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Histological Investigation of Pneumonia in Domestic Ducks (Anas platyrhynchos domesticus) in Basrah Province, Iraq

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THE current study was performed to the histological features of pneumonia in domestic ducks in Basra province of Iraq. The diseased ducks were diagnosed based on clinical manifestations, gross and microscopical lesions as well to histochemical technique. The necropsy findings were characterized by presence white to yellowish bilateral solid uniformed nodules in the parietal surface of the right and left lungs as well to an obvious lesion of red to gray hepatization extend bilaterally in the both lung; however, additionally, both lungs showed bilateral severe congestion mostly in the middle to lower parts with scattered nodules. The microscopic picture indicate a severe interstitial hemorrhage, as well to infiltration of inflammatory cells mainly in the bronchi and interstitial pulmonary tissues revealing to bronchopneumonia; in addition to severe fibrinous exudate that contains a fibrin associated with inflammatory cells infiltration, as well to peri-bronchial inflammatory cells infiltration. The histochemical results showed formation of thick fibrous connective tissue infiltrated in pulmonary interstitial parenchyma and in peri bronchial tissue revealed to diffuse interstitial pulmonary as well to severe interstitial infiltration of mucoid like substances in the pulmonary parenchyma and in the peri-bronchial tissue. It has been concluded that the typical histological features of pneumonia of domestic ducks characterized by severe stages of pulmonary congestion, red and gray hepatization that may overlapped in the complicated cases.

Keywords: Pneumonia, Domestic ducks, Histological features, Basrah, Iraq.

Introduction

The domestic ducks are used for the production of meat and eggs , however, a lot of ducks usually kept for show like pets or for ornamentals values; the entire variety of domestic ducks are part of Muscovy duck (*Cairina moschata*) which had descend from mallard (*Anas platyrhynchos*) [1]. Ducks are domesticated for thousands of years; perhaps, near to three billion ducks are slaughtered annually for meat worldwide [2]. Mallard duck was firstly domesticated in southeast of Asia from 4000 years ago, and was farmed by the Romans in Europe as well to the Malays in Asia [3]. In addition, the ducks were captured in nets in order to breed in captivity by ancient Egypt [4].

Pneumonia and airsacculitis in poultry appear particularly in necropsied birds as congested lung, exudative tracheobronchitis, multifocal granulomatous pneumonia and airsacculitis with multifocal granulomatous pneumonia in severe chronic cases [5]. Pathological nodules may found in the syrinx as well to the adjacent bronchi in the lung; the lesions of the pneumonia can explain respiratory symptoms on surviving birds in which ranged from mild interstitial inflammation to severe pleuricy, pneumonia involving deep to lateral margins in commercial birds [6].

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Histological features of the affected lung in pneumonia entirely showed a sub-acute to chronic granulomatous pneumonia, in which the nodules and the plaques characterized by center of eosinophilic cellular debris these surrounded by multinucleated giant cells and epithelioid macrophages, it surrounded by marked fibrous tissues and lymphocytes in commercial turkeys, ducks and chickens [7]. In addition to a pollutant, may increase sensitization lead to augment the damaging effects of the bronchogenic pathogens [8].

There are limited studies on this disease in Iraq, therefore, this study performed to give the main gross and histological features of pneumonia in ducks particularly those domesticated in Basrah, southern of Iraq.

Materials and Methods

Eleven adults domestic ducks (*Anas platyrhynchos domesticus*) were admitted to the Basra teaching veterinary hospital, Iraq from the period extended from August, 2019 to March, 2020; Animals are of 1.4-1.55 kg weight and about 6-11 months old were suffered from some respiratory disorders like dyspnea, coughing, labored breathing and gasping, as well to other signs as loss of appetite, listlessness and dehydration; after that the birds were sacrificed according to the global guideline of animal ethics, through separating the main neck blood vessels, and then the complete necropsy particularly to the respiratory system was done and the macroscopic changes were recorded.

Lungs were examined macroscopically to recorded any abnormalities and then histological examination was performed; the pulmonary samples that isolated were washed in normal saline 0.9% and then were fixed in 10% neutral buffered formalin for 72 hours; after that a histological technique included the paraffin blocks, cutting at 5 µm, staining in hematoxylin and eosin (H&E) stain for routine staining as well to using a special stains like Mallory stain as indication for presence of collagen fibers and the periodic acid schiff stain (PAS) as indication for presence of mucopolysaccharides [9].

