

## Epidemiological and clinical studies on respiratory affections of sheep

By

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### Abstract

Respiratory affections of sheep considered as One of the most serious problems affecting sheep production and causing sever economic losses. In ths study we study the pattern of respiratory affections occurrence in sheep flocks of different breed . we concluded that repiratory mainfestation occure in two manner the first one is sever with fever, cough , mucopurulent nasal discharge and depression with high chest abnormal sound. The other from was less sever with prolonged cough and thick muciod discharge and poor weight gain. The relation between the incidence of respiratory affections occurrence and pattern of sheep rearing , season, age ,sex and breed had been studied. The end result showed that significant correlation between the incidence of the respiratory affections occurrence and first three factors but non significant correlation with the last two factors. The pathological changes in lung tissue had been studied in relation to etiology to determine the severity of affection of the aetiological agent.

Key words

Sheep, respiratory affection, epidemiolgy.

### Introduction

Respiratory affections occur frequently in sheep. In many countries respiratory diseases represent the most serious sheep problem and can be an important cause of death and reduced productivity (Martin, 1996). Respiratory disorder appears to be a complex disease. Many infectious agents synchronized with stress and/or environmental factors responsible for such disease causing a considerable level of economic losses of the infected animals (Alley, 1975; Al-darraj et al., 1982 and Sharma and Woldehiwet, 1991). Some management and husbandry circumstances predispose sheep to outbreak of respiratory disease (Martin, 1996). The infection rate increased during temperate months (December, January and February). This due to stress of cold weather and rain (Nadra, 1998).

The fundamental goal of the present work carried out to :

- 1- Clinical description of the respiratory affections manifestation in sheep .
- 2- Epidemiological study of the pattern of respiratory affections in relation to age, sex, breed, season and the pattern of sheep rearing.
- 3- pathological study of changes occur in pneumonic lung of sheep.

### Materials and Methods:

*Animal and history:*

542 Living sheep of different ages, sexes and breeds (Braky-Rhmany- Baladi) were examined clinically in the field for investigation of the animals which suffered from signs of respiratory manifestation [ nasal discharge (serous – mucoid - mucopurulent), lacrimation, coughing and abnormal lung sound by auscultation ]. Those animals were reared in private farms at desert road and Sadat City others were reared in mobile flocks at Kafer Dawood village, Wadeielantron village and Elrahhab village).

Sheep reared in the private farms were reared in properly ventilated pens at night and during the day they kept in wide yard with hygienic condition and good plane of nutrition in which the sheep fed daily on 1.5 kg concentrates plus hay or green bresseem also they were administrated broad spectrum anti-parasitic drug at regular interval as well as they vaccinated against clostridial diseases. But those of mobile flocks were reared in bad hygienic conditions, poor nutrition. As they graze along the day on any area contain any herbage at night they kept with other flocks in narrow and poorly ventilated pen with moisten earthy ground.

Dead sheep at farms and slaughtered sheep at abattoirs were subjected for postmortem examination, for collection of pneumonic lung that showing different degree of pneumonia (congestion, consolidation and hepatization).

*Clinical examination of Animals:*

Every sheep showing signs of respiratory disorder was examined. This examination include recording of temperature, observation of nasal and ocular discharges and mucus membrane and finally auscultation of the chest by stethoscope to recording any abnormal sound. This examination also performed to apparently healthy sheep. Age, sex and breed of each animal have been recorded according to (Radostitis et al., 2000a). The postmortem finding of freshly dead or emergency slaughtered animals were recorded. Although all lungs of slaughtered sheep at abattoir were examined for detection of pneumonic ones. 100 lung showing various degree of pneumonia collected from freshly slaughtered animal at El-Bassatin and El-Moonib abattoirs, plus about 20 lung that apparently free from any pathological changes (normal lung). Also lung of 5 dead sheep at farm from pneumonia were collected separately in sterile plastic bags and transported to laboratory in an ice tank within two hours of collection. Tissue samples were fixed in 10% neutral buffered formalin for histopathological examination.

