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MORPHOLOGICAL AND HISTOLOGICAL STUDY OF THE TESTES IN ADULT DUCK

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Abstract

The aim of the current research was to study the histological, morphological and histochemical structures of testes in duck. The morphological study showed that the testes of adult duck was suspended by mesorchium with the roof of the abdominal cavity. The shape of the testis appear as elongated bean shaped and situated asymmetrically. The mean average of the left testis was 30.74±2.55 in diameter while right testis was 33.135±4.15, and the left testis was 52.67±3.4 in length while the right was 58.875±4.1. Microscopically, each testis was covered by a connective tissue capsule, tubular structures (seminiferous tubules) be composed completely almost the testis. Leydic cells were commonly found in groups within the connective tissue which filled the spaces between the seminiferous tubules, these cell appear polyhedral , uninucleated and relatively large. Spermatogenic cells and Sertoli cells constituent the main component of the seminiferous epithelium, sertoli cells possess oval nuclei but some of them look irregular in shape, series of mitosis undergoing of the spermatogenic cells and award increase to type of A-spermatogonia, Spermatogonia intermediate type and type B- spermatogonia. Histochemical stains (PAS &Van giesons) gave negative results to testis tissue structures.

Keywords **:** Male Reproductive tract, seminiferous tubules, spermatogonia, Sertoli cells, Leydig cells, Duck.

Introduction

Duck is a swimming bird has a wide flat bill and is smaller than a related swan and goose, which is the common name of different species in the Anatidae waterfowl family, it is also includes geese and swans, any of several swimming birds (Anatidae, family of the duck) to be short the legs and neck, feet are usually webbed, flat and broad of the bill, and usually the different sexes from each other in feathers. Different studies on the testes of duck (Aire & Ozegbe, 2007; Elbajory *et al.*, 2013).

Variety sources of food eat by ducks such as aquatic plants, grasses, fish, ,insects small amphibians, small molluscs and worms; may be found in both sea and fresh water, (Dohner, Janet Vorwald, 2001); Visca, Curt; Visca, Kelley, 2003).

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 (Dyce *et al*., 2010).

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. (Aire & Ozegbe, 2007) in duck many studies about the weight, development, histology and morphometry of testes were done in some poultry: roosters (Trefile *et al.,* 2006; Aire & Ozegb, 2007; Bull *et al.,* 2007), ducks muscovy (Gerzilov *et al.,* 2002; Islame *et al.,* 2013), geese (Halse, 1985), turkeys (Noirault, 2006; Air & Ozegbe, 2007; Bakest, 2007), ducks (Aire & Ozegbe, 2007; Elbajory *et al.*, 2013), Japanese quails (Mareta & Maretova, 2004; Al-Tememi, 2010) and in hybrids intergeneric poultry well as (Castilo *et al.,* 2012). Histologically the testis was covered by a thin capsule of connective tissue, almost totally consists of seminiferous tubules (tubular structures).

Materials and Methods

Twenty sexually mature male indigenous ducks were purchased from local market at Basra city, Iraq used for this study after being examined the ducks to detect any clinical diseases ,ten specimens for anatomical study and ten for histological study done the abdominal laboratory, and the viscera has exposed to allowing a part of the testes to appear, and morphological observations were noted while the testes in situ. Some parameters were made (length, diameter) by using by digital veirnier calipers. To study the histology of the testes of ducks, another ten 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 alcohol series ranged 50%, 60%, 70%, 80%, 90%, and 100% each concentration for two hours. Xylene clearing, and embedded in molten paraffin. Cut the testis by using rotary microtome to 4-6 microne consider the next process, later histological section were stained with hematoxylin and eosin (Luna,1968) and special stains.

Results and Discussion

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 (Fig. 1) these result agreement with (Ahmed, 2008; Dyce *et al*., 2010) who reported that the same results in testis of racing pigeon. The nourishment of the testis was found from the testicular artery (Fig. 4, 8) agree with (Ahmed, 2008) in racing pigeon.

The present study showed that the mean average of the left testis was 30.74±2.55 in diameter while right testis was 33.135±4.15, and the left testis was 52.67±3.4in length while the right was 58.875±4.1 according to (Table. 1) (Halldin *et al*., 1998; Onu and Ndodo, 2003) who study on morphometry of birds in general and domestic chicken in particular.