Results

The clinical examination of the birds were suffered from some respiratory disorders like dyspnea, coughing, labored breathing and gasping, as well to other systemic signs as loss of appetite, listlessness and dehydration.

The results of macroscopic examinations of the lungs of indicated a white to yellowish bilateral solid uniformed nodules that present in the parietal surface of the right and left lungs in which the biggest nodule represented in the right lung surrounded by patchy to ecchymotic hemorrhages and vascular congestion while the smallest nodules scattered at the middle to the lower part of the left lung which surrounded by hemorrhagic patches extended laterally; moreover, An obvious red hepatization extend bilaterally in both lung showed in (Fig.1).

Also, a whitish to yellowish solid multiple uniformed nodules scattered in both the central middle to lower part of the visceral surface of the left lung in which surrounded by area of ecchymosis, also it shown an area revealed to gray hepatization that extend in the almost of middle to lower parts of the lung as in (Fig.2). A bilateral severe congestion of the lung that located particularly in the almost of middle to lower parts of the both lungs, as well to nodules scattered in the both lung as in (Fig.3).

The histological results of the lung showed a severe interstitial hemorrhage, as well to infiltration of inflammatory cells mainly in the bronchi and interstitial pulmonary tissues revealing to bronchopneumonia as in (Fig.4). A severe fibrinous exudate that contains a fibrin associated with inflammatory cells infiltration, as well to peribronchial inflammatory cells infiltration as in (Fig. 5). In addition to inflammatory cells infiltration in the bronchus, as well to peri-bronchial, in addition to a severe inflammatory cells infiltration in the pulmonary interstitial tissue as in (Fig.6).

The histochemical results of the lung when masson trichrome stain was used a formation of thick fibrous connective tissue surrounded the bronchus revealed to peribronchial fibrosis as in (Fig.7); and a thick fibrous connective tissue infiltrated in pulmonary interstitial parenchyma revealed to diffuse interstitial pulmonary as in (Fig.8); a severe infiltration of mucoid like substances surrounded the bronchus as in (Fig.9); in addition to severe interstitial infiltration of mucoid like substances in the pulmonary parenchyma when PAS stain was used as in (Fig.10).

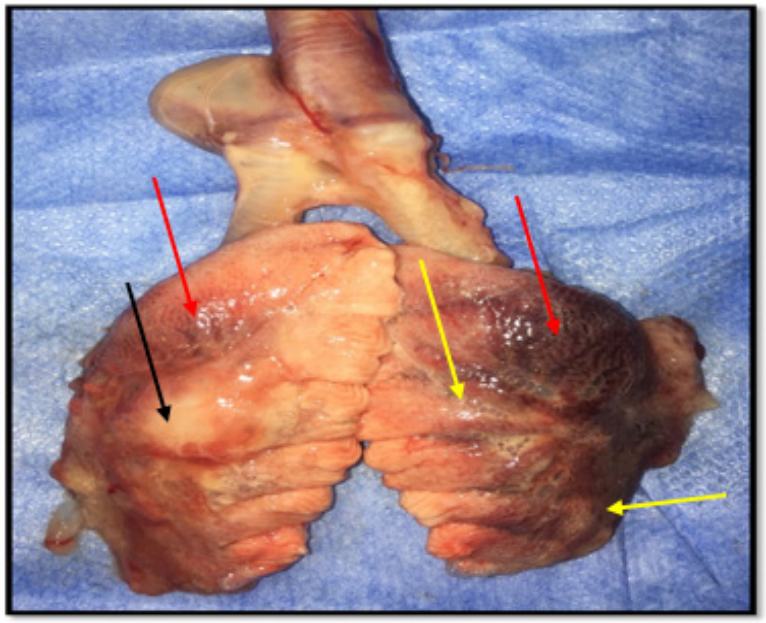

Fig. 1. A macroscopical section of the lung shows a bilateral uniformed white to yellowish nodules located in the right lung surrounded by hemorrhagic area (black arrow), while the left lung shows a smallest scattered nodules in the left lung (yellow arrows), also there are an area of red hepatization extend on both lungs (red arrows).

