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Ovarian activity of she-camel (Camelus dromedarius) in relation to season, hormonal pattern, age and body condition scores

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The present work was done to investigate the interrelationship between the ovarian activity and each of seasonal environment, hormonal pattern, age and body condition scores(BCS) in she-camel. Over a period of one year (November 2005– October 2006), jugular blood samples were collected from 320 she-camel (5-20 years old) in Cairo–slaughter house during their antimortum inspection and body condition was scored. Immediately, after slaughter both ovaries were individually collected and morphometric findings were recorded. The results of hormonal assay including estrogen (E), progesterone (P4), follicle stimulating hormone (FSH) and luteinizing hormone (LH) were recorded. The obtained hormonal levels were studied in relation to the ovarian findings and seasonal variation. Moreover the ovarian activity was studied in relation to age and BCS. According to the ovarian findings and hormonal levels, there is clear breeding season in dromedary camel extended from November to April under Egyptian conditions. Otherwise, the period from May to October (non-breeding season) has a lower ovarian activity and concomitant with lower hormonal levels. She-camel reaches its maturity later and has a higher longevity than cattle. The best reproductive capacity of she-camel are found within 8-15 years of age (BCS,2.92±0.21).

The genus Camelus comprises two species: Camelus dromedarius, the dromedary or one-humped camel and Camelus bactrianus, the Bactrian or two-humped camel (Jean and Judith, 2004). Both the dromedary and bactrian camels are regarded as seasonal breeders, with a relatively short breeding season, based on the seasonal, distribution of births and the status of ovarian activity in slaughtered animals (Novoa, 1970; Shalash, 1980). Outside the breeding season mating activity ceases and the ovaries are inactive or only have a few, small follicles. However, there are conflicting reports about the beginning and length of the seasonal activity in the dromedary. Increased breeding activity has been reported to occur in March and August in Sudan, (Musa and Abusineina, 1978) December to March in Pakistan (Yasin and Wahid, 1957), December to April in Egypt (Shalash, 1980; Shalash, 1987) and from November to April in most of Arabia (Abou-Ela 1994; Tibary and Anouassi, 1996). This is generally during the period of low climatic temperature, rain and better grazing conditions. In the United Arab Emirates, well fed and watered animals show ovarian activity allover the year and the determinate factor of the seasonality in conception dates are due to a decrease in libido of the male and an increase in early embryonic death during the summer months (Tibary and Anouassi, 1997).

She-camel (camelus dromedarius) is induced ovulators (Novoa, 1970; Musa and Abusineina, 1978; Adams *et al.,* 1990; Skidmore *et al.,* 1995). However,mechanical stimulation of the cervix does not induce ovulation in dromedary female camels (Musa and Abusineina,1978; Elias *et al.,* 1984; Anouassi and Ali, 1990). Therefore, the mechanism triggering ovulation in the dromedary camel could be a combination of stimuli, including chemical factors in the seminal plasma, neurohormonal responses to the mechanical stimuli of coitus and pheromonal effects of the male (El-Wishy, 1987).

Follicular growth occurs in regular waves during the breeding season (Musa *et al.,* 1993). Follicular waves divided into three phases including growth, maturation and atresia and occurred constantly in both ovaries where waves occur constantly in both ovaries (Musa and Abu-Sineina, 1976; El- Wishy and Hemeida, 1984).

FSH and LH control growth and reproductive activities of the gonadal tissues (Franchimont, 1973; Daughandy, 1985). The

gonadotrophic cells of pituitary secrete both FSH and LH in response to gonadotrophic releasing hormone (Gn-RH) from the medial basal hypothalamus. Both FSH and LH from the pituitary are under a negative feedback control by the gonadal hormones (Bonnar, 1973).

The camels are sexually mature at 4 to 5 years of age (Evans and Powys, 1979), although a 3-year old camel can be used for reproduction (Leonard, 1894; Novoa, 1970). In dry years, when forage is scarce, maturity is delayed and first conception occurs at a later age (Salih 1988).

Condition scoring is a technique for assessing the condition of livestock at regular intervals. The purpose of condition scoring is to achieve a balance between economic feeding, good production and good welfare (DEFRA, 2000).Unfortunately; there is no available literature about the effects of body condition score on the ovarian activities in she-camel.

