

## CLINICAL AND CLINICOPATHOLOGICAL STUDY ON BRONCHOPNEUMONIA IN SHEEP

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### ABSTRACT

*The purpose of this study is to study the hematological and biochemical parameters reflecting the acute phase protein associated with pneumonia. For this purpose, 65 Ossimi sheep were used. Of all ten sheep were selected and considered as a control group; however, 35 sheep were suffering from signs of acute bronchopneumonia and 20 were suffering from signs of chronic bronchopneumonia. serum blood samples were collected from healthy and diseased sheep in order to determine total and differential leukocyte count, RBCs, Hb, PCV, MCV, MCH, MCHC, HP, Alpha 1 acid glycoprotein, Zn, Fe, Cu, vit.c, Total protein, albumin, globulin, A/G ratio. Compared to the control group, in acute and chronic pneumonia, there was a significant increase in the levels of total leukocyte count, whereas, there was a significant decrease in the lymphocytes percentage, however, there was non significant changes in the percentage of eosinophils and basophils. Mean while, in chronic pneumonia, there was a significant increase in the levels of monocytes whereas, there was a significant increase in the percentage of neutrophils in the acute pneumonic cases. Hematological results, revealed that, in acute and chronic pneumonia, there was a significant decrease in the levels of RBCs, Hb and MCHC. Whereas, there was a significant increase in the levels of PCV, MCV however, the levels of MCH showed a significant increase in acute cases. Biochemically, there was a significant decrease in the levels of albumin, A/G ratio, vit.c, Zn and Fe in acute and chronic cases. In contrast, there was a significant increase in the levels of globulin and copper. However, there was a significant increase in the level of total protein in sheep with chronic pneumonia. A significant increase in the mean serum haptoglobin concentration in sheep with acute and chronic pneumonia compared to healthy sheep was demonstrated. Haptoglobin values were markedly elevated in acute cases in comparison to chronic ones. Whereas, Alpha 1 acid glycoprotein showed non significant changes in acute and chronic pneumonic sheep compared to control group. The levels of alpha 1 acid glycoprotein in all groups were less than 5mg/dl.*

### INTRODUCTION

Bronchopneumonia is a common disease of sheep in all major sheep-producing coun-

tries, where it causes mortality, decreased growth and a predisposition to pleurisy, at considerable cost to the industry, along with

animal welfare implications. Pneumonia in sheep is best regarded as a disease complex involving interactions between host (immunological and physiological), multiple agents (viral, bacterial, mycoplasmal) and environmental factors (Bruere et al., 2002).

#### **Sheep pneumonia and related hematological abnormalities**

**Jackleen (2000)** mentioned that there were leukocytosis, neutrophilia, and decrease in lymphocytes and eosinophils percentage in pneumonic sheep compared to healthy sheep. They added that there were a significant increase in PCV (%), a very high significant reduction in total number of erythrocytic count and a very highly significant decrease in haemoglobin concentration in pneumonic sheep in comparison to healthy sheep.

**Faten (2001)** stated that in pneumonic sheep there was a significant decrease in the levels of haemoglobin and lymphocytes percentage. However, total leukocytic count and neutrophils percentage were significantly increased. On the other hand, there was no remarkable changes in eosinophils (%), basophils (%), and monocytes (%).

**Radostitis et al. (2007)** stated that in cases of sheep bacterial pneumonia, there was marked leukocytosis with shift to left which in long course, severe cases changed to leukopenia, but the prominent feature was the presence of neutrophilia. Further more, in chronic pneumonia there was relative increase the monocytic percentage.

**Shehata (2008)** said that the haematologi-

cal values of blood samples obtained from sheep suffering from pneumonia showed a significant decrease in the levels of haemoglobin whereas, there was insignificant decrease in the levels of RBCs and the percentage of PCV, lymphocytes and eosinophils.

#### **Sheep pneumonia and related serum abnormalities**

##### **1. Total protein, albumin and globulin in pneumonic sheep**

**Jackleen (2000)** stated that there were insignificant decrease in the levels of blood serum total protein while there was a very high significant decrease in albumin level and a significant increase in globulin level in pneumonic sheep when compared to the healthy sheep.

**Azza (2001)** reported that in sheep with acute and chronic pneumonias, there was a significant increase in the levels of serum total protein and albumin, whereas, there was insignificant increase in the value of globulin. Additionally, there was a significant increase in the albumin/globulin ratio in sheep suffering from acute pneumonia.

**Faten Attia (2001)** revealed that the serum levels of total protein, albumin and globulin of pneumonic lambs were found to be significantly decreased.

##### **2. Acute phase protein (APP)**

Acute phase proteins are groups of proteins produced and secreted by the liver as apart of the acute phase response to tissue injury. Acute phase proteins indicated inflammation, either chronic or acute. (**Burgess, 2009**).