Histologically each testis was covered by a thin capsule, almost the testis consists of tubular structures

(seminiferous tubules). The tubules consists from two cells line types, spermatogenic cells and (sustanticular) Sertoli cells. The seminiferous tubules were surrounded by outer layer of connective tissue. The testes interstitium was consists of wide connective tissue, that include Leydig cells (Figs. 2, 3, 4, 5, 6, 9, 10 and 11) these results agreement with (Dyce *et al*., 2010; Elbajory *et al.*, 2013; & Ozegbe, 2007) in testis of duck.

Spermatogenic waves (the seminiferous tubules begin with spermatogonia. These cells undergo mitosis series and give rise to type of A-spermatogonia or dusty type, type B-spermatogonia or crusty type, and intermediate spermatogonia) with in seminiferous tubules. The present study showed that the spermatogenesis in adult male duck pass through several stages to give the adult sperm which represented by the fallowing stages (Spermatogonia A type, Spermatogonia intermediate type and Spermatogonia B type) Spermatogonial increase in size and complexity with development and maturation of sertoli and leydig cell differentiation.

Spermatogonia A(dusty)

Type A- Spermatogonia are relatively large in size but smaller than type B- Spermatogonia &larger than intermediate type, the type A- Spermatogonia elliptical or round nuclei and located attached or nearest of basement membrane. The chromatin is presents on nucleus from one side and may be have one or two nucleoli (Fig. 3, 6, 11).

Spermatogonia intermediate type

Intermediate type spermatogonia consider smaller than type –A-and B- Spermatogonia and located relatively for from the basement membrane of seminiferous tubules.

Intermediate type spermatogonia represented the intermediate cells which located or gradulation between type A-and B- spermatogonia (The chromatin is located on one side of it is nucleus and may be have one or two nucleoli (Fig. 3, 6, 11).

Spermatogonia-B(crusty type)

Type B- Spermatogonia consider the largest one of the type A and Intermediate type which located also for than the basement membrane which have large round or ellipitical nuclei and have less homogenous chromatin &some crust of chromatin adherence to nucleus membrane The chromatin is located on one side of it is nucleus and may be have one or two nucleoli (Fig. 3, 6, 11).

The division of B-spermatogonia give source to primary spermatocyte where the last pass during 6 different stages which include : Preleptoten stage (Leptoten stage, Zygotene stage, Pachytene stage, Diplotene stage and Diakinesis stage).

These observations were in agreement with (Hodges,1974) in domestic fowls, and with (De Reviers & Williams, 1984) in cockerel, and with the demonstration of (Al-Shamary, 2001) in general quail and with (Islam *et al.,* 2013 ; Gerzilov *et al.,* 2002) in muscovy ducks and with (Al-Samawy, 2009) in adult pigeon.

Sertoli cells extend from the basement membrane to the tubular lumen and possess oval nuclei but some of them look irregular in shape. The lateral sides of Sertoli appear infolding (Fig. 3, 6, 11). These observations were in agreement with the demonstration of (Al-Shamary, 2001) in general quail, and (Hussin, 1996) in Turkey.

Leydig cells appear polyhedral, uninucleated and relatively large observed In the interstitial connective tissue. These results coincides with (Rosenstrauch *et al*., 1998)in aging rooster. Outside the wall of the seminiferous tubules there were Leydig cell (Fig. 3, 6, 11) .

The seminiferous tubules surrounded by longitudinal thin layer of contractile myoid cells ,it adhere to the basement membrane, which produce waves of contraction to move immature spermatozoa out of the testis(Fig.11) these result agreement with (Aire & Ozegbe, 2007). Histochemical stains (PAS &Van giesons) gave negative results to testis tissue structures.

Table 1 : Measurements of Left and Right testis

Right testis	Left testis	Parameters
33.135±4.15 a	30.74±2.55 a	diameter
58.875±4.1 a	52.67±3.4 a	Length

P≤0.05 (The different litter represent the significant differences).

