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COMPARATIVE MORPHOHISTOLOGICAL STUDY OF THE KIDNEYS IN DOMESTICUS FOWL (*GALLUS GALLUS*) AND DOMESTICUS DUCK (*ANAS PLATYRHYNCHOS*)

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Abstract

The present study was carried on ten domesticate fowl *(Gallus gallus*)and ten domesticated duck (*Anas platyrhynchos*) to determinate the morphological and histological differences in the kidneys of both species, For histological study (5-7)µm. paraffin section stained with Hematoxylin and Eosin stain were prepared. In both birds species the kidneys were elongated cranio- caudally, flattened dorso-ventrally, extended from the lungs to the end of the synsacrum bone, and the ventral half of the kidneys were sink deep in the synsacrum fosse. Each kidney consisted of three parts which were not completely separated (cranial, middle and caudal). The main differences between the domestic duck and domestic chicken were the color of duck kidney was brown red, in chicken the color was red. In duck kidney the caudal part was irregular and was the largest, in chicken the caudal part was oval in shape.

The histological structure of the kidneys in domestic chicken and duck was mostly similar. The only important difference was the present of numerous reptilian corpuscles in the kidney of the domestic duck. In conclusion the kidney of chicken had the ability to conserve water more than the kidney of duck.

Key words : domestic duck kidney, cortex, mammalian corpuscles.

Introduction

The urinary system of birds consist of paired kidneys and the ureters, which transport urine to the urodeum of the cloacae, The renal pelvis and urinary bladder were absent (King, 1975). The avian kidneys were extended from the caudal margin of lungs to the caudal end of the synsacrum and embedded in its fossa (Batah, 2012). The avian kidney consists of three incompletely separated lobes (Nabipour and Sadian, 2009; Sreeanjini *et al.,* 2010) each lobe is composed of numbers of lobules that drain into many ureter branches (Reshag *et al.,* 2016; Abood *et al.,* 2016). The kidneys regulates the body fluids and minerals composition thus they necessary to maintain the homeostasis and expelled the metabolic waste, as well as excess water and electrolytes (Nabipour and sadianm, 2009; Wideman, 1988) Urine produced in the kidneys were refluxed into cloacae-rectum, where it is finally modified before elimination, due to the fact that the end product of nitrogen metabolism was uric acid, avian urine was less concentrated than mammals urine (Braun 2003; Braun and Pacelli, 1991; Bataille *et al.,* 2008).

The ducks are aquatic birds and may be found in fresh water and sea water (Darien and fow Hughes, 2003; Warui, 1989).

The Gallus Gallus Domesticated or the chicken is domesticated fowl live in terrestrial (non aquatic birds) (Warui,1989). The kidney lobule of birds was divided to lobules which enclosed central vein, Each was divided to two regions cortex and small medulla. The cortical region

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contained renal corpuscles (reptilian and mammalian type). Proximal convoluted tubules, distal convoluted tubules and cortex collecting ducts. The medulla region contained thin and thick segments of Henle loop The cortex was largest than medulla (Abood *et al*., 2016; Reshag and Abood, 2016), mammalian corpuscles characterized by presence of loop Henle 's and large corpuscle, The reptilian type has small corpuscle without loop of Henle's (Reshag and Abood, 2016).

Aim of study: The study aims to recorded the morphological and histological differences between the kidneys of domestic duct and chicken.

Materials and Methods

Twenty adults healthy birds of both species domesticated fowl (*Gallus gallus*) and domesticated duck (*Anas platyrhynchos*) (ten of each) were bought from the local markets of Basra province. The birds were sacrificed by decapitation, the abdomen was opened, the viscera were removed carefully. The kidneys were washed by running water to remove the blood , than fixed by 10% neutral buffered formalin for two hours in situ before removing from the synsacral fossa, for histological study the kidneys samples washed with normal saline fixed with 10% neutral buffered formalin for 48 hours. paraffin Section at (5-7) µm thickness were prepared and stained with Hematoxylin and Eosin stain (Luna, 1968; Bancroft's *et al*., 2020) The stained sections were examined by light microscope. The histological measurement was done by using oculometer.

