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Short Communication

GROSS ANATOMY AND HISTOMORPHOLOGY OF TESTES IN NEW ZEALAND WHITE RABBIT

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ABSTRACT: The present study investigated the gross and histological description of the rabbit testes with the histomorphometrical indices of the testes. Four male intact New Zealand white rabbits were procured with average weight of 1.35 ±0.13kg and were housed in individual cages at the animal house of the Faculty of Veterinary Medicine, University of Ibadan. Gross pictures and measurements of the testes were recorded while the testes tissues were processed for histology and histometric assessment of seminiferous tubules. Results showed that gross measurement of the right testis were about 2.88cm in length and 0.61cm in breadth. The measurement of the left testis were about 2.65cm and 0.65cm. The average histomorphometrical readings for the seminiferous tubular diameter and seminiferous epithelial height were 265.84µm and 204.09µm respectively. The histological slides revealed normal testicular architecture in the rabbits.

Key words: New Zealand white rabbit, Gross anatomy, Histology, Histomorphometry.

Rabbits are small mammals in the family *Leporidae* and in the order *Lagomopha*. Rabbits (*Ortctolagus cuniculus*) are reared commercially for human consumption in rabbiteries for the production of cholesterol free meat and the meat has a high level of protein. Rabbits are becoming popular as pets among families especially in urban areas (Kilic 2004). Their importance in meat production is the capacity to convert plant proteins of low nutritional value into animal proteins of high food value for man (Dontas *et al.* 2011). The leather of rabbits has high quality which can be used to make clothes, hats, cover of bicycle seats, crafts, etc. Rabbits are used in cosmetics industry, medical and pharmaceutical research laboratories (Dontas *et al.* 2011). Also, these animals are reared for exhibition and as pets. It is considered the third most popular pet in the world, behind dogs and cats (Moreki 2007).

The reproductive system of the male rabbit consists of two numbers of testes, two numbers of epididymis, two numbers of ampulla, two numbers of vas deferens, urethra, penis, two numbers of preputial glands and the accessory glands. The rabbit presents a peculiarity in the external genitalia, a well-developed scrotum that is located cranial to the penis and the urogenital opening (Capello and Lennox 2006). The testis consists of seminiferous tubules and interstitial tissue containing Leydig cells, demarcated from outside by a thick vascular connective tissue, tunica albuginea. The site for spermatogenesis is the seminiferous tubules, while Leydig cells are responsible for secreting male sex hormones, testosterone to mediate spermatogenesis (Eurell and Frappier 2006). The anatomical description of the rabbit testes has shown to have connective tissue septum that originates in the tunica albuginea and then enters the testicular parenchyma with the effect of dividing into lobules with each lobule formed by 4 to 6 seminiferous tubules that are delimited by areolar connective tissue and fused with center of the testis. Lobules of the rabbit testis contain seminiferous tubules lined with stratified epithelium of Sertoli cells and spermatogenic cells those later forms spermatozoids (Zamora *et al* 2014).

Quantitative histomorphometric evaluation of the testes has been described for a number of animal species including humans (Mehraein and Negahdar 2011, Franca

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Table 1. Results showing the measurements of each rabbit testis before and after castration.

	Gross Morphometry	Rabbit 1	Rabbit 2	Rabbit 3	Rabbit 4	Average
Before Castration	Right Testis length (cm)	2.9	3.0	3.5	2.8	3.05±0.27
	Right Testis breadth (cm)	0.8	1.0	1.0	0.8	0.90±0.10
	Left Testis length (cm)	2.8	2.9	3.2	2.7	2.90±0.19
	Left Testis breadth (cm)	0.8	1.0	1.0	0.7	0.88±0.13
After Castration	Right Testis length (cm)	2.8	2.7	3.3	2.7	2.88±0.25
	Right Testis breadth (cm)	0.6	0.7	0.6	0.6	0.61±0.04
	Left Testis length (cm)	2.7	2.6	-	-	2.65±0.05
	Left Testis breadth (cm)	0.6	0.7	-	-	0.65±0.05

Table 2. Results showing the tubular diameters and epithelial heights (3 readings for each testis).

