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Pulmonary and Hepatic lesions in slaughtered sheep in Mosul city

Hadeel Basim Thannon
Department of pathology , College of Veterinary Medicine , University of Tikrit , Tikrit , Iraq

Abstract
The aim of study was designed to determine the prevalence rates, gross and histopathological lesions of lungs and livers in sheep slaughtered house at Mosul city. 9127 slaughtered sheep were examined During April and May 2014. 1235 infected carcasses were observed harboring different pathological gross lesions in the lungs and livers with 10.26% and 3.26% prevalence rates. The highest prevalence rates of gross pathological lesions of the lung were pneumonia of various types and the lightest was observed in T.B-like lesions was 3.34% and 0.04% out of total slaughtered sheep, respectively. In the affected livers, peak and the lowest prevalence of gross lesions were 0.77% for fascioliasis and 0.14% for enlarged and pale livers out of the total sheep ante-mortem inspected, respectively. However in the lungs, different rates of histopathological lesions were recorded for interstitial pneumonia, edema, emphysema, bronchopneumonia, atelectasis, verminous pneumonia, granuloma, necrosis and hemorrhage in variable percentages. As concerned with the liver, these microscopc lesions were coagulative necrosis, hepatic congestion, hydatid cysts, hemosiderin deposition, sinusoidal congestion, vacuolar degeneration and infiltration of inflammatory cells forming various rates. Uniform pathological observations and similar remarks of microscopical changes having identical description and morphological features were entirely demonstrated as explained in pathology references.

Key words: gross, histopathology, lesion, liver, lung, sheep, prevalence, Mosul.

Introduction
The respiratory system constitutes an important entity of animal body connecting directly with external environment, However, the responses of this system to any insult or in the wake of disease largely established structural and functional complexity of the system. Pneumonia (of different types), pulmonary abscess, pleurisy (adhesion), emphysema, hydrothorax, empyema, pulmonary tuberculosis, melanosis and parasitic infestations are the main pulmonary pathology of the contractected sheep [1]. The liver is the largest gland having numerous functions including circulatory, excretory, metabolic, defensive and hemopoietic [2]. The liver disease are reflected by gross and histopathological changes involving size, shape , colour, texture and continuity due to inflammation, degeneration which may be congenital , nutritional, vascular or neoplastic [3]. Some of lung and liver lesions are zoonotic and many others are of economic impact [4]. Such affections can be well identified through keen meat inspection process and the diseased organs are strictly condemned to protect both public and animal hygiene [5]. Similar to other organs of the body, the pathological lesions of the lung and liver could be due various biological agents such as parasites (e.g. *Cysticercus tenuicollis*, hydatial cysts [6], *Fasciola hepatica* [7], *Dicroccelium dertriticum* [8], viruses; bacteria (e.g. *Fusobacterium necrophorum* biovar A, B. ; *Escherichia Coli*, *Clostridium perfringens* which are responsible for abscess formation [9] as well as mycoses [10]. Other abiotic factors answerable for abscess formation of the lambs may be due to frequent occurrence of ruminitis as well as their feeding with concentrate rations [11]. Also, dietary cobalt deficiency may lead to fatty change [12]. However, this hypothesis was on firmed later in the etiology of white liver disease and ovine chronic hepatitis were observed in outbreaks of rations deficient with cobalt [13,14]. Various prevalence rates of lung and liver lesions were reported in overall the world within the country and even in the some local area. Such variations require multiple, continuous and urgent studies to find out these changes and their etiology. The current work was designed to elucidate the prevalence gross and microscopical pulmonary and hepatic lesions of sheep slaughtered in Mosul city as well as histopathological demonstration and description of these lesions. Also we found that different type of disease that affected the lung and liver is occurs due to effect of environment or host defense mechanism[2,3,10] ,and the inflammations of lung which may be appear as a nodular reactions , and inflammations of liver which known as (hepatitis)which also may acute or chronic, and also the necrosis and congestion which affected the lung and liver and lead to gross and microscopic changes .and finally cause economic losses for sheep slaughtered in Mosul city.

