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Synchronization of Estrus in the She-Camel

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ABSTRACT

The study included 8 female dromedary camels during breeding (BS) and non-breeding (NBS) seasons. During (BS) hCG was injected (i/m) into females having large follicles (5,000 IU/female). Ovulation was induced 1-2 days post injection. Plasma progesterone increased significantly from 0.52±0.12 ng/ml before injection to 6.29±1.63 on day-8 post injection. On the other hand, estradiol-17ß (E_2) decreased significantly from 34.20±6.04 pg/ml before injection to 15.25±2.32 and 11.93±1.21 on days 2 & 8-post injection, respectively. Corpora lutea (CL) were palpated 4-days post injection.

On day 8 post hCG injection, $PGF_{2\alpha}$ was injected (2 ml Prosolvin/female, i/m). All females came into estrus and mature follicles were palpated 4-5 days post injection. Plasma progesterone decreased significantly to 0.82±0.15 and 0.50±0.09 ng/ml on days 3 & 5 post injection, respectively. On the other hand, E_2 increased significantly to 22.77±6.71 and 28.94±6.40 pg/ml on days 4 & 5-post injection, respectively.

During (NBS), females without any palpable structures on their ovaries were injected with GnRH (2.5 ml Fertagyl/female, i/m). Mature follicles were palpated 6-8 days post injection, but there were no palpable CL. Plasma E_2 increased significantly from 6.90±1.78 pg/ml before injection to 18.10±2.17 and 14.80±8.28 pg/ml on days 6 & 8 post injection, respectively. hCG and $PGF_{2\alpha}$ injections in GnRH-treated females during (NBS) produced similar results to those obtained during (BS).

Key words: hCG, GnRH, $PGF_{2\alpha}$, Synchronization, Camels.

INTRODUCTION

The one-humped (dromedary) camel plays an important economic role in Egypt and many other countries. The fertility rate in the camel is extremely low (Nova, 1970). Normally only one calf is born every two years, which may be due to short breeding season, together with long lactation periods (Minoia et al. 1992).

Estrus is the most vulnerable time in the sexual life of the she-camel (Shalash, 1965). In addition, synchronization of estrus as a means of improving the reproductive performance is currently in use in reproductive programs of most farm animals. On the contrary, estrus synchronization trials in the she-camel are very limited and of contraversing results.

Synchronization of estrus in the she-camel is based on the use of PMSG (Yagil and Etzion, 1984; Elias et al. 1985 and Anouassi and Ali, 1991), hCG or LH (Nova, 1970; Shalash, 1987; Elias, 1990 and Anouassi and Ali, 1991). GnRH together with LH or hCG hormones, were also used for the same purpose (Chen et al. 1985 and Bono et al. 1991a & b). Although all of these trials are good steps in achieving that purpose, all of them are still missing a complete regimen for induction and synchronization of estrus in the she-camel, especially during the non-breeding season.

Our approach has been to study the interrelation of hCG, $PGF_{2\alpha}$, GnRH, gonodal hormones and induction of estrus which may offer a new insight into synchronization of estrus in the she-camel during breeding and non breeding seasons.

MATERIALS AND METHODS

The study was carried out on 8 female (6-8 years of age) one-humped camels (*Camelus dromedarius*) in the farm of the Faculty of Veterinary Medicine, Suez Canal University. The study was conducted during breeding (February through April, 1993) and non-breeding (June and July, 1993) seasons. All females were kept away from the males to avoid the effect of the male on the occurrence of estrus in females and to avoid copulation. The females were rectally examined for the appearance of ovarian structures. Follicles measuring from 1.5-3 cm in diameter were considered large follicles, those measuring less than 0.5 cm were considered small ones and

those in between were considered growing ones (Arthur et al. 1985). Corpora lutea measuring from 1.5-2.5 cm in diameter were considered as functioning ones (Arthur et al. 1985).
Treatments of the females were scheduled according to the following:

