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Review article

Reproduction in the one humped camel (*Camelus dromedarius*) in semi arid Nigeria

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ABSTRACT

This review examines the one humped camel *(Camelus dromedarius)* a considerable number of the dromedary about 50,000 is found in the semi-arid part of Northern Nigeria. Apart from the wide use of the camel as a draught animal the camel now serve as a source of milk, meat and hide in this region, these notes examines the anatomical basis of reproduction, pregnancy, and its diagnosis, fertility, and the application of modern techniques in camel reproduction. Different techniques and equipments are now being employed for explicit study of the reproductive processes in the camel. Transrectal ultrasaonographic scanning machine is now being used to study ovulation pattern and timing, video endoscopic hysteroscopy is another technique employed to study various aspects of the camel conceptus. Techniques like oestrous synchronization, super ovulation, semen collection artificial insemination, embryo recovery and transfer are all used in the study of camel.

1. Introduction

The one humped camel (*Camelus dromedarius*) with a worldwide estimated population of about 20 million (FAO, 1990) was originally domesticated for meat and milk some 25,000 years ago. (Wilson, 1984) it has become over the centuries, synonymous with transportation through some of the most formidable deserts and arid areas

of the planet. It used to be an irreplaceable part of the socio-economic structure of these areas, but the advent of the motor car and aeroplane has reduced this role and contributed to the camel's economic eclipse (Bello *et al*., 2012a)

A considerable number of the dromedary (About 17,000) is found in the semi-arid part of Northern Nigeria (Mukasa-Mugerwa, 1981, Anon 1992). Apart from the wide use of the camel as draught animals, there has been increase in the use of camel as a source of milk and meat in this region.

The camel has not received the attention it deserves, very few literatures are found on camel production and reproduction in this part of the world. Only few studies are available on camel reproduction in Nigeria (Ribadu, 1988); Umaru 1977; Umaru and Mera, 2000, Ribadu *et al*, 1991; Umaru *et al*, 1988).

In Nigerian and African Literature of livestock the camel rarely received the attention that it merits, the reasons for this are unclear, It is also simply unfamiliar, as are the yak and the llama and is given little attention in livestock production textbooks. It is also more difficult to research on as its owners are mobile and exploit remote areas that make long term monitoring difficult (Bello *et al*., 2012a; Bukier 1975; Wilson 1984; Wilson, 1989, Saint-martin 1990; Chapman 1991; Anonymous, 1992, Wilson *et al.,* 1984).

Camels are commonly thought of as being confined to the Northern borders of Nigeria, and this is still largely true of breeding herds; Wilson, 1984; Mason and Manley, 1960; Wilson 1984).

For the camel to achieve greater significance, traditional forms of camel raising will have to be modified. To do this will require a better understanding of the basic biology of the camel and its potentials. This will include an understanding of its genetics, reproduction and nutrition; these hold the key to the successful utilization of the camel as a growing protein source (Cohen, 1984; Bello *et al*., 2012b; Skidmore and Adams, 2000; Skidmore 2003; Skidmore et al., 2001; McKinnon *et al*., 1994; Skidmore *et al.*, 1992a; Skidmore *et al*., 2000).

2. Anatomy of the male genitalia

Camel testicles are relatively small and are enclosed in a non-dependent scrotum. The non erect penis is directed backwards and its extremity is in the form of a hook. Elongation of the penis at coitus is caused by straightening of its sigmoid flexure. There is no sigmoid flexure (Arthur, 1992; Williamson and Payne, 1978; Smuts and Bezuidenhout, 1987). Other local studies on the male genital anatomy of the camel include Bello *et al*.,(2012a), Umaru (1997), Mahammadou, (2001) Abdelraouf *et al.*, (1975); El-Belly *et al.*, (1995) Cleff *et al.,* (1981).