Materials and Methods
The study was conducted on 9127 sheep presented from different locations of Ninevah governorate for slaughter at Mosul city. These animals were slaughtered during the whole months of April and may 2014 and were inspected. After slaughtering, samples were collected from lesions of infected lungs and livers in clean plastic packs and were transferred in a cool box to a private laboratory for further investigation of gross and histopathology. Histological examination was carried out by trimming the specimens from the infected organs with a knife into about 1cm size and in several times the whole organ and were fixed, dehydrated, cleared and impregnated in melted paraffin. After impregnation of the samples, they were blocked with paraffin wax. Later, the prepared blocks were sectioned by rotary microtome into 4-6 *M* of thickness. Subsequently the ribbons were stained with haematoxylene and eosin

applying routine procedures as described by [15]. All slaughtered sheep were of local breed, mostly male young Awassi with few exceptions of aged ewes.

Results

Gross pathological lesions examination:

Out of 9127 sheep examined pre-slaughter, 1235 carcasses were found to be infected by gross lung liver lesions at post-mortem inspection with 13.53% of the total number of examined sheep (table1). The table also revealed that numbers and percentages of lungs harbouring gross pathological lesions were more than their counterparts of liver which were 937, 10.26% and 3.26%, respectively.

Table (1): Number and percentage of gross lung and liver pathological lesions of slaughtered sheep

Organ affected	Total infected	% of total infected	%of total examined
Lung	937	75.87	10.26
Liver	298	24.13	3.26
Overall	1235		

It is obvious that number of pneumonia cases (of different etiology) was the most prominent pulmonary lesions (305) forming 3.34%, followed by abscess (214) constituting 2.34%. The less number of pathological lesion was atelectasis occurrence and the least was tuberculous- like vesides which formed only 0.42% of total infected lung and 0.04% of total examined carcasses. Other pathological lesions were noted in variable percentage (table 2).

Table (2): Type, number and percentage of gross pathological lesions of affected lungs of slaughtered sheep

Type of pathological lesion	Total infected	%of total infected	% of total examined
Abscess	214	22.83%	2.34%
Hydatid cyst	167	17.82%	1.82%
Pneumonia (of various types)	305	32.55%	3.34%
Adhesion	32	3.41%	0.35%
T.B.-like lesion	4	0.42%	0.04%
Luaguworm infestation	116	12.37%	1.27%
Tumer 9of unidentified origin)	8	0.85%	0.08%
Coagestion	74	7.89%	0.81%
Atalectasis	5	0.53%	0.05%
Emphysema	12	1.28%	0.13%
Total	937		

Concerning the liver the result indicated that the variation in pathological occurrence ranged from the lowest 4.36% which was due to enlarged and pale livers up to the highest (21.47%) which was due to fascioliasis (4.36%). Also, congestion still reports 0.69%. Approximate findings were detected between abscesses and hydatid infection with 0.49% and 0.47% occurrence, respectively (Table3).

Table (3): Types, numbers and percentages of gross pathological lesions of affected livers of slaughtered sheep.

Type of pathological lesion	Total infected	%of total infected	% of total exarimed
Fatty changes	18	6.04	0.19
Single and diffuse abscesses	45	15.1	0.49
Hydatid cysts	43	14.42	0.47
Fascioliasis	64	21.47	0.7
Necrosis	52	17.44	0.57
Enlarged and pale livers	13	4.36	0.14
Congestion	63	21.14	0.69
Total	298		

Histopathological findings:

1- Liver

Hydatid cyst: The histopathlogical changes of hepatic hydatis cysts showed that these cysts had three layers which were the germinal, laminated and the capsule with vacuolar degeneration and hypertrophy of kupffer cells. In the hydatid cysts of lung, the contracted lungs revealed emphysema associated with infiltration of mononucleated inflammatory cells and atelectasis. Some lungs had daughter cells originated from germinal layer. Also, collapse of pulmonary tissue of lungs were shown with lungs containing cysts (Figure 1).

