Investigations on Reproductive Performance of the Female Camel (AL-NAGA)* '*Camelus dromedarius*' III. In Vivo Investigations of Ovarian Activity in the Female Camel

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ABSTRACT

Ovarian activity was examined using peritoneal cannulation in seven estrous cycles of four female camels. Length of estrous cycle and period of estrus averaged 27.6 ± .48 and 6.45 ± .43 days, respectively. Estrous was characterized by a dominant follicular phase in the absence of luteal phase. Growth and regression of follicles were continuous and alternating between the two ovaries throughout the estrous cycle. Ovulation determined to be induced and may require induction through coitus. Mechanical cervical stimulation failed to induce ovulation in three out of four females.

INTRODUCTION

Investigations on camel reproduction were early considered in the literature (7). Since then very little attention has been devoted to this subject in contrast to other species of animals raised and considered of economic importance in the temperate zones. In semi-tropical areas as in Libya, the camel is considered a draft animal as well as a good source of meat and milk. Furthermore, it is a part of cultural heritage and traditions. Unfortunately, in the absence of scientific methods and programs to improve the camel's productivity of meat and milk, the number of camels in Libya was reduced from 274,692 heads in 1964 to 75,196 heads in 1974 (5). Therefore, it is of economical and practical importance to develop sound reproduction and breeding programs in order to stimulate the production potential of this animal. Recently, few

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**Al-Naga is the Arabic name of the female camel.*

attempts have been made to investigate the characteristics of the reproductive cycle in the female camel (8, 9) and the fitness of camels to serve as worthy source of meat and milk (5).

Published research concerning estrous cycle, follicular activity, and pattern of ovulation in the female camel (Al-Naga) is rare and inefficient with apparent contradictions (1, 8, 9, 12). In addition, rectal palpation was the only method used to investigate the nature of these mechanisms with no direct *in sito* examination of the ovaries and ovarian cycles (8, 10). Therefore, this study, which may be considered as a pioneer work in the areas of camel's reproductive physiology, was undertaken to use peritoneal cannulation and direct endoscopy to expose the ovaries in an attempt to:

1. Directly observe the follicular development and regression during the breeding season under Libyan conditions; and
2. Determine the pattern of ovulation in the female camel.

MATERIALS AND METHODS

Four adult female camels (*Camelus dromedarius*) of Libyan breed were used for the experiment. The animals were clinically healthy, non-pregnant and checked twice daily for signs of estrus. About the time of estrus, all females were examined at 6 hours interval for signs of vaginal estrus and cervical mucus discharge. At least one complete estrous cycle was detected after which animals were subjected to laparotomy and endoscopy. Laparotomies were carried out in 3 females, in which, polyethylene cannulae were inserted for further endoscopy. Details of the surgical procedure are described in a separate article (3). After surgery, each animal was housed separately and kept for at least 2 weeks before leaving to pasture. Feed was with-held for 14 to 36 hours prior to endoscopy. Four to six days post-surgery, laparoscope and a pair of serum grasping forceps[1] were separately introduced through the cannula. Follicles and corpora lutea were photographed through the telescope as necessary. In an attempt to induce ovulation, manula mechanical stimulation of the cervix for 12 minutes was used. Stimulation of the cervix was carried out on the day of cervical mucus discharge.

RESULTS AND DISCUSSION

Ovarian activity was examined, using laparoscopy technique as described by (3), in seven estrous cycles of four female camels. This technique has the advantage of permitting repeated observation in the same animal without creating adhesions. In addition, it appears that peritoneal cannulation has no effect on the length of estrous cycles nor on the length of estrus periods. Mean length of the estrous cycles and estrus periods were $27.6 \pm .48$ (range 26–30 days) and $6.45 \pm .43$ (range 5–7 days), respectively. These results are in agreement with our previous report (11) and contradicts the results reported by Leonard (7) and Bodenheimer (1), who stated that the length of the estrous cycle is 14–21 days and heat may last 3–4 days. Moreover, Yasin and Wahid (13)