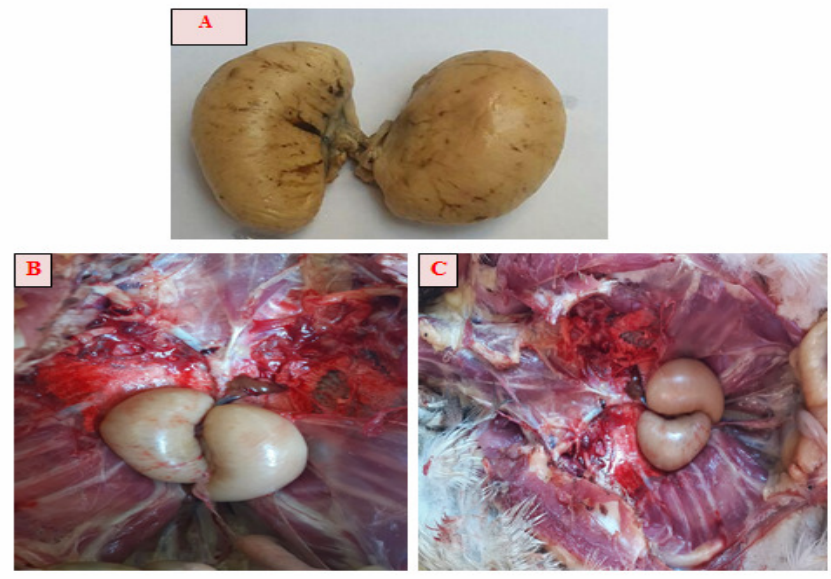

Fig. 1 : Show the Testis of male reproductive tract in the duck:(A)Shape(B)Position the testis in body.

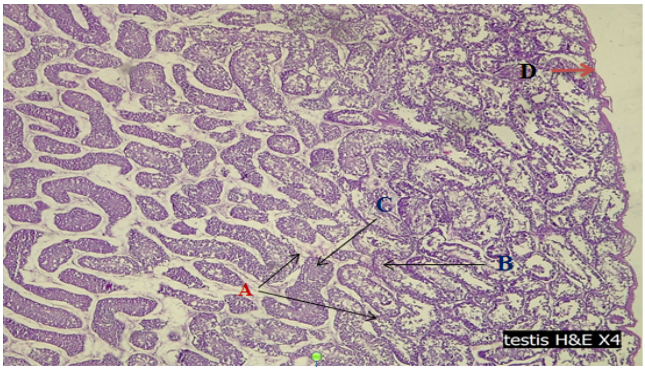

Fig. 2 : Photograph of testis in the duck show the (A) Seminiferous tubules, (B) Lumen of seminiferous tubules (C) Interstitial tissue (D) Capsule tunica albuginea

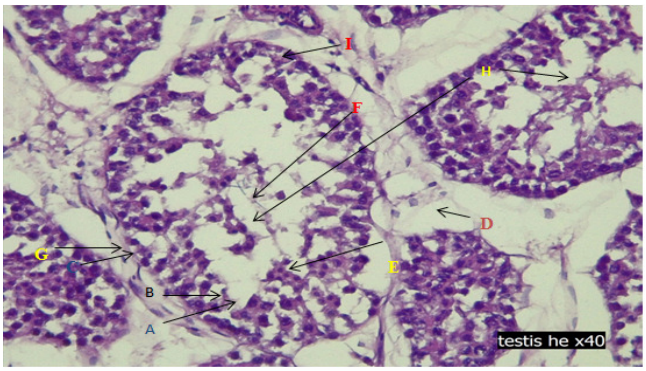

Fig. 3 : Photograph of testis in the duck show the: (A) Spermatogenic A (B) Spermatogenic B, (C) Spermatogenic I (D) Leydig cells (E) Sertoli cells (F) Sperm (G) Myoepithelial cells (H) Lumen of seminiferous tubules (I) Basement membrane.

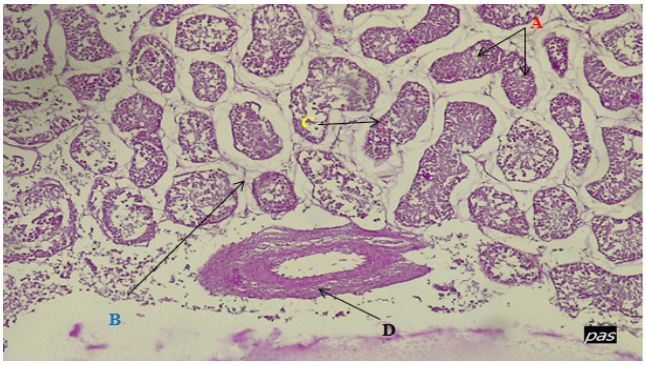

Fig. 4 : Photograph of testis in the duck show the (A) Seminiferous tubules (B) Connective tissue septa (C) Basement membrane (D) Testicular artery.