Acute phase proteins (APPs) are a group of blood proteins that change in concentration in animals subjected to external or internal challenges, such as infection, inflammation or stress. Positive APPs, such as haptoglobin, C-reactive protein, serum amyloid A, ceruloplasmin, fibrinogen, and alpha 1-acid glycoprotein, were found to be increased in response to inflammation. While, negative APPs were found to be decreased in response to inflammation including proteins like albumin and transferrin (Murata et al, 2004). The acute phase proteins are produced and released by the liver following stimulation by pro-inflammatory cytokines such as IL-6 and TNF- $\alpha$  (Gabay and Kushner, 1999).

In ruminants, haptoglobin (Hp) and serum amyloid A (SAA) are known to be major acute phase proteins increasing up to 1,000-fold on stimulation, while  $\alpha_1$  acid glycoprotein (AGP) is a moderate acute phase protein which can increase several fold from its normal plasma concentration (Murata et al., 2004 and Petersen et al., 2004).

Pfeffer et al. (1993) reported that measurement of the concentrations of ceruloplasmin, fibrinogen, and HP may be more useful in the diagnosis of tissue injury and infectious disease than the number of circulating neutrophils in sheep.

Skinner and Roberts (1994) reported that Hp was useful as a marker for the presence of bacterial infection in sheep, and was more sensitive, specific, and efficient and less likely to give false positive and negative results than a haematological examinations. Ulutas and

Orzpinar (2006) inoculated lambs with *Mannheimia haemolytica* by intratracheal route and they found that the mean haptoglobin levels were significantly increased in infected lambs.

Eckersall et al (2007) Found that the concentration in serum of Hp, SAA and AGP in 6 sheep challenged with  $2 \times 10^5$  cells of *C. pseudotuberculosis* increased significantly compared to 3 unchallenged control sheep and suggest that AGP suggesting its role as a marker for chronic conditions in sheep.

Nowroozi et al. (2008) determined reference values of serum Hp in clinically healthy Iranian fat-tailed sheep. They reported the mean and SD of serum Hp in male less than 1 year were  $.113 \pm .069$  g/l, at 1-3 years is  $0.118 \pm 0.062$  g/l, at 3-5 years is  $0.092 \pm 0.054$  g/l.

#### **Vit C :**

Jackleen (2000); Ali (2000); Manal (2002) recorded a significant decrease of vitamin C levels in serum of Egyptian sheep suffered from bronchopneumonia when compared to its level in clinically healthy sheep serum.

Mervat Matta (1997) and Azza Mohamed (2001) found a significant decrease in vitamin C levels in pneumonic sheep and this may be attributed to the effect of vitamin C as antioxidant or due to its role in the immunological processes needed for combating the occurring pathological disorder and for collagen biosynthesis in the damaged tissue due to the diseased condition.

**Trace elements :**

During the acute-phase response, Fe and Zn concentrations declined substantially (Hayes, 1994 and Ekin et al., 2006). Ulutas and Ozpinar (2006) stated that serum Fe and Zn levels in lambs inoculated with *M. haemolytica* were significantly lower than the control groups.

Ekin et al, (2006) determined the levels of zinc, copper and iron in lambs with pneumonia. They recorded that there was a significant decrease in Zn level in pneumonic lambs compared to control group while there was a significant increase in Cu concentration ( $p < 0.001$ ) and non-significant decrease in Fe concentration in pneumonic lambs.

**MATERIALS AND METHODS**

**Animal selection :**

The present study was conducted on 65 Ossimi sheep. Of all, ten healthy sheep were selected and considered as a control group; however, 35 sheep were suffering from signs of acute bronchopneumonia and 20 were suffering from signs of chronic bronchopneumonia. The animals under investigation were selected from herds at Dakahlia governorate during the period from 2007-2010. Their body weight ranged from 30- 80 kg and their age ranged from three months to two years.

**Sampling and samples processing :**

Two types of venous blood samples (ten ml for each) were collected via jugular vein puncture from each animal; the first blood sample was collected and added to 5mg sodium ethylene diamine tetra acetic acid (EDTA) as anti-coagulant for evaluation of total and differen-

tial leukocytic counts, whereas, the second blood sample was collected without anti-coagulant for biochemical analysis of iron, zinc, copper, haptoglobin, alpha 1 acid glycoprotein, albumin, total protein, globulin concentration.

**Hematological Analysis :**

Complete hematological parameters with erythrocytes indices were estimated in all group of animals.

**Serum biochemical analysis :**

Iron was measured colorimetrically by using commercial test kits (Fortess Diagnostics limited, United Kingdom). However, Zinc, copper and ascorbic acid were estimated by colorimetric method, by using commercial test kits (Biodiagnostic company, Egypt). Albumin and Total protein were measured by colorimetric method by using commercial test kits (Stanbio, Boerne, Texas, USA). Haptoglobin was measured by nephelometric method by using commercial test kits (Turbox, Orion diagnostic company, Finland).

