



Progesterone profile and ultrasonographic scanning of uterus during post partum period in Jakhrana goats

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The post partum (pp) period is characterized by involution of the uterus in the form of integrated anatomic and physiologic re-adjustments and restoration of ovarian functions to prepare animal for future pregnancy. The accomplishment of uterine involution is defined as the day when the diameter of the uterus returns to the original non-pregnant state (Takayama *et al.* 2010). Completion of uterine involution and recommencement of sexual activity after parturition in farm animals normally depend on nutrition, lactation or suckling intensity, breed and season of parturition (Freitas *et al.* 2004). Progesterone levels are indicative of luteal function and have been used as a tool for studying the reproductive physiology of farm animals and early pregnancy determination. Moreover, ultrasonography plays important role in investigation of reproductive organs including pp uterus for diagnosis of any abnormal condition (Feldman and Nelson 1996).

Tropical goats are characterized by longer pp oestrus interval, requiring more period for re-establishment of ovarian cyclicity. The Jakhrana is a dual purpose large sized goat breed and is characterized by long pp oestrus interval (129.83 ± 8.02 days, Goel and Agrawal 1989) and non-seasonal oestrous activity (Goel and Agrawal 1994). Perusal of the available literature demonstrated inadequate information on endocrine profile during postpartum period and uterine involution in tropical goat breeds and diverse information on ultrasonography of the involuting uterus in particular. Therefore, the objectives of this study were to observe specific endocrine characteristics in terms of progesterone profile and ultrasonographic investigation of uterine involution during the pp period in Jakhrana goats.

This study was conducted on six large sized pluriparous (3–4 parity) suckling Jakhrana goats (4–5 years of age) weighing 35–47 kg. Animals under study were reared in

semi-intensive system of management with uniform nutritional conditions on the experimental farm of Central Institute for Research on Goats, Mathura (169 m above mean sea level; latitude 10°N and longitude 78°E). The animals were exhibiting normal oestrous cycles regularly and mated naturally by fertile bucks. After kidding, all does under experiment were allowed to nurse their kids for entire duration of the study (60 days). All the experimental procedures carried out under the study were approved by the Animal Ethics Committee of the Institute.

Blood samples were collected at day 0, 15, 30, 45 and 60 days pp from all the animals. Sampling was initiated within six hours of parturition and thereafter at 15 days interval at 0800 hours. A volume of 5 ml of blood was taken via jugular venipuncture and allowed to clot overnight at 4°C. Serum was removed by centrifugation ($600 \times g$, 15 min. at RT) and samples were stored at –20 °C till assayed for progesterone concentration.

Quantitative determination of progesterone concentration in serum samples was carried out in duplicate using ELISA kit. The analytical sensitivity of assay was 0.045 ng/ml. Intra- and inter-assay coefficient of variation for progesterone were 5.4 to 6.99 and 4.34 to 9.96%, respectively. The measuring range of the assay was 0–40 ng/ml.

An ultrasound scanner equipped with a real time convex array transrectal transducer (PVF-738F) of 7 MHz frequency was used for ultrasonographic examination of pp uterus in the present study. The urinary bladder was taken as land mark for identification of genitalia and was located as non-echoic black area. Post-parturient Jakhrana does (6) were subjected to trans rectal ultrasonographic scanning in standing posture using a transducer of variable frequency (5/7 MHz) at day 0, 15, 30, 45 and 60 days pp to assess the uterine horns and associated organs for their relative size to ascertain pp uterine involution as per the procedure previously described (Goel *et al.* 2009). The uterine involution was considered to be completed and defined on the day when the diameter of the uterus returned to the original pre-gravid stage, as observed between two consecutive ultrasonograms.

One-way repeated measures analysis of variance

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(ANOVA) test with time as the repeated measure was used to determine the level of significance in mean progesterone concentrations between sampling days using SPSS (version 16.0). All data are presented as means \pm standard error of the mean (mean \pm SEM) and statements of significance are based on $P < 0.05$.

