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Incidence of the Pathological Lesions in Lung and Associated Lymph Nodes of Slaughtered Cattles in Babylon Abattoir

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ONE OF the governorates of Iraq, Babylon is well-known for its agricultural and animal industries. The purpose of the study was to offer information on various pathological respiratory disorders affecting cattle and their effects on resources of animal. (30) samples of slaughter cattle (both male and female) were collected from the Al-Hashymia and Al-Qasim abattoirs at Babylon governorates. The morphological alterations in the lung and associated lymph nodes were examined postmortem, and tissue samples were collected, and finally sent for histopathological analysis in a plastic container with 10% formalin. The postmortem examination of the lung 60% revealed the existence of several hydatid cysts, many of which were big cysts measuring 1 to 5 cm in diameter. 16.7% of the samples had granulomatous lesions, which were visible as thick, yellow caseated material, which was surrounded by a thick connective tissue capsule. Additionally, there are vast fibrotic areas, 23% atrophy, and gray staining in the pulmonary lymph nodes. The findings of the lung's histologically included substantial pulmonary blood vessel congestion. 6.7% Papillary projection is the result of hyperplasia of the epithelial cells lining the bronchioles. There was hemosiderin-loaded macrophages (26.7%) and follicular hyperplasia with a spherical follicular center surrounded by broad lymphocyte mantles in the exanimated lymph node with severe necrosis (16.7%).

Keywords: Lung disease, Babylon, Respiratory system, Cattle, Granuloma, Hydatic cyst.

Introduction

The respiratory system is a biological system present in any organism that exchanges gases. The respiratory system takes carbon dioxide out of the body and returns it to the lungs for exhale in coordination with the circulatory system [1]. The most common issue in feedlot livestock systems worldwide is pneumonia. New medicines and vaccines do not appear to reduce the losses recommended [2]. The issue is caused by younger, lighter cattle entering the feedlot without preconditioning treatment. These animals are more prone to respiratory ailments because of their high stress sensitivity [2]. When infectious diseases increase among individuals who are predisposed to them, similar situations occur [3]. A complex ailment, bovine respiratory disease occurs in calves at any age or developmental stage. Shipping fever is a common word used in the feedlot sector to describe the disease that drives up costs by increasing labor and medicine consumption, decreasing productivity, and increasing investment losses associated with mortality. It is a major issue for farmers and veterinarians [6,7] since it causes the most financial loss in the young stock-rearing and feedlot industries as a result of mortality and morbidity [4,5]. These financial losses are a result of a decline in daily weight gain and yield, an increase in conversion rates, and the cost of therapy. Consequently, worse carcass quality, increased mortality, and decreased animal well-being are all common [8,9].

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Bacterial respiratory diseases (BRD) encompass disorders of both the upper and lower respiratory tracts. Aspiration pneumonia, allergic extrinsic alveolitis (also known as bovine farmer's lung), and atypical interstitial pneumonia (also known as acute pulmonary emphysema, edema, and fog fever) are examples of lower respiratory tract infections that fall under the category of infectious BRD. Some of infections (thromboembolic pneumonia), parasites, and airborne lung infection by viruses and bacteria, including mycoplasma, are the causes of infectious BRD were spread via hematogenous. According to numerous research [10,11]. Mannheimia haemolytica is frequently implicated as the primary etiological agent in fatal infectious BRD in calves. Foxes and dogs are typically the end hosts for the zoonotic the infection echinococcosis, pigs, sheep, cattle, camels, and humans are considered intermediate hosts [12]. Oral contact with the eggs discharged into the final host's excrement is the main route of infection. Examples of intermediate host organs where parasite development occurs are the liver and the lung [13]. The echinococcosis (also known as the metacestode stage or larval stage) grew relatively slowly, reaching a size of 1 cm by the fifth month [14]. In the last stages of growth, the cysts contain hydatid fluid, about 15 quarts some of which are sterile [15].

