THE CYCLE EVENT OF SPERMATOGENESIS AND SPERMIOGENESIS IN THE TESTES OF INDIGENOUS DUCK (*ANAS PLATYRHYNCHOS*)

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(Received 23 march 2014 ,Accepted 4 May 2014)

Keywords: spermatogonia,Testis, Sertoli cells

ABSTRACT

Morphologically,the testes of adult duck was suspended by mesorchium with the roof of the the abdominal cavity. The testes appear as elongated bean shaped and situated asymmetrically. The mean average of the testis was 1,48 cm in length, 0.47cm in width, and 1.54gm in weight.

Histologically, each testis was covered by a connective tissue capsule.The stroma of the testis posses no mediastinum. Leydic cells were commonly found in groups within the connective tissue which filled the spaces between the seminiferous tubules. Germ cells and Sertoli cells constituent the main component of the seminiferous epithelium. There were type A-spermatogonia, type I-spermatogonia, and type B-spermatogonia. Type B-spermatogonia passes through proleptoten, leptotene, zygotene, pachytene, diplotene, and diakineses. The primary spermatocytes give rise to secondary spermatocytes. These latter cells enter the second meiotic division to form the spermatids which undergo through thirteenth stages to form the sperms.

INTRODUCTION

There were some research on the male reproductive tract of domestic birds (1,2). On the other hand, some of the studies were mainly concerning the physiological and endocrinological aspects which were carried out by (3,4,5). Other researcher deal with the most dramatic chromatin remodling processes in order to pick up the stages of spermatogenesis and spermiogenesis (6,7). Acriteria for stages of seminiferous epithelium has also been desgined by (7) in the testes of some birds. The goal of the present work is to investigate the spermatogenesis and spermiogenesis in the testes of ducks as less attention has been noticed and to provides basic information necessary for proper understanding of the reproductive physiology and clinical application.

MATERIALS AND METHODS

Twelf sexually mature male indigenous ducks were purchased from local market at Hilla city, Iraq. These birds were given feed and tap water adlibitum. Ducks were kept for more than one week in order to eliminate those whose have the signs of illness. Six of these birds were weighted and sacrified by capitations. Abdominal

laboratory was done,and the viscera were exposed to allowing a part of the testes to appear,and morphological observations were noted while the testes in situ. Some parameters were made (position,length,width)by using vernier caliber (8). To study the histology of the testes of ducks, another six ducks were taken. These birds were slaughtered, and the testes were obtained immediately and fixed in 10% formalin in labeled container for 24 hours. The testes washing out with tap water for more than three hours, dehydrated through a series of alcohol from 50%,60%,70%,80%,90%, and 100% for two hours of each concentration. Clearing with xylene, and embedded with molten paraffine. The next subsequent process was to cut the testis by using rotary microtome. The thickness of cutting was about 5-7 micrometers. The cutting specimens were carried out and fixed on slide contain mixture of egg albumin with glycerin. The slides obtained were dried with 40^{o}C for 24 hours. Cover slides were used by adding a drop of canada balsam(9). Staining was performed by using Harris heamatoxylin and eosin stain, and weigarts iron hematoxylin stain(10).Photographs of examined slides were done with Olympus microscope that supplied with a digital camera with resolution power of two megapixel necessary for examinations.

RESULTS AND DISCUSSION

Morphologically, the testis of adult duck was found suspended from its abdominal surface to the roof of the abdominal cavity by mesorchium that in its way beer the blood vessels and nerves. Each testis appeared elongated bean shaped and was pink in colour. Those testes were situated asymmetrically on each side of the midline of the body and cranioventral to the kidney (Fig1). The cranial part of the testis may reach to the caudal third of the lung. The caudal part of the testis was found nearer to the common iliac vein, and the abdominal aorta, caudal vena cava and adrenal gland were parallel to the median border of the testis. The cranial end of the testis was surrounded by abdominal air sac. Each testis was covered by visceral peritoneum. These results of present research were coincided with (11) and with (12) in birds. The mean average length of the duck testis was 1.48cm, and 0.47cm in width. Its weight was 1,54gm. The nourishment of the testis was found from the testicular artery and the venous blood of the testis was drained into vena cava by plenty of veins. The epididymis was formed by tightly packed efferent ductules. The later connect each other to form epididymal duct. This duct gives rise to tightly coiled ductus deference. Histologically, each testis was covered by a thin capsule (Fig2). The

