerally believed to have important functions in mammalian gestation by virtue of a variety of anabolic and metabolic effects with the growth of the uterus and more specifically with the synthesis of protein of myoepithelial contractile cells and of enzymes concerned with energy provision for the foetus (Segal and Scher, 1967). However, the source of oestrogens during pregnancy is not known, but it appears that camel's ovary continuous to develop follicles irrespective of pregnancy. Follicular growth and regression during pregnancy has been reported by Agrawal (1987) and the placenta has also been suggested as another source (Elias et al, 1984) (a) In addition, it has been reported by El Azab and Musa (1976), that a hormone with FSH-like properties circulates in the blood of pregnant camels and causes the continuation of ovarian activity. This substance according to Homeida (1990) is present between Day 70 and 270 of gestation and has dual FSH and LH-like biological activities. However, oestrogens pattern in the llamas and alpacas (South American Camelids) seems to be different from that observed here. In this species no obvious surge release of oestrogen was detected during luteal phase (Sumar et al, 1988).

The acute increase in plasma oestrogen occurring during the last few days of gestation has also been reported in sheep (Challis, 1971; Robertson and Smeaton, 1973) and sheep and goats, (Thorburn, et al., 1972). It has been suggested that this change may comprise an important factor in the onset of parturition process (Bedford et al, 1972).

Examination of the mean pattern of oestrogen and progesterone release during the post-partum period reflect great variation in the time of first post-partum oestrus. However, the variation in oestrogen levels reflects the number of follicles in the ovary at the time of study. Cyclic changes that occur in the camel's ovaries during the breeding season have been described as waves of follicular growth, maturation and atresia that occur constantly in both ovaries (Musa, 1969 and El Wishy, 1988). Plasma oestrogen profiles follows the same pattern in the dromedary (Marie and Anouassi, 1987) and in the Bactrian camels (Xu et al, 1985).

Only short-lived corpora lutea were found as a result of service by the prepubertal young male but not fertilization. A similar situation occurs in camels after induction of ovulation with pregnant mare serum gonadotrophins (PMSG) as reported by Elias et al (1985). Marie and Anouassi, (1987) noted that sterile mating with a vasectomized male was usually followed by ovulation and formation of a CL with a short functional life span of only 7 days. The reason for this short life of CL during sterile mating is not known but is most likely due to absence of an embryonic signal and thus production of PGF2α.

It appears that camel ovary continues to develop secondary follicles throughout pregnancy, irrespective of pregnancy. An acute increase in progesterone and oestrogn occurs over the last few days of gestation; changes that may an important factor in the onset of parturition. A significant decrease in both hormones occur immediately following parturition, and a gradual increase in oestrogen concentration accompanies a new wave of follicular growth in the postpartum period initiating oestrus and receptivity of the male.

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Table I : Mean ± s.d. plasma progesterone (ng/ml) and oestrogens (pg/ml) during pregnancy in 6 camels.

Gestation Period (weeks)	Mean Progesterone conc. ±	Mean Oestrogen conc. ±S.E.
1	1.5 ±0.4	178.2 ± 14
2	3.8 ± 1.2	282.9 ±21
3	4.0 ±0.9	378 ±72
4	4.1 ±1.4	211 ±15
5-8	4.2 ±0.8	216 ±23
9-12	3.3 ±1.02	180 ±40
13-16	4.0 ±0.66	228 ±14
17-20	2.5 ±2.1	294 ±112
21-24	2.9 ±0.4	157 ±26
25-28	3.6 ±2.01	353±18
29-32	2.6 ±1.6	156.5 ±12
33-36	2.2 ±2.1	250.9 ±42
37-40	3.8 ±2.0	443.6 ±112
41-44	4.2 ±1.2	148.4 ±51
45-48	3.01 ±0.8	337 ±110
49	3.15 ±2.0	135.11±42
50	4.1 ±2.0	232.9 ±24
51	3.0 ±1.0	240.6 ±16
last week	7.7 ±2.4*	726 ±220**

n = 12

* $P < 0.05$; ** $P < 0.001$.