The mean progesterone concentration (ng/ml) during different days pp are presented in Fig. 1. The uterine involution by ultrasonographic examination during different interval pp is illustrated in Fig. 2. Progesterone level remained at basal level (≤ 1.00 ng/ml) indicating that regular

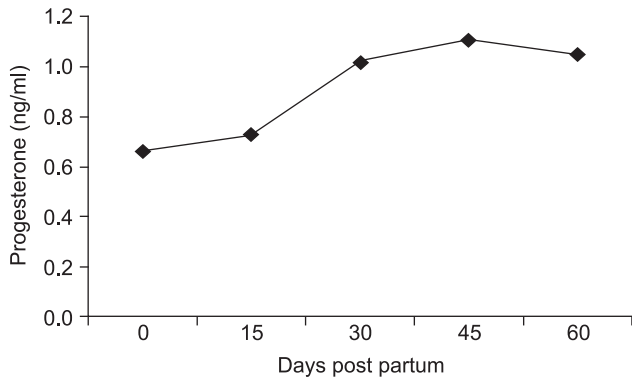


Fig. 1. Serum progesterone levels during different days from day 0 to day 60 pp in Jakhrana goats (6).

oestrous activity did not reoccur up to 60 days pp. Overall mean progesterone concentration during the period of study was 0.92 ± 0.11 ng/ml. The lowest (0.67 ± 0.14 ng/ml) and highest (1.11 ± 0.28 ng/ml) progesterone levels were observed on day 0 and day 45 pp, respectively. Mean progesterone concentrations between sampling days were not significantly different ($P > 0.05$). Ultrasonographic examination revealed that pregnant uterus regained pre-gravid stage at day 45 pp.

Relatively meager information on endocrinology of postpartum ovarian cyclicity in goats is documented as compared to bovine species. Progesterone levels are indicative of luteal development and have been used as a tool for studying the reproductive physiology of various domestic animals. The basal level of progesterone (≤ 1.00 ng/ml) in the present study indicates no ovulation during suckling period of first 60 days after kidding and is consistent with earlier report in Shiba goats (Takayama *et al.* 2010). This is also in agreement with earlier report which demonstrated that during pp anestrus period, the progesterone concentrations remained at basal levels (between 0.1 and 0.9 ng/ml) and specified an increase in concentration with the resumption of pp cyclicity in Dwarf goats (Khanum *et al.* 2007).

In general, less number of follicles develops during early pp period. Reduced growth of follicles and subsequent