stroma of the testis appears homogenous posses no mediastinum. Thus, it was not divided into testicular lobules because there was no septa (Fig3). Connective tissue occupy the space between the seminiferous tubules and contain Leydig cells which commonly found in groups, fibroblast, macrophages, mast cells, and numerous blood and lymphatic vessels. The seminiferous tubules were surrounded by outer layer of connective tissue contains fibroblast and myoepithelial cells. Germ cells form more than three lines associated with Sertoli cells. The germ cells and Sertoli cells of the seminiferous tubules were supported by the basement membrane. Sertoli cells (Fig 4) extend from the basement membrane to the tubular lumen and posses oval nuclei but some of them look irregular in shape. The lateral sides of Sertoli appear infolding. These observations were in agreement with (13) in domestic fowls, and with (14) in cockerel, and with the demonstration of (15) in general quail. Spermatogenesis and spermiogenesis in adult duck, the seminiferous tubules begin with spermatogonia. These cells undergo series of mitosis and give rise to type of A-spermatogonia or dusty type, type B-spermatogonia or crusty type, and intermediate spermatogonia (Fig5). Type A- spermatogonia look significant in size and lie on the basement membrane of the seminiferous tubules. Their nuclei were small, round and sometimes look elliptical possess heterochromatine which lie on one side of their nuclei. Granules were also present within their nucleoplasm. B-spermatogonia was bigger than type A- spermatogonia. The chromatin within their nuclei was less homogenous in the form of crust which adhere the nuclear membrane but flakes of chromatin were also distributed throughout the nucleoplasm. The intermediate type spermatogonia were considered as intermediate between A-type and B-type spermatogonia. These cells were located far from the basement membrane of the seminiferous tubules. These results were in contrast to (16) whom they reported that there were A-spermatogonia and B- spermatogonia only in birds. The primary spermatocyte was as the result of division of B- spermatogonia. They were the largest cells and being posses through six different stages which named as; preleptotene, leptotene, zygotene, pachytene, diplotene, and diakinesis stages. The most characteristic of preleptotene primary spermatocyte was the unfolding of their nuclear membrane which give star shaped (Fig 4). Granules of chromatin were in close contact with the nucleolema. Flakes of chromatin were also seen located in the center of their nuclei. The nuclei of leptotene primary spermatocytes were rounded and possess chromatin granules that located at one pole of each cell. These cells were positioned far from the basement

membrane of the seminiferous tubules. The chromatin in the zygotene primary spermatocyte arranged in the form of flakes with little chromatin filaments were also present throughout the nuclear matrix. The size of nuclei in the pachytene primary spermatocytes appear increased more than the previous stage. Besides, band of cytoplasm were found clearly around their nuclei. In diplotene primary spermatocyte, the nuclear chromatin were arranged in two thick and short in the form of two chromatids. The characteristic feature of diakinesis primary spermatocyte was that the two chromatids move apart,and the nuclear membrane was lost. All these forms or stages of primary spermatocyte were also denoted by (13) in fowl, and by (15) in common quail, and by (7) in pigeon. The first meiotic division of the primary spermatocyte gives rise to secondary spermatocyte (Fig6). They were small in size and spent only a short time within the seminiferous tubules. These cells enter the second meiotic division to form the spermatids that undergo a complex process of differentiation leading to form sperm. These differentiation processes include that the spermatids look tiny in size and posses round nuclei that have granular chromatin within their nucleoplasm.This picture represent the first stage of differentiation. The second stage was represented by the appearance of chromatin flakes that adhere to the nuclear membrane and also presence of accumulated flakes in or near the center of their nuclei. In the third stage, the nuclear chromatin transformed into crusts that mostly adhere to the nuclear membrane. Two or more masses of chromatin were found nearer to the nuclear membrane in the fourth stage of differentiation. The nuclear spermatid appear to be elongated,and some masses of chromatin were found at one pole of their nuclei in the fifth stage. Two horns of chromatin within the nucleoplasm of the spermatid in the sixth stage. In the seventh stage, part of the chromatid protrude to form short third horns.The nuclear chromatin condense to form like the head of hummer that connect with a slimy hand in the eighth stage. In the ninth stage, the nuclei of spermatid become round to oval and surrounded by a thick band of cytoplasm. Maturation process of spermatids start in the tenth stage. In this stage, the nuclear spermatid was more elongated. In the eleventh stage, it was noted that short flagellum appear,and the nuclear chromatin become homogenous. The nuclear chromatin become in the form of V-shaped in the twelfth stage and the appearance of spermatozoa were considered as thirteenth stage. These results were in contrary to (14) who reported eight stages and in contrast to (17) who registered ten stages in domestic fowl. Out side the wall of the seminiferous tubules their were