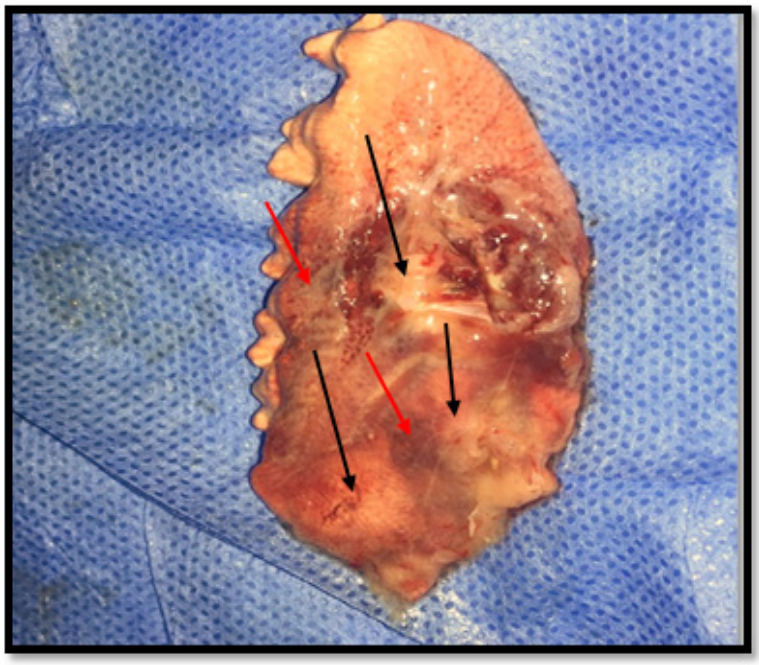

Fig. 2. A macroscopical section of the left lung shows a white to yellowish solid multiple uniformed nodules scattered in both central middle to lower part of the visceral surface of the left lung in which surrounded by area of ecchymosis (black arrows), as well to an area of gray hepatization (red arrows).

Fig. 3. A macroscopical section of the lung shows bilateral severe congestion of the lung that located particularly in the almost of middle to lower parts of the both lungs (black arrows), as well to nodules scattered in the both lungs (red arrows).

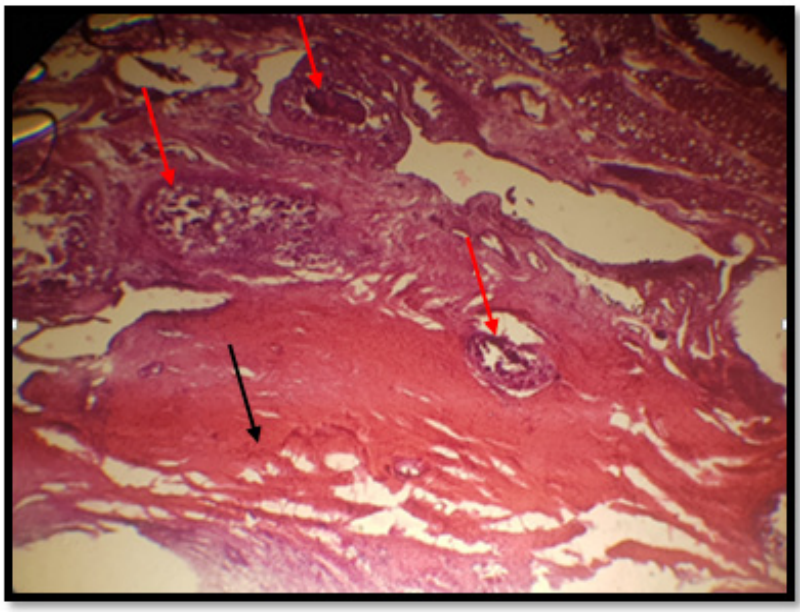

Fig. 4. Histological section of the lung shows severe interstitial hemorrhage (black arrow), as well to infiltration of inflammatory cells mainly in the bronchi and somewhere in the interstitial tissue revealing to bronchopneumonia (red arrows). H&E stain. 10X.