Alpha 1 acid glycoprotein was measured by nephelometric method using commercial test kits, (Dade Behring, Germany)

**Statistical analysis :**

Data analyses were performed using a statistical software program (GMP for windows Version 5.1; SAS Institute, Cary, NC, USA). Mean values and standard deviation for each assessed variable were calculated. Statistical differences between normal and diseased groups were performed using one-way ANOVA with post hoc Bonferoni multiple comparison test.

## RESULTS

Based on the history, results of clinical examination, pneumonia was diagnosed. The obtained results revealed that acute and chronic pneumonia with percentage of 53.84% and 30.76%, respectively. Clinically, there was a significant increase in the rectal temperature, respiratory rate and heart rate in cases of acute pneumonia, whereas in chronic pneumonia, there was non significant changes (Table 1).

Table 2 illustrates the levels of hematological parameters in acute and chronic pneumonia, in which, there was a significant decrease in the levels of RBCs, Hb and MCHC. Whereas, there was a significant increase of the PCV % and MCV. However, in acute pneumonic sheep, there was a significant increase in MCH value.

There was a significant increase in the total leukocyte count, while there was a significant decrease in the lymphocyte percentage, whereas there was non significant changes in the percentage of eosinophils and basophils. However, in chronic pneumonia, there was a significant increase in the percentage of monocytes. In the contrast, there was a significant increase in the percentage of neutrophils in the acute pneumonia there was a significant decrease in the levels of albumin, A/G ratio, vitC, Zn, Fe, whereas, there was a significant increase in the levels of haptoglobin, globulin and copper in both of acute and chronic pneumonic sheep. However, In sheep with chronic pneumonia, there was a significant increase in the level of total protein. Alpha 1 acid glycoprotein level showed non significant changes in acute and

chronic pneumonic sheep compared to control group.

## DISCUSSION

Bronchopneumonia is a major cause of economic loss to sheep industry, due to deaths, reduced growth rate, slaughter-house wastage, drugs and labor costs associated with treatment. The morbidity and mortality rates reached 40% and 5%, respectively (Radostits et al., 2007).

### 1- Clinical findings of pneumonia cases :

The main clinical findings associated with the pneumonic sheep were fever, hurried respiration and inappetance to anorexia, with serous to seromucoid nasal discharge and frequent coughing. Within few days, mucopurulent nasal discharges and dyspnea were observed in some sheep while conjunctivitis was observed in others. There were abnormal lung sounds in diseased animals. A significant increase in the rectal temperature, respiratory rate and heart rate was observed in sheep with acute pneumonia, however, there were non significant changes in chronic pneumonia. These findings were in agreement with those previously reported by Jacklecn (2000) and Faten (2001). Such increase in rectal temperature could be attributed to the increased cytokines which had not only a pyrogenic effect, but also mediated the acute phase response describing the reaction of the animal to pathogen invasion, tissue injury, immunological reactions and inflammatory processes (Radostits et al. (2007).

### 2-Hematological results :

In this study, it was demonstrated that the TLC increased significantly in sheep with

acute and chronic pneumonia compared to those in control group. Whereas, there was a significant decrease in lymphocytes (%) However, in acute pneumonic sheep, there was a significant increase in the neutrophils (%). These findings were similar to those reported by **Jackleen (2000); Faten (2001); Radostitis et al. (2007)**.

The recorded leukocytosis and neutrophilia might be attributed to bacterial infection and inflammatory lesions resulting in stimulation of bone marrow stem cells by bacterial mediators and increasing neutrophils production to meet the tissue demand (**Scham, 1988; Smith, 1990**). The count of lymphocytes was relatively variable, where they decreased. These findings are illustrated by **Schalm (1988)** in such a manner that the stress to which the animal was exposed, resulted in the release of corticoids into circulation, so the number of lymphocytes was reduced, at the same time neutrophils and monocytes leave the blood to participate in the developing inflammation. In addition immature neutrophils enter the circulation in an increasing number during the first 24 to 48 hours. The results demonstrated that there was non significant changes in the eosinophils (%) and basophils (%) in diseased and healthy sheep. These findings were in accordance with those previously reported by **Azza (2001) and Faten (2001)**.

The sheep with chronic pneumonia were found to have higher monocyte levels than control group. These findings were in agreement with those reported by **Sadiek et al. (1993); Radostitis et al. (2007)**.

RBCs levels showed a significant decrease

in acute and chronic diseased cases compared to those in control group. These findings were in agreement with previous reports **Jackleen, 2000**). This may be attributed to the fact that disturbances in the lung parenchyma as a result of damaging pneumonic effect will eventually decrease the capacity of blood forming organs to produce RBCs (**Blum et al., 1996**).