**Histopathology of pneumonic lung tissues:**

Carried out according to Bancroft and Gamble, 2002

*Statistical analysis:*

Statistical analysis was performed using Chi- square test ( $X^2$ ) according to (Hill, 1979).

### Results:

#### *Description of the clinical signs associated with respiratory disease of sheep: -*

135 animal from 542 sheep showed various signs of respiratory disorder. 83 sheep from it showing sever respiratory signs that includes fever (temperature ranged from 40°C to 42°C) with anorexia, depression and usually separated from the flock. All these sheep showing bilateral mucopurulent nasal discharges and crusting around the nostrils fig. ( ) and lacrymation. Mouth breathing in most cases as well as cough is prominent and frequent and usually associated with expulsion of nasal discharges after coughing. Chest auscultation reveal exaggerated vesicular sound in some cases. In other cases moist rales with gargling sound was presented. In other cases no lung sound can be heard over the lung area.

52 sheep exhibiting respiratory signs consisted of thick mucopurulent nasal discharges and seromuroid nasal discharges fig (2) with intermittent cough. The body temperature about 39.5°C, but chest auscultation in most of cases reveals dry rales and frictional sound.

#### **Post mortem examination:**

The post mortem examination of diseased sheep lung in which *Pasteurella haemolytica* was the main isolate showing sever congestion allover the lung with bright purplish solid areas. Also the lung was heavy, edematous with petechial hemorrhage over the lung, in the trachea and in the heart Figure ( ). Other cases showing sever congestion with hepatization of the ventral part of diaphragmatic lobe. Figure ( ). Other cases only showing sever hyperemia and edema of the lung .

The post mortem examination of diseased sheep lung in which *Pasteurella multocida* was the main isolate Showed congestion with petechial hemorrhages and marked emphysema .

The post mortem examination of diseased sheep lung in which other bacterial agents were the main isolates showing various degree of congestion and grayish discoloration of the lung with echymosis and sometimes blackish discoloration of lung tissue that indicating necrosis also emphysema might be present.



**Fig. (1):** Sheep showing nasal crusting with mucopurulent nasal discharge.



**Fig. (2):** Lamb showing unilateral mucopurulent nasal discharges with depression.

Epidemiological findings of respiratory affections of sheep:

1- Morbidity rate and mortality rate and Case fatality percent:

The morbidity rate was 24.9%. The mortality rate about 1% while the case fatality percent was about 3.7%.

2- Effect of region and pattern of sheep rearing in diseased condition and bacterial isolation fig. (5):

The percentage of diseased sheep from the mobile flocks was 27.7% and the percentage of bacterial isolation was 83.18%. The percentage of diseased sheep from housed sheep was 17.76% and the percentage of bacterial isolation was 16.8%. The statistical analysis showed that the percentage of both diseased condition and bacterial isolation is Significantly correlated to pattern of sheep rearing as the  $\chi^2$  at  $P = 0.05$  was 4.398 and 5.76, respectively.

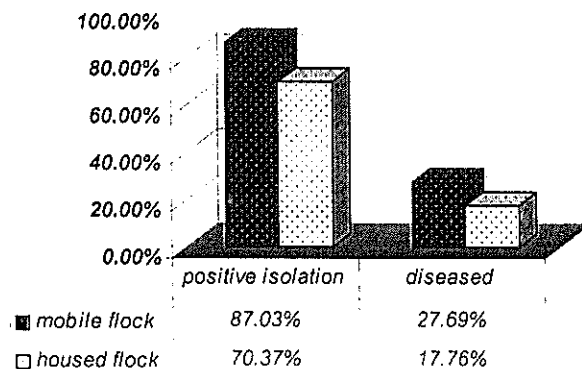


Fig. (5) illustrate the percent of diseased animal and percent of bacterial isolation in both housed and mobile flocks.