Results and Discussion

The current study showed that, the general morphological characters of kidneys in both birds were, red to brown red in color elongated cranio- caudally, flattened dorso-ventrally organs which extended from the ventral aspect of the lungs to the end of the synsacrum bone, and the ventral half of the kidneys were sink deep in the synsacral fosse. Each kidney consisted of three parts which were not completely separated (cranial, middle and caudal) (Fig.1, 2). This facts proved what was reported by many others in different birds species, Like what was mentioned by (Batah, 2012) in common coot bird, (Michalek *et al.,* 2016) in Emu and (Nabipour *et al.,* 2009) in dove and owl. The shapes and the size of kidneys parts showed clear difference between the studied birds (the domestic duck and chicken, the kidney of duck was with, small rounded cranial lobe, The middle lobe was elongated and large irregular caudal lobe (Fig.1). In domestic chicken the kidney was characterized by (small rounded cranial, round middle and large oval caudal) parts (Fig. 2). The same was mentioned by (Nabipour *et al.,* 2009). They found that the kidneys of doves and owl were consisted of a large caudal part, The middle was small and The cranial part appeared larger than the middle one, also (Abood *et al.,*2016) found that there were many differences between the Harrier, which had largest elongated cranial lobe, elongated middle and caudal triangular lobe. Whereas in mallard, the cranial lobe was small rounded, the middle one was elongated and the caudal lobe was large with elongated appearance. The same fact was recorded by (Reshag *et al.,* 2016). They reported that there were differences between the size and shape of the three divisions of great flamingos (*Phoenicopterus roseus*) kidneys, The cranial lobe was small round-oval in shape, the middle was elongated and the caudal lobe was large elongated. The current study suggest that this differences related to species variation, and the apatite and environment were the birds live had no effect on kidneys shape and size. The present study recorded that the relative weight of chicken kidney to the body weight was 0.62%, and the relative weight for the domestic duck kidneys was 0.82% this results were slight different of what was mention by (Abood *et al.,2016)* they reported that the relative weight were (Chicken =0.58, Mallard duck=0.44, Harrier =0.63)% which may be caused by the species variation or the different in the weight of the birds used in their study. In large bird as in Emu weight Kidney/body (%) was high, it was 1.84% this fact was recorded by (Michalek *et al.,* 2016).

Histological results

The kidney lobes of domestic fowl and domestic duck consisted of many renal parenchyma tissue masses (lobules) which was poorly distinguished, Each lobules had small medulla centrally located surrounded by wide zone of cortex, which was made of two types of nephrons, numerous mammalian type of large diameter glomeruli and reptilian type with small diameter glomeruli and lake of loop of Henley's (Fig. 3) and (Fig. 4). This results was in agreement with the results of (Nabipour *et al*., 2009); (Al-AJeely and Fadhils, 2012); (Al-AJeele, 2012). In dove, racing pigeon and gold eagle and the results of (Abood *et al.,* 2014) in Harrier, mallard and chicken, In all this birds species the lobes of kidney consisted of many lobules which formed of large cortex and small medulla. The renal nephrons were in two types according to size of renal corpuscles the present of loop of Henley's. In this study the arrangement and distribution of renal nephrons segment in both birds were the same, In the cortex zone the renal corpuscles of the both types, the mammalian and reptilian renal corpuscles (MC, RC), were