The first aim of the current study was to illustrate the pattern of secretion of estrogen, progesterone, follicle stimulating hormone and luteinizing hormone in relation to different ovarian status throughout breeding and non-breeding season in she-camel under Egyptian conditions. The second aim was to visualize the interrelationship between age and body condition score from one side and the ovarian activities from the other side.

Materials and methods

The animals. The current study was conducted on 320 she-camels of unknown breeding history in Cairo Abattoir over the period from November 2005 to October 2006.These animals were antimortum examined for general health condition and body condition scores (BCS) . Body condition scores of the studied animals were done according to PISC (2004). The condition of a camel is estimated by looking at the store of body fat (i.e. the hump).According to the size of hump, BCS was including 1-5 scores: Score 1, little or no fat in the hump sac; hump hairy and may be leaning to one side. Score 2, hump with moderate development rising five percent higher than chest depth, but may also be leaning to one side. Score 3, hump with good development and rising to ten percent higher than chest depth. Hump is still sculptured inwards on both sides and still fits over the chest and abdominal area. Score 4, hump fully developed and rising to fifteen percent higher than chest depth. Hump rounded outwards on both sides and runs from the shoulder to the rump. Score 5, hump overextended and rising more than fifteen percent higher than chest, or so full that it is rounded on the sides like a semicircle.Dentition of the animals was according to Wahby (1938).Accordingly, the present animals covered the age from 5-20 years.

Sampling

Blood samples. Ten milliliters blood were collected from each animal before slaughter in silicon-coated tubes. Sera were separated and marked according to ovarian structures and stored at –20 ºC for further hormonal analysis.

Ovaries. Paired ovaries were individually obtained from all animals. All samples were taken as soon as possible, covered with medical gauze soaked with normal saline to avoid dehydration. The ovarian structures were classified into follicular structures and luteal structures. The follicular structures were classified according to (El-Wishy, 1987; Skidmore *et al.,* 1996 into inactive ovaries (those containing follicles less than 3 mm in diameter), growing follicles (>3 to 9 mm in diameter), ovulatory follicles (10-19 mm in diameter) and over mature or aged follicles (20-24 or 25-30 mm in diameter respectively). Follicles > 30 mm in diameter was regarded as follicular cyst (Tibary and Anouassi, 1996).

The luteal structures were classified according to (Osman, 1965; El-Wishy, 1992) into corpus luteum , with thin capsule, orange in color and the parenchymatous tissue > 10 mm in diameter, regressed corpus luteum, with thick capsule, faint yellow colour and the parenchymatous tissue < 10 mm in diameter ,and luteal cyst, > 30 mm in diameter and not associated with other ovarian structures.

Hormonal assay. The serum estradiol-17 β level was estimated by the radioimmuno- assay (RIA), using coat –A-Count I125 estradiol-17 β kits (Medgenix Diagnostic –Zoming industrial E2 - RIA –CT code 3006200) according to (Mehta, 1987). Progesterone assay was measured by using Fertigenix Prog-EASIA by Biosource Europe S.A.K, according to (Matthiews, 1986). The FSH was estimated by the enzymatic immunoassay (Medix Biotech INC.Catalog number KIF 4057) according to the procedure reported by (Engvall, 1980).

The quantitative estimation of luteinizing hormone (LH) was carried out according to the procedure of Engvall (1980) by the enzymatic immunoassay test supplied by Medix Biotech INC.Catalog number KIF 4023.

Statistical analysis. The obtained data were statistically analyzed by using the GIM Procedures (SAS.1990).

Results

The ovarian structures in relation to seasons are shown in (Table1).Overall the year mature follicles were recorded in 25.3% and 18.75% of the left and right ovaries, respectively. The corresponding values were higher during the cold season (November-April) than those during the hot season (May-October).The functioning corpora lutea were recorded to be 11.56% and 10.31% in left and right ovaries allover the year. The corresponding values were higher in cold season (November-April) than in hot season (May-October). Inactive ovaries, follicular cysts and luteal cysts were higher in hot season (May-October) than in cold season (November-April).The current results indicate that the cold season (November-April) must be regarded as breeding season and therefore the hot season (May-October) must be regarded as a non breeding season.

As shown in (Table 2), Estradiol 17β levels were in its basal levels in she-camels with inactive ovaries, CL and follicular luteal cysts groups. Estradiol 17β levels run parallel to the follicular diameter up to those < 20 mm then decreased sharply in over mature and aged follicles (20-24 and 25-30 mm in diameter) .No seasonal variation was recorded in estradiol 17β levels.