	Rabbit number				Average
Tubular Diameters (µm)	1	141	139	151	143.67±6.43
	2	366	294	324	328.00±36.17
	3	276	243	290	269.67±24.13
	4	220	303	335	286.00±59.36
	Grand Average				256.84
Epithelial Heights (µm)	1	189	240	290	239.67±50.05
	2	190	100	187	159.00±51.12
	3	184	187	183	184.67±2.10
	4	225	236	238	233.00±7.00
	Grand Average				204.09

et al. 2016). It has been applied to the studies of both physiological and pathological conditions including testicular toxicity (Murphy and Richburg 2014, Johnson 2015). Histomorphometric examination of tissues has a major role in the evaluation of male reproductive toxicity. It could supply information on the severity and cellular site of damage (Gholami *et al.* 2015). Accordingly, the present study was designed to assess the gross, histology and histomorphometry of testes of New Zealand White rabbits.

STUDY AND DISCUSSION

Testicular specimens were obtained from four rabbits aged 15 weeks with average weight of 1.35±0.13kg. The animals were raised in the animal house of Faculty of Veterinary Medicine, University of Ibadan and all procedures were according to the recommended guidelines by the University of Ibadan Animal Care and Use for Research Committee. The rabbits were castrated at the end of the 15th week. The rabbits were divided into two groups in which rabbits 1 and 2 had bilateral castration while rabbits 3 and 4 were castrated unilaterally. The testes were immediately harvested. The length and breadth of each testis was determined which was recorded in centimeters. A caliper was used to measure length and breadth of the testes. This procedure was done at the Veterinary Physiology Laboratory, University of Ibadan.

The testes were collected and fixed in fluid for 24 hours. Samples from the tissues were taken from the equatorial regions, washed in 50% and 70% alcohol, cleared in xylene before being embedded in paraffin wax. Sections of 5 µm thickness were obtained using a microtome. Staining was done using haematoxylin-eosin stain. The slides were viewed and studied under a light microscope. Histomorphometrical indices related to testicular growth such as seminiferous tubular diameter and seminiferous epithelial height were evaluated. The tissue sections were observed under a light microscope for histomorphometric changes. The data collected were

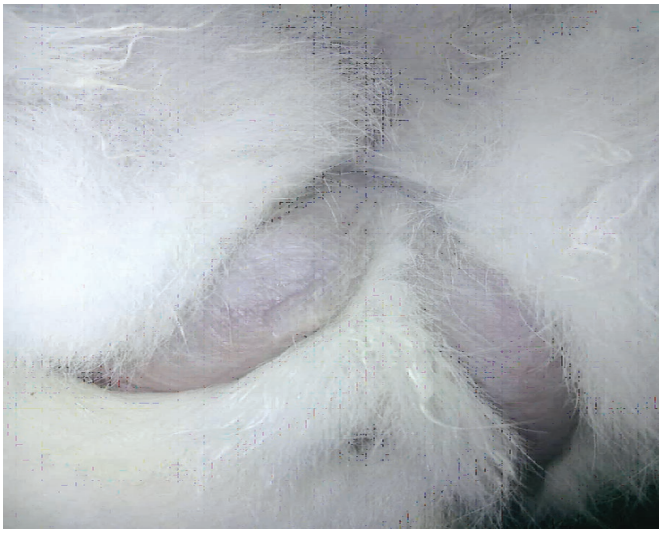

Fig. 1. Picture showing each testis housed in each scrotal sacs.