3-Effect of season on diseased condition and bacterial isolation fig. (6):

This study carried out during the period extended from the summer of 2005 to spring of 2006. The percentage of respiratory affections in each season and the percentage of bacterial isolation during each season recorded. Statistical analysis showed that the percentage of the disease and percentage of isolation Significantly correlated to the season of the year.

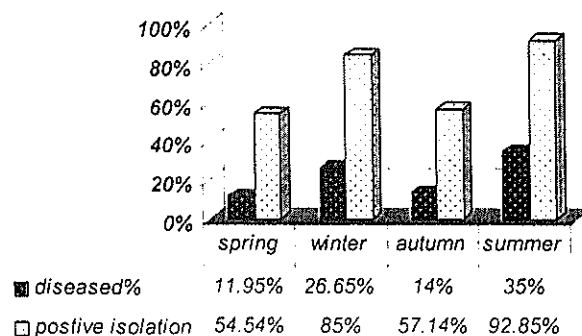


Fig (6) The percent of diseased animal and the percent of bacterial isolation in relation to season of the year.

4-Effect of age on diseased condition and bacterial isolation fig. (7):

The percentage of diseased animals and bacterial isolation from lamb and adult sheep from the total sheep. The percentage of disease in lamb was 32.25% and the percentage of bacterial isolation was 91.66%. While those of adult sheep were 21.07% and 77.33%, respectively. Statistical analysis showed that the percentage of the disease and percentage of isolation Significantly correlated to the age of the animal.

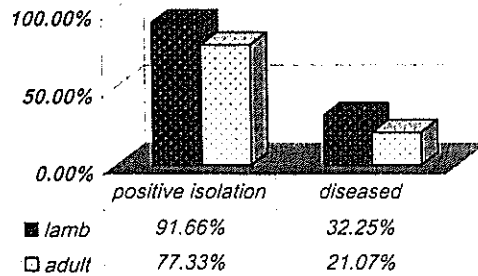


Fig. (7) illustrate the percent of diseased animal and percent of bacterial isolation in relation to age of the sheep.

5- Effect of breed and sex on the percentage of diseased condition and bacterial isolation fig. (8, 9):

The examined animals belonged to 3 different breeds, Elbarky breed, Elbaladi breed and Elrhmany breed. The percentage of diseased animal in relation to these breeds were 23.33% (70 from 300), 28.33% (51 from 180) and 22.58% (14 from 62) , respectively and the percentage of bacterial isolation were 82.85% (58 from 70), 84.31% (43 from 51) and 85.71% (12 from 14) respectively. The statistical analysis showed that the percentage of both diseased condition and bacterial isolation was not significantly correlated to breed of the animal .The percentage of diseased condition in male and female animals were 28.5% (57 from 200) and 22.80% (78 from 342), respectively, while the incidence of bacterial isolation from both sexes were 84.21% (48 from 57) and 83.33% (65 from 78), respectively. The statistical analysis showed that the incidence of both disease and bacterial isolation was not significantly correlated to sex of the animal .

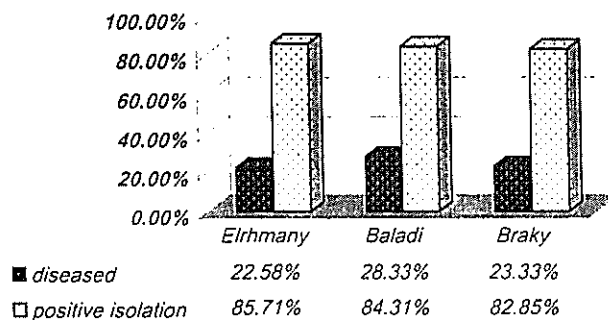


Fig. (8) illustrate the percent of diseased animal and percent of bacterial isolation in relation breed of the sheep.