The location of the hydatid cyst determines the pathological consequences. For instance, a pleural effusion or bronchobiliary fistula may cause a burst cyst in the liver through the diaphragm. One case report details the clinical symptoms in cattle that included emaciation, eating problems, obstructive lung illness, big liver enlargement, liver dysfunction, and elevated liver enzyme levels in addition to intermittent pain. Cystic echinococcosis has numerous negative impacts on humans and livestock [16]. Direct losses, according to [17], are associated with the condemnation of all or some of the carcass or the injured organs. In Yugoslavia, it was reported that hydatid cysts in affected cows reduced milk production by 10% and carcass weight by 5% [18].

Experimental

Specimen Processing

There were regular visits to the slaughterhouses in Al-Hashymia and Al-Qasim. Thirty lung specimens from both sexes were acquired after slaughtered cattle were inspected postmortem, with particular focus given to the lung. Gross pathology was examined in order to detect any changes in the morphology of the lungs. The gross lesions were then photographed using a digital camera. Tissue samples (one centimeter by one centimeter) were also taken and placed in a plastic container with 10% formalin in addition to the lesions being noted. To investigate the histological changes, the obtained tissues were stained using standard H&E methods.

Gross Pathology

Look for these signs:

1. The percentage of cysts in every lung and associated lump nodes.
2. Cyst sizes were measured with a vernix calibrator.
3. Any unusual alterations to the lung size, consistency, or color.
4. Any anomalous lesions throughout the structure.

Technique for Histopathology

The specimens from lung and associated lymph nodes were selected for the histopathological section. The standard protocol involved preserving the samples in 10% formaldehyde, embedding them in paraffin, and sectioning them into (5 µm) finally the sections stained by using hematoxylin and eosin [19].

Statistical analysis

Using the SPSS program Ver. 20, probability values of $P<0.05$ have been considered statistically significant. The correlation between the rate of pathological conditions and each animal was found using the Chi-square test [20].

Results and discussion

Gross Pathological inspection

Lung:

Multiple regions of ecchymosis and petechial bleeding were the pathological abnormalities seen in lung samples (Fig. 1.A). However, the majority of the samples that had been examined showed that there were several hydatid cysts present, ranging in size from 1-3 cm and dispersed throughout various regions. Many of these cysts were enormous, measuring between 1 and 5 cm (Fig.1.B). A thick connective tissue capsule that surrounded nodules of granuloma, which were contain thick yellow caseated material in certain of the samples that were seen (Fig. 2.A). Furthermore, a large fibrotic region that looked as a consolidated white area was seen in additional specimens (Fig.2.B).

Pulmonary lymph nodes

To identify any pathological alterations, the pulmonary lymph nodes were also inspected. In the majority of cases, the lesions displayed significant bleeding, atrophy, and gray staining (Fig.3.A). There was evidence of significant hemorrhagic atrophy in the bronchial lymph nodes (Fig.3.B).

Histopathological examination

Lung

Histopathologically, the lung showed severe congestion of the pulmonary blood vessels with neutrophils present and thickening of the alveolar wall; additionally, there was hemorrhage inside the alveoli with alveolar macrophages present, and capillary blood vessel congestion (Fig.4.A). The lesion in the most studied region revealed three layers: the cyst wall with inflammatory cell infiltration, especially in the adventitial layer; this was an infertile hydatid cyst. The thick collagenous layer that forms as a result of these cysts and the influx of inflammatory cells compresses the surrounding alveoli (Fig.4.B). A large volume of eosinophilic fluid filled the cysts (Fig.5.A). The results indicated that the epithelial cells lining the bronchioles had hyperplasia in many exanimated sections. These cells appeared as finger-like structures with inflammatory cell infiltration (primarily neutrophils) in bronchiolar lumen (Fig.5. B). In other cases, the cells appeared as papillary projections with surrounding blood vessel congestion. Additionally, a significant region of fibrosis was seen to have replaced the pulmonary tissue (Fig.6.A), and the walls of the pulmonary blood vessels had thickened due to the presence of foamy cells (Fig.6.B).