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Figure (1): sheep liver showing many variable size of hydatid cyst

Necrosis: The affected livers showed centrolbular coagulative necrosis infiltrated by intermediate inflammatory cells. (it can be seen with the naked eye)

Congestion: The affected livers are manifested by central and sinusoidal congestion, some lesions showed haemosidrin deposition (Figure 2).

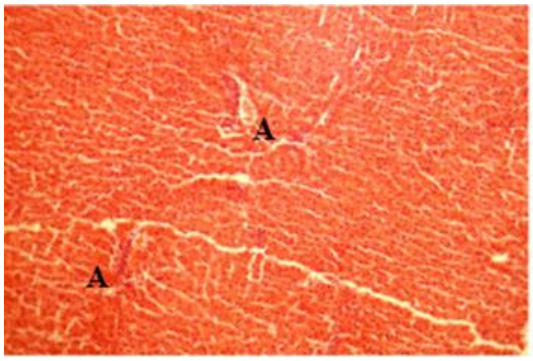

Figure (2): Microscopical changes of liver section of sheep showing sinusoidal congestion (A) H&E staining. magnification

2- Lung:

Pneumonia: Pulmonary parenchyma showed gray consolidation with inflammatory exudate mostly composed of lymphocytes, plasma cells and macrophages interfered with hyperemic blood vessels. In some cases, sloughing of bronchial epithelium and exudate present in the lumen bronchi associated with pulmonary edema and emphysema with infiltration of inflammatory cells in pulmonary tissue (Figure 3).

Figure (3): sheep lung showing late stage of sub-acute interstitial pneumonia appears as gray in color (gray consolidation)

Lungworms infestation: These lesions manifested by presence of adult and larval stages of lungworms within bronchi and pulmonary with inflammatory exudate mostly composed of plasma cells and esinophils. Microscopically, hyperemic blood vessels are prominent in thee lesion. (figure 4).

Figure (4): sheep lung showing verminous bronchopneumonia manifested by presence of worms in some of air ways

Tuberculous – Like lesions: The lung affected with these lesions show granulomatous inflammation with necrotic central area deposited by calcium granules (figure 5, 6).

Figure (5): sheep lung showing granulomatous nodules which consist of central area of necrosis and deposition of calcium salts

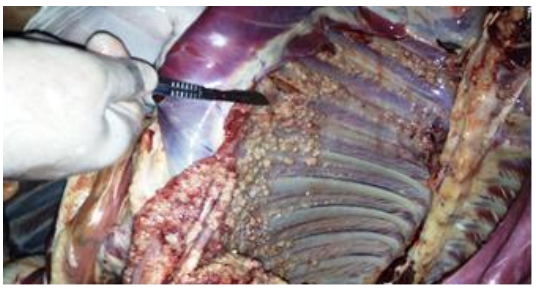

Figure (6): sheep lung showing variable size of granulomatous nodules attaches to wall of ribs.

Abscess: Lung sections exhibit liquifactive necrosis infiltration with neutrophils and surrounded by fibrous tissue capsule (Figure 7).

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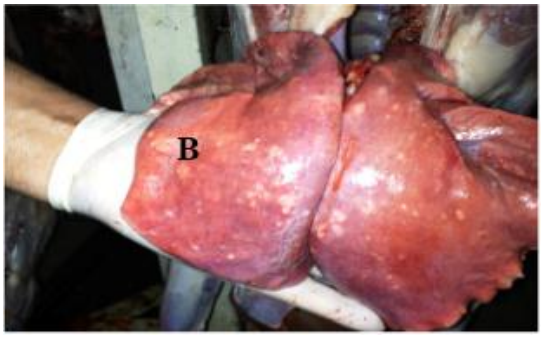

Figure (7): sheep lung showing many variable area of absses

Histopathological Findings:

1- Lung:

Table (4) explains microscopical changes of pathological lesions of the total examined lung specimens, which were different related cases. The highest percentages of these lesions in frequency order were 38.8%, 32.8%, 24.9% and 23.4% for chronic suppurative bronchopneumonia, pulmonary emphysema, acute interstitial pneumonia and congestion, respectively (Table 4).