Table II: Plasma progesterone and oestrogen during pre and post-partum period in 6 camels.

No.	Days pre and post-partum	Mean Progesterone	Mean Oestrogen
1	-6	8.8	240
2	-5	7.2	235
3	-4	5.3	225
4	-3	4.4	215
5	-2	4.3	110
6	-1	4.2	92
7	P	2.2	38
8	1	2	27
9	2	0.35	28
10	3	0.4	15
11	4	0.11	10
12	5	0.45	15
13	6	0.31	10
14	7	0.44	8
15	8	0.4	15
16	9	0.42	10
17	10	0.4	15
18	11	0.51	10
19	12	0.5	12
20	13	0.4	15
21	14	0.52	10
22	15	0.51	8
23	16	0.26	17
24	17	0.54	20
25	18	0.51	60
26	19	0.3	68
27	20	0.32	75
28	21	0.33	85
29	22	0.24	75
30	23	0.25	80
31	24	0.26	78
32	25	0.5	150
33	26	0.52	146
34	27	0.4	0
35	28	0.4	0
36	29	0.42	0
37	30	0.4	0
38	31	0.3	0
39	32	0.5	0
40	33	0.4	0
41	34	0.3	0
42	35	2.45	0
43	36	4.42	0
44	37	3.98	0
45	38	3.5	0
46	39	2.2	0
47	40	2.0	0
48	41	0.57	0
49	42	0.22	0