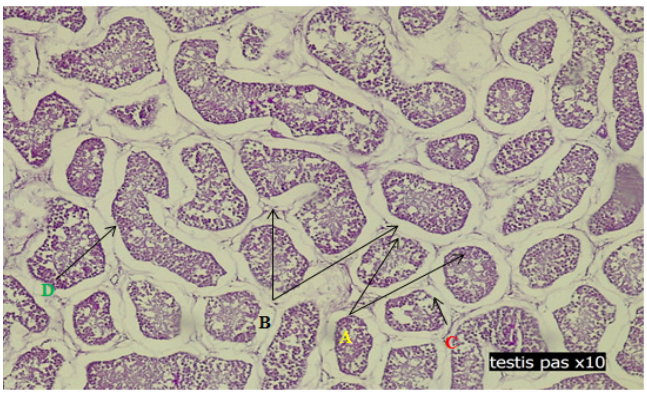

Fig. 5 : Transverse section of testis in the adult duck showing the (A) Seminiferous tubules (B) Lumen of seminiferous tubules (C) Basement membrane (D) Inter connective tissue septa.

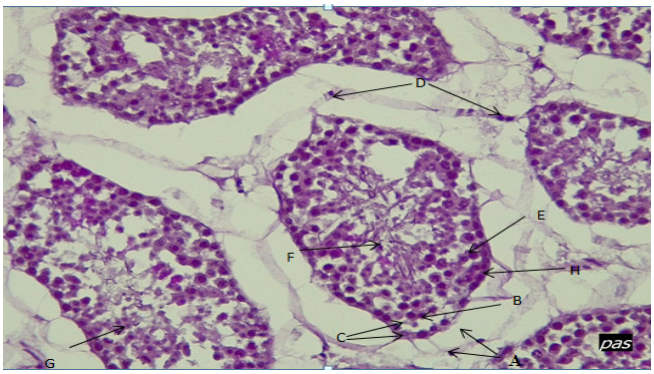

Fig. 6 : Transverse section of testis in the adult duck showing the(A) Spermatogenic type A(B) Spermatogenic type B(C) Spermatogenic type I(D) Leydig cells (E) Sertoli cells (F) Sperm (G) Spermatid (H) Basement membrane.

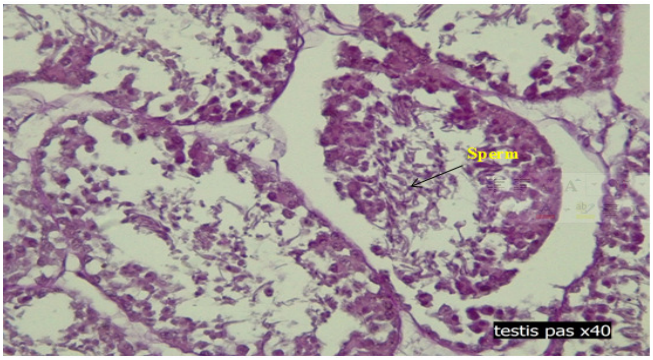

Fig. 7 : Transverse section of testis in the adult duck showing the Sperm.

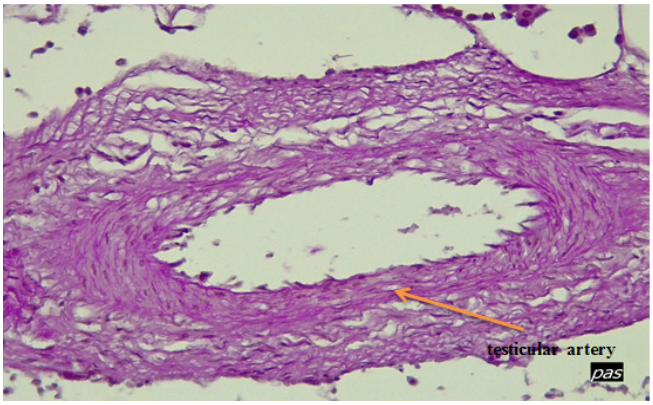

Fig. 8 : Transverse section of testis in the adult duck showing the testicular artery.