Table (4): Types, numbers and percentages of histopaological lesions of affected lungs of slaughtered sheep

Type of histopathological lesions	Total infected	% of total infected	%of total examined
Acute interstitial pneumonia	234	24.9	2.56
Pulmonary oedema	157	16.7	1.72
Pulmonary emphysema	308	32.8	3.37
Actue bronchopneumonia	70	7.4	0.76
Pulmonary atelectasis	43	4.5	0.47
Chronic pleuropneumonia	17	1.8	0.18
Verminous bronchopneumonia	96	10.2	1.05
Granulomatous inflammation	3	0.3	0.03
Consolidation	52	5.5	0.56
Liquifactive necrosis	107	11.4	1.17
Chronic suppurative bronchopneumonia	364	38.8	3.98
Pulmonary haemorrhage	35	3.7	0.38
Congestion	220	23.4	2.41

Suppurative bronchopneumonia showed exudate in alveoli and bronchi, bronchial epithelial hyperplasia and mononuclear intra and peri bronchial infiltratration dominantly with neutrophils (figure 9). Samples of interstitial pneumonia exhibit severe inflammatory cell infiltration in the interstitial tissue, beside alveolar bronchial epithelial hypertrophy (Figure 8).

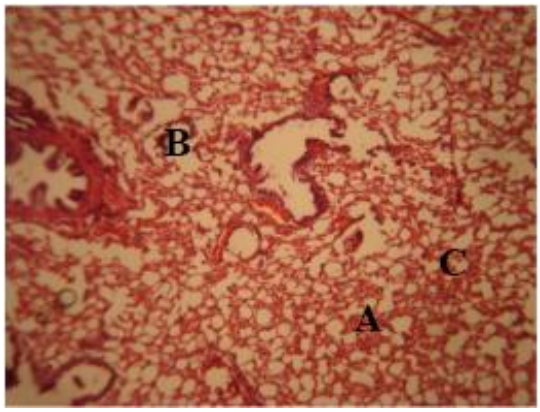

Figure (8): microscpical changes of lung tissue section in sheep showing acute interstitial pneumonia manifested by infiltration of acute inflammatory cell (A). Pulmonary edema (B), and emphysema(c). H&E Staining. magnification (115 X)

Lower occurrence were found with granulomatous inflammation, chronic pleuropneumonia, pulmpnary haemorrhage, atelectasis and consolidation having percentage of 0.3%, 1.8%, 3.77, 4.5% and 5.5%, respectively (Table4).

The granulomatous lesions had central pale pink-coloured necrotic area surrounded inflammatory cells principally with epitheloid and giant cells and areas of fibrosis. Calcium granules precipitated in lung tissue irregular violet-coloured bodies (figure 9).

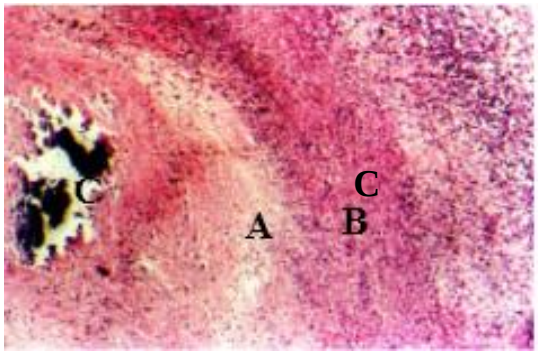

Figure (9): photomicrograph of lung section in sheep showing granulomatous inflammatory reaction which consists of necrotic area (A) surrounded by inflammatory zone and deposition of with calcium salts in necrotic tissues as black granules (c). H&E Staining. Magnification

Lesions of chronic pleuropneumonia exhibit hepatized area with epithelial desquamation, mononuclear cellular infiltration filling the alveoli, bronchi and peribronchial. Bronchial epithelial endure hyperplasia (Figure 10).