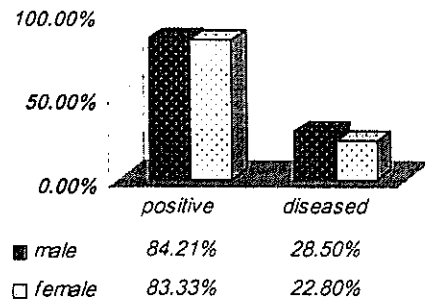


Fig. (9) illustrate the percent of diseased animal and percent of bacterial isolation in relation sex of the sheep.

#### 4.7.Histopathological findings:

The histopathological study of pneumonic lungs of sheep in which *Pasteurella haemolytica* was the main isolates revealed the presence of fibrinopurulent pneumonia. The alveoli filled with neutrophils, oat cells and fibrin. Also the lumen of terminal bronchioles were filled with desquamated epithelial cells, neutrophils and mucin. With peribronchial lymphoid cells infiltration as well as alveolar emphysema were observed near the pneumonic areas Fig. (10) and (11).

The pneumonic lungs of sheep infected with both *Pasteurella haemolytica* and *Staphylococcus aureus* showed similar findings to those described in pneumonic lungs infected with *Pasteurella haemolytica* only in addition with sever congestion of the pulmonary vessels, the peribronchial lymphoid infiltration was more prominent. Emphysema was also present in the non pneumonic areas, Fig (12). These finding were similarly presented in pneumonic lungs infected with *Pasteurella haemolytica* and *E.coli*.

The pneumonic lungs of sheep in which *Pasteurella multocida* was the main isolate during the histopathological study showed that the lesion consist of focal area of fibrinopurulent pneumonia and catarrhal bronchitis Fig. (13). Other findings were similar to that described above.

The pneumonic lungs infected with *Staphylococcus aureus*, *Streptococcus pneumoniae* and *E.coli*. showed catarrhal bronchopneumonia. The lumen of the bronchi were filled with mucin, desquamated epithelial cells and neutrophils. In the pneumonic area near the affected bronchioles the alveoli were filled with mucin and neutrophils. There were also congestion with interalveolar haemorrhage, Fig. (14).

The histopathological findings in cases infected with *Klebsiella pneumoniae* as well as *Pseudomonas aeruginosa* were peribronchial lymphoid nodule formation, catarrhal bronchitis and hyperplasia of the bronchial epithelium. As well as lymphoid hyperplasia, fig (15).



Fig. (3): Lung of sheep infected with *Pasteurella haemolytica* showed sever congestion, consolidation and petechial hemorrhage on the pericardium with percarditis with ateleclatsis in the apical lobe

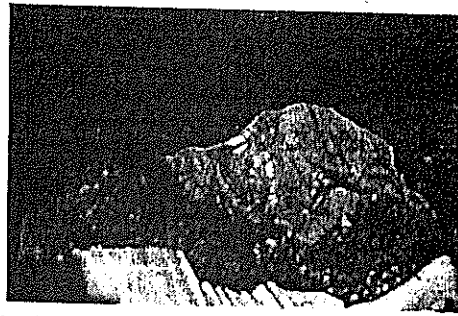


Fig. (4): part of sheep lung infected with *Pasteurella haemolytica* showed sever hepatization.

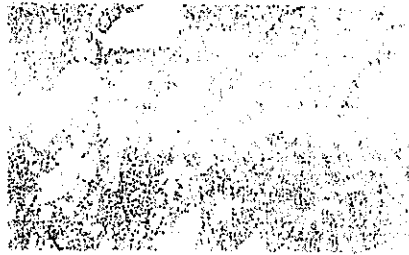


Fig (14) Catarrhal bronchopneumonia, proliferation of goblet cells of the bronchial epithelial with sever congestion and haemorrhage in the interalveolar septa (H&E stain X10).