P = Parturition

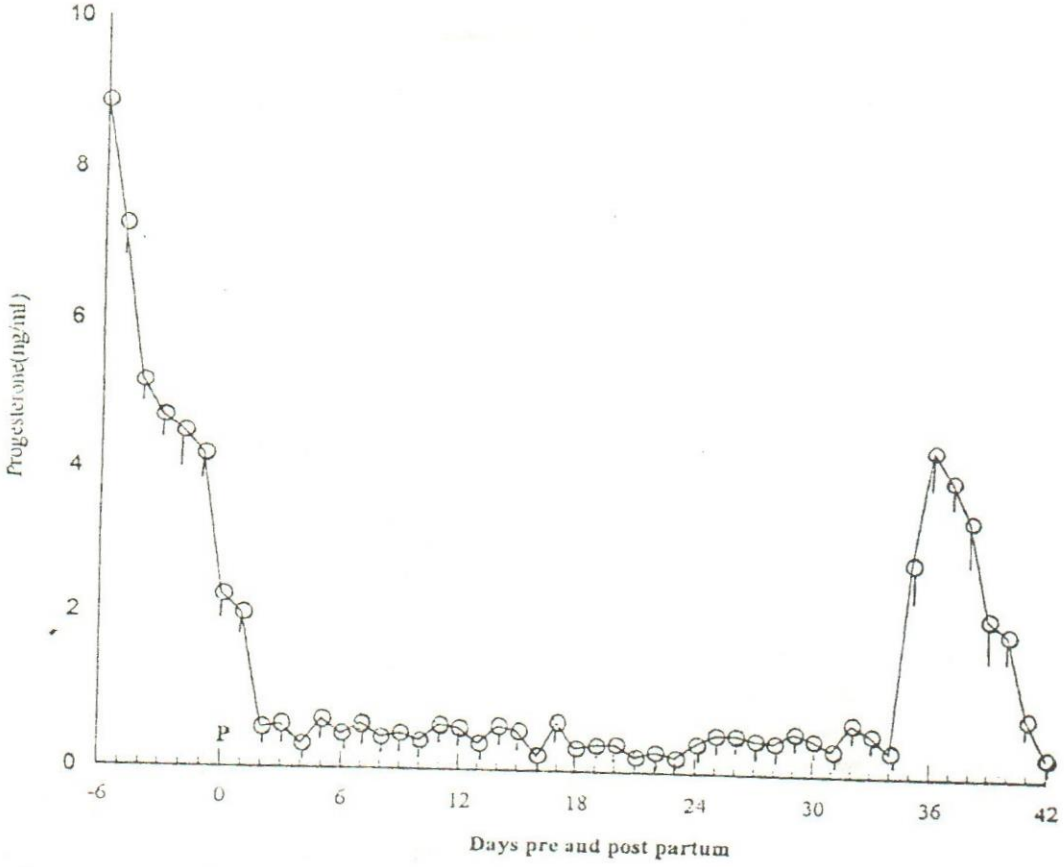

Fig. 1: Peripheral plasma concentrations of progesterone in 6 camels during pre and post-partum period.
P= parturition.

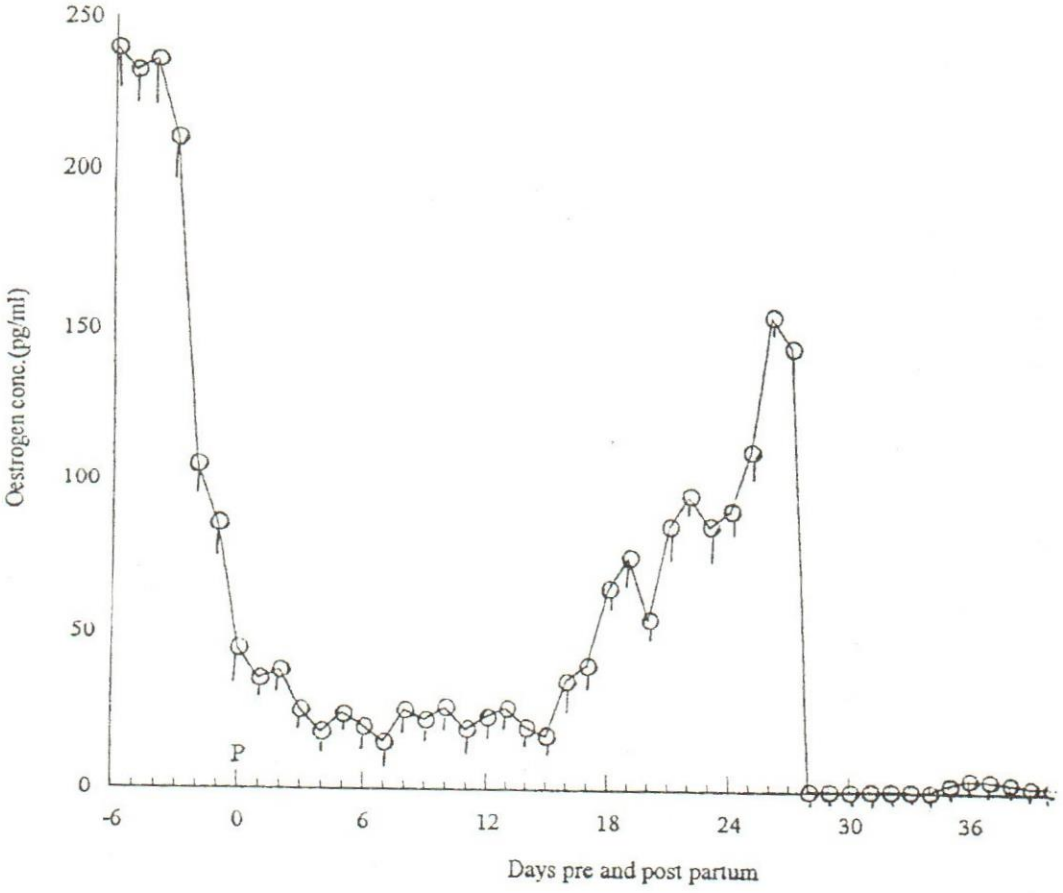

Fig. 2: Peripheral plasma concentrations of oestrogen in 6 camels during pre and post-partum period.
P= Parturition.