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Oestrous cyclicity, follicle development and progesterone profile in indigenous donkeys and ponies

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The equids are seasonally polyoestrus species in which the breeding season extended from April to September in North Hemisphere is associated with increase in daylight, temperature and availability of food (Hughes *et al.* 1975). The breeding season can be altered by extending photoperiodicity and mares can be bred at any time of year (Cooper and Wert 1975, Nequin *et al.* 1989). Most of the information on reproductive characters is limited to exotic breeds (Squires *et al.* 1974, Driancourt and Palmer 1984, Singhvi 1992, Montavon 1993). Breed differences and individual variations in reproductive parameters exist in mares (Mckenzie and Andrews 1939, Gibbon 1966). In the present study, information on folliculogenesis and progesterone profile in cyclic, pregnant and irregular cyclic indigenous donkeys and pony mares, have been reported.

Adult non-descript donkey mares (60) and pony mares (30) maintained under standard management conditions operative at the farm were used for this study. Oestrus was detected with the help of a vasectomized donkey/pony stallion teaser. Cycling mares were used continuously for 3 oestrous cycles to study their behaviour and folliculogenesis by using ultrasound 5-MHz linear-array scanner. Blood samples were collected from both donkey and pony mares (10 each) on alternate day during oestrous cycle and sera were stored at –35°C. Serum progesterone was estimated by radio-immunoassay kits. The sensitivity of the assay was 0.1 ng/ml. Intra-assay and inter-assay variations were 6.5% and 10.5% respectively. The data were statistically analysed as per Snedecor and Cochran (1980).

Folliculogenesis

Regular heat symptoms and oestrous cyclicity were observed from mid February onward. Average duration of oestrus, in both the species, was of 5 days with a range from 3 to 8 days. Average length of each cycle in non-descript donkeys was 25.6 (range 25–27) and 25.2 (range 21–29) days while in non-descript ponies it was 25.06 (range 23–27) and 26.19 (range 24–29) days during breeding (mid Feb to mid Nov) and non-breeding (mid Nov to mid Feb) season respectively. Daels *et al.* (1991) reported average cycle length of 21–22 days during the breeding season. In this study the higher average oestrous cycle length in both the species may be attributed to differences in breed and nutritional status of the animals (Dimmick *et al.* 1993).

The shape of follicle before ovulation was observed as oval, irregular and round. The irregular shapes may be due to compression by adjacent follicles and luteal structures or the ovarian stroma (Ginther 1988). The average size of mature follicle on the day of ovulation was 35.82±0.67 (range 32–40 mm) and 35.28±0.98 (range 28–42 mm) in donkey mares and 40.94±1.24 (range 34–50 mm) and 39.76±0.74 (range 31–45 mm) in pony mares during breeding and non-breeding seasons, respectively. In more than 90% donkey and pony mares, size of follicle before ovulation reached more than 35 mm. Being the long oestrus duration in the equids, it becomes difficult to know the exact time of ovulation, which results in loss of few oestrous cycles before the donkey/pony mare conceived. But this study has shown that follicle size of 35 mm reaches near the ovulation i.e., approximately by fifth day of oestrus. This can help in deciding the time of insemination. The diameter of the pre-ovulatory follicle often remained static during the present study, however, sometimes a slight reduction in the diameter (1 to 2 mm) was also observed on the day of ovulation. The size of the follicle on the day prior to ovulation is known to very considerably (Ginther 1988). In earlier studies, no follicle ovulation prior to reaching 35 mm was reported even in single ovulating mares (Ginther 1988). Watson *et al.* (1994) also observed that 60% ovulations occurred in the last 2 days of oestrus, and average size of follicle on the day of ovulations was 4.15 mm with a range of 31–51 mm.

During breeding season, follicle size increased at 2.18 and 2.68 mm per day 1 week before ovulation whereas in non-breeding season the growth was 1.97 and 2.28 mm per day in donkey and pony mares respectively. Pierson and Ginther (1985) and Will *et al.* (1988) had also reported a mean diameter of dominant oestrus follicles as 25 mm and

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they grow at 2.0 to 2.5 mm per day and reach their maximum diameter of 41 to 45 mm at one to 2 days before ovulation.

In present study, about 10% of the donkey and pony mares had irregular cycles. The average follicle size in such mares was 20 mm, which was much lower than the normal ovulatory follicle size of 35 mm. No ovulation was observed in such mares and such follicles persisted for 20 to 30 days before reducing to 9–11 mm. In a few mares, follicle attained full size of about 35 mm but did not ovulate even after 8–10 day of reaching full size. Such mares showed irregular oestrous cycles and did not conceive even after repeated coverings.

Progesterone profile

The mean progesterone levels observed on day 10 before ovulation in normal donkeys and pony mares was 13.1 and 10.2ng/ml, which started decreasing significantly ($P<0.05$) between seventh and fourth day before ovulation, reaching a low value of 0.3ng/ml on the day of ovulation in both donkey and pony mares. In other animal species also the progesterone level at estrus is at its nadir (Palta *et al.* 1996, Mondal and Prakash 2003, Paul 2003). Thereafter, the level increased significantly ($P<0.05$) and reached to a peak value of 16.3 and 11.6ng/ml on day 11 after ovulation in donkey and pony mares respectively. The progesterone profile obtained in non-descript mares were consistent with the results of previous studies (Ginther 1979, Terblanche and Maree 1981, Townson *et al.* 1989, Perkins *et al.* 1993). Sato *et al.* (1977) also reported that progesterone level decreased after day 18 of the cycle in cycling mares. Progesterone levels were significantly higher ($P<0.05$) in donkey mares than pony mares throughout the estrous cycle.

In pregnant mares, progesterone levels varied from 8.95ng/ml to 14.5ng/ml between day 12 and 38 of gestation in both types of equids. This high progesterone level during early gestation period is generally due to formation of secondary corpora lutea after regression of first corpus luteum (Niekerk *et al.* 1975). Increased progesterone levels following conception might be associated with the development of viable blastocyst which may stimulate progesterone secretion by the corpus luteum or cause changes in the utilization or degeneration of progesterone. Sato *et al.* (1977) also reported that progesterone levels increased after day 18 of the cycle in pregnant mares.

In mares, having irregular cycle, progesterone levels were much higher than normal cycling animals (>5.0 to 15.0ng/ml vs 0.3 to 16.0ng/ml). These high progesterone levels like pregnant mares were maintained as such for 10–15 days. Irregular cycle along with high progesterone levels indicated hormonal imbalance as one of the basic causes of infertility in these mares. An imbalance in secretion of these hormones is known to be responsible for reproductive failure in animals (Loy and Swan 1966).

SUMMARY

Folliculogenesis and progesterone profile in cyclic, pregnant and irregular cyclic indigenous donkeys and pony mares were studied. About 10% of the donkey and pony mares had irregular cycles, and in them the average follicle size was 20 mm, which was lower than normal size (35 mm). Progesterone levels were slightly higher in donkey mare than pony mares throughout the oestrous cycle.

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