Fig (15) pneumonia with pribronchial lymphoid infiltration and emphysematous area (H&E stain X10).

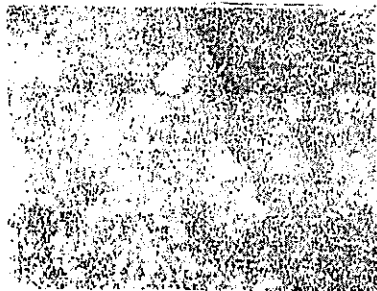


Fig (10) Fibrinopurulent pneumonia with the alveoli filled with neutrophils, lymphocytes, oat cells and fibrinous exudate (H&E stain X 20).

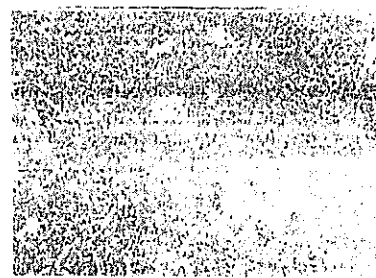


Fig (11) Fibrinopurulent pneumonia with the terminal bronchioles filled with desquamated epithelium and mucin and neutrophiles with peribronchial lymphoid cell infiltration (H&E stain X 20).

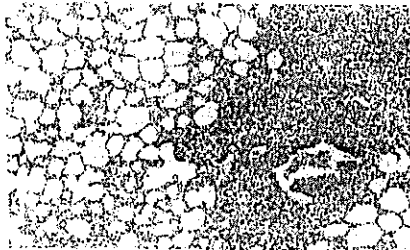


Fig (12) Fibrinopurulent bronchopneumonia, alveolar emphysema near the pneumonic area and the lumen of the bronchioles filled with neutrophils, mucin and desquamated epithelial cells (H&E stain X4).

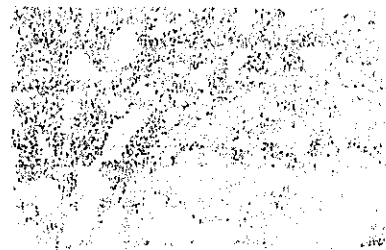


Fig (13) Focal area of Fibrinopurulent pneumonia with catarrhal bronchitis and alveolar emphysema (H&E stain X10).

### **Discussion**

542 sheep of different ages, sexes and breeds were examined through period extended from summer of 2005 to spring of 2006 for the respiratory disease manifestations. These animal selected either housed or as mobile flocks .This selection was designed for studing the relation between the percentage of the diseased condition in relation to age, sex, and breed as well as the effect of life pattern upon the percentage of diseased condition occurrence as well as upon percentage of bacterial isolation from diseased animals. And to study the effect of season upon the percentage of diseased condition occurrence as well as upon percentage of bacterial isolation from diseased animals. Clinical examination revealed that the affected sheep suffering from fever (temperature above 40°C) with mucoid to mucopurulent nasal discharges and crusting around the nostrils with depression in some cases. Chest auscultation reveals the presence of abnormal lung sounds as moist rals, exaggerated vesicular sounds as well as bubbling sound also heard in some cases. In other cases no lung sound can be detected over the lung area but the heart sound is clear from the right chest side. From these signs the affected sheep suspected to be suffered from bronchopneumonia. These signs also recorded by Yousif, 1981; Elyas, 1993; Sadiék et al., 1993; Abdel-Salam and Abdou, 1994; Mary and David, 1994; Martin, 1996 and Zaitoun, 2001, they described the clinical findings in sheep suffering from acute bacterial pneumonia.

The results of clinical examination are also supported by the records of Donachie, 2000; Radostitis, et al., 2000b and Mona et al., 2005 as they described mild clinical disease with seromucoid and thick tenacious nasal discharges and intermittent cough. Chest auscultation reveals the presence of dry rales and friction sound.

