Age Related Changes in the Ultra structure of the Interstitial and Sertoli Cells in Goat (Capra hircus)

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Abstract
Electron microscopic studies on interstitial and Sertoli cells of testis of goat were conducted on 18 specimens. Six each from the kid, young and adult healthy normal goats. The samples of testicles were processed for ultra structural studies by Transmission Electron microscopy. In kid, immature Sertoli cells had prominent features of presence of electron dense membrane bound bodies and abundant microtubules in cytoplasm, while in young and adult, the nuclei of the Sertoli cells were deeply indented. Four types of Leydig cells were observed viz. Type I, Type II, Type III and Type IV on the basis of ultra structure appearance of shape of nuclei, chromatin material and cytoplasm.

Key Words: ultrastructural changes, age, sertoli cells, interstitial cells, goat.

Production of spermatozoa through a process of spermatogenesis is not a simple process but involves a complicated series of changes, before they are released for fertilization from the epididymis. The chain of events in the process involves maturation and shedding of gametes. The testes produce spermatozoa and male sex hormones, the testosterone. The interstitial tissues are believed to produce hormones responsible for functional maturation and maintenance of male genital system. It is observed that the reproductive efficiency of male animal’s changes with the advancement of age, which may occurs due to some structural and histoenzymic changes occurring at cellular level (Johnson, 1995).

Materials and Methods
The present study was conducted on eighteen specimen of testis (six from each group) of local goats ranging from 3 to 12 months onwards collected from abattoir. The samples were...
divided into three groups as -I) Kid (3 months to 6 months), II) Young (6 months to 12 months) and III) Adult (12 months onwards).

The tissue pieces of 3 to 4 mm thickness were cut and transferred to vial for fixation in 2.5% gluteraldehyde solution in 0.05M phosphate buffer at pH 7.2 for TEM study as per the method described by Bazzola and Russell (1998). Semi thin sections were cut on ultramicrotome for light microscopy and stained with 1% Toluidene blue. Ultrathin sections were stained with uranyl acetate and lead citrate and examined with electron microscope for TEM. The specimen preparation, staining and observations at various magnifications under the transmission electron microscope (Model: Hitachi, H-7500) were done at the RUSKA Lab, college of Veterinary Science, Rajendranagar, Hyderabad.

Results and Discussion

In between the spermatogenic cells, some elongated shaped Sertoli cells were present rested on the basement membrane. Their nuclei were spherical, oval or pear shaped and located at the basal part of the cells. The luminal surface of these Sertoli cells was deeply intended by the old spermatids (Fig.1). These findings were similar to those reported by Goyal et al. (2000) goat. In kid, the cytoplasm of Sertoli cells extended to a considerable distance towards the center of the seminiferous tubules and this portion of the cytoplasm contained round or elongated mitochondria, polyribosome and Golgi apparatus associated with numerous coated vesicles. Rough Endoplasmic reticulum was scanty. Prominent features of these cells included the presence electron dense, membrane bound bodies and an abundance of microtubules in the cytoplasm. These cells were identified as immature Sertoli cells (Fig 2).

In young and adult testes, the nuclei of the Sertoli cells were deeply indented and within their recesses, granular endoplasmic reticulum and ribosome were noted frequently. The nucleoli were prominent with numerous vesicular elements of various sizes. These vesicles were located along the strands of nucleolonema. The outer surface of vesicular elements and tubules were surrounded by ribosome like particles. The cytoplasm of these cells exhibited an abundance of elongated mitochondria with electron dense cisternae, microtubules, polyribosomes and a few lysosomes and multivesiculat bodies. Golgi complexes associated with coated vesicles and sacules were observed in the cytoplasm. Perinuclear cytoplasm contained microfilaments, which appeared to keep other cellular elements a uniform distance away from the nucleus. These observations corroborated with those reported by Dellmann and Wrobel (1981) in ruminant, Copenhaver (1979) in human, Leal

![Fig 1. Transmission electron microphotograph showing elongated spermatids attached with apical portion of sertoli cell in young testis. [5790x]](image1)

![Fig 2. Transmission electron microphotograph showing seminiferous tubule of goat testis a) myoid cell b) fibroblast c) spermatogonial cell d) sterol cell [1930x]](image2)

Azmi et al. (1994) reported the appearances of mature Sertoli cell coincided with a marked increased in the diameter of the seminiferous tubules in the goat. The increase in the seminiferous tubules diameter also assisted the fluid transport from the interstitium through the basement membrane. Sertoli cell activity was evidenced by nucleolar transformation may be an integral part of the trigger needed for fluid transport and differentiation of the germ cells during spermatogenesis.

The transformation of indifferent Sertoli cells into mature Sertoli cells was associated with the appearance of vesicles in the nucleoli of these cells in young animals. Matured Sertoli cells were identified by the presence of nucleolar vesicles and spermatids in the cytoplasm.

The androgen binding protein secreted by Sertoli cells served for transportation androgens to the epididymis and thus helped in maintaining a high concentration of androgen surrounding the epithelial cells, especially in the caput epididymis.

The seminiferous tubules were separated by stroma, which contained well vascularised groups of interstitial cells or Leydig cells besides stromal cell. The lymphatic vessels were located near the clusters of interstitial cells. It had been established that interstitial cell volume was correlated with the amount of smooth endoplasmic reticulum and with its capacity to secrete testosterone noted by Leal et al. (loc. cit) and Yung Chung (2008).

It was observed that there were variations in the shape of the interstitial cells, size and shape of nuclei and the cytoplasmic granules. Bordoloi and Dhingra (1983) reported three types of interstitial cells in the testis of goat on the basis of cellular morphology.

On the basis of nuclear ultrastructure interstitial cells were categorized into four types of cells as Type 1, Type 2, Type 3 and Type 4 (Fig. 3).

Type 1 interstitial cells were seen elongated in shape, the shape of nuclei was elongated with notched. The chromatin materials spread throughout the periphery of nucleus. The cell organelles contained mitochondria, Golgi body, smooth endoplasmic reticulum (Fig. 4).

Type 2 interstitial cells were seen irregularly triangular shape nuclei with scanty cytoplasmic granules. There were many small membrane bound granules.

Type 3 interstitial cells were seen with round nuclei, with distributed chromatin materials. The cytoplasm was scanty with many

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**Fig 3**: Transmission electron microphotograph showing different types of Leydig cell in kid testis. a) Type 1 b) Type 2 c) Type 3 d) Type 4 [3860x].

**Fig 4**: Transmission electron microphotograph showing Leydig cells having notch at nucleus cell organelles [5790x].
Type 4 interstitial cells had elongated nuclei with relatively few organelles. The difference in cellular morphology might be attributed to the varied function of interstitial cells from nourishment to production of steroid hormones.

It was noted that interstitial cells forms a well-vascularized group of polyhydral cells, which occupied the space between seminiferous tubules. Similar observations were reported by Dellmann and Wrobel (loc. cit) and Ashdown and Hancock (1980) in ruminants; Leal et al. (loc. cit) and Andriana et al. (loc. cit) in immature lesser mouse deer.

Yung Chung (loc. cit) in Boleophthalmus reported that during the period of maturation divisions well developed leydig cells have three major morphological characteristic a vesicular nucleus, mitochondria and with tubular cristae and number of SER similar observation was recorded in the present study.

This is justified with the fact that interstitial cells secrete gonadal hormone testosterone, which had an important role in reproductive status of animal without sexual maturity. Thus the present study puts on record existence of 4 types of interstitial cell in the testis of goat, which is altogether a new finding.

References

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