In comparison to healthy sheep, there was a significant decrease in Hb levels in sheep with acute and chronic pneumonia. similar results were recoded in sheep (**Jackleen, 2000; Faten, 2001**). **Coles (1986) and Schalm (1988)** attributed anemia to sequestration of iron in the bone marrow, macrophages and hepatocytes during the infection, thus become unavailable for utilization of haemoglobin synthesis resulting in inhibition of erythropoiesis. PCV % showed a significant increase in acute and chronic cases compared to those in control group. These findings were in agreement with those reported by **Jackleen (2000)**. In contrast to our findings, it has been shown that chronic pulmonary disease may cause appropriate compensatory erythropoietin secretion, which leads to increase in the PCV (**Duncan and Prasse, 1986**).

### **3- Biochemical findings :**

Our results revealed that T.protein significantly increased in sheep suffering from chronic pneumonia compared to those in control group. These findings were in agreement with those reported by **Azza (2001)**. The obtained increase in the level of total protein in the blood serum could be attributed as the defense mechanism against the diseased conditions where the disease stimulates the

animal tissues that form total serum protein to share in the needed defense mechanism (Schalm, 1986).

A significant decrease in serum albumin value in acute and chronic pneumonic sheep compared to those in healthy group was observed. These findings were in agreement with those reported by Schalm (1986); Fatten Attia (2001); Jackleen (2000). The low levels of albumin in diseased sheep could be attributed to the destructive effect of bacteria or bacteria toxins on the liver cells resulting in impaired synthesis of blood serum albumin (Mottelib, 1972) or due to the stress factors to which the animals exposed (Coles, 1986). Furthermore, the reduction in albumin values is caused by febrile diseases (Coles, 1986).

As previously reported by Jackleen (2000), in sheep with acute and chronic pneumonia, we observed a significant increase in globulin level in comparison to those in the sheep considered as control. In contrast to that, Schalm (1986) and Fatten Attia (2001) reported a significant decrease and. Hyperglobulinaemia may be attributed to the immune response of the animals body to tissue breakdown (Jackleen, 2000). We observed that the sheep with acute and chronic pneumonia had significantly lower serum vit C than the healthy sheep as previously reported by Mervat Matta (1997); Azza Mohamed (2001); Jackleen (2000) and Manal (2002).

Mervat Matta (1997) and Azza Mohamed (2001) stated that the decrease in vit.c level in pneumonic sheep may be attributed to the effect of vitamin C as antioxidant or due to its

role in the immunological processes needed for combating the occurring pathological disorder and for collagen biosynthesis in the damaged tissue due to the diseased condition.

Compared to control group, zinc and iron levels significantly decreased in acute and chronic pneumonic sheep. These findings were in agreement with those reported by Ekin et al. (2006) and Ulutas and Ozpinar (2006) who mentioned that in some experimental or natural bacterial and viral infections, the rise in body temperature is accompanied by low iron and zinc levels, induced by some pyrogenic and metabolic reactions. During the acute-phase response, Fe and Zn concentrations decline substantially (Hayes, 1994 and Ekin et al., 2006) The sheep suffering from acute and chronic pneumonia had significantly higher serum copper than control group. These findings were in agreement with those reported by Ekin et al. (2006).

A significant increase in the mean serum haptoglobin concentration in sheep with acute and chronic pneumonia compared to those in healthy sheep was demonstrated. HP values were markedly elevated in acute cases in comparison to chronic ones. These findings were in agreement with that reported by Skinner and Roberts (1994) who reported that HP was useful as a marker for the presence of bacterial infection in sheep, and was more sensitive, specific, and efficient and less likely to give false positive and negative results than a haematological examinations. Additionally, Ulutas and Ozpinar (2006) reported a significant increase in the HP concentration in sheep inoculated with *Mannheimia haemolytica*. More over, Eckersall et al. (2007)

reported a significant increase in HP concentration in sheep inoculated with *C. pseudotuberculosis* .

The results showed a significant decrease in the level of albumin, Zn and Fe in acute and chronic diseased cases compared to healthy sheep and be negative acute phase protein. These findings were in agreement with those reported by **Gruys et al. (1994)** and **Murata et al. (2004)** who said that in infection and inflammation, some proteins decrease and called negative acute phase protein as albumin, zinc, iron.

The results showed non-significant changes in ASG level in acute and chronic pneumonic cases compared to those in healthy sheep. The levels of  $\alpha_1$  acid glycoprotein in all groups were less than 5mg/dl. To our knowledge, no previous reports exist on  $\alpha_1$  acid gly-

coprotein in sheep with natural pneumonia. We concluded that  $\alpha_1$  acid glycoprotein had no particular diagnostic value to assess the condition of pneumonia in sheep in the field.

These findings also were in contrary with **Murata et al. (2004)** who mentioned that  $\alpha_1$  acid glycoprotein was found to be positive acute phase protein and increase in response to inflammation. This is in contrast to the results of **Eckersall et al. (2007)** who reported a significant increase in ASG concentration in lambs inoculated with *C. pseudotuberculosis* and serum AGP concentration in infected sheep continued to rise to a peak of  $0.38 \pm 0.05$  g/L on day 13 post-infection, after which a slow decline occurred, although the mean concentration remained significantly higher ( $P < 0.05$ ) than the control group up to 29 days post-infection, suggesting its role as a marker for chronic conditions in sheep.