During breeding season

Females having mature follicles were injected i.m. with 5,000 IU of hCG (Profasi, EIPICO, ARE). Rectal examination was carried out for detection of ovulation and formation of CL. By the formation of functioning CL (8 days post hCG injection), all females were injected i.m. with 15 mg luprostiol as a $PGF_{2\alpha}$ analogue (Prosolvin, Intervet International B.V. Boximeer, Holland). Rectal examination was continued till the appearance of the signs of estrus. Blood samples (15 ml/animal) were collected by venipuncture from the jugular vein in heparinized tubes just before hCG injection, 1, 2, 4, 6 and 8 days post hCG injection as well as 1, 2, 3, 4, and 5 days post $PGF_{2\alpha}$ injection.

During non-breeding season

Females without any palpable structures on their ovaries were injected i.m. with 2 ml Fertagyl as a synthetic GnRH (Intervet Internatonal B.V. Boximeer, Holland) according to Bono et al. (1991b). Blood samples were collected just before GnRH injection, 2, 4, 6 and 8 days post injection. When large follicles were detected on the ovaries, females were injected i.m. with 5,000 IU of hCG and the experiment was continued as described during the breeding season.
Blood samples were immediately centrifuged at 1000 rpm to separate plasma, which was then stored at –20 °C until analyzed for hormone concentrations. Estradiol-17ß and progesterone were measured by double antibody RIA as described by Gorski et al. (1986) and Buster et al. (1981), respectively. The data were statistically analyzed for F test and L.S.D. according to the methods described by Snedecor and Cochran (1969).

RESULTS AND DISCUSSION

During the breeding season

The present study revealed the presence of functioning CL (1.5-2.5 cm in diameter) on day 4 post hCG injection (Table 1) which reached its maximum size and function 6-8 days post injection. These results are close to those reported by Chen and Yuen, (1979) and Marie and Anouassi (1987).

However, Shalash (1965) and Elias et al. (1984b) reported that CL could be palpated 8-10 days post mating. Plasma progesterone increased significantly from 0.52±0.12 ng/ml before injection (mature follicular stage) to exceed 1.0 ng/ml, (confirming these clinical findings) on day 4 post injection and reached its maximum (6.29±1.63 ng/ml) on day 8 post hCG injection (Table 2).

These results agree with those reported by El-Wishy et al. (1983); Heshmat et al. (1984) and Cristofori et al. (1989). On the other hand, plasma estradiol-17ß decreased suddenly from 34.2±6.04 pg/ml at the mature follicular stage to reach 10.27±2.06 pg/ml on day 4 post hCG injection. The drop in estradiol-17ß level, together with a low progesterone level (below 1.0 ng/ml), is considered as an indication for ovulation (Elias et al. 1984a).

$PGF_{2\alpha}$ injection into a she-camel primed with hCG (having functioning CL) during the breeding season induced an increase in plasma oestradiol-17ß from 11.93±1.21 pg/ml just before injection to 28.94±6.4 pg/ml on day 5 post injection. In addition, progesterone level decreased significantly from 6.29±1.63 ng/ml just before injection to 2.10±0.21 and 0.99±0.16 ng/ml on days 1 and 2 post injection, respectively (Table 2). Mature Graafian follicles were rectally palpated after 4-5 days post injection (Table 1). The correlation between the plasma progesterone and estradiol level augments the hypothesis that luteolysis can be induced within 2-4 days and mature follicles can be palpated 3-5 days posts $PGF_{2\alpha}$ injection.

However, the luteolytic action of $PGF_{2\alpha}$ in she-camels was proposed by Ismail (1982) who demonstrated a high level of uterine and placental $PGF_{2\alpha}$ during the late stages of pregnancy. $PGF_{2\alpha}$ or its analogues have been approved for induction and synchronization of estrus in the cow (Bolze and Peters, 1993 and Patterson et al. 1993), ewe (Light et al. 1993), buffalo cow (Rao and Venkatramiah, 1991), goat (Bretzalff et al. 1983) and in the mare (Voss et al. 1979).