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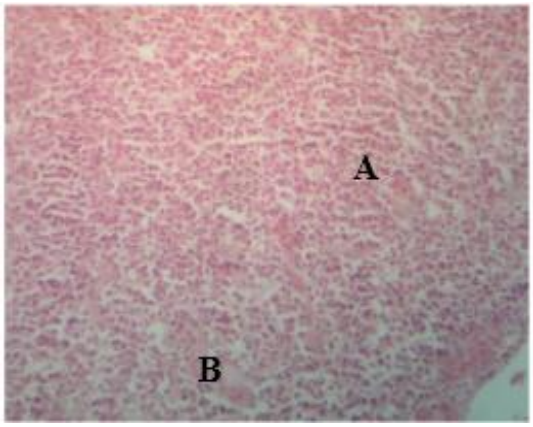

Figure (10): Microscopical changes of lung section in sheep at late stage of sub-acute interstitial pneumonia (gray consolidation) showing sever infiltration of different chronic inflammatory cells (A) and exudates (B). H&E Staining. magnification (265X).

Liquifactive necrosis represented 11.4% of the total affected lungs which manifested by the presence of pinkish amorphous substance in the lung parenchyma with leucocyte infiltration chiefly neutrophils surrounded by fibrous tissue capsule (figure 11).

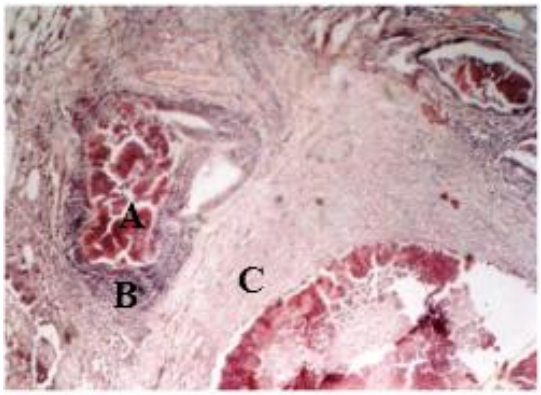

Figure (11): Microscopical changes of liquifactive necrosis in lung section of sheep showing abscess (A) which surrounded by zone of inflammatory cells (B) as well as fibrous connective tissue as a capsule (C) staining H&E. magnification.

Different pathological lesions were observed including pulmonary oedema (figure 12).

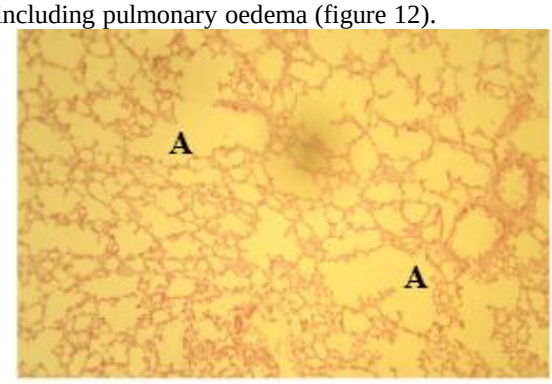

Figure (12): Microscopical changes of lung section in sheep showing massive pulmonary emphysema (A). H&E staining. magnification (165X).

Acute bronchopneumonia and congestion, with variable percentages histopathologicaly showing bronchits manifested by sloughing of bronchial epithilum and exudate in the lumen of the bronchi. And pneumonia manifisrted by sever infiltration of inflammatory cells, Pulmonary edema and pulmonary emphysema(C). (Figure 13).