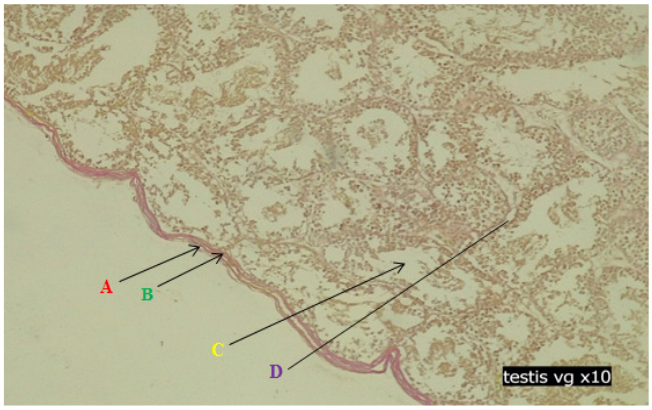

Fig. 9 : Transverse section of testis in the adult duck showing the (A) Capsule (*Tunica albugenia*) (B) connective tissue of capsule (C) Lumen of seminiferous tubules (D)Connective tissue septa.

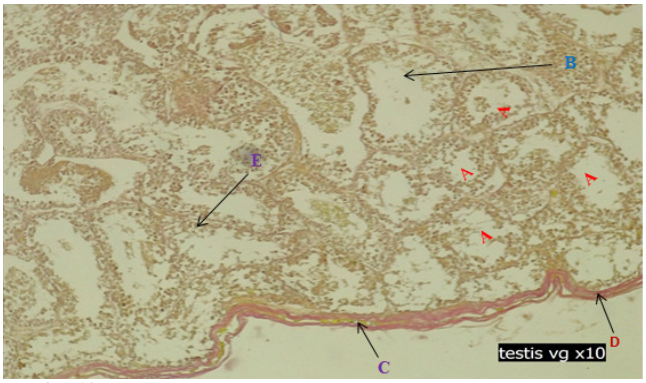

Fig. 10 : Transverse section of testis in the adult duck showing the(A)Seminiferous tubules (B)Lumen of seminiferous tubules (C)Capsule (*Tunica albugenia*) (D) Connective tissue (E) Connective tissue septa.

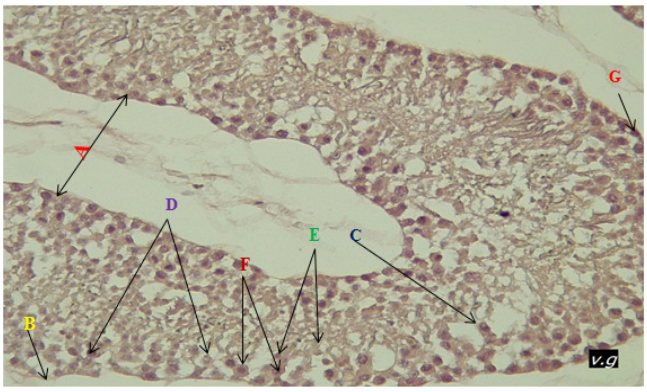

Fig. 11 : transverse section of seminiferous tubules in the adult duck showing the (A) Lumen of seminiferous tubules (B) Basement membrane (C) Sertoli cells (D) Spermatogonia A (E) Spermatogonia I (F) Spermatogonia B (G) Myoid cell.

References

Ahmed, A.M. (2008). Anatomical and Histological study of the male Genital system and spermatogenesis in Racing Pigeon M.Sc. Thesis, College of vet. Med. Basrah University.

Aire, T.A. and Ozegbe, P.C. (2007). The testicular capsule and peritubular tissue of birds: morphometry, histology, ultrastructure and immunohistochemistry. J. Anat., 210: 731-740.

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.

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.

Bakst, M.R.; Akuffo, V.; Trefil, P. and Brillard, J.P. (2007). Morphological and histochemical characterization of the seminiferous epithelial and Leydig cells of the turkey. Animal Reproduction Science, 97: 303–313.