Table1 : Clinical findings in sheep with acute and chronic pneumonia .

	Temperature T°C	R.R. Cycle/Min.	H.R. Beat/Min.	Nasal discharge	Cough	Lung sound
Acute (n=35)	41.1±.3 <sup>a</sup>	62.7±8.6 <sup>a</sup>	120±7.0 <sup>a</sup>	Serous 6/35 Mucoid 19/35 Mucopurulent 8/35 Absent 2/35	Dry cough 15/35 Moist 20/35 cough	Wheeze 12/35 Crackles 10/35 Exaggerated vesicular 11/35 Mixed 2/35
chronic (n=20)	39.6±1.5 <sup>b</sup>	50.02±6.5 <sup>b</sup>	90.5±7.3 <sup>b</sup>	Mucoid 8/20 Mucopurulent 12/20 Absent 0/35	Dry cough 7/20 Moist cough 13/20	Wheezes 5/20 Crackles 6/20 Exaggerated vesicular 7/20 mixed 2/20

Table 2 : Hematological parameters (mean values ± SD) in clinically healthy sheep and in those with acute and chronic pneumonia.

	RBCs x10 <sup>6</sup> /µl	Hb (g/dl)	PCV (%)	MCV (fl)	MCH (pg)	MCHC (%)
Control (n=10)	9.2± 4.3 <sup>a</sup>	11.0±1.6 <sup>a</sup>	26.2±5.5 <sup>b</sup>	28.4±2.1 <sup>b</sup>	11.9±2.2 <sup>a</sup>	42.3±2.5 <sup>b</sup>
Acute (n=35)	5.1 ±2.6 <sup>b</sup>	8.9±2.4 <sup>b</sup>	34.03±3.3 <sup>a</sup>	66.6±2.8 <sup>a</sup>	17.4±1.3 <sup>b</sup>	26.1±1.5 <sup>a</sup>
Chronic (n=20)	6.5±2.5 <sup>b</sup>	9.7±1.3 <sup>b</sup>	41.2±6.4 <sup>a</sup>	63.3±4.5 <sup>a</sup>	14.9±2.5 <sup>ab</sup>	23.5±1.9 <sup>a</sup>

The value in the same column is significant at P < 0.05

**Table 3 :** Total and differential leucocytic count (mean values  $\pm$  SD) in clinically healthy sheep and in those with acute and chronic pneumonia.

	TLC X 10 <sup>3</sup> (count)	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)	Eosinophils (%)	Basophils (%)
Control (n=10)	10.3 $\pm$ 3.9 <sup>b</sup>	39.6 $\pm$ 1.1 <sup>b</sup>	56.09 $\pm$ 2.8 <sup>b</sup>	2.4 $\pm$ 1.7 <sup>a</sup>	1.9 $\pm$ .8 <sup>a</sup>	.1 $\pm$ .07 <sup>a</sup>
Acute (n=35)	21.2 $\pm$ 3.3 <sup>a</sup>	54.2 $\pm$ 3.4 <sup>a</sup>	39.2 $\pm$ 3.4 <sup>a</sup>	3.9 $\pm$ 2.3 <sup>ab</sup>	2.2 $\pm$ .2 <sup>a</sup>	.40 $\pm$ .2 <sup>a</sup>
Chronic (n=20)	17.4 $\pm$ 2.3 <sup>a</sup>	47.2 $\pm$ 2.06 <sup>ab</sup>	44.6 $\pm$ 1.0 <sup>a</sup>	4.8 $\pm$ 3.6 <sup>b</sup>	2.6 $\pm$ .5 <sup>a</sup>	.67 $\pm$ .32 <sup>a</sup>