Lymph nodes

Follicle hyperplasia, characterized by a spherical follicular center encircled by broad lymphocyte mantles (Fig.7.A), and significant dilatation of the sinuses loaded with red blood cells (Fig.7.B) were the outcomes of the lymph node exanimated section. A few sections had sinus hyperplasia and follicular hypoplasia together with a large number of histiocytes, which have a lot of cytoplasm and seem pale and eosinophilic (Fig.8.A). amyloid buildup. On the other hand, numerous sections showed hemosiderin-laden like macrophages, blood vessel congestion, and severe necrosis associated with hemosiderosis (Fig.8.B).

Incidence of pathological lesion

Table 1 shows the incidence of every lung lesion that was investigated. Hydatid cysts (60%) were the conditions with the highest percentages documented, granulomas (16.7%), fibrotic lesions (10%), hemorrhaging, and bronchial hyperplasia (6.7%),

Table (2) showed the percentage of lymph nodes with abnormal conditions. In the deaminated lymph nodes, there was a high percentage of hemorrhage and hemosiderin (33.3 and 26.7, respectively). Atrophy was to 23%, although necrosis was just 16.7%.

Bacterial respiratory diseases, or BRDs, are still a major problem for feedlot beef cattle productivity. A wide range of cow herds have been found to harbor several viruses, bacteria, and Mycoplasma spp., demonstrating the widespread role that various infectious agents play in BRD [6]. The current study's goal was to examine the pathological lesion in the respiratory system of cows. The results showed that some of the lungs had suppuration and hemorrhages, and that the hue had changed from bright pink to dark red. The rigid textures were due to the black or gray consolidation of the pulmonary lobules and lobes. Most of the consolidations were seen in the cranioventral and caudodorsal areas of the lung [21]. A pulmonary toxicant must be located and given a severity level when it is the direct cause of a lung hemorrhage. If bleeding is a feature of another lesion, like inflammation, necrosis, or neoplasia, it should be reported in the pathology narrative rather than being recognized. Nonetheless, if the bleeding is a substantial component of an inflammatory or chronic illness, the pathologist might choose to diagnose the bleeding [22]. A physical examination of hydatid cysts detected in an infected bovine revealed the presence of one or more hydatid cysts in the lung, with a diameter ranging from less than 1 cm to more than 5 cm. These cysts were embedded in the lung parenchyma either completely or partially. The largest hydatid cysts were fluid-filled unilocular cysts made up of germinal, laminated, and adventitial layers. Related results were reported in [16].

The most frequent gross lesion discovered in the lymph nodes of buffalo that have been killed exhibits an expansion of the lymph nodes, primarily due to inflammation, and is consistent with [23]. In accordance with [24], it may also primarily present as lymphadenitis. Lesions manifesting as pigmentation of lymph nodes in the cortex, medulla, or both may cause congestion

and other pigment. These results are consistent with [25] observations that lymph node congestion and infections often coexist.

These results also suggest that parasite infections may be a contributing factor to lymph node congestion. According to his report [26], lymphangitis could be the underlying cause. Based on clinical and visual examination, it is understood that bacterial, viral, or fungal infections, as well as autoimmune diseases and cancer, are the causes of lymphadenopathy, or enlargement of the lymph nodes. Additionally, cyanosis-a reddish-blue color inside a lymph node-occurs in some places. This can be attributed to a variety of causes, such as increased tissue extraction or decreased arteriole oxygen [27,28]. The histology results revealed neutrophil infiltration along with considerable constriction of the pulmonary blood vessels and thickening of the alveolar wall. This result is consistent with [29], who found that inflammatory cells, such as neutrophils and phagocytic macrophages, accumulated in several lung lesions. This discovery also aligns with [30], who observed lymphatic tissue depletion exhibited as lymphatic. In addition, there is capillary blood vessel congestion and alveolar macrophages within the alveoli due to the bleeding. According to the latest research, lesions in the lung tissue of dead cattle exhibited a variety of macroscopic and microscopic features. Findings by [31] suggest that insufficient disease prevention and management in the region may be the cause of the elevated prevalence of echinococcosis in the Al-Hilla abattoir.