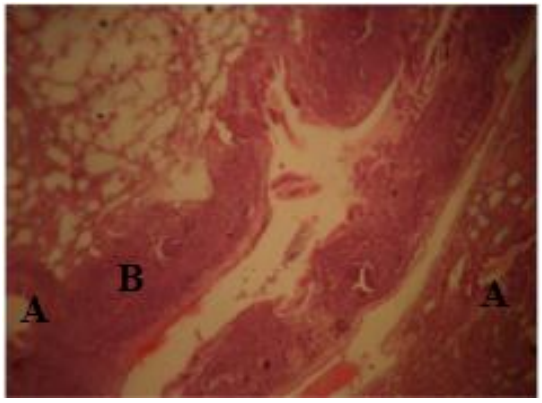

Figure (13): Microscopical changes of lung section in sheep showing acute bronchopneumonia manifested by inflammatory reaction of both bronchitis(A) and pneumonia (B) staining H&E. magnification (165X)

Verminous pneumonia constituted 0.2% of the microscopical findings manifested by the presence of adult and/or larval stages of lungworms within bronchi and pulmonary tissues. Inflammatory exudate basically composed of plasma cells and eosinophils and hyperemic blood vessels (figure 14).

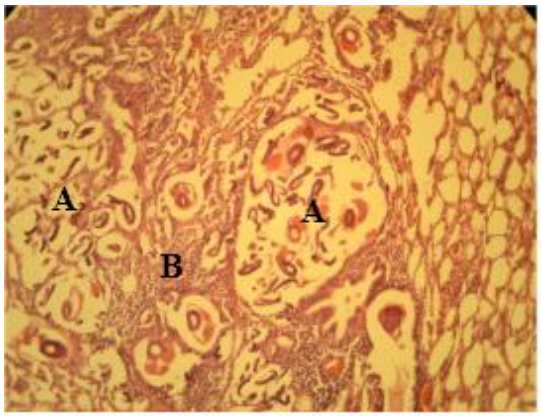

figure (14): Microscopical changes of lung section in sheep showing verminous bronchopneumonia manifested by presence of adult and larval stages of Long worms within bronchi and pulmonary parenchyma(A). and eosinophilic inflammatory reaction(B) H&Estaining. magnification (200X).

Hydatid cyst of lung were manifested by emphysema associated with infiltration of mononucleated inflammatory cells and atelectasis. Three layers were seen which were germinal laminated and the capsule collapse of pulmonary tissue were shown with lung containing cysts. (Figure 15).

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Figure (15): photomicrograph of lung in sheep showing different variable size of hydatid cysts.

Liver:

The histopathological changes of hepatic hydatid cysts showed three layers which were germinal , laminated and capsule with vacuolar degeneration and hypertrophy of Kupffer cells (figure 16).

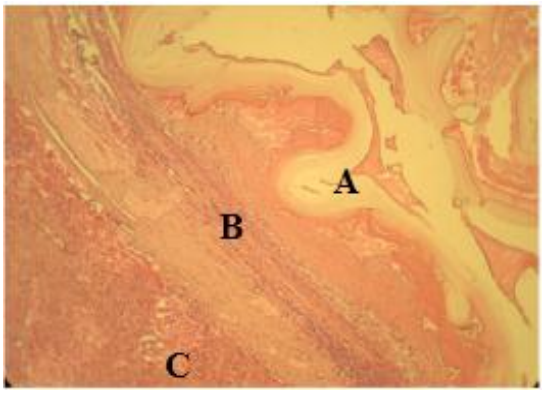

Figure (16): Microscopical changes of liver section in sheep effected with hydatid cyst showing large hydatid cyst (A) surrounded by chronic inflammatory zone (B) and fibrous connective tissue as capsule (C). H&E. Staining. magnification (40X)

These lesions formed 14.4% of all liver lesions (Table 5). showed the higher frequency in order of hepatic lesions were infiltration of inflammatory cells, vacuolar degeneration and sinusoidal congestion having the percentages of 20.8%; 16.7 % and 12.4% of all microscopically examined contracted livers.