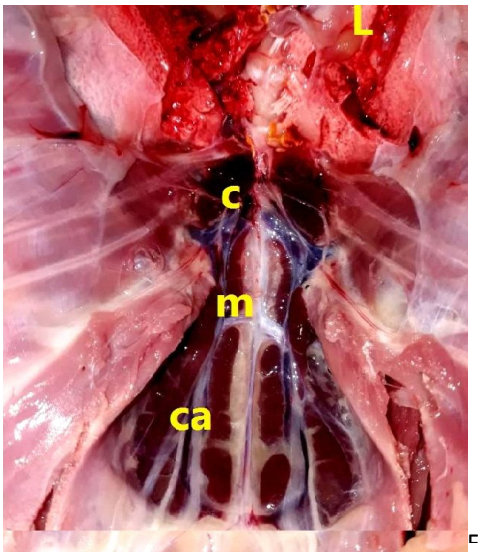

Fig. 1: Macrograph of duck kidney, L-lung, c-cranial lobe, m-middle lobe, ca-caudal lobe.

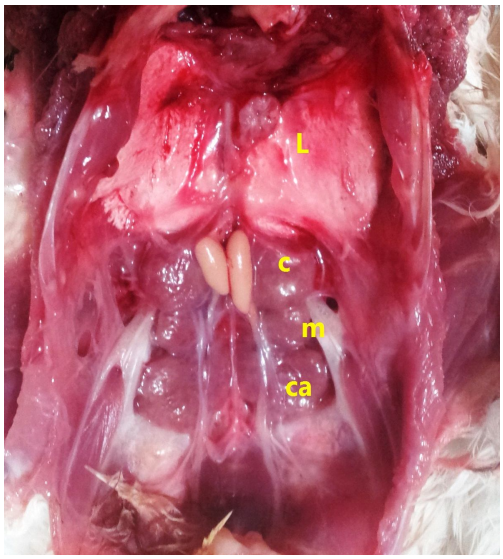

Fig. 2: Macrograph of chicken kidney, L-lung, c-cranial lobe, m-middle lobe, ca-caudal lobe.

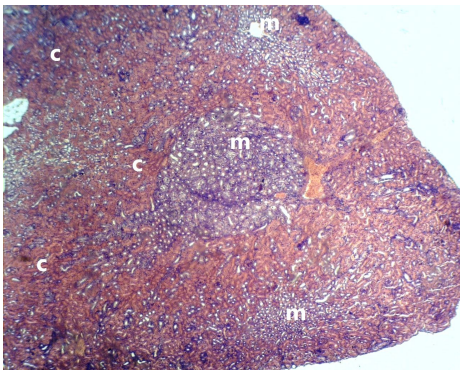

Fig. 3: Histological section chicken kidney showing : C-cortex zone, M-medulla (H&E stainX40).

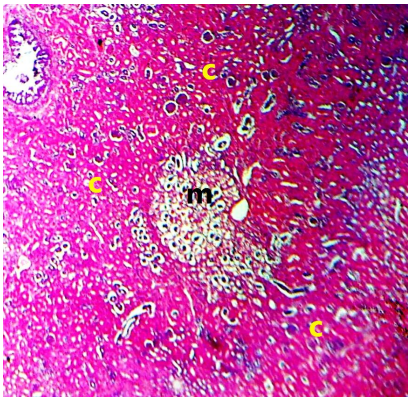

Fig. 4: Histological section duck kidney showing : C-cortex zone, M-medulla (H & E stainX40).

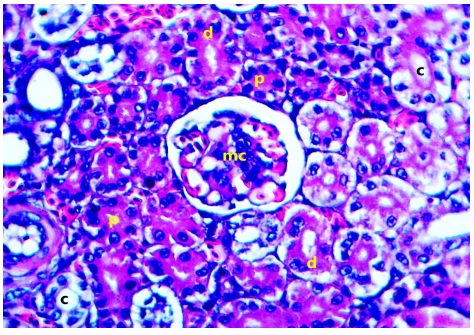

Fig. 5: Histological section chicken kidney showing : cortex zone, Mc-mammalian corpuscle, p-proximal renal tubule, d-distal renal tubule, c-collecting duct (H&E stainX400).