Nevertheless, there is no recorded data about the use of $PGF_{2\alpha}$ for induction and synchronization of estrus in she-camels.

The results obtained offer a possibility to prolong the limited breeding season of the she-camel by a single injection with hCG followed by a single injection with $PGF_{2\alpha}$ (Anouassi and Ali, 1991 and Minoia et al. 1992).

During non breeding season

Plasma progesterone and estradiol-17ß levels were 0.42±0.11 ng/ml and 6.90±1.78 pg/ml just before GnRH injection (Table 3) where no palpable structures were present on the ovarian surface (Table 1). After GnRH injection, there was no significant change in progesterone levels that remained below 1.0 ng/ml. On the other hand, estradiol-17ß increase significantly on day 8 posts injection (24.8±8.28 pg/ml). Mature follicles were rectally palpated after 6-8 days post GnRH injection (Table 1). These results suggest that GnRH was capable of inducing follicular growth and maturation in the female camel in 6-8 days post injection. This agrees with the results of Bono et al. (1991a & b) and Moslah et al. (1992). Induction of estrus in female dromedary camel was performed during the last part of seasonal anestrus by the use of PMSG and mature follicles were palpated 7-10 days post injection (Elias et al. 1985). This suggests that the pituitary sensitivity to GnRH treatment was not altered during the first months of the non-breeding season. Progesterone level increased gradually and significantly after hCG injection (8 days after treatment with GnRH) (Table 3). It averaged 2.55±0.36 and 5.48±0.75 ng/ml on days 6 and 8 post injection, respectively. On the other hand, estradiol-17ß level decreased significantly 2 days post hCG injection and reached its lowest level on 6 and 8 days post injection (18.23±2.56 and 11.20±2.01 pg/ml, respectively). Rectal palpation revealed the presence of palpable corpora lutea and the disappearance of large follicles 4-5 days post injection (Table 1). These findings were similar to those obtained during the breeding season.

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Table 1: The number of ovarian structures before and after hormonal treatments in the female dromedary camel during breeding and non- breeding seasons.

Days before and after injection		Breeding season								Non breeding season							
		Right ovary Follicles				Left ovary Follicles				Right ovary Follicles				Left ovary Follicles			
		S	M	L	CL	S	M	L	CL	S	M	L	CL	S	M	L	CL
Just before GnRH										-	-	-	-	-	-	-	-
Post GnRH	2 days									4	-	-	-	5	-	-	-
	4 days									5	4	-	-	7	4	-	-
	6 days									7	5	3	-	10	7	4	-
	8 days									9	6	5	-	11	9	7	-
Just before hCG		7	5	5	-	10	7	10	-	-	-	-	-	-	-	-	-
Post hCG	1 day	5	5	4	-	7	7	5	-	9	5	4	-	9	6	6	-
	2 days	4	4	3	-	5	5	5	-	7	4	3	-	6	4	5	2
	4 days	4	3	2	2	4	4	3	3	4	3	2	2	5	4	4	3
	6 days	3	2	-	4	4	3	2	4	3	2	-	3	3	3	2	4
	8 days	2	2	-	5	3	2	-	7	2	2	-	5	2	2	-	5
Post $PGF_{2\alpha}$	1 day	3	2	-	5	3	2	-	5	3	2	-	5	3	2	-	5
	2 days	4	2	-	4	5	3	-	4	4	2	-	4	4	3	-	4
	3 days	5	4	-	2	6	5	-	2	5	4	-	3	7	4	-	2
	4 days	7	6	2	-	9	7	4	-	6	5	2	-	10	6	7	-
	5 days	9	7	5	-	10	11	9	-	7	6	4	-	10	9	10	-

The numbers in the table represent the total ovarian structures found in the 8 female camels. S = Small follicles; M = Medium follicles; L = Large follicles.

Table 2: Plasma progesterone (ng/ml) and estradiol-17ß (pg/ml) levels before and after hCGand $PGF_{2\alpha}$ in the female dromedary camel during the breeding season (mean ± S.E.)