The histopathological results showed characteristics of peripheral fibrous tissue surrounding the hydatid cyst and infiltration of mononuclear cells, eosinophils, neutrophils, macrophages, and fibroblast, especially in adventitial and surrounding the fibrous layer. The lung tissue of cattle infected with cystic echinococcosis also showed features of chronic inflammation. Eosinophilia is a typical side effect of parasite infection, according to [32].

The hydatid cyst is surrounded by an adventitial layer, which is mainly composed of connective tissue and is created by the intermediate host in reaction to the parasite. Consistent with what was reported by [33, 34], the adventitial layer varies in thickness and may show some localized fibrosis due to the host's immunological response to the cyst as a foreign body. The germinal layer, which is the innermost cellular layer, is connected to the laminated layer, an acellular layer that is in close proximity to the adventitial layer. The lumen of the hydatid cyst is encircled by layers of parasite tissue and filled with hydatid fluid.

Hydatid cyst-infected cattle lung samples showed a fibrous tissue reaction (capsule) with tiny blood vessels. There were instances of diffuse or moderately intense cell infiltrations, despite the presence of mononuclear cell infiltrations as granulomas in certain regions. It was discovered that inflammatory cells had invaded multiple areas, especially on the inner side of the adventitial layer. The pulmonary tissue surrounding the cyst also showed signs of necrosis and dilated bronchi; these findings were also documented by [35,36]. Necrosis of the lymph nodes' medulla, which can result from a variety of illnesses, including inflammatory ones, also affected the lymph nodes. This is consistent with the claims stated in [37].

This study found evidence of bleeding, edematous fluid accumulation, and thicker capsule lymph follicular responses, all of which were reported in the histology analysis and confirmed by [38], so supporting the claim made by [30] that the highest ratio also indicated inflammation. A decline in the quantity and size of follicles with few to no germinal centers and/or a reduction in paracortical lymphocytes are two common indicators of lymphoid tissue loss [29]. It's possible for the paracortical lymphocytes to vanish and the stromal cells to take the lead. The illness is most likely the result of glucocorticoid injections, which is consistent with many of the cases reported by [29]. We also observed the presence of a large fibrotic zone that thickened the pulmonary blood vessel walls with foamy cells, replacing the pulmonary tissue. Current theories state that repeated, chronic micro-injuries to the alveolar pneumocytes are the cause of the sickness.

Examples of these microinjuries include viral infections and environmental pollutants. In response to epithelial damage, The cells that line the interstitial (resident mesenchymal cells, including alveolar fibroblasts), vascular (capillary endothelial cells, pericytes), and interstitial compartments of the lung are all damaged or stimulated. Furthermore impacted are local macrophages and the distal airway epithelium. Lung mesenchymal cells eventually divide and develop into myofibroblasts, which are known as the effector cells of fibrogenesis, following glycolytic reprogramming [39]. Whether the

increase in myofibroblast numbers in IPF (intra-pulmonary fibrosis) is due to the recruitment of circulating fibrocytes or the epithelial-to-mesenchymal transition is a matter of debate. Mesenchymal cells get activated due to the excessively stiff extracellular matrix produced by myofibroblasts (Bagnato and Harari, 2015) [40]. Lung fibrosis is defined by the abnormal matrix that is high in fibrillar collagen replacing the healthy, compliant, elastin-rich lung extracellular matrix, according to [41]. Different changes in the circulatory system are seen in the fibrotic and more preserved parts of the lungs with IPF. Thick fibrosis areas exhibit substantial declines in vessel density [42, 43]. The walls of the pulmonary arteries show thickening, medial hypertrophy, and intimal fibrosis. The pulmonary veins and venules exhibit reduced diameter loose and intimal fibrosis, as reported by [44] and [45].