3. Anatomy of female genitalia

The ovaries are fairly flattened organs with numerous ovisacs giving them the appearance of a bunch of grapes. The lateral surface tends towards convexity. They are reddish in colour and each is enclosed in an ovarian bursac which ends blindly and laterally but has a medically located opening where the fimbriae are situated (Shalash, 1965; Novoa, 1965, Tayeb, 1948). The uterine (Fallopian) tubes are about 22-24cm long. Their width increases towards the ovarian end where the tubes are obviously funnel shaped (Arthur *et al.,* 1989). The uterus is bicornuate, with a developed uterine body, from which the two horns diverge and taper anteriorly to give a combined uterine shape intermediate between that of letters 'Y' and 'T'. The left horn is longer than the right (Arthur 1992; Chen and Yuen, 1984; Joshi *et al.*, 1978, Umaru and Mera, 2000). The endometrium shows irregularly raised mainly longitudinal folds, which are conspicuous, the left horn. The cervix resembles that of the cow, with a number of mucosal folds. (Arthur *et al.*, 1989, Akingbemi and Aire (1991);

The Graafian follicles on the ovaries may grow to a size of 10cm in diameter but a more common ovulating size is 1.5- .3.0cm, the mature follicle can easily be detached from the ovary as a discrete sphere by gentle pressure. Because ovulation is a sequel to ovulation, corpora lutea are to be expected only in pregnant camels. The left and right ovaries function equally and ovulate alternately. Because ovulation is induced by coitus the length of oestrus depends on weather and when mating occurs. In the absence of a male, oestrus may last about two weeks, whereas if copulation occurs on the first day of oestrus, receptivity system like the male has received little attention in Northern Nigeria, but a few reports are now available (Umaru and Mera, 2000; Umaru *et al*., Ribadu, 1988, Umaru, 1997; Ribadu, *et al*., 1998; Ribadu *et al*., 1991).

3.1. Puberty

Female camels reach puberty at two years of age but are not usually mated until three years (Arthur, 1992; Williams and Payne, 1978; Leupold, 1968a). However, Khatami (1970) indicated that both the Iranian female and male camel reach sexual maturity at the age of five years. It is a common practice to practice to withhold female camels from breeding until they are 4-6 years old (Williamson, 1978; Matharu, 1966). This practice doubtlessly results from the fact that fecundity continues to increase with age, even after sexual maturity and only starts to decline with sensuality. Males are not usually used as stud until beyond the fifth year (Bello *et al*., 2012b; Mukasa-Mugerwa, 1981). Both sexes maintain fertility up to 25 years of age. It is customary to breed from the female in alternate years only. The mean gestation period is 375 years. Camels are seasonally polyestrous, with peak sexual activity from November to February. in the Northern hemisphere The males show seasonal sexual activity called the 'rut' but stud males will make and fertilize females at anytime of the year. During the rut they become less tractable and are more aggressive towards other males and people. Prominent features of rutting behaviour include frothing at the mouth loud vocal gurgling with protrusion of the markedly edematous and mobile soft plate and discharge of fetid fluid from the poll glands located behind the head, (Chen and Yuen, 1984b; cooper *et al.*, 1990; Abdulrahim 1997).

3.2. Oestrus and mating

The signs of oestrus are restlessness bleating .vulval swelling and mucous vaginal discharge. The female wages its tail vigorously on the approach of a male, or when it hears the gurgling voice of the rutting. Under natural, condition the male pursues the oesterus female and presses the head on her neck to induce her to sit down. The male then mounts her in a squatting posture (Abdelrahim and El-Nazier, 1990). Copulation lasts from 1-22 minutes (Rai *et al.*, 1988 reports of a mean of 5 minutes) and it is accompanied by oral frothing vocal gurgling, intermittent protrusions of the soft palate by the male and bleating by the female. Interspersed with these activities are several bouts of male pelvic thrusts (Agarwahl and Khanna, 1990). One male is considered sufficient for 50-30 females (Arthur, 1992). According to a study by Abdulkadir (2000) in some areas of Sokoto State namely illela, Dange-Shuni, Bodinga and Goronyo. The Local Camel rearers usually identify females on heat through the behavioral exhibition of restlessness, vaginal discharge swelling of the vulva, frequency of urination and females running towards the male. However, there is confusions regards the estimation of the duration of estrus in which most of the camel herders believe can last as long as the female has not been mated. The authors are not aware of any published report locally on oestrus and related physiological state. (Manjunata, 2012; Skidmore *et al.*, 1995; Monaco *et al.*, 2012)