Progesterone (P4) levels fluctuated within the follicular developmental stages. However, over mature (20-24 mm Ø) and aged follicles (25-30 mm Ø) were associated with insignificantly higher levels of P4.

P4 level peaked in CL group and was high in both follicular and luteal cyst groups. P4 level in CL group was higher in breeding season in comparison with that in non breeding season.

Basal level of follicle stimulating hormone (FSH) basal were recorded in inactive ovaries and luteal cyst groups. Slightly higher levels of FSH were obtained in CL, regressed CL and follicular cyst groups. FSH levels increased parallel to the diameter of follicles up to those of 9-19 mm Ø, then gradually decreased in larger follicles groups (20-24 and 25-30 mm Ø).

The most important noticeable result was the obvious decrease in Luteinizing hormone (LH) in all animals groups at the non breeding season. The highest levels of LH were in mature follicle and over mature follicle groups. Slightly lower levels were recorded in aged follicles and CL groups.A steady increase of LH level was recorded as growing follicle increased in diameter.

Table1: Ovarian structures of she-camel in relation to season under Egyptian conditions.

Seasons	Side	No%	Ovarian structures									
			Follicular structures (Ø of Follicles mm)							Luteal structures		
			Inactive ovary (<3 mm)	Growing follicle		Mature follicle	Over mature follicle	Aged follicle	Follic. Cyst>30	CL	Regressed CL	Lut. Cyst
				3 - 5	6 – 9	10 – 19	20 – 24	25 – 30				
Nov – Apr	R	168 (100%)	16 (9.52)	22 (13.09)	19 (11.30)	38 (22.62)	12 (7.14)	8 (4.76)	10 (5.95)	18 (10.71)	22 (13.09)	3 (1.78)
	L	168 (100%)	12 (7.14)	18 (10.71)	25 (14.88)	52 (30.95)	10 (5.95)	4 (2.38)	5 (2.97)	21 (12.50)	18 (10.71)	3 (1.78)
May – Oct	R	152 (100%)	21 (13.81)	15 (9.86)	16 (10.52)	22 (14.47)	12 (7.89)	7 (4.60)	20 (13.15)	15 (9.86)	13 (8.55)	11 (7.23)
	L	152 (100%)	18 (11.84)	14 (9.21)	15 (9.86)	29 (19.07)	11 (7.23)	5 (3.28)	18 (11.84)	16 (10.52)	13 (8.55)	13 (8.55)
Overall year	R	320 (100%)	37 (11.56)	37 (11.56)	35 (10.93)	60 (18.75)	24 (7.5)	15 (4.68)	30 (9.37)	33 (10.31)	35 (10.93)	14 (4.37)
	L	320 (100%)	30 (9.37)	32 (10)	40 (12.5)	81 (25.3)	21 (6.56)	9 (2.81)	23 (7.18)	37 (11.56)	31 (9.68)	16 (5)

Nov.-Apr.:(cold season), May-Oct.: (Hot season) R=right ovary L=left ovary N= number of follicles Ø=diameter

Table2: Serum hormonal level of she-camel in relation to ovarian structure and season (M±SE and range).