Conclusion

We came to the conclusion that the respiratory system of cattle in the Babylon Governorate had a high number of pathological lesions based on the specimens collected; 60% of the specimens had hydatid cysts of varying sizes, while 16.7% had granulomatous lesions. The histopathological lesions included fibrosis (10%), pulmonary hemorrhage, and bronchial hyperplasia (6.7%). High percentages of bleeding and hemosiderin in the exanimated lymph node (33.3 and 26.7 percent, respectively) were found in the lymph nodes. Atrophy amounted to 23%, although necrosis was just 16.7%. Thus, the pathological lesions suggest inadequate hygiene practices and animals exposed to numerous inflammatory and poisonous substances.

Acknowledgment

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Conflicts of interest

The author declare that they have no competing interests

Funding statement

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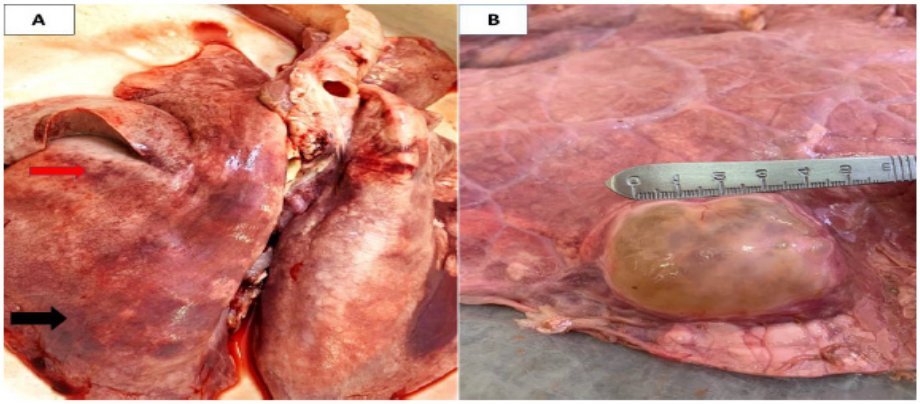

Fig. 1. Gross images of the cattle lung that include (A): several areas of ecchymosis hemorrhage (black arrows) and petechial bleeding (red arrows); (B) a big hydatid cyst (1–5 cm).

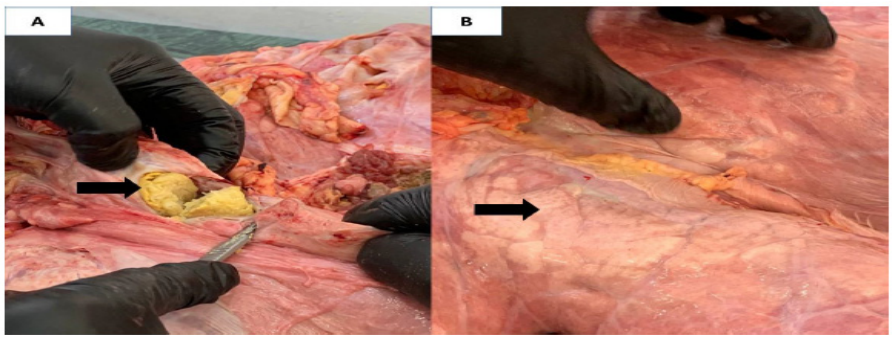

Fig. 2. Gross image of cattle lung (A) shown nodules of granuloma contain thick yellow caseated material covered by thick connective tissue capsule (black arrow). (B) large fibrotic region that resembles a consolidated white area (black arrow).

