STUDIES ON FOLLICULAR DEVELOPMENT AND OVARIAN STEROID PROFILE IN SEASONAL ANESTRUS GOATS

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ABSTRACT

The present study was conducted with the objective to study the follicular growth and steroid profile in acyclic goats. The seasonal anestrus goats (n=7) were selected on the basis of absence of estrus after buck parading. All the goats were subjected to twice in a week (Day 0(day of first scanning), 4, 8, 12, 16 and 20) ultrasonographic scanning of ovaries using real time B-mode scanner equipped with 6.0 MHz linear array transducer to examine follicular development. Follicles were counted, measured and classified as small (<3.0mm), medium (3-4mm) and large (>4.0mm). Blood samples were also collected through jugular venipuncture on the day of scanning for estimation of estradiol and progesterone. Serum estradiol and progesterone were estimated by Radioimmunoassay (RIA). In the present study, there was no significant difference in different category of follicles and total follicular population in anestrus goat indicating emergence of relatively constant number of follicles on different days of observation. There was no appreciable difference in the follicular diameter between different days of observation. Serum estrogen values did not differ significantly on different examination days in acyclic goats. Serum progesterone was significantly low throughout study period.

Key words: Follicular dynamics, Goat, Anestrus, Ultrasonography

INTRODUCTION

Small ruminant sector plays an important role in the national economy of India. This enterprise is associated with social and cultural fabric of millions of resource poor farmers. Small ruminant especially goats receive more importance mainly on account of their short generation intervals, higher rates of prolificacy and the ease with which they can be marketed. They are very useful in semi arid and arid zones, where they can sustain themselves on sparse vegetation and extreme climatic conditions. Early sexual maturity, low age at first kidding (10-14 months) and multiple births in well-managed goats are factors contributing to a rapid rise in goat population in India. They produce a variety of products, mainly meat and skin and to some extent milk, fleece and manure. They are prolific breeders and kids twice in 14-18 months (Sharma and Kumar, 2004). However, anestrus is the major constraints in the goat to exploit its reproductive potential. Anestrus is the condition in which animal fail to exhibit estrus as a result of aberration in the endocrine profile leading to ovarian inactivity. Increased day length with high environmental temperature causes hyper-prolactinaemia, suppressing the secretion of gonadotrophins, which leads to an alteration in ovarian steroidogenesis. However, follicular growth and ovarian steroid profile in anestrus goat remained unclear. Therefore, the present study was conducted with objective to study the follicular growth and ovarian steroid profile in anestrus goats.

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MATERIAL AND METHODS

The study was conducted on seven local adult female anestrus goats of 2-3 years of age with fairly good body condition (Score: 3-4). The animals were maintained at experimental shed of Animal Reproduction Division, IVRI, UP, India. All the goats were maintained under uniform feeding and managmental conditions. Forage rocks, concentrate bowl and water troughs were made available in the barn round the clock. The study was undertaken during the period between the month of March and June 2005 with average environmental temperature of 28.4°C and average relative humidity of 65%. The goats were identified as acyclic based on absence of estrus through buck parading twice a day for two cyclic lengths. All the animals were subjected to ultrasound scanning of ovaries for follicular development on days 0 (day of first scanning), 4, 8, 12, 16 and 20 using real time B-mode scanner equipped with 6.0 MHz linear array transducer (Pie Medical, Netherland). Animals were kept off-feed for 12 h prior to ultrasonographic scanning. Goats were restrained in the standing position and fecal pellets were removed digitally from rectum. Carboxy methyl cellulose gel was inserted with a syringe into the rectum to act as coupling medium between rectal wall and transducer. The transducer was inserted and manipulated within the rectum. The urinary bladder, vagina and cervix were viewed in the longitudinal plane while the transducer was being inserted. After the cervix and caudal uterus were viewed, the transducer was rotated 45° to 90° clockwise and counter-clockwise to locate the ovaries. Follicles of both the ovaries were counted, measured and classified as small (<2 mm), medium (3–4 mm) and large (>4 mm) categories (Khan *et al.*, 2005). Jugular venepuncture was also carried out with hygienic measures for collection of blood on days 0, 4, 8, 12, 16 and 20 respectively. Blood samples were kept in slanting position for 6–8 h and were centrifuged at 2000×g for 15 min to harvest serum followed by their storage at 20°C until further use. The concentration of estradiol and progesterone were estimated through radioimmunoassay using the diagnostic I^{125} kits (Immunotech, France). For estradiol analytical sensitivity of the kit was <0.6 pg/ml; the intra- and inter-assay coefficients of variation were 12.1% and 11.2%, respectively. For progesterone analytical sensitivity of the kit was 0.05 ng/ml; the intra- and inter-assay coefficients of variation were 5.8% and 9.0%, respectively. The data was analyzed statistically using paired't' test (Snedecor and Cochran, 1989).