Leydig cells embedded within delicate connective tissue frame work in which run small blood and lymph vessels were also present.These Leydic cells appear polyhedral and uninucleated. These results coincides with (18) in aging rooster and with (19) in the chicken.

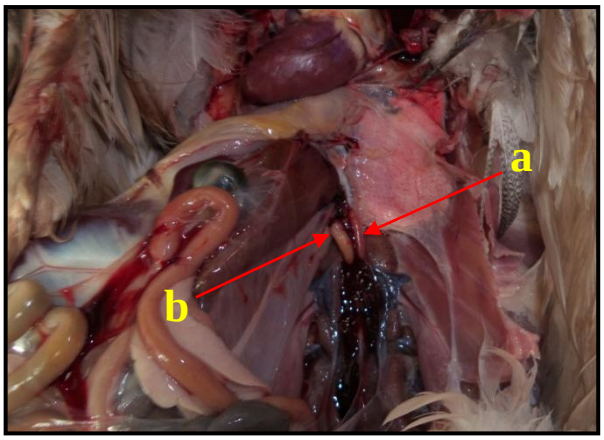

Fig. (1) shows asymmetrical situated of the testes of duck a. Left testis b. Right testis

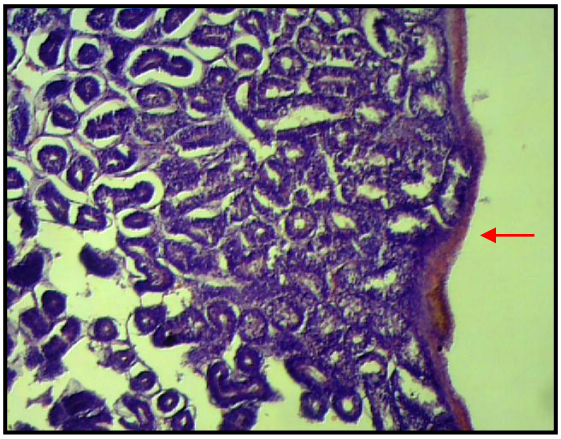

Fig. (2) shows a thin capsule covered the testis (arrow) (H&E X100).

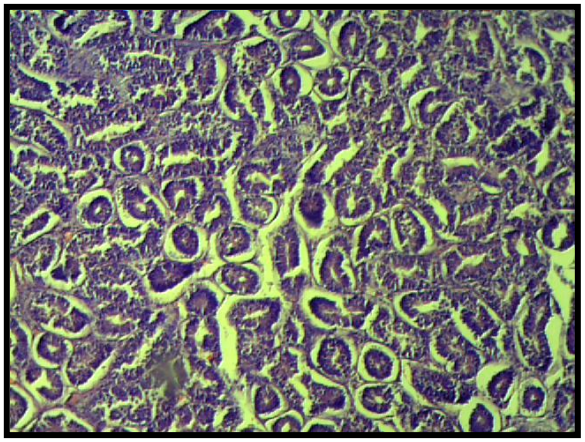

Fig. (3) seminiferous tubules of the testes of the duck, and no septa was present. (H&E X100).