Season	Hormones	Ovarian structures									
		Follicular structures (Ø of follicles in mm)							Luteal structures		
		Inactive ovaries (<3mm)	Growing follicle		Mature follicle	Over mature follicle	Aged follicle	F.cyst >30mm	CL	Regressed CL	Luteal cyst
			3-5 mm	6-9 mm	10-19 mm	20-24 mm	25-30 mm				
Nov.-April (Breeding Season)	E2 (pg %)	23.43±1.66^{a} (10-36)	32.61±2.00^{b} (15-40)	37.62±1.71^{c} (21-55)	64.35±2.18^{d} (25-92)	37.83±3.58^{bc} (21-55)	31.38±2.37^{b} (21-40)	22.20±2.56^{a} (10-36)	21.53±1.61^{a} (10-36)	31.50±1.78^{b} (16-56)	22.00±5.51 (13-32)
	P4 (ng%)	0.36±0.05^{a} (0.21-61)	0.42±0.04^{a} (0.21-0.54)	0.39±.0.09^{a} (0.3-0.7)	0.43±0.08^{a} (0.28-0.69)	0.51±0.06^{ab} (0.25-0.76)	0.64±0.08^{ab} (0.24-0.87)	0.89±0.12^{b} (0.36-1.12)	1.65±0.19^{c} (0.79-2.54)	0.72±0.13^{ab} (0.32-0.95)	0.93±0.25 (0.42-1.23
	FSH (mg%)	2.26±0.09^{a} (0.98-3.46)	6.36±0.09^{c} (2.12-8.9)	7.79±0.20^{d} (3.21-11.7)	9.68±0.33^{e} (3.21-13.6)	8.21±0.24^{de} (2.6-12.5)	7.32±0.26^{d} (1.62-10.2)	5.48±0.21^{b} (2.2-8.1)	4.84±0.31^{b} (2.0-8.2)	5.64±0.27^{bc} (2.6-9.2)	2.66±0.52 (1.2-5.1)
	LH (mg%)	0.76±0.05^{a} (0.52-0.96)	0.86±0.09^{a} (0.56-1.10)	0.94±0.13^{a} (0.72-1.15)	1.96±0.12^{c} (1.52-2.38)	1.86±0.15^{c} (1.52-2.25)	1.36±0.09^{b} (0.92-1.86)	0.72±0.05^{a} (0.50-0.99)	1.06±0.11^{b} (0.82-1.31)	0.82±0.05^{a} (0.62-1.06)	0.86±0.17 (0.53-1.13
May-Oct. (non-breeding Season)	E2 (pg %)	22.65±1.12^{a} (10-41)	33.25±1.12^{b} (14-43)	36.75±1.52^{b} (18-54)	63.41±2.32^{c} (21-91)	38.62±2.96^{b} (21-79)	32.25±2.45^{b} (18-45)	24.62±3.61^{a} (10-46)	20.63±1.42^{a} (10-38)	30.55±1.82^{b} (15-59)	21.45±4.63 (13-37)
	P4 (ng%)	0.42±0.07^{a} (0.21-0.72	0.41±0.06^{a} (0.17-0.54)	0.38±0.07^{a} (0.28-0.82)	0.45±0.08^{a} (0.26-0.71)	0.52±0.08^{ab} (0.23-0.82)	0.60±0.08^{ab} (o.21-0.72)	0.87±0.13^{b} (o.40-1.12)	1.41±0.23^{c} (o.66-2.32)	0.63±0.12^{ab} (o.32-0.96)	0.88±0.21 (o.40-1.12
	FSH (mg%)	2.16±0.11^{a} (0.86-2.72)	5.86±0.03^{c} (2.06-7.82)	6.56±0.22^{cd} (2.96-9.62)	7.95±0.24^{c} (2.96-11.7)	7.16±0.19^{c} (3.16-10.7)	6.36±0.21^{cd} (2.36-9.42)	5.12±0.19^{c} (2.26-9.32)	4.36±0.26^{b} (1.86-7.92)	4.66±0.23^{b} (2.16-8.71)	2.42±0.41 (1.26-5.12
	LH (mg%)	0.35±0.09^{a} (0.18-0.98)	0.52±0.08^{b} (0.20-0.98)	0.62±0.10^{bc} (0.38-0.86)	0.96±0.12^{c} (0.58-1.13)	0.89±0.13^{c} (0.53-1.12)	0.79±0.11^{c} (0.48-1.08)	0.42±0.05^{ab} (0.28-0.72)	0.63±0.13^{bc} (0.38-0.96)	0.53±0.07^{b} (0.31-0.82)	0.57±0.15 (0.31-0.83

Means within the same raw with different alphabetical are significantly different at p <.01%.

Table3: Significance of difference between hormonal levels during breeding and non breeding seasons in relation to ovarian structures.

Ovarian structures	Hormonal levels E2	P4	FSH	LH
Inactive ovaries(<3mm)	–	–	–	++
3-5 mm follicle Diameter	–	–	+	++
6-9 mm follicle Diameter	–	–	+	+
10-19 mm follicle Diameter	–	–	++	++
20-24 mm follicle Diameter	–	–	+	++
25-30 mm follicle Diameter	–	–	+	++
F.cyst >30mm	–	–	–	+
CL	–	–	–	+
Reg.CL	–	–	–	+
Luteal cyst	–	–	–	–

– Non significant **+ Significant at P ≤ 0.05** **++ Significant at P ≤ 0.01**

Table 4: Ovarian structures overall year as a function of age and body condition scores (BCS) in she-camel .