RESULTS AND DISCUSSION

The mean number of small, medium, large and total follicles in anestrus goats varied between 1.2 ±0.14 to 1.5 ±0.21, 6.0 ±0.21 to 6.4 ±0.36, 1.0 ±0.25 to 1.9 ±0.23 and 8.6 ±0.10 to 8.9 ±0.21, respectively. There was no significant difference in different category of follicles and total follicular population in anestrus goat except population of large follicle on day 4 ($P<0.05$), indicating emergence of relatively constant number of follicles on different days of observation. The results were in accordance with Bartlewski *et al.* (1998) who reported in anestrus ewes, follicular growth was maintained up to ovulatory stage, but the estradiol production appeared to be lower compared to breeding season. Further rhythmically generated increases in serum FSH concentration may initiate the emergence of follicular waves in anestrus ewes. However, the LH output is suppressed during the entire period of anestrus, it is likely that FSH alone has the potential to stimulate ovarian antral follicle development up to preovulatory size throughout anestrus. Moreover, the LH is important for the terminal phase of antral follicular growth, maturation and survival of dominant follicle leading to ovulation (Rubianis and Menchaca, 2003). Apparently, the absence of an LH drive prevents ovulatory cycles, yet ovarian antral follicular turnover is not impaired during seasonal anestrus in ewes which closely resembles the breeding season (Bartlewski *et al.*, 1998). The mean diameter of medium and large follicles ranged between 3.4 ±0.02 to 3.5 ±0.03 and 4.1 ±0.03 to 4.2 ±0.05, respectively. There was no appreciable difference in the follicular diameter between different days of observation. The LH is important for the terminal phase of antral follicular growth, maturation and survival of dominant follicle leading to ovulation (Rubianis and Menchaca,

2003). So the absence of LH might be the reason for the minor variation in the follicular diameter. Moreover, the phenomenon of follicular dominance is poorly defined in caprine species (Ginther and Kot, 1994). There was no corpus luteum in the experiment indicating that absence of ovulation and CL development.

The serum estradiol level during different days of observation varied between 2.52 ±0.13 to 3.14 ±0.65 pg/ml (table 1). Serum estradiol level remains low throughout the study period and it did not differ significantly on different examination days in anestrus goats, which are in accordance with findings of Bartlewski *et al.* (1998) in anestrus ewes. This might be due to the absence of matured/ovulatory follicle which can produce large amount of estradiol hence responsible for estrus behavioural signs. The serum progesterone concentration varied between 0.42 ±0.07 to 1.33 ±0.83 ng/ml (table 1). The basal level of serum progesterone concentrations in acyclic animals confirms the absence of CL. Serum progesterone level remains low throughout study period indicating absence of CL. However, sporadic fluctuations in serum progesterone concentrations were detected in some anestrus animals; however, the cause of sporadic fluctuation of progesterone is still unknown. The present study, it is concluded that follicular development may be continuous process even in anestrus condition; however, follicle will not grow up to ovulatory stage in anestrus condition.

TABLE : MEAN SERUM ESTROGEN (pg/ml) AND PROGESTERONE (ng/ml) CONCENTRATION IN ACYCLIC GOAT

	Days					
	0	4	8	12	16	20
Estrogen	2.69 ±0.22	2.58 ±0.16	2.68 ±0.49	3.14 ±0.65	2.52 ±0.13	2.83 ±0.43
Progesterone	0.45 ±0.12	0.41 ±0.07	0.48 ±0.09	0.33 ±0.18	0.42 ±0.07	0.51 ±0.09

*(P<0.05)

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