[1] *Endoscopy equipments: Richard Walf GmbH, Knitt Linger, West Germany.*

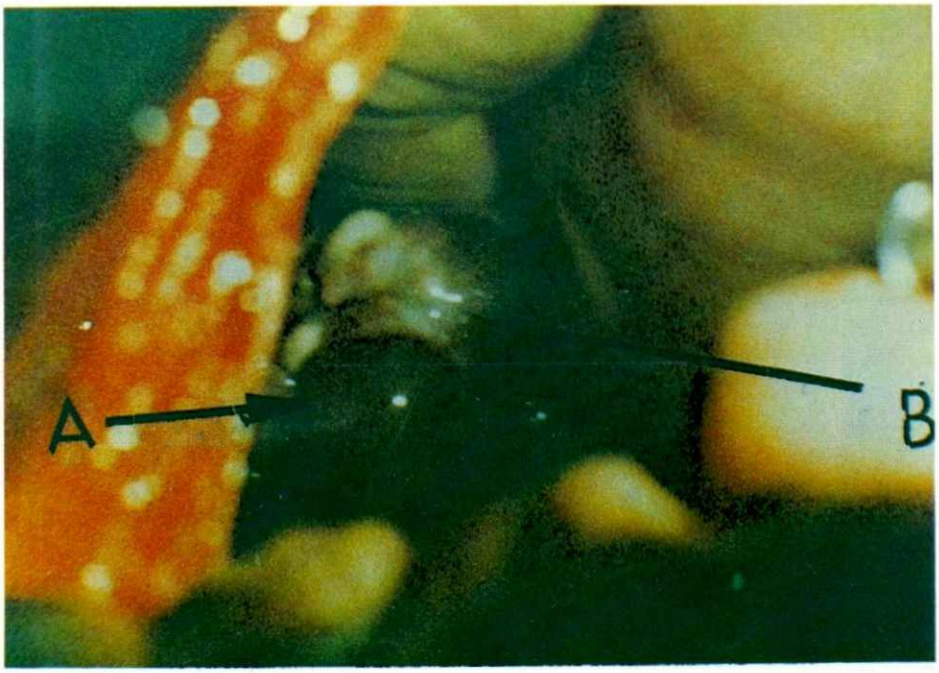

Fig. 1. A. Fully developed graffian follicle as seen on the third day of estrus.
B. A newly growing follicle (1 cm in diameter).

Fig. 2. A newly regressing follicle as seen six days following estrus.

reported that heat lasted for 21 days. The estrous cycle in Al-Naga is characterized by a dominant follicular phase with no apparent luteal tissue development. On days of estrus, all females exhibited fully developed Graffian follicle on one of the ovaries (Plate 1a) with a mean diameter of $4.2 \pm .2$ cm (Mean $\pm$ SEM) (range 4–5 cm). Fully grown follicles are soft, palpable, full of follicular fluid, and are covered with a transparent membrane. If ovulation does not take place, these mature follicles start to regress, and become hard with a very slight reduction in size a few days after esturs (Plate 2). They are fully regressed by one week before the beginning of next estrus (Plate 3a). Furthermore, while a follicle is regressing on one ovary, another follicle(s) is/are developing on the other ovary. This follicular activity starts with the development of small follicles (Plate 1b, 4a), and continues so that only one follicle will be at the specific stage of development for it to undergo preovulatory sweeling and becomes mature on the days of the next estrus. In cattle, follicular development is dependent upon levels of FSH, LH, and estrogen. In addition, the growth and regression processes are continuous and appear to be independent upon phase of the reproductive cycle (2). In camels, follicular growth and development appear to be continuous throughout the estrous cycle. However, hormonal control of this process still to be determined. In all estrous cycles studies in this experiment and other reports (8), the follicular activity and development was alternating between right and left ovaries. Follicular maturation was accompanied by a marked enlargement of the ovaries. Regression of non-ovulatory follicles begins most frequently about 5–7 days following estrus. During regression, the