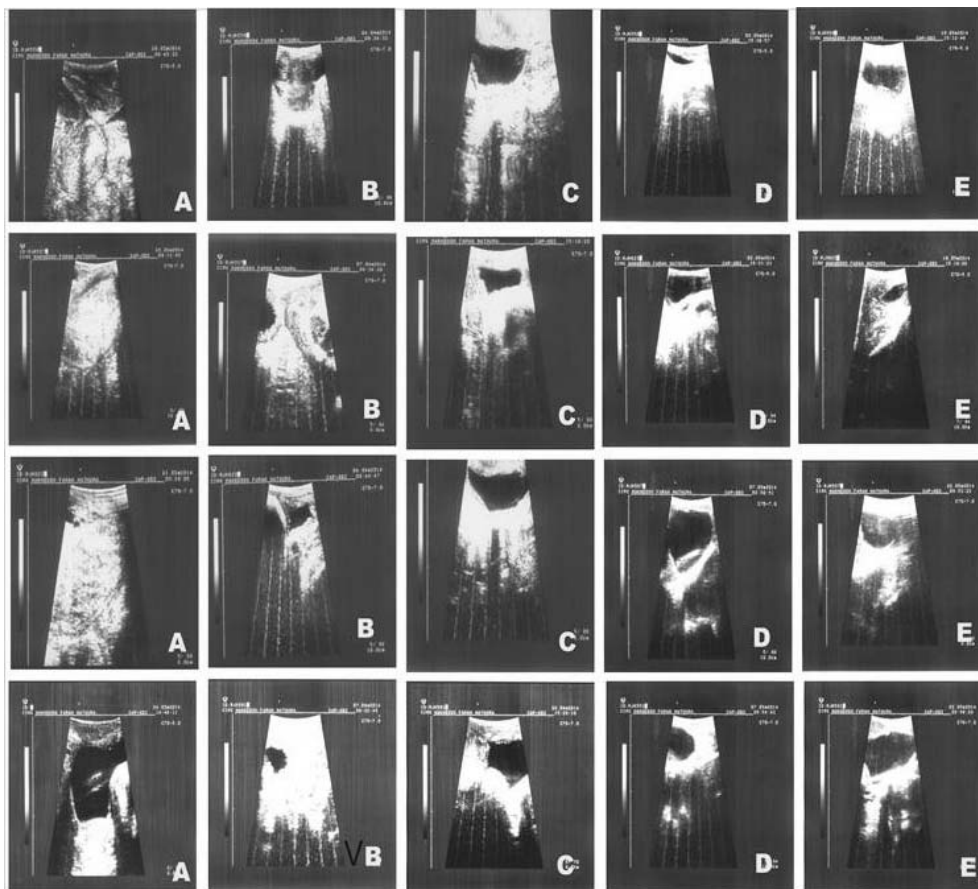


Fig. 2. Ultrasonograms of pp uterus of Jakhrana goats (4). A, day 0 pp; B, day 15 pp; C, day 30 pp; D, day 45 pp; E, day 60 pp.

follicular atresia allows progesterone level to remain at its basal level. As progesterone plays an important role in the growth and development of the embryo and in the maintenance of pregnancy, the low level of circulating progesterone concentration observed in this study is suggestive of poor fertility during first 60 days pp in Jakhkana goat. Therefore, rebreeding may be delayed in this breed until after day 60 pp.

The ultrasonographic results show that uterine involution was completed in Jakhkana goats by day 45 pp. Earlier workers demonstrated varied intervals of day 35 (Badawi *et al.* 2014) or day 28 (Greyling and Van Niekerk 1991) for completion of uterine involution in goats. As assessed by ultrasonographic measurements, uterine involution is completed by day 19 pp in Baladi goats (Ababneh and Degefa 2005) and 3 to 4 weeks pp in Sahelian goats (Zongo *et al.* 2015). The variability in relation to time required for complete uterine involution may result on account of breed difference, parity, season, method of measurement and suckling effect. Relatively longer duration of uterine involution in the present study seems due to the profound effect of suckling and pluriparity of does involved in the study as both are reported to delay the uterine involution process (Zdunczyk *et al.* 2004). The present study confirms the reliability of transrectal ultrasonography as an important management tool for estimation of uterine involution in small ruminants (Badawi *et al.* 2014; Zdunczyk *et al.* 2004). Early diagnosis of uterine involution will help in planning of early rebreeding of does and shortening of kidding interval, thus increasing reproductive efficiency of goats.

SUMMARY

It is evident from our findings that oestrous cyclicity was not resumed during 60 days pp in Jakhkana female goats, as progesterone level remained at basal level (≤ 1.00 ng/ml) during this period. The ELISA results were further supported by ultrasonographic examination which revealed that post partum uterus regained pre-gravid stage by day 45 pp. Transrectal ultrasonography was confirmed as a reliable tool to determine uterine involution in goats. Thus, the results suggest the possibility of sustaining next pregnancy in Jakhkana goats after 60 days pp. Moreover, based upon these findings, it is clear that interventions are possible by advocating hormonal therapy in order to induce and synchronize oestrus/ovulation at or after 60 days pp from the perspective of augmenting reproductive efficiency.

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