The value in the same column is significant at P < 0.05

**Table 4.** Different biochemical parameters in clinically healthy sheep and in those with acute and chronic pneumonia.

	T.protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	A/G ratio	Vit.C (mmol/l)	Cu ( $\mu$ mol/l)	Zn. ( $\mu$ mol/l)	Fe ( $\mu$ mol/l)	Haptoglobin (mg/dl)	Alpha 1 acid glycoprotein
Control (n=10)	8.8 $\pm$ 1.5 <sup>b</sup>	4.8 $\pm$ 0.6 <sup>b</sup>	4.0 $\pm$ 1.5 <sup>b</sup>	1.2 $\pm$ .4 <sup>b</sup>	73.5 $\pm$ 2.7 <sup>b</sup>	18.1 $\pm$ .5 <sup>b</sup>	12.9 $\pm$ 1.1 <sup>b</sup>	28.1 $\pm$ 0.9 <sup>a</sup>	3.4 $\pm$ 2.0 <sup>a</sup>	3.1 $\pm$ .7 <sup>a</sup>
Acute (n=35)	10.2 $\pm$ 3.8 <sup>ab</sup>	3.8 $\pm$ 1.0 <sup>a</sup>	6.4 $\pm$ 1.8 <sup>a</sup>	.6 $\pm$ 0.2 <sup>a</sup>	51.5 $\pm$ 2.8 <sup>a</sup>	25.1 $\pm$ .7 <sup>a</sup>	9.1 $\pm$ .1 <sup>a</sup>	25.1 $\pm$ 0.7 <sup>b</sup>	88.8 $\pm$ 5.5 <sup>b</sup>	3.9 $\pm$ .3 <sup>a</sup>
Chronic (n=20)	10.7 $\pm$ 3.0 <sup>a</sup>	3.7 $\pm$ 0.7 <sup>a</sup>	7.2 $\pm$ 2.6 <sup>a</sup>	.5 $\pm$ .2 <sup>a</sup>	43.9 $\pm$ 1.2 <sup>a</sup>	24.4 $\pm$ 1.1 <sup>a</sup>	9.1 $\pm$ .6 <sup>a</sup>	24.4 $\pm$ 1.1 <sup>c</sup>	34.0 $\pm$ 1.4 <sup>c</sup>	3.4 $\pm$ .2 <sup>a</sup>

Figure 1. Hematological parameters levels in control sheep, acute and chronic pneumonic sheep

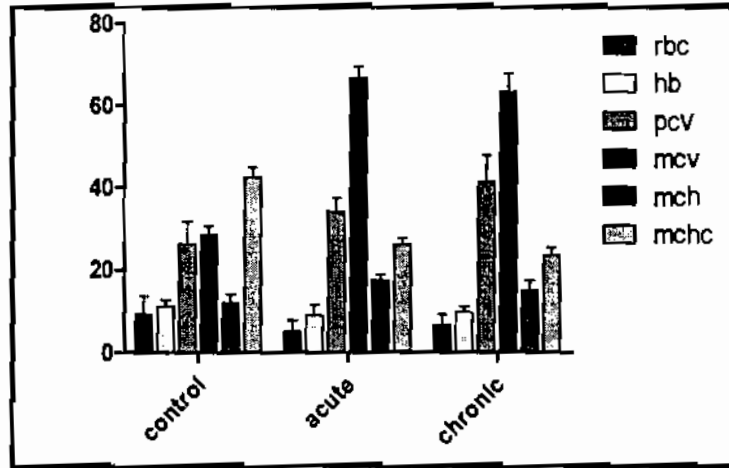


Figure 2. Total and differential leucocytic count levels in in control sheep, acute and chronic pneumonic sheep.

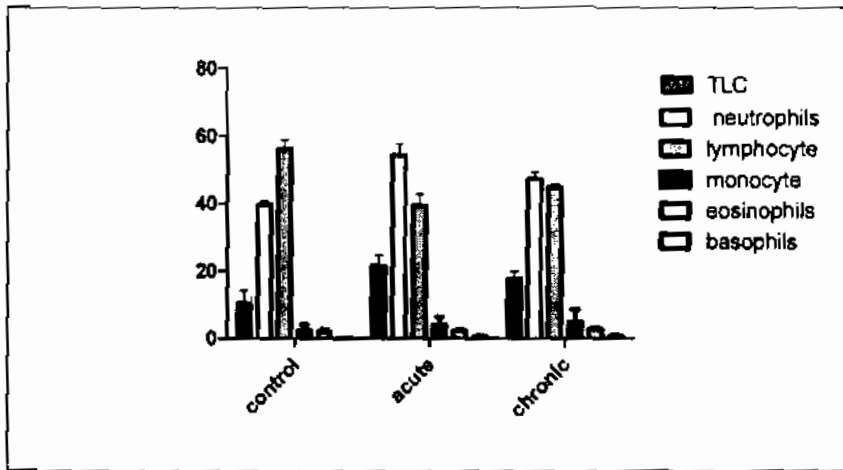
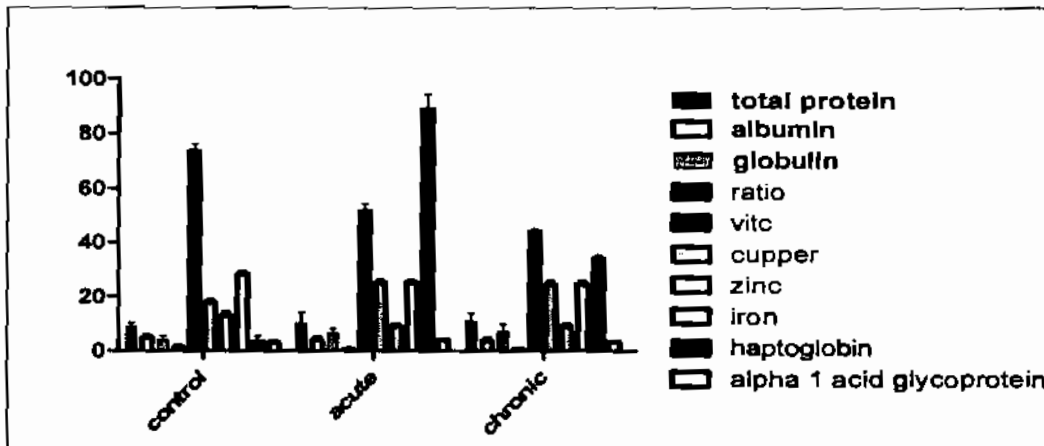