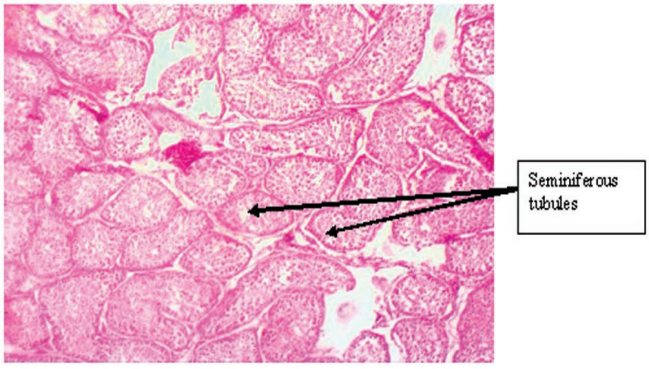

Fig. 2. Normal testicular morphology of rabbits showing testicular lobules. H.E ×100.

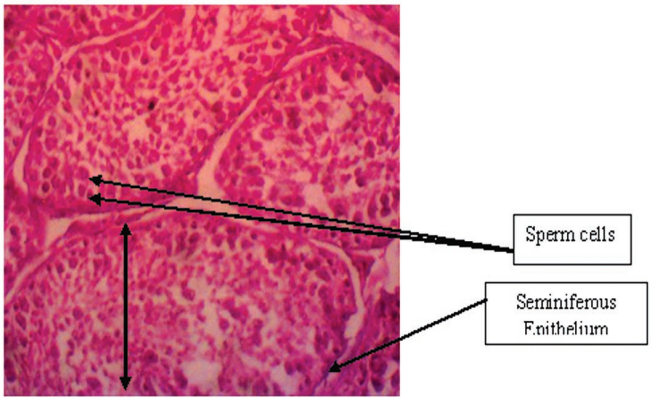

Fig. 3. Normal testicular morphology of rabbits showing stratified epithelium lining the lobules. H.E ×400.

expressed as mean. The diameters of the seminiferous tubules with three readings from each testes were taken and the average diameter was determined. Also, the seminiferous epithelial height from each testis was taken (three readings with the average height).

The focus in reproduction in rabbits has to be on the males as the females are induced ovulators and a male animal is used for several females. The success or otherwise of any breeding program thus depends on the release of GnRH and then LH surge which is important to mediate ovulation (Bakker and Baum 2000). The gross picture demonstrated that the individual testis was housed in individual scrotal sac which retain communication with the abdomen and can be retracted in situations of stress similar to marsupials (Capello and Lennox 2006). Before castration, the average length and breadth of the right testis were 3.05cm and 0.90cm respectively. The average length and breadth of the left testis were 2.90 cm and 0.88 cm respectively. After castration, the average length and breadth of the right testis were 2.88cm and 0.61cm respectively. The average length and breadth of the left testis of those castrated bilaterally (rabbits 1 and 2) were 2.65 cm and 0.65 cm as shown in Table 1. These measurements revealed similar findings by Abadjieva *et al.* (2016).

The histology of rabbit testes was similar to those of West African dwarf goat testes with well-defined Sertoli cells and seminiferous tubules filled with well-differentiated sperm cells as seen in Figure 2. According to the study conducted by Yasser *et al.* (2012), the lumination of the testicular cords started after 12 weeks forming seminiferous tubules lined by spermatogonia, spermatocytes and round spermatids, in addition to Sertoli cells that corroborate the present study. Seminiferous tubules make up the main compartment of the testis and occupy approximately 70% to 90% of the parenchyma in most mammals investigated (Russell *et al. 1*990). The average values found for seminiferous tubular diameter and seminiferous epithelial heights in New Zealand white rabbits were 256.84µm and 204.09µm as shown in Table 2. In this regard, compared with other mammalian species, the value found for the seminiferous tubular diameter falls within the range (180-350µm) cited for most mammals investigated (Setchell *et al. 1*994). The value found for the seminiferous tubular diameter in this study is similar to the findings in cat (223±5µm) (Franca and Godinho 2003) and West African dwarf goats (182.15±12.25µm) (Olurode *et al.* 2018). This work presents information on gross, histology and basic morphometric values of testes in New Zealand White rabbits thereby contributing to the general histomorphological knowledge of the reproductive biology as well as developmental study of testes in this small animal.

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