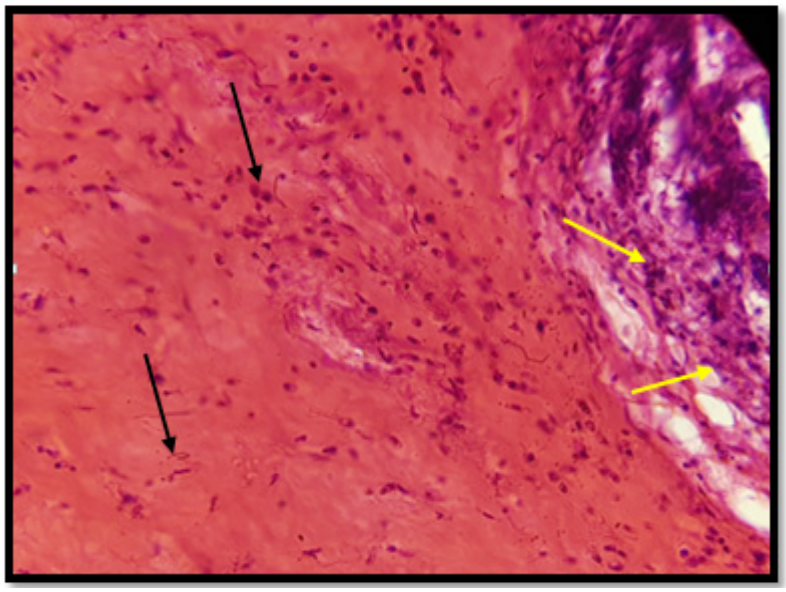

Fig. 5. Histological section of the lung shows a severe fibrinous exudate that contains a fibrin associated with inflammatory cell infiltration (black arrows), as well to peribronchial inflammatory cell infiltration (yellow arrows). H&E stain. 40X.

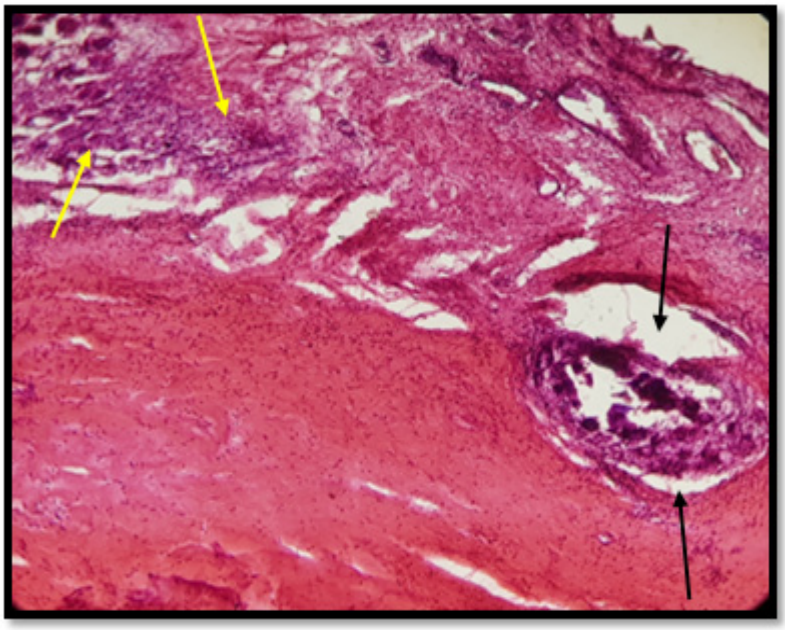

Fig. 6. Histological section of the lung shows inflammatory cell infiltration in the bronchus, as well to peribronchial edema (black arrows), in addition, there are a severe inflammatory cell infiltration in the pulmonary interstitial tissue (yellow arrows). H&E stain. 10X.