Table (5): Type, number and percentage of histopathological lesions of affected livers of slaughtered sheep

Type of histopathological lesions	Total infected	%of total infected	%of total examined
Coagulative necrosis	35	11.7	0.33
Chronic hepatic congestion	16	5.3	0.01
Hydatid cysts	43	14.4	0.47
Haemosedrin deposition	26	8.7	0.28
Vacuolar degeneration	50	16.7	0.54
Sinusoidal congestion	37	12.4	0.4
Infiltration of inflammatory cells	62	20.8	0.68

The affected livers suffered from congestion manifested by central and sinusoidal congestion. Coagulative necrosis represented by 11.7% and was manifested by centrolobular lesion infiltrated by intermediate inflammatory cells

Haemosiderin deposition had 8.7% percentage of the examine affected lungs (table 5).

Discussion

It was found that most hydatid cycts were observed in lungs (17.16%) versus the liver (14.42%) which resembled to the explanation of occurrence stressed by [16]who stated that about 70% of hydatid cysts exist in the lungs and 25% were present in the livers. The prevalence of hydid cysts were slightly higher than those noted earlier by several local investigators in Mosul abattoir which were 9.3% [17]; 7.3% [18] and 5.5% [19] but in accorodnce with 15.5% recorded by [20] of Duhok slaughter house. It was noticed that 15.1% of the affected livers has single and diffuse abscesses which is much lower than those reported in Jordan sheep [9] and Iraqi sheep [21]. Such dissimilarity is plausible and acceptable which, may be attributed to differences of animal husbandry, age and body resistance of the sheep [22]. Generally, in Iraq and elsewhere, ascrtainment rate of pathological lesions may be affected by season, climate, rainfall level, routes of husbandry, feeding regimen as well as variable numbers of animals slaughtered due to local tradition and religious feasts and socio-economic and cultural backgrounds [17,20]. Apart from environmental factors, other important agents play major roles such as types and strains of bacteria and their virulence, the immunological status of the body, the nutritional content of the ration and animal management followed Consequently, hydatidosis depends on the age and immunoresponse of the host [23]. The feeding *i.e.* lack of macro or microelements has an important role in the formation of hepatic abscess [24]. It was mentioned previously that animals reared under intensive methods of feeding e.g. barley had accompanied by liver abscess [25]. In young animals, liver abscesses may occur as a sequel of an umbilical infection but in all ages they may occur in cases of pyaemia as well as low vitamin A content of the diet [4]. Generally, the histopathological findings observed in this study were in agreement with these described in several scientific literature [26,1]. The alveolar emphysema and pulmonary collapse usually accompany pneumonic lesions [1]. The microscopical change, of lung lesions indicated high occurrences of different types of pneumonia involing suppurative bronchopneumonia,

interstitial preamonia, verinous bronchopneumonia and chronic pleuropneamonia among other pulmonary lesions. Those observations were basically explained by other workers [27,28,29]. This phenomenon confirmed other interpretations that lung infections are common in domestic ruminants, especially when these herbivores are conducive to adverse environmental conditions [30]. Also, pneumonia is often a major economic problem when the sheep are kept close either indoors or in yards [25]. Unfortunately, pneumonia is the most important cause of condemnation of sheep lungs [4]. Unlike hepatic dysfunction, symptoms of respiratory diseases can easily be detected pre-slaughter. Calcification of necrotic-lung lesions and existence of haemosiderin pigments were related with pulmonary congestion or haemorrtage which were observed in this study. Although a classical stain (Haemosiderin easin) was used, differentiation between haemosiderine and other substances was well confirmed. Caseous necrosis and calcification can be seen in association with specific inflammations e.g tuberculcsis and abscessation. Consequently granulomatous lesions resembling those of tubereulosis with the typical histopathological observations as demonstrated by [31,32,29] were detected in 0.3% of the total infected lungs . Such record of discovery of postmortem is regretful because tuberculosio is a serious zoonotic malady that can be transmitted to human beings. In spite of the fact that, only three cases of unidentified tuberculosis were found in sheep lungs, such low incidence should be regarded as important and should be tackled. Confirmation is required by study the biochemical reactions and other related test of cultured bacteria as well as special stain should be used e.g Ziehl Neelsen stain. Microscopical features of pathology of verminous pneumonia revealed that alveoli accommodated with unrecognizable slits which all lying parallel. These notes are similar to that explained by [33]. Atelectasis is related with air passage obstruction by the worms and exudates leading to pulmonary collapse to which alveoli are the smallest easily compressed parts of the lung [34]. In some cases, too large alveoli with many opernings were observed which was mentioned earlier by [35].