The postmortem examination of pneumonic lung of cases infected with *Pasteurella haemolytica* showed that these lung showing sever congestion allover the lung with bright purplish solid areas. Also the lung was heavy, edematous with petechial hemorrhage over the lung, in the trachea and in the heart. Other cases showing sever congestion with hepatization of the ventral part of diaphragmatic lobe. Other cases only showing sever hyperemia and edema of the lung. This agreed with finding observed by Mohamed, 1996; Martin, 1996; Nadra, 1998 and Zaitoun, 2001.

The postmortem examination of pneumonic lung of cases infected with *Pasteurella multocida* showed that these lung showing congestion allover the lung with petechial hemorrhages and marked emphysema. These finding agreed with that recorded by Nadra, 1998 and Odugbo et al., 2005.

The post mortem examination of lung infected with other bacterial agents showing various degree of congestion and grayish discoloration of the lung with ecchymosis and sometimes blackish discoloration of lung tissue that indicating necrosis also emphysema might be present. That was similar to that recorded by Porter et al., 1993.

During this study from 542 sheep examined 135 sheep suffering from respiratory problem and showing the previously mentioned signs in different degree. This meant that the morbidity rate was 24.9%. This



percent agree with that recorded by Zaitoun, 2001. but some what higher than that recorded by Mohamed, 1996 and Michael et al., 2003. Also it less than that recorded by Umesh. et al., 1994. They studied the sheep pneumonia caused by *Pasteurella multocida* only.

The mortality rate and case fatality percent calculated during this study were 1% and 3.7%, respectively. These findings agree with that recorded by Gilmour and Gilmour, 1989; Mustafa, 1994 and Donachie, 2000. This was less than that recorded by Zaitoun, 2001 and Faten, 2001.

The study results concerning the effect of pattern of sheep life in relation to percentage of respiratory problem occurrence as well as percentage of bacterial isolation from diseased sheep revealed that the incidence of the problem in free ranging flocks (mobile flocks) was 27.7%. On the other hand the total percentage of the disease occurrence in housed sheep was 17.76%. The statistical analysis showed that there was a significant effect of the pattern of sheep life and the incidence of disease occurrence as well as the incidence of bacterial isolation. The  $\text{Chi}^2 = 4.398$  and  $5.76$ , respectively. This data explain higher percentage of respiratory disease problem and bacterial isolation in mobile flocks than that in housed sheep. This may be attribute to the stress of environmental condition as the sudden change in climate and humidity poor nutrition and unhygienic condition were another two factors that can not be neglected. Again the mobile flocks usually lowered their head during the searching trails for feeds resulting in inhalation of dust that help in decrease the defense mechanism of the immune system of the lung tissue increasing the chance of pathogen invasion and induction of the disease. Also the role of stress factors in induction of ovine respiratory disease was explained by many authors as Gilmour et al., 1979; Pfeffer et al., 1983; Sadiq et al., 1993; Marry and David, 1994; Nadra, 1998 and Faten, 2001.

The effect of season on the disease was presented in table (10). The percentage of the problem increases during summer and winter. The percentage of the disease occurrence was 35% and 26.66%, respectively as well as the percentage of bacterial isolation increases during these seasons, as the percentage of the bacterial isolation was 92.85% and 85%, respectively. This might be due to bad environmental condition and high humidity as well as during these seasons the animal usually transported from the field to the market and from the market to the field that effect badly on the health status of the sheep. While the incidence of the problem decrease during the spring and autumn as the percentage of the disease occurrence was 11.95% and 14% respectively and incidence of bacterial isolation also decrease during this period as it was 54.54% and 57.14%. This might be due to that during this period the animal stabilized in its place with little transportation and less susceptible to environmental changes. Statistical analysis showed that there was a significant effect between the incidence of the disease occurrence and season of the year ( $\text{Chi}^2 = 25.751$ ). In the same side the effect of season on percentage of

bacterial isolation was also significant ( $\text{Chi}^2= 18.446$ .) these results were in accordance with that obtained by Pefeffer et al., 1983; Gilmour et al., 1979; Nadra 1998 and Donachie, 2000. But with the results obtained by Hafez et al., 1991 and Ali and Mohmoud, 1993).