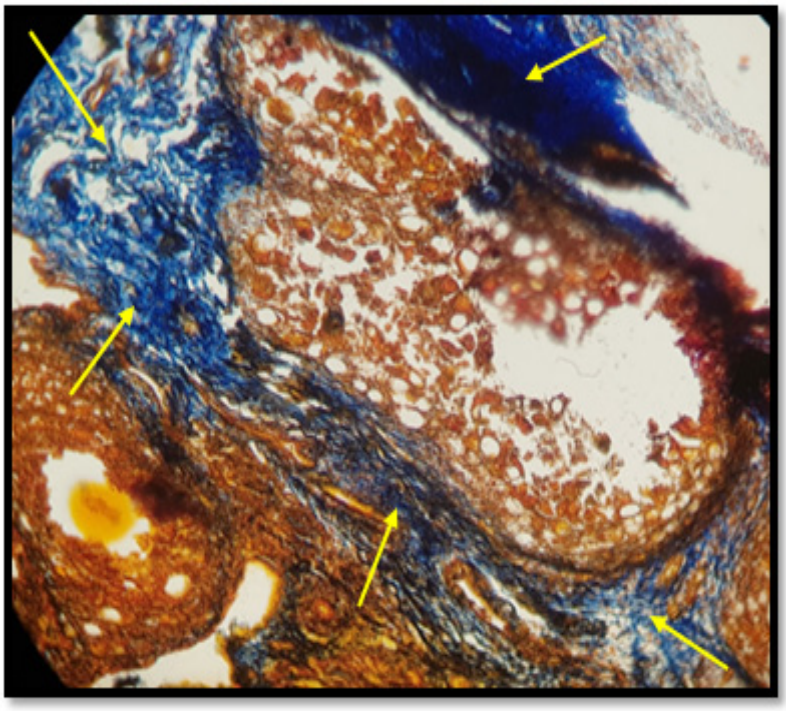

Fig. 7. Histochemical section of the lung show formation of thick fibrous connective tissue surrounded the bronchus revealed to peri-bronchial fibrosis (yellow arrows). Masson trichrome stain. 10X.

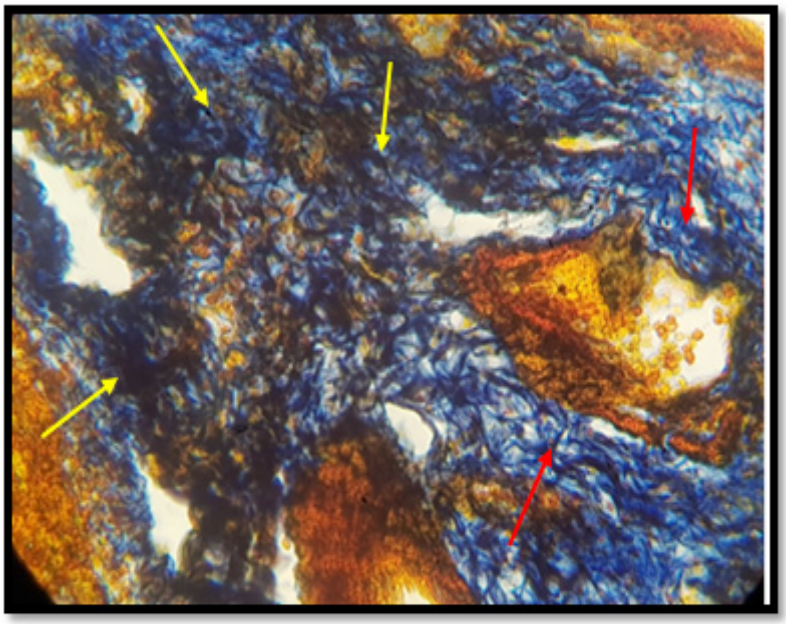

Fig. 8. Histochemical section of the lung show formation of thick fibrous connective tissue infiltrated in pulmonary interstitial parenchyma revealed to diffuse interstitial pulmonary fibrosis (yellow arrows) as well to peri-bronchial fibrosis (red arrows). Masson trichrome stain. 10X.