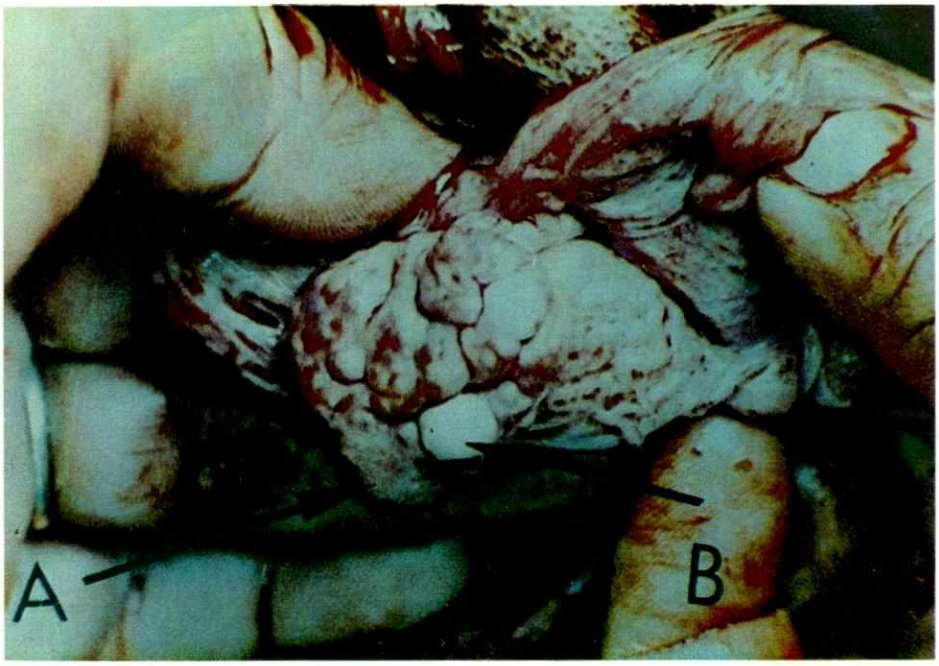

Fig. 3. A. Fully regressed follicle as seen one week before the next expected estrus.
B. Fully regressed C.L.

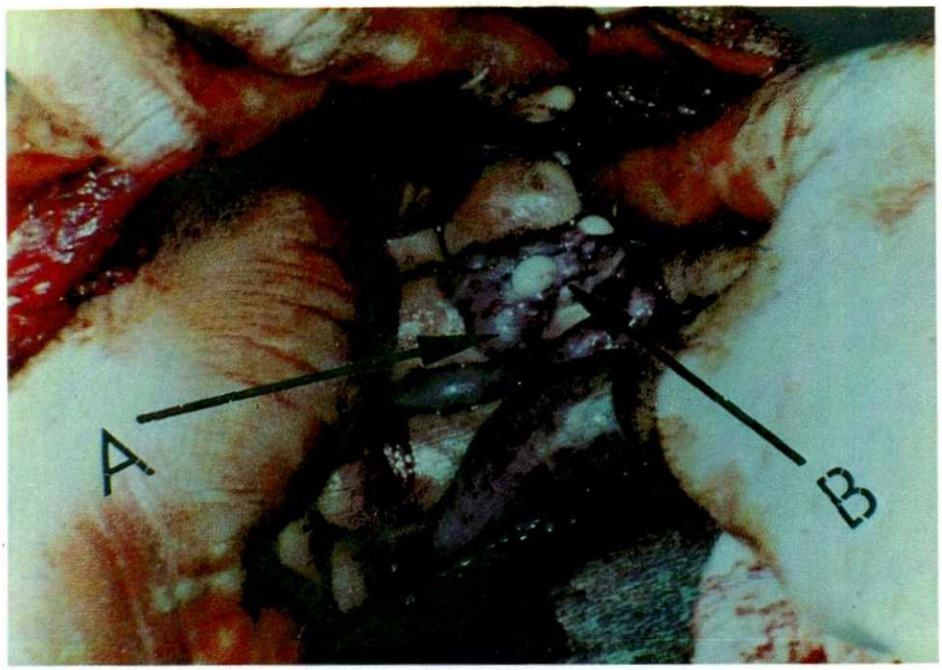

Fig. 4. A. Newly growing follicle (2 cm) as seen at 4 days after estrus.
B. Small C1. developed as a result of vaginal mechanical stimulation of the cervix.

follicles contract and become small in size (Plate 2). In cattle follicular atresia is characterized by loosening and sloughing of the granulosa cells, disappearance of the membrana propria and shortening of the theca interna cells (8). These authors further indicated that at later stages of atresia, collapsing, contracting, cystic or luteinization of follicles is evident with follicular size being reduced, cells become disorganized and the antrum becomes filled with fibrous granulosa and theca interna remnents.

Ovulation in Al-Naga appears to be of the induced type. Salash (10) stated that female camels develop corpora lutea only during pregnancy, and for ovulation to occur during the estrous cycle, coitus, mechanical or electrical stimulation of the cervix is necessary. Musa and Abusineina (9), however, failed to induce ovulation when manually stimulated the cervix for 2–15 minutes. Moreover, in this study, ovulation was not induced following mechanical stimulation of the cervix for 12 minutes in 3 of 4 animals used. In one estrous cycle, ovulation was induced and a soft, small and spherical corpus luteum was developed (Plate 4b) and normally regressed (Plate 3b) by one week before the next expected estrus. For ovulation to be induced by mechanical stimulation, the later has to be probably performed at a specific time of the estrus period which is not possible to predict at this time and still to be determined. Musa and Abusineina (9) reported that coitus is the only stimulus which induced ovulation in camels. This appears to be true and camels should be classified as coitus induced ovulators. Coitus and/or pre-coital behavior appears to be the triggering stimulus which induces the reflex of ovulation in camels. In induced ovulators, triggering stimuli

are transmitted to the CNS by a different nervous pathways, and are translated in the thalamic-hypothalamic-pituitary complex into neurohormonal phenomena, causing ovulation (4). More research should be conducted to shed light into the poorly understood mechanisms which may lead to induced ovulation in camels. Knowledge of the normal events and cycling changes that take place in the ovaries and ovarian follicles would be very helpful in developing sound programs towards profitable camel industry.