Time of Sampling	HCG injection		$PGF_{2\alpha}$ injection (8 days post hCG)	
	Progesterone	Estradiol	Progesterone	Estradiol
Before	0.52 ± 0.12	34.20 ± 6.04	6.29 ± 1.63	11.93 ± 1.21
1 day post	0.61 ± 0.40	21.13 ± 3.34	2.10 ± 0.71	7.86 ± 1.91
2 days post	0.87 ± 0.13	15.25 ± 2.32	0.94 ± 0.16	11.65 ± 1.80
3 days post			0.82 ± 0.15	14.57 ± 2.75
4 days post	0.99 ± 0.26	10.27 ± 2.06	0.69 ± 0.16	22.77 ± 6.71
5 days post			0.50 ± 0.09	28.94 ± 6.40
6 days post	1.73 ± 0.61	10.65 ± 1.94		
8 days post	6.29 ± 1.63	11.93 ± 1.21		
F value	18.73**	7.88**	17.81**	3.73*
L.S.D	1.52	9.61	1.54	12.03

N=8; *significant at P<0.05; **significant at P<0.01

Table 3: Plasma progesterone (ng/ml) and estradiol-17ß (pg/ml) levels before and after GnRH, hCG and $PGF_{2\alpha}$ In the female dromedary camel during the non-breeding season (mean ± S.E.).

Day of Sampling	GnRH (no ovarian Structures)		HCG (8days post GnRH)		$PGF_{2\alpha}$ (8 days post hCG)	
	Progesterone	Estradiol	Progesterone	Estradiol	Progesterone	Estradiol
Before	0.42±0.11	6.90±1.78	0.87±0.37	24.80±8.28	5.48±0.75	11.20±2.04
1 day post			0.87±0.34	21.55±3.55	4.47±1.03	11.89±1.95
2 days post	0.55±0.16	8.88±1.47	0.96±0.21	18.23±2.56	3.21±1.43	12.33±1.66
3 days post					2.02±0.73	15.34±2.70
4 days post	0.61±0.24	14.14±3.08	1.04±0.31	14.83±2.57	0.92±0.71	21.66±4.82
5 days post					0.63±0.25	25.01±2.47
6 days post	0.64±0.29	18.10±2.17	2.55±0.36	10.63±2.56		
8 days post	0.87±0.37	24.80±8.28	5.48±0.75	11.20±2.01		
F value	0.42^{NS}	2.96*	18.80**	2.75**	4.77**	4.24**
L.S.D.	--	12.38	1.24	6.55	2.60	8.18

N=8; NS=non significant; *significant at P<0.05; **significant at P<0.01.

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Progesterone level decreased significantly 3 days post $PGF_{2\alpha}$ injection and became less than 1.0 ng/ml 4-5 days post injection (Table 3). On the other hand, plasma estradiol-17ß level significantly increased and reached its maximum 4-5 days post injection, which confirms the presence of mature follicles on the ovarian surface. These data suggest that $PGF_{2\alpha}$ could induce and synchronize estrus in the she-camel during non-breeding season when the ovaries had functioning corpora lutea and that this occurs 4-5 days post injection. The response of she-camels to the luteolytic action $PGF_{2\alpha\alpha}$ during breeding and non-breeding seasons was not different.

CONCLUSION

Human chorionic gonadotropin (hCG) treatment is capable of induction of ovulation 1-2 days after injection into female camels having mature Graafian follicles during breeding and non breeding seasons. In addition, $PGF_{2\alpha}$ can induce luteolysis (2-4 days) and estrus (3-5 days) after injection in female camels having functioning corpora lutea. The change in estradiol-17ß and progesterone during non-breeding season after GnRH treatment is indicative of actual estrus induction and follicular growth after 6-8 days post treatment. The use of GnRH or hCG should be coupled with other triggering active drugs like $PGF_{2\alpha}$ to improve the effectiveness of estrus synchronization.

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