Bull, M.L.; Martins, M.R.F.B.; Cesário, M.D.; Padovani, C.R. and Mendes, A.A. (2007). Anatomical study on domestical fowl (*Gallus domesticus*) reproductive system. International Journal of Morphology, 25: 709–716.

Castillo, A.; Marzoni, M.; Pirone, A. and Romboli, I. (2012). Histological observations in testes of hybrids of *Gallus gallus x Phasianuns* colchicus. Avian Biology Research, 5: 1–10

De Reviers, M. and 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.

Dohner, J.V. (2001). The Encyclopedia of Historic and Endangered Livestock and Poultry Breeds. Yale University Press. ISBN 030013813X.

Dyce, K.M.; Sack, W.O. and Wensing, C.J. (2010). Text book of Veterinary Anatomy published in China library of Congress cataloging in. WB Saunders Comp. pp 805-806.

Elbajory, S.I.A.; El-Tingari, M.D. and Abdalla, M.A. (2013). Morphological study of the testis of adult Sudanese duck (*Anas platyrhynchos*). International Journal of Animal and Veterinary Advances, 5: 103–107.

Gerzilov, V.; Vitanov, S.; Nikolova, M. and Nikolov, I. (2002). Morphological and histological assessment of testes of *Muscovy drakes* producing ejaculates two-and threefold weekly. Animal Science (Sofia), 39: 119–123 (BG).

Halldin, K.; Berg, C.; Brandt, I. and Brunstrom, E. (1998). Sexual behaviour in Japanese quail as a test end point for endocrine disruption: Effects of in-vivo exposure to ethinylestradiol and diethylstilbestrol. Environmental Health Perspectives, 107(11): 861–866.

Halse, A. (1985). Gonadal cycles and levels of luteinizing hormone in wild spur-winged gees, *Plectropterus gambensis*. Journal of Zoology, 205: 335–355.

Hodges, R.D. (1974). The histology of the fowl. 1st.ed. Academic press, London, U.K. 300-326.

Hussin, A.M. (1996). Gross anatomical and histological study of the male reproductive system in the Turkey (*Meleagris gallopavo*) M.SC. Thesis, college of vet. Med. Baghdad University.

Islam, F.; Ishishita, S.; Uno, Y.; Mollah, B.; Skrikulnath, K. and Matsuda, Y. (2013). Male hybrid sterility in the mule duck is associated with meiotic arrest in primary spermatocytes. Journal Poultry Science, 50: 311–320.

Luna, L.G. (1968). Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology. (3n! edn.), McGraw Hill Book Co., New York.

Maretta, M. and Marretova, E. (2004). Immunohistochemical demonstration of myoid cells in the testis and its ex-current ducts in the domestic fowls. British Poultry Science, 45, Al-Tememy, H., 2010. Histological study of testis in quail (*Coturnix coturnix japonica*). Al-Anbar Journal Veterinary Sciences, 3: 36–44, 585–589.

Mori, G. and George, C. (1978). Seasonal histological changes in the gonads, thyroid and adrenal of the Canada goose (*Branta Canadensis* interior). Acta Anatomica, 101, 304–324.

Noirault, J.; Brillard, J.P. and Bakst, M.R. (2006). Spermatogenesis in the turkey (*Meleagridis gallopavo*): Quantitative approach in immature and adult males subjected to various photoperiods, Theriogenology, 65: 845–859.

Onu, J.E. and Ndodo, N. (2003). Comparative morphometric study of the testes of domestic fowl (Gallus gallus domesticus), domestic duck (Anas platyrynchos) and

domestic goose (*Anser anser*). Nigerian Veterinary Journal, 24(3): 1 – 3.

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.

Samuelson, D.A. (2007). Text of veterinary histology, 230.

Trefil, P.; Micakova, A.; Mucksova, J.; Hejnar, J.; Poplstein, M.; Bakst, M.R.; Kalina, J. and Brillard, J.P. (2006). Restoration of spermatogenesis and male fertility by transplantation of dispersed testicular cells in the chicken. Biology of Reproduction, 75: 575–581.

Visca, C. and Visca, K. (2003). How to Draw Cartoon Birds. The Rosen Publishing Group. ISBN 9780823961566.