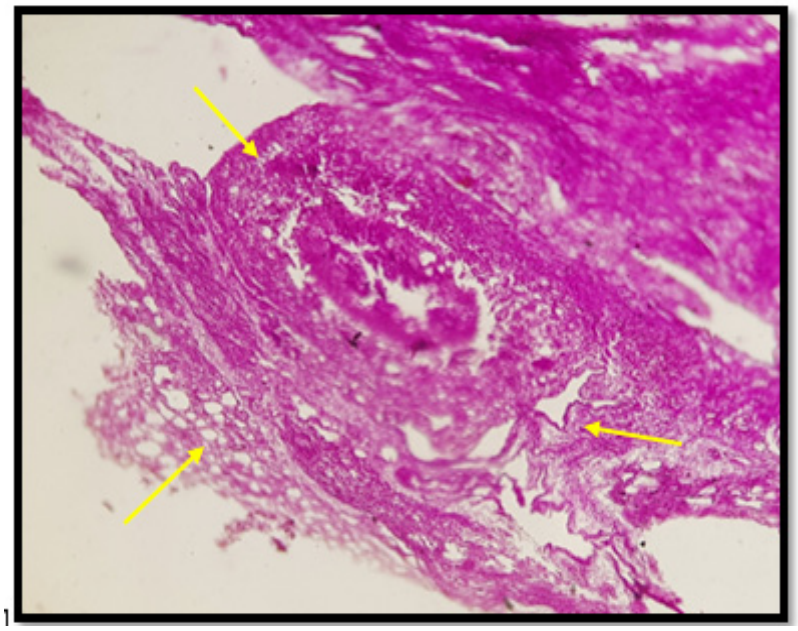

Fig. 9. Histochemical section of the lung shows severe infiltration of mucoid like substances surrounded the bronchus (yellow arrows). PAS stain. 10X.

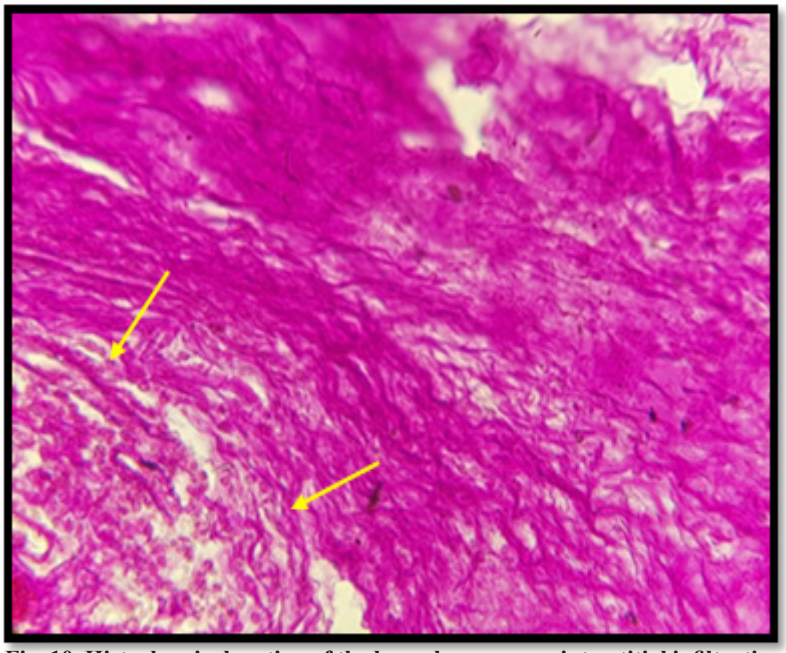

Fig. 10. Histochemical section of the lung shows severe interstitial infiltration of mucoid like substances in the pulmonary parenchyma (yellow arrows). PAS stain. 10X.

Discussion

Respiratory diseases of the domestic ducks causing major problems as a part of poultry industry, therefore the current study focused on the major gross and histological features associated with pneumonia.

The macroscopical findings showed a bilateral uniformed white to yellowish nodules located in the lung surrounded by hemorrhagic area, these resulting from the infiltration of inflammatory cells to engulfing any pathogenic causative agent that may induced a robust immune response causing nodular inflammatory reaction, these idea may agree with the investigation of Eassa et al. [10] who reported that the pathognomonic lesions of pneumonia were recorded as a small white to yellow caseous nodules in the lung resulting from the colonization of the causative agents in the lungs and air sacs of birds can lead to the proliferation of organism and causing such nodular inflammation ; also it was recorded an area of caseous necrosis, in which the nodules appeared surrounded by a zone of inflammatory cells mainly mononuclear cells, therefore, the histological results of the lung showed a severe interstitial hemorrhage, as well to infiltration of inflammatory cells mainly in the bronchi and interstitial pulmonary tissues revealing to bronchopneumonia, these investigation may agree with Tonu et al. [11] who mentioned that the postmortem findings of the birds that affected with pneumonia revealed a congestion and consolidation of the lung in some birds as a results of heterophils infiltration accompanied by macrophages and lymphocytes infiltration in the bronchial wall as well to peribronchial alveolar affection due to multiplication of the pathogenic causative agent in the pulmonary tissues as well to the lungs granuloma were also present.