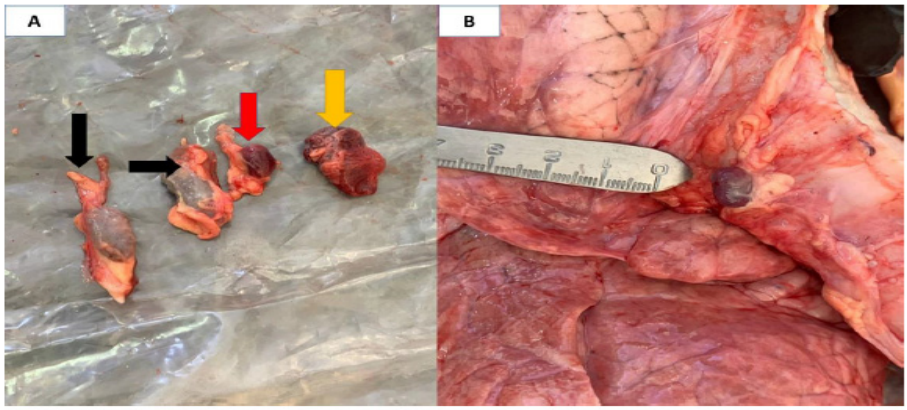

Fig. 3. Gross image of pulmonary lymph node in cattle demonstrating (A) widespread hemorrhage (yellow arrow), atrophy, and hemorrhagic (red arrow) gray staining (black arrow). (B) severe atrophy and hemorrhagic lymph node.

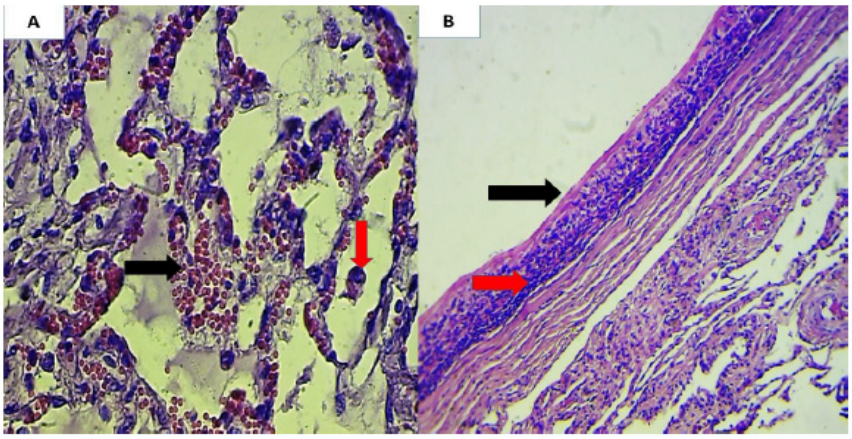

Fig. 4. Histopathological section of a cattle lung (A) demonstrating congestion of alveolar capillaries and hemorrhage inside the alveolar wall (black arrow) with alveolar macrophages present (red arrow). (H &E,stains 400x). (B) An infertile hydatid cyst in a cow's lung showed three layers: the adventitial layer (red arrow) had a high infiltration of inflammatory cells, and the cyst wall (black arrow) .(H&E, stain, 200x).

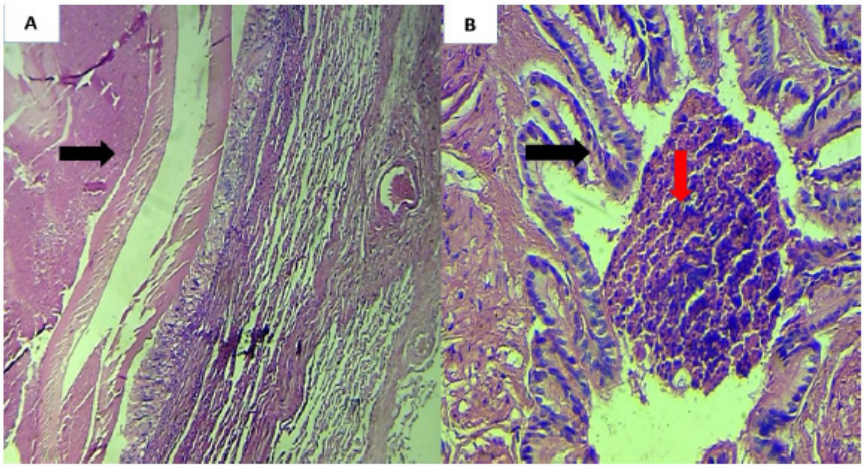

Fig. 5. Histopathological section of cattle lung (A) demonstrate an infertile hydatid cyst with large volume of fluid inside the lumen appear eosinophilic in color (black arrow). (B) demonstrating hyperplasia of the bronchiole-lining epithelium, which resemble finger-like structures (black arrows) and have purulent exudate inside of them (red arrow) (H & E, stain, 200x).

