

Sexual behaviour of the Arabian camel (camelus dromedarius) during pubertal development.

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SUMMARY

The significance of behavioural interactions during courtship and mating of 6 male Arabian camels were studied during prepubertal period. Testicular weight changes were also examined during the same period in slaughtered animals. The results indicated that young camels show distinct sexual responses from the age of 24 months. The average ages for the beginning of preparatory movements and precopulation behaviour were 112 and 153 weeks respectively. The average age of penile prepuce separation, erection of the penis and ejection of the soft palate were 126, 160 and 166.5 weeks respectively, while copulatory behaviour was observed at age of 174.5 weeks. Testicular weight changes coincided with the increase in age from 17.5 ± 2.1 g about one year to 53.1 g at puberty. The mean testicular weight of 12 mature camels was 135.4 ± 26.6 g.

INTRODUCTION

In the past years, the attainment of puberty in camels has received considerable attention. Studies have included investigations of the structural changes of the testicular interstitial endocrine cells in correlation with the levels of serum androgens from birth to puberty (Taher *et al.*, 1991), histochemical observation of the testes and evaluation of spermatozoa from slaughtered animals (Dafalla and El-Eknah, 1993), and semen collection and quality (Abdel Rahim, 1996). However, studies on the sexual behaviour of camels during the pubertal stage is lacking. There is evidence of the importance of social interaction, play and communication in behavioural development and attainment of puberty (Bromley and Neaves, 1972). In the

present study the significance of behavioural interactions during courtship and mating of prepubertal camels was investigated. Testicular weight changes and morphology of spermatozoa during the same period were also studied and compared with those in mature animals.

MATERIALS AND METHODS

The sexual behaviour of 6 male Arabian camels was studied during 3 consecutive years from the age of one year until puberty. The animals were kept in fenced yards with shaded areas at the Camel Research Unit within the premises of the College of Agriculture and Veterinary Medicine. All the animals were healthy, separately penned from females and fed a ration of alfalfa and barley grains. Each male camel was exposed to one of four females at weekly intervals throughout the year. The behaviour of each male was observed for 30 minutes each time and

behavioural interactions were monitored and their significance was determined. However, the females were teased daily for oestms during the entire period of the .study but were never bred. Each behavioural act was recorded and analysed.

The following behavioural interactions by the males were monitored and recorded.

Series A: Preparatory movements (sexual interest, commencement of courting and chasing).

Series B: Disoriented mounting (side, head, hump, back and premature mounting).

Series C: Penile-prepuce separation (partial and complete).

Series D: Precopulation behaviour (premature mounting, seminal plasma secretion and tail flapping).

Series E: Erection of penis (weak, moderate and strong). **Series F:** Ejection of the soft palate.

Series G: Secretion of the poll glands.

Series H: Copulatory behaviour (intromission, thrust, jerks and ejaculation). **Series I:** Post copulatory behaviour (dismounting and side falling).

The second part of the study included:

Morphological changes of the testis during the prepubertal period:

Pair of testes and epididymises were obtained from 61 camels ranging in age from 12 to 42 months. The testicles obtained shortly after slaughter were stripped of their tunics and weighed. Testes were also collected from 12 mature camels after slaughter. A small drop of the contents was squeezed from the tail of the epididymises over a glass slide and stained with two drops of aqueous eosin-nigrosin. The slides prepared were examined at a magnification of x1200 in bright field and the morphology of the sperms was recorded. Statistical significance of weight of testes and epididymides of mature camels was assessed by the unpaired student's t-test (Snedecor and Cochran, 1967).

RESULTS

The sequence of events which occurred during pubertal development in camels is presented in figure 1. It was quite clear that camels as young as 24 months of age showed distinct sexual responses in the presence of a female. Young males showed abnormal mounting orientation, but without erection or intromission. The average ages at which the males first showed preparatory movements and precopulation behaviour were 112 and 153 weeks respectively and the difference was highly significant. Differences were also found with respect to the average age of penile prepuce separation and erection of the penis (126 and 160 weeks respectively). However, the average age for first time ejection of the soft palate was 166.5 weeks and was preceded by secretions of the *poll* glands. This stage was immediately followed by the males showing

copulatory behaviour at average age of 174.5 weeks (about 3.6 years), which was considered the puberty stage.