The histological observation of the lung section showed a several of serious changes in which ranged from interstitial inflammatory changes to bronchopneumonia these may consistent with the investigations of Zafra et al. [12] who reported a lymphoid tissue hyperplasia, bronchitis, bronchopneumonia as well to typical pneumonia, besides a variable lesions intensity mostly like those associated in bacterial or viral invaders that causing a complicated pneumonias in the poultry industry.

The current histochemical investigations showed formation of thick fibrous connective tissue surrounded the bronchus revealed to peribronchial fibrosis as well to interstitial infiltration of mucoid like substances in the pulmonary parenchyma, these findings may resulted from the inflammatory defence mechanism against to invaders in order to ameliorate it harmful effects on the pulmonary tissues, this idea may agree with the investigations of Spanamberg et al. [13] on the pathological features of pneumonia in poultry which reported a histopathological changes mostly necrotic, fibrinous, heterophilic pneumonia and pulmonary lymphoid tissue hyperplasia associated with the complicated cases of poultry pneumonia.

The robust inflammatory response against pneumogenic stress may lead to seroius damage to pulmonary parenchyma, that agreed with Ibrahim et al. [14] they reported an inflammatory stress indicated as bronchiolitis, hyperplastic changes of ciliated epithelia and hypertrophied bronchioles due to hyperplasia of lining epithelium as papillae and inflammatory cells infiltration.

Conclusions

The typical macroscopical and histological features of pneumonia of domestic ducks characterized by nodular inflammatory masses ranged from severe stages of pulmonary congestion, red and gray hepatization that may overlapped each of other in the complicated cases.

Acknowledgments

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Ethical consideration

This study was carried out in accordance to the ethical rules for samples handling and animal's managements and researches, College of Veterinary Medicine, University of Basrah, Iraq.

Conflict of interest

The authors declare that they have no competed interest.

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التحري النسيجي لذات الرئة في البط المستأنس في محافظة البصرة، العراق

اسيل كامل حميد[1]، جهاد عبدالامير احمد[2]، علاء حسين سعدون[3] وأنسام صالح عبدالقادر[3]
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أجريت هذه الدراسة لتقييم الصفات النسيجية لذات الرئة في البط المستأنس في محافظة البصرة، اذ شخص المرض في الطيور المصابة وفقا للعلامات والاعراض السريرية والآفات العيانية والمجهرية فضلا عن استخدام تقنية الكيمياء النسيجية. أظهرت نتائج فحص الصفة التشريحية وجود عقيدات بيضاء مصفرة اللون صلدة ومتحدة الشكل منتشرة على السطح الجداري لكلتا الرئتين اليمنى واليسرى مع ملاحظة وجود افات التكبد الحمراء والرصاصية منتشرة على كلتا الرئتين فضلا عن احتقان شديد في كلتا الرئتين والتي تشير الى مرحلة الاحتقان الرئوي وبخاصة في الجزء الأوسط والسفلي من الرئتين، كما اشارت النتائج النسيجية المجهرية لوجود نزف بيني شديد مع ارتشاح للخلايا الالتهابية حول القصبات الرئوية و النسيج الرئوي البيني مشيرتا الى التهاب الرئة القصبي، إضافة الى وجود نضحات التهابية ليفينية متضمنه على خلايا التهابية. اشارت الدراسة الكيميائية النسيجية بتكون نسيج ليفي كثيف تركز وجودة في النسيج الرئوي البيني والنسيج حول القصبات الرئوية كما شوهد ارتشاح شديد لمواد شبيه بالمخاطية في نسيج الرئة والمنطقة حول القصبات الرئوية. استنتجت الدراسة الحالية بان التهاب الرئة في البط المستأنس يتميز بمراحل التهابية شديدة تتضمن الاحتقان الرئوي والتكبد الأحمر والرصاصي مع إمكانية تداخل هذه الآفات النسيجية والعيانية مع بعضها في حالات الالتهاب الرئوي المعقّدة.

الكلمات المفتاحية : ذات الرئة، البط المستئنس، الصفات النسيجية، البصرة، العراق.