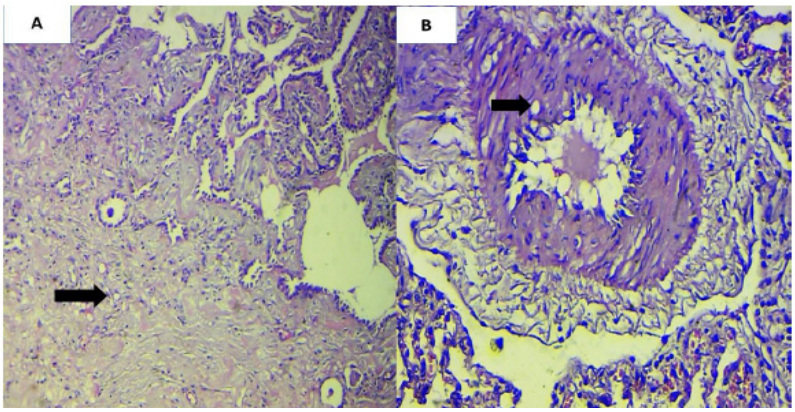

Fig. 6. Histopathology section of the cattle lung (A) displays the pulmonary tissue is replaced by a large region of fibrosis (black arrow) (H & E, stain, 200x). (B) pulmonary blood arteries with significant thickening and their wall contain foamy cells (black arrow) (H & E, stain, 400x).

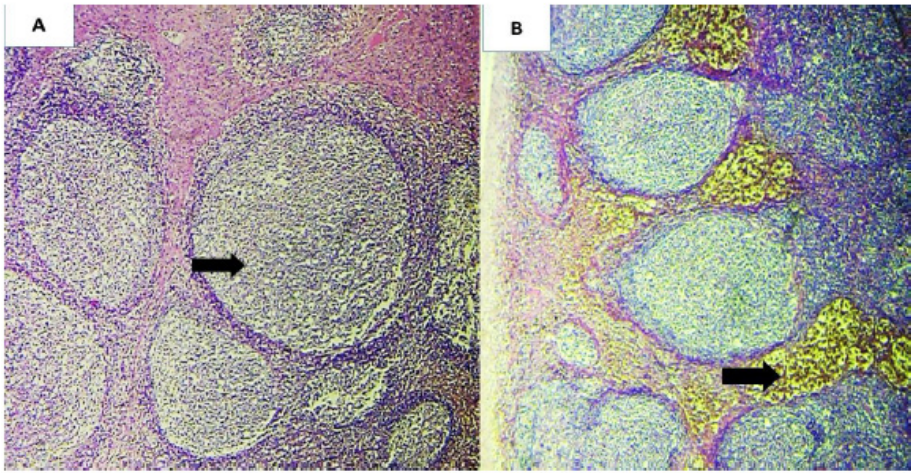

Fig. 7. Histopathological section of cattle bronchial lymph node (A) demonstrating follicular hyperplasia with a spherical follicular center encircled by broad lymphocyte mantles (black arrow), and (B) extensive sinus dilatation filled with red blood cells. (200X stain, H&E).

