

Gross characterization of ovarian follicular population in relation to developmental stage of corpus luteum in goat

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ABSTRACT

Studies were carried out to observe the effect of age and stage of cycle on ovarian follicular dynamics in goat ovary. 264 genitalia from non-descript goats were collected from the local slaughterhouse throughout the year and classified into immature, mature, old and pregnant on the basis of color, condition and tonicity of muscles of uteri, oviducts and ovaries. Cyclicity of mature and old animals was further adjudged on the basis of presence and stage of corpus luteum. Maximum numbers of genitalia were observed from the mature class and minimum were that from pregnant. The total number of follicles observed was more in immature ovary as compared to mature and aged animals. Ovaries in late luteal phase of mature animals had more number of follicles per ovary as compared to early luteal and follicular phase. In aged animals, the number of follicles/ovary did not differ significantly during different stages of estrous cycle. Rate of atresia increased in mature and old animals as compared to immature animals. Generally left ovary had more number of follicles as compared to the right.

Key words: Atretic, Follicle, Goat, Non-atretic, Corpus luteum.

Ovarian follicles develop and undergo degeneration throughout the estrous cycle of ewes (Turnbull *et al.* 1977), rats (Hirshfield and Midgley, 1978) and mice (Pederson 1970). Changes in ovarian follicular populations during the estrous have been reported for bovine (Skyer *et al.*, 1987, Chandrahasan and Rajasekaran 2004), ewes (Dailey *et al.* 1982), and swine (Clark *et al.*, 1975). Increased follicular activity on the surface of the ovary has been observed consistently when function of corpora lutea (CL) is maximal. In bovines early luteal phase is characterized by the presence of one large follicle, one to three medium follicles and many small follicles (Skyer *et al.*, 1987). The number of follicles of ≤ 2 mm in diameter in size increased at two times of the cycle indicating two waves of follicular growth in buffalo ovaries (Chandrahasan and Rajasekaran 2004).

Reports on goat follicular population in goat ovaries during different days of the estrous cycle are lacking with respect to age of the animal. So

this study was designed to investigate numbers of small and large follicles during different stages of estrous cycle in immature, mature and old animals and to observe the relationship between the stage of cyclicity and the number of normal or atretic follicles present.

264 genitalia from non descript goats at random stage of reproductive cycle were collected from local slaughter house throughout the year and were transported to the laboratory in physiological saline containing antibiotics within 30 minutes after slaughter at 20 – 25°C. The genitalia were classified into immature, mature, old and pregnant on the basis of overall condition, colour, and tonicity of muscles of uteri, oviduct and ovaries (Kapil 2004). Based on the characteristics of the corpus luteum (as suggested by Madison 1988 for sheep) the estrous cycle was divided into four stages i.e., Stage –I – early luteal phase with developing richly vascularized corpus luteum with red apex, (day 1-5), Stage II – late luteal phase with fully developed, pink coloured corpus luteum

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(day 5-10), Stage III – early follicular phase having regressing, pale yellow corpus luteum with degenerating tissue (day 11-15) and Stage IV – follicular phase with completely regressed CL/absent (day 16-21). The number of visible follicles were counted in each ovary and grouped into small (<5mm in diameter) and large (>5mm in diameter) groups and. The follicles were further classified as normal or atretic based on their appearance, transparency and vascularity as suggested by the method of Kruij and Dielman (1982).

Out of 264 genitalia, maximum numbers (53.41%) were observed from mature animals, 27.27% from aged animals and 16.30% from immature animals. Rarely 3.3% genitalia from pregnant animals were also obtained. Similar observations have also been observed in goats where majority of the ovaries (44%) brought from slaughter house were from the mature animals (Goswami *et al.* 1992).