The histopathological findings of the liver indicated various pathological lesions i.e. necrosis, congestion, hydatidosis, pigment sedimentation, degeneration and infiltration of inflammatory cells with variable percentages. In the current study, lower prevalence rates of liver lesions were recorded as compared with several local studies which revealed different prevalence rates [19,21]. Differences in lesion occurrences may be attributed to bulk factors such as lack of adaptation to a high concentrates , variation in feed intake patterns and feeding behavior of low amount of fibers in the ration beside temporary seasonal and geographical variations [24] as well as sample size, period of study, breed, age, sex, body condition score and origin of animals which affect the appearance of gross lesions with consequent reflecting of these impacts to the histological manifestations of these insults. Nonetheless, these microscopical changes were typically reported in text-books of basic, general and specific pathology [3,36]. Comprehensive histopathological findings of all studies associated with liver lesions were clearly observed in changeable rate. However, the some comments of microscopical changes having identical description and morphological features were exactly noted in the present study alongside with other related works [1,37,38]).

It can be concluded that although the sheep slaughtered are apparently healthy, large perceatages were found either to harbor certain pathological lesions or being infected with different diseases . However, some of these abnormalities detected in this study is helminthic zoonosis (hydatidosis) or badterial zoonosis (T.B) which impose a serious impact on human health. Contextually, thousands of sheep are daily sacrificied in Iraq for various purposes with subsequent exaggeration of their risks. A suggestive study should be undertaken to determine the etiology of those lesions and to investigate their possible role in zoonosis as well as to evaluate their economic losses reflected by partial trimming of the affected organs or even the total condemnation of the infected carcasses.so that in this study we find that the disease of lung and liver causes significant losses of trading on sheep industry with high cost in treatment and diagnosis [39]. So that the disease of liver and lung will lead to decrease growth performance of animal.

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افات الرئة والكبد في الاغنام المذبوحة في مدينة الموصل

هديل باسم ذنون

فرع علم الأمراض ، كلية الطب البيطري ، جامعة تكريت ، تكريت ، العراق

الملخص

هدفت الدراسة الى تحديد نسب انتشار الافات العيانية والنسجية لرئة وكبد الاغنام المجزورة في مدينة الموصل. حيث تم فحص 9127 ذبيحة اغنام للفترة بين نيسان وايار من العام 2014, وجد بعد الفحص ان 1235 ذبيحة مصابة تحوي آفات عيانية مختلفة المنشأ في الرئة والكبد بنسب انتشار 10.26% و 3.26% على التوالي. وسجلت اعلى نسب انتشار لافات ذات الرئة بمختلف انواعها, وادناها آفات مشابهة للسل حيث بلغت 3.34% و 0.04% من الذبائح الكلية المفحوصة وعلى التوالي. اما في الأكباد المصابة، فإن اعلى نسبة انتشار للافات المرضية العيانية هي 0.7% للاصابة بديدان الكبد و 0.14 % للاكباد المنتفخة الشاحبة من جميع ذبائح الاغنام المفحوصة. اما الافات المرضية النسيجية في الرئة فهي ذات الرئة الخلالية والانتفاخ الرئوي وذات الرئة القصبي والانخماص وذات الرئة الطفيلية والالتهاب الورمي الحبيبي والنخر والنزف والتي كانت بنسب متباينة, وشملت الافات المرضية النسجية في الكبد على النخر التجلطي والاحتقان الكبدي والاكياس المائية وترسب صبغة الهيموسيدرين واحتقان الجيبانيات والتنكس الفجوي وارتشاح الخلايا الالتهابية وحيدة النواة بنسب مختلفة.

الكلمات المفتاحية: آفات مرضية عيانية، نسجية، رئة، كبد، اغنام، نسب انتشار، الموصل.