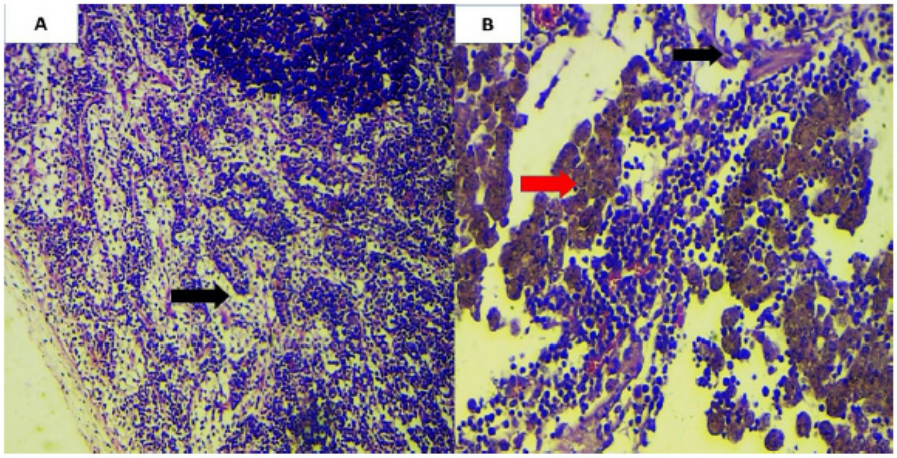

Fig. 8. Histopathological section of cattle lymph node (A): revealed hyperplasia in Sinus with increase histeocyte whose abundant cytoplasm give pale eosinophilic appearance (black arrow), with follicular hypoplasia (H&E, stain, 200X). (B) displaying hemosiderosis (red arrow) and severe necrosis (black arrow) (H&E, stain, 400X).

TABLE 1. Percentage of pathological condition investigated in cattle lung.

Pathological condition	Lung		
	No. of samples	No. of infected calves	(%)
Hydatid cyst	30	18	60
Granuloma	30	5	16.7
Hemorrhage	30	2	6.7
Fibrosis	30	3	10
Bronchial hyperplasia	30	2	6.7
P-Value		0.00**	
X^2		38.75	

TABLE 2. Percentage of pathological condition investigated in cattle lymph nodes.

Pathological condition	Lymph nodes		
	No. of samples	No. of infected calves	(%)
Hemorrhage	30	10	33.3
Atrophy	30	7	23
Necrosis	30	5	16.7
Hemosiderosis	30	8	26.7
P-Value		0.510396	
X^2		2.311111	

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حدوث الآفات المرضية في الرئة والعقد الليمفاوية المرتبطة بها في الأبقار المذبوحة في مسلخ بابل.

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الملخص

تشتهر مدينة بابل، إحدى محافظات العراق، بصناعاتها الزراعية والحيوانية. كان الغرض من الدراسةهو تقديم معلومات عن مختلف اضطرابات الجهاز التنفسي المرضية التي تؤثر على الماشية وتأثيرها على الموارد الحيوانية. تم جمع ثلاثين عينة من ابقار الذبح (ذكور واناث) من مسلخ الهاشمية والقاسم في محافظة بابل. تم فحص التغيرات المورفولوجية في الرئة والغدد الليمفاوية المرتبطة بها بعد الذبح ، وتم جمع عينات الأنسجة وإرسالها أخيرًا للتحليل النسيجي المرضي في حاوية بلاستيكية تحتوي على ١٠٪ من الفورمالين. كشف فحص التشريح المرضي للرئة بعد الذبح بنسبة ٦٠٪ عن وجود العديد من الأكياس العدارية، وكان العديد منها عبارة عن أكياس كبيرة يبلغ قطرها من ١ إلى ٥ سم. كانت ١٦,٧٪ من العينات مصابة بآفات حبيبية، والتي ضهرت على شكل مادة سميكة ذات غلاف أصفر اللون، كانت محاطة بمحفظة سميكة من النسيج الضام. بالإضافة إلى ذلك، هناك مناطق متليفة واسعة، وضمور بنسبة ٢٣٪، وبقع رمادية في العقد الليمفاويةا الرئوية. تضمنت نتائج الرئة من الناحية النسيجية احتقانًا كبيرًا في الأوعية الدموية الرئوية. ٦,٧٪ بروزات حليمية هو نتيجة تضخم الخلايا الظهارية المبطنة للقصبات الهوائية. كانت هناك بلاعم محملة بالهيموسيديرين (٢٦,٧٪) وتضخم جريبي مع مركز جريبي كروي محاط بحزام لمفاوي واسع في العقدة الليمفاوية التي تم فحصها مع نخر شديد (١٦,٧٪).

الكلمات المفتاحية: مرض الرئة، بابل، الجهاز التنفسي، الأبقار، الورم الحبيبي، الكيس المائي.