3.3. Pregnancy

Although the ovaries function equally about 99% of the pregnancies are in the left horn and uterine body (Musa, 1969). The incidence of twin birth is only 0.4%. The placenta resembles the equine organ in shape and size and in being diffuse and non-cotyledonary in structure. The final volumes of allantoic and amniotic fluids are approximately 8.5 and 1 litres respectively (Arthur, 1992; Bello *et al*., 2012b).

3.4. Diagnosis of pregnancy

Until recently the only reliable method of pregnancy diagnosis was by palpation of the camel genital organs per rectum (Barminstsev, 1951, Musa and Abusineina, 1976). Now, however, ultrasonic scanning of the camel genitalia and estimation of blood progesterone level are also available (Tinson and McKinnon, 1992 and Skidmore *et al.*, 1992). The authors are not aware of any report by Nigerian authors on pregnancy diagnosis in the camel, apart from those mentioned above from authors elsewhere. The rectal palpation method is the same as for cattle, but the she-camel needs to be restrained in the sitting position. In connection with early diagnosis, it is important to remember four features of camel reproduction: Large corpora lutea are only present in pregnancy. 99% of pregnancies are in the left horn.

The empty (or early pregnant) right horns is congenitally shorter than the left. The amount of fetal fluid at all stages of camel pregnancy is less than in the cow; from the foregoing it is clear that the presence of a palpable corpus Luteum in one or both ovaries is a very strong indication of pregnancy. It should be noted that because the camel placenta is non-cotyledonary it is not possible to 'slip' the fetal membrane (Arthur *et al.,* 1989). As regards

the length of gestation in the camel, almost incredible variations exists; twelve months and a few days (Yassin and Wahid, 1957), 370 days (Williamson and Payne, (1959) and 389.87 ± 2.1 days (Matha and Prakash, 1962).

Other newer pregnancy detection tests include real-time ultra sound scanning of the uterus and ovaries. This technique enables visualization of the fluid-filled extra embryonic membranes from as early as day 18 after ovulation (Skidmore, *et al.*, 1992; Tinson and McKinnon, 1992). The ability to visualize salient features and significant structural changes in the reproductive tract or the female animals during the ovarian cycle and early pregnancy is important when attempting to apply modern breeding techniques such as artificial insemination (AI) and embryo transfer (ET). Skidmore *et al*., (1992) employed ultrasaonographic and video endoscopic monitoring machines to study foetal development in the dromedary camel. Indirect methods, based on measurement of hormone level in maternal blood have been investigated and, and of these, the one based on progesterone seems useful (Elias *et al.*, 1987). Unmated and anovulatory camels have basal progesterone levels; those which ovulated but do not conceive, show a peak value at six to ten days after mating which declines to baseline by day 12. Pregnant camels show raised progesterone concentration beyond day 12 after mating is a very strong indication or pregnancy (Bello *et al*., 2012a; Arthur, 1992 Juharsz *et al.*, 2009, Nagy and Juharsz, 2010; Skidmore *et al.*, 2002; Tibary and Anouassi, 1997).

There is little or no information about problems associated with camel parturition in Nigeria. Statistical figures on abortion, Dystocia, fetal mummification, maceration, congenital anomalies, uterine prolapsed, fetal membrane retention and other problems associated with parturition are to our knowledge very few elsewhere and almost non-existent in Nigeria.

3.5. Dystocia

Because of the paucity of published reports of Dystocia in camels, there seems to be very little veterinary experience of Dystocia in the camel. However, camel breeders are familiar with dispositional dystocia such as carpal flexion. They have confirmed the rarity of posterior presentation feto pelvic disproportion, monstrosities and transverse presentation are thought to be uncommon and the frequency of twin birth is said to be 0.1 to 0.4% of all births. Retention of after birth is uncommon. If placental retention follows a Dystocia treated by manual interference, fetal metritis may occur. Prolapse of the vagina is relatively common in late pregnancy (Arthur, 1992. Tibary and Anouassi; 1997).