Ovarian activities she-camel			Follicular structures (Ø in mm)						Luteal structures			
			Inactive ovary (<3 mm)	Growing follicle		Mature follicle	Over mature follicle	Aged follicle	Follicular cyst>30	CL	Regressed CL	Luteal cyst
N	Age (year)	BCS		3 - 5	6 – 9	10 – 19	20 – 24	25 – 30				
65	7.21 ±0.17 (5-8)	2.31 ±0.16 (1½-3)	21 (32.30%)	13 (20.00%)	14 (21.53%)	25 (38.46%)	11 (16.92%)	5 (7.69%)	16 (24.61%)	15 (23.07%)	15 (23.07%)	4 (6.15%)
172	11.65 ±0.13 (>8-15)	2.92 ±0.21 (2-4)	20 (11.62%)	40 (23.25%)	45 (26.16%)	89 (51.74%)	22 (12.79%)	7 (4.06%)	17 (9.88%)	41 (23.83%)	38 (22.09%)	11 (6.39%)
83	17.53 ±0.26 (>15-20)	2.17 ±0.17 (1½-3)	26 (31.32%)	16 (19.27%)	16 (19.27%)	27 (32.53%)	12 (14.45%)	12 (14.45%)	20 (24.09%)	14 (16.86%)	13 (15.66%)	15 (18.07%)

As shown in table 3, there is no significant effect of season on the levels of both estradiol 17β and progesterone in relation to different ovarian structures. Meanwhile season exerted a significant effect (P ≤0.o5) on FSH in animals with growing ,over mature and aged follicles and exereted a highly significant effect (P ≤0.o1) on the same hormone in animals with mature ovulatory follicles .The most noticeable results were the significant effect of season on LH regarding all the ovarian structures except for animals with luteal cystsAs shown in table 4,the body condition score (BCS) of the first age group (5-8 years) averaged 2.31,peaked at the second age group (> 8-15 years) to be 2.92 and decreased again to be 2.17 in the third age group (> 15-20 years).

The percentages of inactive ovaries were much higher in each of the first and third age groups (32.3 and 31.32 % respectively) than that of the second age group (11.62%).

Growing follicle of subovulatory size (3-9 mm), showing a higher incidence in the second age group in comparison with those in the first and third age groups. Mature ovulatory follicles were higher in the second age group (51.74%) than those of the first age group (38.46%) which was slightly higher than those of the third age group (32.53%).

Over mature and aged follicles were higher in the third age group (28.90%) than those of the first age group (24.61%) which higher than those of the second age group (16.88%).

Follicular cyst showed approximately the same incidence of the first and third age group (24.61 and 24.09 5 respectively).Meanwhile the corresponding value of the second age group was 9.88%.

Corpus luteum (CL) and regressed corpus luteum were following the same pattern in relation to both age and BCS. They were higher in each of the first and second age group in comparison with the third age group.

Regarding luteal cyst, the incidence was much higher in the third age group (18.07%) in comparison with those in the first and second age group (6.15 and 6.39 % respectively).

Discussion

The present study revealed that, the ovarian activity was observed throughout the different seasons with a maximum activity during cold season (November–April), which may be attributed to the breeding season (Table 1). Shalash 1965; Ismail 1987; Akral and Khanna 1995 reported similar results in Egypt and Pakistan, respectively. However in Saudi Arabia, providing of a good nutrition resulted in breeding of the she-camel allover the year (Arthur and Al-Rahim , 1982; Arthur *et al.,*1985) which was confirmed later by the finding of Schwartz and Dioli 1992.

The incidence of inactive ovaries in the present study reached its peak in the summer, which may be responsible for the failure of conception during May to October as reported by Arthur *et al.,* 1985; Abdel Rahim and El Nazier 1992. This may be attributed to the higher temperature associated with adverse nutritional status of the animals during the summer season (Yagil 1985;Tibary and Anouassi, 1997; Tibary *et al.,* 2005).

In the current study, the cystic ovaries were observed throughout the whole year with variable percentages .Similar results were obtained in Saudi Arabia (Hegazy *et al.,* 2001). It is believed that the problem of cystic ovaries is the deficiency of LH surge. The present results indicated the low level of LH in cases of cystic ovaries in comparison with that of normal cyclic ovaries and confirm the previous results of Hegazy *et al.,* 2004.