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LITERATURE CITED

1. Bodenheimer, F. S. 1954. Biology of Deserts. Ed. J. L. Cloudsley Thompson. Institute of Biology. London.
2. Choudary, J. B., H. T. Gier and G. B. Marion. 1968. Cyclic changes in the bovine vesicular follicles. J. Anim. Sci. 27:468.
3. A. El Sheikh, M. Monzaly, A. Zaied, A. Magdub and A. M. Shareha. 1983. Investigations on reproductive performance of the female camel (AL-NAGA) *Camelus dromedarius*. II. Peritoneal cannulation for ovarian endoscopy. Libyan J. Agr. vol. 11 pp 47–52.
4. Jochle, M. 1975. Current research in coitus-induced ovulation: A review. J. Reprod. Fert., Suppl. 22:165.
5. Karam, H. and M. Alansary. 1981. Preliminary study about raising camels in the Jamahiriya. FAO Public. No. 285 (In Arabic). Secretariat of Agriculture, Tripoli.
6. Kroess, K. H. 1977. The camel as a meat and milk animal. World Animal Review 22:39.
7. Leonard, A. G. 1884. The camel. Longmans Green, London.
8. Marion, G. B., H. T. Gier and J. B. Choudary. 1968. Micromorphology of the bovine, ovarian follicular system. J. Anim. Sci. 27:451.
9. Musa, B. E. and M. E. Abusineina. 1978. The oestrous cycle of the camel. The Vet. Record. 103:556.
10. Shalash, M. R. 1965. Some reproductive aspects in the female camel. World Review of Animal Production 4:103.
11. Shareha, A. M., A. El-Magdub and A. A. Zaied. 1983. Investigations on repro-

ductive performance of the female camel (AL-NAGA) (*Camelus dromedarius*). I. Characterization of the estrous cycle. Libyan J. Agr. 11 pp. 44–45.
12. Shingh, V. and Prakash. 1964. Mating behavior in camel. Indian Vet. J. 41:475.
13. Yasin, S. A. and A. Wahid. 1957. Pakistan Camels. A preliminary survey. Agriculture Pakistan 8:289.

دراسات عن النشاط الجنسي في الإبـل

٣ ــ التتبع المباشر لنشاط المبيض في الناقة عن طريق منظار داخل التجويف البطني

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المستخلـــص

قد تم تتبع نشاط المبيض في أربعة نياق خلال موسم التلقيح بواسطة منظار عن طريق ناسور البلاستيك الذي تم وضعه بين الجلد وتجويف الجسم في المنطقة الخلفية من التجويف البطني . وقد وجد أن الناقة تمر بفترات شبق متتالية يبلغ متوسط طول كل منها ٢٧,٦ + ٠,٤٨ يوما . وتبدأ كل فترة شبق بشياع يستمر لمدة ٦,٤٥ + ٠,٤٣ يوما . ويلاحظ خلال فترة الشياع وجود كيس بويضة كبير الحجم على أحد المبيضين . وأن ضمور هذا الكيس لا ينتج عنه تكوين الجسم الأصفر بعد انتهاء فترة الشياع . ولكنه يصل نهاية حجمه خلال فترة الشياع ثم يبدأ بعد ذلك في الضمور تدريجياً حتى ينتهي بنهاية مدة الشبق . وفي نفس الوقت يكون هناك كيس بويضة آخر يبدأ في النمو على أحد المبيضين أثناء عملية ضمور الكيس الأول . والأخير يعيد نفس مدة الشبق والشياع مرة ثانية ، وهكذا تكون دورات الشبق في الناقة .

وثبت أيضاً من هذه الدراسة أن عملية الإباضة (خروج البويضة من الكيس المبيضي) وتكوين الجسم الأصفر في الإبل لا يتم إلا بعد حدوث عملية التزاوج الحقيقية .

وقد وجد أن الحث الإصطناعي لجدار المهبل غير مجد في إحداث الإبياض في ٣ من ٤ نياق . وهذا يدل على أن الإباضة في الإبل عملية مرتبطة إرتباطاً وطيداً بالوقت المناسب للتزاوج .