The effect of age on the disease was presented in table (11). The percentage of the problem in lamb as well as the percentage of bacterial isolation from diseased lambs were 32.25% and 91.66%, respectively. In comparison the percentage of the problem and bacterial isolation from the adult sheep were 21.07% and 77.33% respectively. Statistical analysis showed that there was a significant effect between the incidence of the disease occurrence and age ( $\text{Chi}^2= 7.592$ ). In the same side the effect of age on percentage of bacterial isolation was also significant ( $\text{Chi}^2= 4.025$ .) These results were in accordance with that obtained by Gilmour et al., 1979; Frank, 1982; Pasic and Popovic, 1988; Kaya and Erganis, 1991; Hafez et al., 1991; Baysal and Guler, 1992; Mahamed, 1996 and Nadra, 1998. Its clear that adult sheep were less influenced by the effect of the predisposing as well as they built some immunity due to the frequent infection with small doses of the pathogens during life.

Both sexes also affected with the respiratory disorder or problem in which the percentage of the disease in male was 28.5% but in female was 22.80% The percentage of bacterial isolation from male and female were 84.21% and 83.33%, respectively. The statistical analysis showed that sex had no significant effect on both the percentage of the disease occurrence and percentage of bacterial isolation as the  $\text{Chi}^2= 2.5$  and 0.15, respectively. This disagree with Gilmour and Gilmour, 1989 and Radostitis, et al., 2000b. Both reported that most outbreaks of respiratory affection involving both ewes and lambs.

The effect of breed on the disease occurrence and the bacterial isolation was illustrated in table (12). The percentages of disease occurrence were 23.33%, 28.33% and 22.58% in Elbraky, Elbaladi and Elrhmany sheep, respectively. The percentages of bacterial isolation from diseased sheep of different breeds were 82.85%, 84.31% and 85.7% , respectively. Statistically there was no significant effect of the breed on the percentage of the disease of occurrence and percentage bacterial isolation as the  $\text{Chi}^2= 1.69$  and 0.092, respectively. Again the breed had no effect on the occurrence of respiratory disease of sheep and this supported by The Merck Veterinary Manual 2006.

Collectively age and stress factors of environmental and surrounding condition were the main determinant factors in the development of the respiratory problem in sheep. This agree with Ikede, 1978; Zaitoun, 2001 and Mona et al., 2005.

The histopathological study of lung tissue infected with *pasteurella haemolytica* revealed that the main pathological feature was fibrinopurulent pneumonia with heavily cellular infiltration consisted of oat cells and neutrophils. That agree with histopathological findings recorded by Martin, 1996; Nadra, 1998 and Donachie 2000; but

disagreed with finding recorded by Mona et al., 2005 they found histopathological changes associated with *Pasteurella haemolytica* infection were interstitial pneumonia and pleuritis.

The reaction was more sever in combined infection of *Pasteurella haemolytica* with other bacteria such as *Staphylococcus aureus* or *E. coli*. the histopathological changes were similar to the above with presence of sever congestion of pulmonary blood vessels and peribronchial lymphoid infiltration with liquafactive necrosis. That was similar to findings reported by William, 1994 and Nadra, 1998.

*Pasteurella multocida* infected lungs histologically showed focal area of fibrinopurulent pneumonia and catarrhal bronchitis with cellular infiltration and emphysema that was similarly described by Nadra, 1998 and, Odugbo et al., 2005.

Features of exudative proliferative pneumonia consisted of catarrhal bronchitis and hyperplasia of bronchial epithelium with lymphoid nodules formation were recorded in cases infected with *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. This was similar to that described by Gilmour et al., 1979, and with Martin, 1996.

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