Although ovulation in she-–camel is mainly induced and the CL only present after mating , in the current study about 10% of the animals were recorded to have CL. The incidence of CL in these animals may be referred to the natural mating during transport and marketing or spontaneous ovulation (Nagy *et al.,* 2005) otherwise it may be due to early embryonic death (Tibary and Anouassi 1997).

In the present study during the breeding season, the significantly high estrogen level (31.50±1.78 pg/ml) in animals with regressed CL comparing with the basal level recorded for inactive ovaries may reflect the continuation of follicular activity even in the presence of a CL (Elias *et al.,* 1984; Agarwal *et al.,* 1987 and Tibary and Anouassi ,1996) which may be attributed to species variations. On the contrary, low values of estradiol were recorded in cases of cystic ovaries (21.53± 1.61 and 22.00±5.51 pg / ml for follicular and luteal cysts, respectively). Estrogen in camels has been reported to be highly variable and seemingly impossible or difficult to interpret (Tibary and Anouassi 1997). In general, estradiol concentrations in our results tend to follow follicular development, as the follicle diameter increase, estradiol concentrations increase from

basal levels of 23.43±1.66pg/ml to 64.35±2.18d pg/ml until the follicle reaches 1.9 cm in diameter. However, even though the follicle may continue to grow to >2.0 cm , mean estradiol levels tend to decline to basal levels of 22.20±2.56 pg/ml in both follicular and Luteal cysts.These results is in consistent with Shalash (1965) and Skidmore *et al.,* (1996) where these follicles remain until the next wave of follicles . This may be the reason why these overlarge follicles do not ovulate, as once they are over 2.0 cm they start to undergo atresia (Skidmore *et al.,* 1996).

Regarding progesterone concentration, it was noticed in the current study that progesterone concentrations remain low (<1ng/ml) except that cases recorded with CL(1.65±0.19 ng/ml).The main source of progesterone is the CL (Skidmore *et al.,* 1996).Therefore in the absence of mating , ovulation and CL formation progesterone concentrations remain low (<1ng/ml).

The current study revealed that FSH increased steadily with the increase in the size of the follicle reaching its peak when the follicle reached to 1.9 cm in diameter. There is scarcity of the knowledge about the FSH seasonal changes and functional aspects in she-camel. Therefore this current results about FSH may be unprecedented and non comparable with others.

In the current study LH mean values averaged from 0.76±0.5 to 1.96±0.12 and 0.35±0.09 to 0.96±0.12 ng /ml in both cold (breeding) and hot (non-breeding) season , respectively .These results are in consistent with (Bono *et al.,* 1989 and 1990).They reported that, concentrations of LH are higher during the breeding season than during the non-breeding season as during the breeding season the pituitary is more sensitive to Gonadotrophin Releasing Hormone (GnRH) and releases more LH after challenge (Bono *et al.,* 1985). As camels are induced ovulators it is mating that induces an LH surge. In the dromedary camel LH plasma levels increase within one hour of mating and reach a maximum (3 - 19 ng/ml) 2 - 3 hours later, then start to decrease 6 hours following mating. The LH surge is thought to elicit the last stages of follicle development and subsequent ovulation (Marie and Anouassi 1986 and 1987).

Our results pointed to low BCS in young age group (5-8 years) as well as in senile age group (>15-20 years) in comparison with that in the second age group (>8-15 years).This may be attributed to sub maturity in the young age group as she-camel reached its sexual maturity in about 70 % of its mature equivalent weight **(**Evans and Powys, 1979)**.** Meanwhile the low BCS in senile group may be due to under feeding associating over wearing and sometimes losses of the teeth. Over wearing and losses of the teeth in aged camel were previously recorded by Misk *et al.,* 2006.

The percentage of inactive ovaries (those containing follicles < 3 mm in diameter),were much higher in young and senile groups than that of the second age group, otherwise a higher percentage of growing follicles were recorded in the second age group. These results may indicate incomplete follicular waves in both young and aged groups in comparison with normal follicular waves in the second age group which may be referred to nutrional , hormonal and /or microenvironmental variations (Leonard,1984; Sghiri and Driancourt 1999; Deen *et al.,*2007).