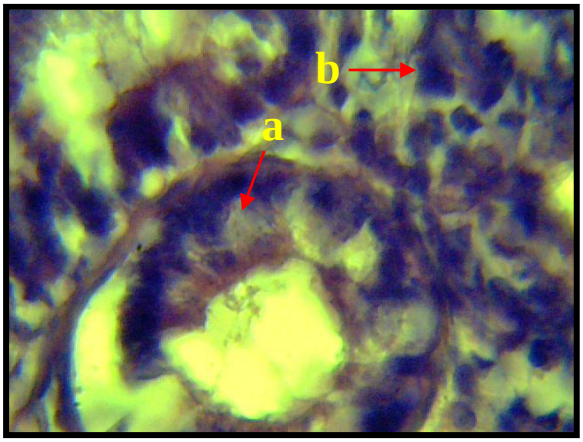

Fig. (4) a. Sertoli cells were founded within the seminiferous tubules. b. preleptotene primary spermatocyte was showed star shaped of its nuclear membrane. (H&E X1000)

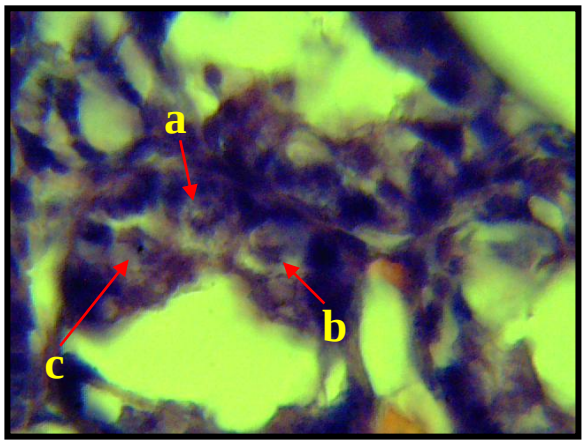

Fig. (5) Different types of spermatogonia; a. A- spermatogonia b. B- spermatogonia c- Intermediate spermatogonia (H&E X1000).

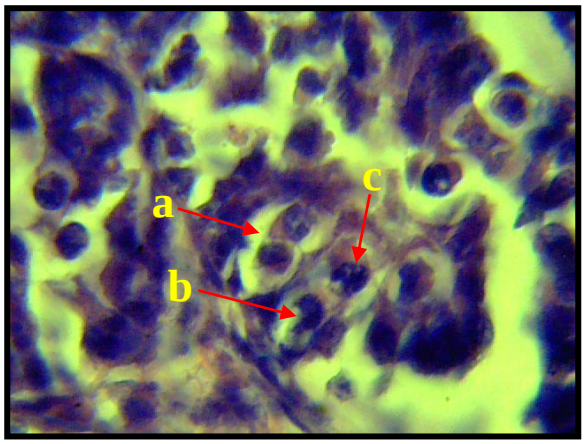

Fig. (6) seminiferous tubules of the testes of the duck were showed; a.Cells of secondary spermatocyte. b.sixth stage in which cell was showed two horns of chromatin within the nucleoplasm of the spermatid . c. seventh stage, part of the chromatid protrute to form short third horns. (H&E X1000).

الحوادث الدورية لنشوء وحؤول النطف في خصي البط المحلي
(Anas platyrhynchos)

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الخلاصة

تعلق خصي ذكر البط بواسطة المسراق الخصوي في سطح التجويف البطني . يكون شكل الخصي على شكل حبة الفاصوليا المتطاولة ، وتقع بصورة غير متناظرة . ان معدل الخصية طولا 1.48سم ، و0.47 سم عرضا ، و1.54غم وزنا.

نسجيا، تحاط الخصية بمحفظة من نسيج ضام ولايوجد منصف خصوي. توجد خلايا ليدك بشكل مجاميع في النسيج الضام الموجود في فسح بين النبيبات المنوية. تشكل الخلايا الجرثومية وخلايا سرتولي المكون الرئيسي للظهارة المنوية. توجد خلايا سليفات النطف نوع أ، و، ب . تمر خلايا النطف الابتدائية بمراحل، proleptoten، leptotene ، zygotene ، pachytene ، diplotene ، diakineses . تنشأ خلايا النطف الثانوية من خلايا النطف الابتدائية . تمر خلايا النطف الثانوية لتكوين طلائع النطف. تتمايز طلائع النطف الى نطف خلال 13 مرحلة معقدة.