The total number of follicles observed was more in immature ovary as compared to mature and aged animals, with left ovaries having more numbers than the right ovary (Table 1). Side of the ovary did not influence the total number of follicles in aged animals. Fihre *et al.* (2005) have also observed that cows below 3 years of age grow more number of follicles than mature and aged animals. It appears that species specific differences exist as in Assam goats follicles were

more on the right ovary than the left (Kalita *et al.* 2000). However, the mean number of visible follicles between right and left ovaries did not differ significantly in buffalo (Chandrasekaran and Rajasekaran 2004).

Majority of the follicles in goat ovaries were small follicles (\approx 98%) while the large follicles were in very negligible proportion (\approx 2%). The present investigations confirmed the findings of Matton *et al.* (1981) and Skyer *et al.* (1987) who reported that a large pool of small antral follicles developed during the preovulatory and early luteal periods and might be associated with the rise in both FSH and LH prior to ovulation. The late luteal phase of the animal had more number of visible follicles per ovary than the early luteal and follicular phase ovary. In aged animals, the number of follicles/ovary did not differ significantly during different stages of estrous cycle. Percentage of atretic follicles increased in the aged ovary. Small and large normal follicles predominated in luteal phase ovary (Table 1). For several domestic animals a positive relationship between ovarian luteal and follicular activity has been observed (Clark *et al.*, 1975, Dailey *et al.*, 1982, Abdoon and Kandil, 2000). The effect of day on number of small follicles was also attributed to changes in the number of small follicles with an absence of any luteal effect. The ovary bearing the CL had more large follicles than the ovary bearing the

Table 1: Distribution of Atretic and non-atretic follicles form different reproductive stages of goat

Status of the animalz	Stage of the animal	No. of Ovaries	Follicle/ Ovary		Small Follicles				Large Follicles			
			Left	Right	Atretic		Non Atretic		Atretic		Non Atretic	
					Left	Right	Left	Right	Left	Right	Left	Right
Im-mature		70	20.66	15.92	4.82	3.66	15.48	11.86	0.24	0.14	0.14	0.26
Mature	I-Early luteal	80	14.92	15.12	9.60	8.60	5.08	5.56	0.16	0.68	0.10	0.28
	II-Late luteal	86	20.56	17.72	13.12	11.22	6.70	5.80	0.52	0.54	0.24	0.18
	III-Early follicular	46	14.82	13.04	8.14	6.18	6.08	6.18	0.48	0.44	0.12	0.26
	IV-Follicular	74	16.32	16.74	7.94	8.70	7.78	7.32	0.38	0.52	0.22	0.30
Old	I- Early luteal	10	16.20	14.60	9.2	10.40	5.80	3.40	0.60	0.40	0.60	0.40
	II- Late luteal	28	17.42	20.28	11.30	15.14	5.58	4.50	0.28	0.50	0.28	0.14
	III- Early follicular	20	10.50	11.40	7.20	7.30	1.80	1.58	0.30	0.40	0.20	0.10
	IV- Follicular	66	17.40	15.86	12.32	10.46	4.40	4.58	0.34	0.60	0.16	0.22

corpus albicans (Dufour *et al.*, 1971). Similar observations were made by Matton *et al* (1981) in cows where the ovary bearing the corpus luteum had more large follicles than the ovary bearing the corpus albicans.

In immature animals the incidence of atresia was minimum as compared to mature and old animals (Table 1). The percentage of atretic follicles was more in the luteal phase ovary and less in the follicular phase ovary and minimum in ovary without CL during late follicular phase. Maximum number of growing follicles per ovary was observed in prepubertal goat ovary but majority of them were small follicles and large follicles number was less in immature animals as compared to mature animal's ovary. In these animals the small growing follicles do not mature to a large stage and do not rupture due to insufficiency of FSH and LH, hence these follicles later on undergo atresia. Further insufficient or excess of hormones leads to failure of follicular growth and results into atresia of follicles (McNatty *et al.*, 1984).

In conclusion the stage of estrous cycle had negligible effect on the follicular populations while amongst the immature, mature and old animals there was difference in the number of follicles. The rate of atresia expectedly was higher in mature and old animals as compared to immature animals.

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