Mature ovulatory follicles were higher in the second age group in comparison with those of the young age group and much higher in comparison with the third aged group. Similar results were recorded by Skidmore *et al.,* 1996. This may be attributed to a full capacity of hypothalamic-hypophysial -ovarian axis in mature age group (Sahani, *et al.,* 2003).

Over mature and aged follicles were higher in aged animal group than those of the young animal group and much higher than those of the mature age group. This may be attributed to failure of young and aged animals to obtain a fertile mounting in competition with stronger mature females .It is well known that She-camel is induced ovulators (Adams *et al.,* 1990; Skidmore *et al.,* 1995).

Follicular cysts showed approximately the same incidence in young and aged groups in comparison with those animals of mature group. This result is in consistent with Sghiri and Driancourt 1999 and inconsistent with El-Wishy 1989. Sghiri and Driancourt (1999) reported that, she-camels with low body condition scores and young age (< or = 5 years old) had a low ability to conceive.

Hence the over growth of the follicles will be occur due to failure of ovulation (Skidmore *et al.,* 1996).

The lower percentage of corpus luteum and regressed corpus luteum in aged group may indicate lower responsiveness of the ovary of these animals to ovulatory stimulations. Further investigations are needed to answer the

following question: Are their any change in the ovarian receptors in aged she-camel?

The incidence of luteal cyst in the current study was much higher in the aged group. The high percentage of cystic ovarian disease in the aged group animals had been referred to uterine bacterial infections in these animals due to low uterine defense as a function of age factor (Tibary *et al.,* 2006). The high incidence of luteal cyst in aged she-camel may re –indicate the former observation of ovarian irresponsiveness to hormonal regulation which may indicate deterioration of the specific hormonal receptors.

Conclusion

It could be concluded that, the ovarian activity was observed throughout the different seasons with a maximum activity during the cold (winter) season. The incidence of inactive ovaries reached its peak in the summer (hot) season. The cystic ovaries were observed throughout the whole year with variable percentage regarding both ovaries reaching the peak during hot season. Cl in non pregnant she-camel may be attributed to spontaneous ovulation, infertile mating or early embryonic deaths. She-camel reaches its maturity later and has a higher longevity than cattle. The best reproductive capacity of she-camel are expected to be 8-15 years of age.

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نشاط المبيض فى النوق وحيدة السنام وعلاقته بفصول السنة ، نمط إفراز الهرمونات والعمر ومعدل إكتناز الدهون

أجريت هذه الدراسة لاستبيان العلاقة البينية لنشاط المبيض وكل من هرمونات التكاثر ، فصول السنة ، والعمر و معدل إكتناز الدهن فى النوق وحيدة السنام . أجريت هذه الدراسة على عدد ٣٢٠ من النوق وحيدة السنام تراوحت أعمارها بين٥ – ٢٠سنة فى مجزر القاهرة ، فى البداية تم تقدير معدل إكتناز الدهن لهذه النوق ثم أخذت عينات دم من الوريد الودجى لهذه الحيوانات و ذلك لفصل مصل الدم و قياس مستوى هرمونات الاستروجين ، البروجستيرون والهرمون المنبه للحويصلات وكذا هرمون التبويض. بعد ذبح هذه الحيوانات تم فحص الجهاز التناسلى لإثبات خلوها من العشار والآفات الظاهره وكذلك قسمت المبايض لهذه الحيوانات على حسب التراكيب الوظيفية الظاهره على المبيض مع الأخذ فى الإعتبار القياسات المختلفة لهذه التراكيب الوظيفية .

طبقا للقياسات الهرمونية و التراكيب الوظيفية المختلفة على المبيض ظهر جليا أن للجمال موسم تزاوج يبدأ من شهر نوفمبر حتى شهر أبريل تحت ظروف البيئة المصرية ، على الجانب الآخر فإن العينات التى أخذت من شهر مايو حتى شهر اكتوبر أظهرت نشاطاً فسيولوجيا أقل .

تبين من هذه الدراسة أن النمو الجنسى فى النوق يأتى متأخراً عن مثيله فى الأبقار مع ملاحظة أن عمرها الإنتاجى أطول من الأبقار . أيضا تبين لنا من هذه الدراسة أن قمة النضج الجنسى فى الجمال تتأتى فى المرحلة العمرية من ٨- ١٥سنة .