REFERENCES

1. Kirby,J.D., Froman,D.P. (2000). Reproduction in male birds.In:Whittow G.C. ed. Avian physiology. Academic press,London,UK. Pp:597-615.
2. Bull,M.L., Martins,M.R., Cesario,M.D., Podovani,C.R., and Mendes, A.A. (2007). Anatomical study on domestic fowl (*Gallus domesticus*): Reproductive system. Int.J.Morphol. 25: 709-716.

3. Aguilar,M.G., Romano,M., and Pedernera,E. (1981). Ultrastructure of Leydig cell in the testis of chicken submitted to early embryonic surgical bursectomy. J.Anat. 133: 543-553.
4. Brillard,J.P. (1986). Age-related variations in seminiferous dimensions and germinal and Sertoli cell numbers in guinea chicken raised under 14L: 10D photoperiod. Poult.Sci. 65: 369-374.
5. Blomgvist,A., Berge,C., Holm,L., Brandt,I., Ridderstrale,Y., and Bronstrom, B. (2006). Defective reproductive organ morphology and function in domestic rooster embryologically exposed to, Pddt, or ethynylestradiol. Biol. Repr. 74: 481-486.
6. Turner,J.M. (2007). Meiotic sex chromosome inactivation. Develop. J.134: 1823-1831.
7. Al-Samawy,E.R. (2009). The squence events of spermatogenesis and spermiogenesis in adult pigeon (*Columba liva*):A thesis submitted to the College of Veterinary Medicine, University of Baghdad, Baghdad, Iraq.
8. Tompsett,D.H. (1970). Anatomical techniques,2nd.ed. Longman group limited, London, U.K. pp: 105-107.
9. Edward,G. (1962). Staining animal tissue. Practical 1st.eds.Leandard hill books, LTD. London,U.K.
10. Luna, L.G. (1968): Manual of histology staining of the armed institute of pathology,3rd.ed. Mcgraw Hill Book company, New York.U.S.A. P:123.
11. Tingari,M.D. (1971). On the structure of the epididymal region and ductus deferens of the domestic Gallus domesticus. J.Anat. 109, 3: 423-435.
12. King,A.S., and Mclelland, J. (1975). Outlines of avian anatomy. Bailliere press, London, U.K. pp: 86-88.
13. Hodges,R.D. (1974): The histology of the fowl. 1st.ed. Academic press, London, U.K.. Pp:300-326.
14. De Reviers,M., Williams,J.B. (1984). Testis development and production of spermatozoa in the cockerel (*Gallus domesticus*). In Reproductive biology of poultry. Cunningham,J.,Lake,P.E., and Hewitt,D.,eds. Pp: 183-202.
15. Al-Shamary,B.F. (2001). Anatomical and histological study of the male genital system and some ultrastructure studies of spermatogenesis in common quail (*Coturnix C. Coturnix L.*) Msc thesis, College of Veterinary Medicine.University of Baghdad,Iraq.
16. Lofts,B., Murton,R.K., Westwood,N.J. (1966). Gonad cycles and the evolution of breeding season in British Columbidae. Zool.J. 150: 249-272.
17. Gunawardana,V.K. (1977). Stages of spermatids in the domestic fowl. A light microscopic study using Araldite section. J.Anat. 123: 351-360.
18. Rosenstrauch,A., Weil,S., Degen,A.A., and Friedlander,M. (1998). Leylig cell functional structure and plasma Androgen level during the decline in fertility in aging roosters. Gen.Comp. endocrinol. 109: 251-258.
19. Jordanov,J., Angelova,P., Boyadheva,M., Michahova,A., and Bakaisks,M. (1978). Ultrastructure of interstitial cell in chick embryonic gonad in relation to their genesis and steriogenic function. Zeit. Furmik. Anat. Forschung 92: 449-464.