4. Fertility in camels

Reports on fertility are conflicting, according to Arthur *et al.*, 1989, and Arthur, (1992) the fertility is good Abdel Nazier (1990) reported a fertility range of about 80-90% in a study of some camel herds. But on the contrary Dahl and Hjort, (1976) and Novoa, (1970) described the fertility rate in camels as low not higher than 50% in pastoral herds. The abattoir studies of El-wishy (1990), Arthur *et al.*, (1989); Ribadu, (1988); Umaru (1997); Bello *et al*.,(2012a) all suggested that structural and functional defects of the genitalia including cystic ovaries and ovarobursal adhesions are relatively rare. Anaestrus due to malnutrition or debilitating diseases is probably a major cause of infertility. Embryonic death is known to occur especially in twin gestations. Abortions are reported occasionally but the causative role of *Brucella abortus* in the dromedary camel is not yet clear. (Mukasa – Mugerwa, 1981 Agab, 2006; Ahmad and Nemat (2007) Ivanov and Kozhaev, 2012; Pretap *et al.,* 2012;

The fertility rate of camels in Northern Nigeria has not been investigated. Therefore, discussion about fertility level or animals in this area is only speculative from preliminary abattoir studies on the presence or absence of genital abnormalities in abattoir samples (Ribadu *et al.*, 1998; Bello *et al*.,2012a;Umaru *et al*., 2002: Al-aqraw; 2005 Al-qaraw, *et al.*, 2000, 2001 2002, 2004, El-Hassanesi 2003; Kennelly *et al.,* 1999 Tingari *et al.*, 1986; Tibary *et al;* 1997; Yasin and Wahid 1957; Waziri *et al*., 1999; Author *et al.,* 1985).

4.1. Application of modern techniques in camel reproduction:

Due to the long gestation period of camels and the relatively short peak breeding season, it is impossible for camels to produce a calf a year. However, two calves in three years could be achieved provided the animals were maintained in good bodily condition through out the breeding season (Arthur, 1992). Modern breeding techniques are now applied in camels kept semi-intensively e.g. Artificial insemination (Chen *et al.*, 1990) and synchronization of oestrus (Copper *et al*., 1990 and Yagil, 1985, Anouassi, and Ali; Yagil and Von Creveld 1990).

Different techniques and equipments are now being employed for more explicit study of the reproductive processes in the camel. Hormones are now being used to induce ovulation (Anouassi *et al.*,) Transrectal ultrasaonographic scanning machine is now being used to study ovulation pattern and timing various aspects of the camel conspectus. This can be done as early as day 17 or 18 (Skidmore *et al*., 1992). There are several reported successes of embryo recovery and or transfer in the dromedary; (Cooper et al., 1992; Tinson and McKinnon (1992); Skidmore *et al*., 1992, Wani, 2009; Wani, *et al.*, 2005; Wani and Skidmore, (2010); Wani and Wernery 2010; Wani *et al;* 2010; Skidmore 2000, Skidmore 2003).

5. Conclusion

The camel is a very prominent and useful "infrastructure" of the desert, arid and semi-arid areas of the world, Northern Nigeria inclusive. Great benefit can be achieved through the maximum exploitation of the animal. The unique physical and physiological feature of the animal makes it an all rounder. It is worth noticing that most of the pioneering research on this particular animal was done elsewhere. In fact only very little have been done in this part of the world. There is no report yet on the non-spontaneity of ovulation in the camel, Artificial insemination, Embryo recovery and transfer in camel. In fact even basic data about oestrus, duration of oestrus, gestation length, calving interval semen analysis of the dromedary is lacking. It is hoped that this write-up will stimulate wider research interest in camel and its reproduction in Northern Nigeria.

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