Figure 2 shows sexual behaviour of camels during prepubertal period, which was mainly considered disoriented mounting and included head mounting (1&2), **hump mounting (3&4), courting in the sitting position (5), standing on the back (6), approaching from the side (7) and incomplete mounting (8).**

Fig. 1. Sexual behaviour of camels during pubertal development.

Figure 2: Sexual behaviour of camels during prepubertal period.

1 & 2: Head mounting.

3 & 4: Hump mounting.

5: Counting in the sitting position.

6: Standing on the back.

7: Approaching from the side.

8: Incomplete mounting.

The mean weight of testes and epididymises at different age groups of the prepubertal and mature animals are presented in Table 1. The weight gradually increased from 17.5 ± 2.1 g at the age of about one year to 58.2 ± 10.4 g at 42 months (age of puberty) at which time mature sperms were observed. In contrast, spermatozoa were not detected in all the specimens till the age of 24 months when spermatozoa with protoplasmic droplets were seen indicating the beginning of spermatogenesis. The mean testicular weight of the 12 mature camels was 135.4 ± 26.6 g.

DISCUSSION

Results of the present study indicated that development of sexual activity in male Arabian camels encompasses a sequence of behavioural events that included courting and chasing disoriented mounting and specific pricopulation features. These processes were followed by copulatory behaviour which indicated the beginning of puberty. It was clear that young camels, 24 months of age, were able to show sexual responses. However, these sexual responses could not be considered similar to those of mature animals. Copulation in the camel is typical of the mammalian pattern with the posture linea taxis followed by a ventrodorsal mating which terminates upon ejaculation (Abdel Rahim and El Nazier, 1990). The comparatively high incidence of premature and disoriented mounts in the young males could be ascribed to sexual inexperience.

Behavioural characteristics other than mounting frequency and copulatory behaviour might also serve as useful parameters when estimating sexual development and desire. The results also indicate that penile prepuce separation occurs early before erection of the penis. This has been previously reported to be accomplished under the control of testosterone (Combe and Oduor-Okelo, 1977). Ejection of the soft palate and secretions

of *Poll* glands were followed immediately by full copulation and semen production indicating their importance in camel reproduction. However ejection of the soft palate in mature camels is accompanied by frothy secretions and gurgling sounds (Yagil and Etzion, 1980). Camels kept under similar managerial conditions to the present study were found to produce viable sperms at lower body weights and attained sexual maturity by encouragement of rapid growth during the pubertal

Table 1. The mean ($\pm$ S. E.) weight of the testes and epididymises (g) of Arabian camel at different ages (months)

Age group (months)	No. of animals	Testes and epididymises (g)
12-15	8	17.5 $\pm$ 2.1
16-18	6	19.9 $\pm$ 4.5
19-21	6	22.2 $\pm$ 9.4
22-24	8	28.6 $\pm$ 6.0
25-27	5	34.7 $\pm$ 5.8
28-30	4	37.4 $\pm$ 7.2
31-33	7	42.5 $\pm$ 12.1
34-36	6	53.1 $\pm$ 4.7
37-39	5	54.6 $\pm$ 8.0
40-42 ¹	6	58.2 $\pm$ 10.4
> 96 ²	12	135.4 $\pm$ 26.6***

1 = Age of camels at puberty.

2 = Mature camels over 8 years of age.

*** = $P < 0.001$ weight of testes and epididymises of mature camels.

period (Abdel Rahim 1996). The results of the present study indicated that continuous stimulation and presence of cycling females could also be important for release of androgens and production of sperms. Indeed, camels under extensive systems of management took longer time to reach the age of sexual maturity (Dafalla and Al Eknah, 1993).

The gradual increase in testicular weight till puberty correlated well with the changes in sexual behaviour. However, mean testicular weights of mature camels were three times heavier than those at puberty indicating continuation of testicular tissue increase after puberty for more semen production. Incidentally, enlargement of the testis in the bull was accompanied by an increase in the length of the seminiferous tubules (Osman and Fahmy, 1968).

Sexual behaviour is one of the interesting aspects of science that has recently been emphasised for improvement of camel reproduction (Yagil and Etzion, 1980; Abdel Rahim and El Nailer, 1990). However, sexual behaviour and the accompanying changes during prepubertal period are not yet known. This study on different aspects of sexual behaviour combined with development changes could contribute more to our understanding of reproduction in the camel.

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