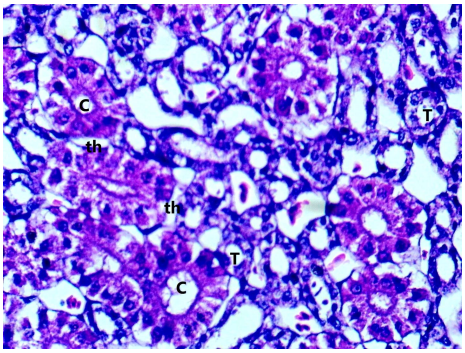

Fig. 6: Histological section kidney showing : renal medulla,T-Thick segment, thin segment (loop of Henles, C-collecting duct (H&E stainX400).

present in different levels, also the (proximal and distal)convoluted tubules and cortical collecting duct could be noticed. In the medullary area the thin and thick segment of Henley's loop in addition collecting duct were present (Fig. 5, 6). This histological feature was mention in previous studies in other birds species (Batah, 2012) in common coot (Michalek *et al.,*2016) in emu bird (Reshag *et al.,*2015) in great flamingos, the (proximal and distal)

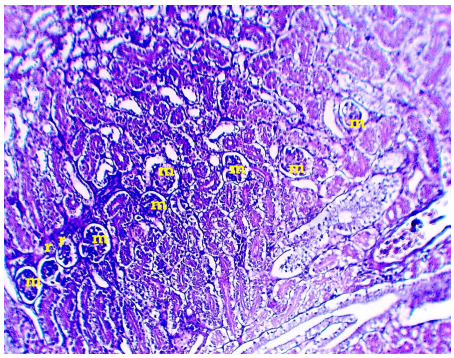

Fig. 7: Histological section chicken kidney showing : cortex zone, Mc-mammalian corpuscle, r-reptilian corpuscle (H&E stainX100).

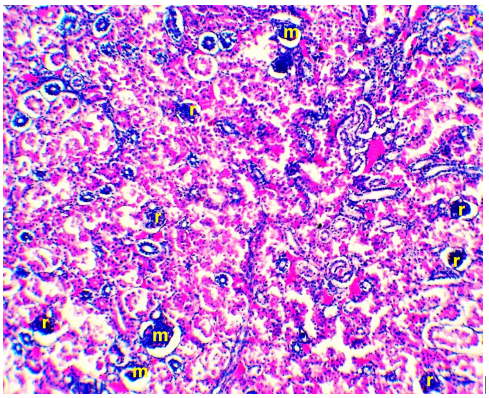

Fig. 8: Histological section duck kidney showing : cortex zone, Mc-mammalian corpuscle, r-reptilian corpuscle (H&E stainX100).

convoluted tubules and cortical collecting duct were present in cortex, the medulla occupied by the thin and thick segment of Henley's loop in addition collecting duct. In comparing between the both birds, The current study found that a- the diameter of renal corpuscles in domestic chicken was larger than the domestic duck, The diameter of RC was 62µ and the diameter of MC was 100 µ. b- The number of RC duck was 5 of 13, whereas in chicken RC was 2 of 12 renal corpuscles (The total number of renal corpuscles calculated in 1mm). The present study suggest that the kidney of chicken had ability to conserve water and produce more concentrated urine than the duck because it posses kidneys with large diameter and larger number of mammalian renal corpuscles than the kidney of domestic duck. This finding proved the data which mention by (Wideman,1988; Warui, 1989). They gave critical anatomical and histological information about the structure of avian kidneys like (the diameter and distribution of corpuscles in cortex. The present of Henley's loop and its role in filtration of salt and water conservation in different avian species, and the results of the present work was in parallel with the results of (Baragoth, 2015) in which he found that the total number of renal corpuscles was in quail (*Conturnix coturni*) lesser than in Green-winged Teal (*Anas crecca*).

Conclusion

1. The kidney of domestic duck and chicken had the same general anatomical and histological structures.
2. The kidney of domestic duck different than that of chicken by the present of numerous RC.
3. The kidney of domestic chicken had high filtration ability and can conserve water more than the kidney of domestic duck.

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