Figure 3. Biochemical parameters levels in control sheep, acute and chronic pneumonic sheep



### REFERENCES

**Ali, A. A. (2000)** : Influence of some diseased conditions on blood serum levels of antioxidant vitamins and some trace elements of Egyptian balady sheep in Assiut Governorate. Assiut. Vet. Med. J. 42, 120-133.

**Azza, M., M. (2001)** : Studies of the levels of vitamins C, E and A in healthy and some diseased Egyptian Balady sheep in Upper Egypt Thesis. Fac. Vet. Med. Assiut University.

**Blum, J. W.; Maier, B. R. M. and Moser, M. D. T. W. D. (1996)** : Endocrine, metabolic and haematological changes associated with reduced growth performance during chronic pneumonia in calves. Tsch. Tieraztp. Wochenschr. 103, 115-6.

**Bruere, A. N.; West, D. and Ridler, A. L. (2002)** : Enzootic pneumonia, In: The sheep: health, disease & production: written for veterinarians and farmers. Veterinary Continuing.

**Burgess, B. A. (2009)** : The development and assessment of along biopsy technique for early BRD detection. M. D. thesis. Fac.Vet. Med. University of Saskatchewan, Canada.

**Coles, E. H. (1986)** : "Veterinary Clinical Pathology". 4<sup>th</sup> Ed., W.B. Saunders CO.

**Duncan, J. R. and Prasse, J. W. (1986)** : Veterinary laboratory medicine, 2nd Ed. Iowa state university Press Ames Iowa., 27.

**Eckersall, P. D.; Lawson, F. P.; Bence, L.; Waterston, M. M.; Lang, T. L.; Donachie, W. and Fontaine, M. C. (2007)** : Acute phase protein response in an experimental model of ovine caseous lymphadenitis. BMC Vet Res. 3- 35.

**Ekin, S.; Berber, I.; Kozat, S. and Gunduz, H. (2006)** : Selected trace elements and

esterase activity of carbonic anhydrase levels in lambs with pneumonia. Biological Trace Element Research.112, 40-233.

**Faten, I. A. G. (2001)** : Studies on some respiratory diseases of lambs. Ph.D. Faculty of veterinary medicine, Cairo university .

Gabay, C., Kushner, I., 1999. Acute-phase proteins and other systemic responses to inflammation. New England Journal of Medicine. 340, 448-454. doi: 10.1056/NEJM199902113400607. [PubMed]

**Gruys, E.; Obwolo, M. J. and Toussaint, M. J. M. (1994)** : Diagnostic significance of the major acute phase proteins in veterinary clinical chemistry: a review. Vet. Bull., 64, 1009-1018.

**Hayes, M. A. (1994)** : Functions of cytokines and acute phase proteins in inflammation. In: Lumsden JH, ed., VIth Congress of the ISACB Proceedings, Guelph, Canada, 1-7.

**Jackleen, H. T. (2000)** : Some laboratory studies on bacterial pneumonia in sheep in upper Egypt. Thesis. Fac. Vet. Med. Assiut University

**Manal, H. T. (2002)** : Some studies on pneumonia in sheep in Assiut Governorate with special references to antioxidant vitamins. Ph.D. Fac. Vet.Med. Assiut University.

**Mervat, H. Matta. (1997)** : Some studies on vitamin C in ruminal and intestinal disorders in sheep. Ph. D.Thesis , Assiut Univ., Assiut, Egypt.

**Mottelib, A. A. (1972)** : A study on the changes of blood in buffaloe calves suffering from enteritis due to different causative agents Thesis. Fac. Vet.Med. Assiut Univ.

**Murata, H.; Shimada, N. and Yoshioka, M., (2004)** : Current research on acute phase proteins in veterinary diagnosis: an overview. Vet. J. 168, 24-40.

**Nowroozi-Aal, A.; Nazifi, S. and Bahari, A. (2008)** : Determination of serum haptoglobin reference value in clinically healthy Iranian fat-tailed sheep. Iranian Journal of Veterinary Research, Shiraz University, Vol. 9, No. 2, Ser. No. 23.

