

FRUIT

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**STUDIES ON THE DEVELOPMENT OF OVARIAN FOLLICLES, CORPUS
LUTEUM AND EARLY EMBRYOS IN THE GOAT**

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for the degree of

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by

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ABSTRACT

A study was undertaken to investigate some aspects of female reproduction in cycling goats and during early pregnancy. The pattern of development of ovarian follicles and histological and histometric aspects of corpus luteum development were investigated in cycling goats while morphological and morphometric features of preimplantation development of embryos collected from naturally breeding animals were studied in pregnant animals. Reproductive organs collected at the abattoir were used as study material.

The histological features of the goat ovary in general, were similar to those described for other ruminants. Atretic and normal follicles were readily recognizable, oblitative atresia with primary follicular wall degeneration being the commonest type of atresia observed. Cystic atresia was seldom seen. Total number of primordial follicles in a pair of ovaries varied between 3612 and 89796 with an average of 35092 ± 24418 . On average, the left and right ovaries contained the same number of primordial follicles, despite the large individual variations. The average number of Graafian follicles >1 mm in diameter in an animal was 31.1 ± 7.3 , out of which 10.6 ± 5.1 were normal and 20.4 ± 5.7 were atretic. Atretic as well as non-atretic Graafian follicles were distributed equally between the two ovaries. A pair of ovaries in the follicular, early luteal, middle luteal and late luteal phase of the reproductive cycle contained, on average, 28, 31, 30 and 35.5 Graafian follicles respectively. Though there was a tendency to have more Graafian follicles in the late luteal phase the differences were not statistically significant. During the four stages

of the oestrus cycle 64, 73, 61.5 and 64.5 percent Graafian follicles, respectively were atretic and the differences were not statistically significant. No correlation was seen between the number of primordial follicles and the number of Graafian follicles in individual animals. Nor was there any correlation between the numbers of Graafian follicles in different phases of the reproductive cycle. The distribution of the largest non-atretic follicle and the atretic follicle was not random in the different phases of the sexual cycle, suggesting the presence of at least two follicular growth waves in the reproductive cycle in this animal.

There were conspicuous changes in the external appearance, the weight and the dimensions of the corpus luteum of the goat during early luteal, middle luteal, late luteal and follicular phases of its development and regression. Histological features of the corpus luteum also differed markedly during these four stages of the sexual cycle. Histometric studies on this organ revealed that the average size of the large luteal cells, the small luteal cells and the non-luteal cells differed significantly from each other. The size of the small luteal cells and the non-luteal cells remained unchanged, while large luteal cells gradually increased in size with the luteal development. There were more non-luteal cells than luteal cells in all phases of the reproductive cycle. The percentage of non-luteal cells increased with proportional decline in the percentage of luteal cells with advancing luteal age. The majority of luteal cells were large luteal cells during the early luteal phase but small luteal cells became the most abundant luteal cells during middle and late luteal phases. There was a significant increase in the proportion of small luteal cells in the middle luteal phase than in the early luteal phase. In any phase of the reproductive cycle, large luteal cell had the highest volume density. Small luteal cells and non-

luteal cells occupied nearly the same volumes during early and middle luteal phases. But a significantly higher volume density of non-luteal cells relative to small luteal cells was evident during the late luteal phase. Volume density of large luteal cells decreased while the volume density for small luteal cells and non-luteal cells increased with the luteal development from early luteal phase to the middle luteal phase and remained unchanged thereafter. Vascular spaces occupied the lowest volume density throughout the cycle. There was a significant increase in volume density of vascular spaces during the middle luteal phase and significant decrease in the late luteal phase, when compared to early luteal phase.

Morphological and morphometric characteristics, and the location in the female reproductive tract were studied for preimplantation embryos of naturally breeding goats. Of a total of 92 eggs and embryos collected, 93.5 percent were fertilized and 8 percent of the fertilized eggs showed degenerative changes. The fertilized eggs were divided into three quality categories of good, fair and poor. The average diameter of the eggs in any developmental stage or quality category remained the same with a value of $178.3 \pm 2.9 \mu\text{m}$. The average thickness of the zona pellucida in the embryos before the stage of expanded blastocyst was $11.5 \pm 0.8 \mu\text{m}$. The zona pellucida became thinner in the expanded blastocyst, the average thickness being $7.8 \pm 0.3 \mu\text{m}$. The average diameter of the embryo proper declined towards the formation of the compacted morula and increased gradually thereafter. Although there was no difference in the diameter of the embryo proper between good and fair quality categories, poor quality embryos were significantly smaller. Morula appeared to be the embryonic stage that enters the uterus. The morphological features were described and morphometric values recommended for each embryonic stage and

quality category which would serve as useful criteria for evaluation of embryos in routine embryological procedures.

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