**Petersen, H. H.; Nielsen, J. P.; Heegaard, P. M. H. (2004)** : Application of acute phase protein measurement in veterinary clinical chemistry. Veterinary Research. 35,163-187. doi: 10.1051/vetres:2004002. [PubMed].

**Pfeffer, A.; Rogers, K. M.; O'keeffe, L. and Osborn, P. J. (1993)** : Acute phase protein response, food intake, live weight change and lesions following intrathoracic injection of yeast in sheep. Res. Vet. Sci. 55, 360-366.

**Radostitis, O. M.; Gay, C. C.; Hinchcliff, K. W. and Constable, P. D. (2007)** : Veterinary medicine. A textbook of diseases of cattle, horses, sheep, pigs and goats 10<sup>th</sup> (ed). Saunders and El Sevier.

**Sadick, A. H.; Abdel-Salam, M. N. and Zaitoun, A. M. (1993)** : Field investigations on ovine pneumonic pasteurellosis with some blood serum analysis . Proc. 2<sup>nd</sup> Scientific.

**Schalm, O. W. (1986)** : "Veterinary Haematology " 4<sup>th</sup> ed. Leg Febtger Philadelphia.

**Shehata, S. A. M. (2008)** : Some studies on pneumoenteritis in sheep. M.D. Fac.Vet.Med. Cairo University.

**Skinner, J. G. and Robert., L. (1994)** : Haptoglobin as an indicator of infection in sheep. Vet. Rec. 134, 33-36.

**Smith, B. P. (1990)** : " Large Animal Internal Medicine "Published by C.V. Mosby company, 390.

**Ulutas, P. A. and Ozpinar, A. (2006)** : Effect of Mannheimia (Pasteurella) haemolytica infection on acute-phase proteins and some mineral levels in colostrum-breast milk-fed and colostrum-breast milk-deprived sheep. Veterinary Research Communications.30, 485-495.

## الملخص العربي

## دراسة إكلينيكية وباثولوجية على الالتهاب الشعبي الرئوي في الأغنام

الغرض من هذه الدراسة هي دراسة التغيرات الكيميائية والتغيرات في صورة الدم المرتبطة بالالتهاب الشعبي الرئوي في الأغنام ولهذا الغرض تم أخذ 65 خروف أوسيمي لهذه الدراسة منهم عشرة خرفان أخذوا كمجموعه ضابطه و 35 خروف كانوا يعانون من التهاب شعبي رئوي وعشرون خروف يعانون من التهاب شعبي رئوي مزمن وتم تجميع عينات سيرم من هذه الحيوانات السليمه والمريضه اكلينيكيًا من اجل تحليل عدد كرات الدم البيضاء الكلويه , كرات الدم الحمراء , الهيموجلوبين , الهيماتوكرايت , الهيماتوجلوبين , الالفا اسيد جليكوبروتين , الزنك , الحديد , النحاس , فيتامين سي , البروتين الكلي , الالبيومين , الجلوبيولين و النسبه بين الالبيومين والجلوبيولين ولقد اتضح من الدراسه انه بالمقارنه بالمجموعه الضابطه فقد لوحظ وجود ارتفاع معنوي في عدد كرات الدم البيضاء وانخفاض ملحوظ في النسبه المئويه للبمفوسيت وذلك في كلا من حالات الالتهاب الشعبي الرئوي الحاده والمزمنه بينما لم يلاحظ اي تغير معنوي في النسبه المئويه لللايزونوفيل والبازوفيل برغم انه لوحظ وجود ارتفاع معنوي في النسبه المئويه للنيروفيل في حالات الالتهاب الشعبي الرئوي الحاده بينما لوحظ في الحالات المزمنه للمرض ارتفاع معنوي في النسبه المئويه للمونوسيت وبالنسبه لنتائج تحليلات صوره الدم الكامله فلقد لوحظ انخفاض ملحوظ في مستوي كرات الدم الحمراء والهيموجلوبين في الحالات الحاده والمزمنه للمرض بينما لوحظ وجود ارتفاع معنوي في مستوي الهيماتوكرايت وبالنسبه لنتائج التحليلات الكيميائيه فلقد لوحظ انخفاض ملحوظ في مستوي الالبيومين والنسبه بين الالبيومين والجلوبيولين وفيتامين سي والزنك والحديد في الحالات الحاده والمزمنه للمرض علي عكس الجلوبيولين والنحاس الذين ارتفعا بشكل ملحوظ ولوحظ ايضا ارتفاع معنوي كبير في مستوي الهيماتوجلوبين في سيرم الحيوانات المريضه بالمقارنه بسيرم الحيوانات السليمه اكلينيكيًا وكانت هذه الزيادة بدرجه اكبر في الحالات الحاده للمرض عن المزمنه بينما لم تسجل الدراسه اي تغير معنوي في مستوي الالفا اسيد جليكوبروتين في الحالات المريضه بالمقارنه بالحالات السليمه اكلينيكيًا وكانت كل القيم اقل من 5مليجرام في الديسيلتر