



## Haematological alterations due to lung diseases in sheep and goats of Jammu region

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Received: September 12, 2016; Revised received: April 7, 2017; Accepted: August 12, 2017

**Abstract:** The present study was conducted for evaluation of haematological parameters in sheep (330) and goat (230) having various lung affections that were slaughtered routinely as a source of food in Jammu region (Gujjar Nagar, Dogra Hall, Bishnah and Nagrota). About 25.75% (85) and 21.30% (49) of lungs examined in sheep and goats respectively were found to have parasitic infestation of Hydatidosis, Myiasis and *Mulleriuscapillaris*. Furthermore about 31.81% (105) and 29.13% (67) of selected lungs had pathological conditions of pneumonia, abscess and haemorrhage in sheep and goats respectively. Diseased sheep and goats reflected significant decrease in haemoglobin (Hb), packed cell volume (PCV) and erythrocytes (RBC) in parasitic infestation of Myiasis as compared to control while non significant alteration in these parameters was observed in conditions of Hydatidosis, *M. capillaris*, pneumonia, abscess and haemorrhage. Mean corpuscular volume (MCV) decreased significantly in Myiasis of sheep and haemorrhagic lungs of goats while no significant change was observed in mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) values. Significant increase in leucocytes (WBC), neutrophils, monocytes, eosinophils were observed in both sheep and goats affected with various parasitic and pathological lung diseases with no significant change in basophilic count. Lymphocytic count decreased in all these adverse lung conditions as compared to healthy ones. Parasitic infection though not mixed one especially that of Myiasis comparatively has significant affected on blood parameters. The present study signifies the complementary importance of ante-mortem examination with that of post-mortem inspection in various parasitic and pathological affections of lungs.

**Keywords:** Diseases, Goat, Haematology, Lung, Sheep

### INTRODUCTION

Lungs are an important organs of the body. Enclosed in double pleural membrane, they are twin conical structures located on either side of the heart (Drake *et al.*, 2014). Each lung is a mass of branching airways which get narrower and narrower as they approach the alveoli (Young *et al.*, 2006). The walls of these airways produce mucus to keep the internal environment of the lungs moist; they are also lined with tiny hairs which beat together trapping dust and other foreign particles and move them out of the lungs so that they can be expelled by coughing or sneezing (Pawlina, 2015). Foreign particles which remain in the lungs, and of course any opportunistic viruses, bacteria, parasites, fungi etc cause local inflammation and excessive production of mucus (Brian *et al.*, 2014). If many small airways become blocked and many clusters of alveoli become flooded with mucus, respiration deteriorates. In bronchitis and pneumonia the lungs are partially suffocated by their own secretions (Lockie, 1998).

Also, various bacterial pathogens are associated with the lung diseases. Some of the common bacterial pathogens associated are Staphylococcus, Streptococcus, Pasteurella and Pseudomonas. Though Staphylococcus and Streptococcus are normal inhabitants but they cause secondary infections (Bhandare *et al.*, 2010)

Various affections of lungs included congenital anomalies, calcinosis, haemorrhage, pulmonary oedema, pulmonary embolism, pulmonary infarction, atelectasis, emphysema, pneumonia etc. Different types of pneumonias encountered in sheep and goats include bronchopneumonia, interstitial pneumonia, embolic pneumonia and granulomatous pneumonia. Parasitic affections of lungs include verminous pneumonia, hydatid cysts and *Oestrusovis* infection in sheep and goats (Vegad and Swamy, 2010). Sheep and goats are useful as they supply quality protein and revenue to man, but on the other hand they serve as vehicles of disease transmission. Besides economic losses, diseases of sheep and goats might constitute an epidemiologic and zoonotic threat. As such problems con-

cerning meat hygiene and possible health risks to the consumer should be documented during both ante-mortem and post-mortem examination. In this context, meat inspection data are a potential source of information and have an important role to play in epidemiology and preventive veterinary medicine (Gracey *et al.*, 2009). However, this source of information is not being fully exploited worldwide. Present study was, therefore, undertaken to study the prevalence of parasitic and pathological conditions of lungs and retrospective correlation was made with various hematological parameters in sheep and goats of Jammu region.

## MATERIALS AND METHODS

**Animals and design:** The study was conducted on 560 animals which included sheep (330) and goats (230) that were slaughtered routinely as a source of food from neighbouring areas of the Jammu division. The selected areas having govt. recognized abattoirs included Dogra Hall and Gujjar Nagar along with unorganized abattoirs of Nagrota and Bishnah.

**Sample collection and analysis:** Prior to post mortem confirmation of lungs, evaluation of various haematological parameters of sheep and goat in all the selected abattoirs were conducted. For that purpose about 5ml of blood sample were collected at the time of ante-mortem examination in the sterile vials containing EDTA at the rate of 2 mg/ml of blood as anticoagulant and processed for the estimation of Haemoglobin concentration (Hb), Packed cell volume (PCV), Total erythrocyte count (TEC), Total leukocyte count (TLC) and differential leukocyte count (DLC) as per standard methods described by Schalm *et al.* (1975). This was followed by post-mortem examination of lung samples of sheep and goats collected from these two areas for the various parasitic (Hydatidosis, Myiasis and *Mullerius capillaries*) and pathological conditions (Pneumonia, abscess and haemorrhages). Lung samples of sheep and goats collected were examined for the presence of pneumonia, hydatidosis, bronchitis, tuberculosis, emphysema, pulmonary fibrosis and other pathological conditions. Number of cysts, size and volume of cyst,

viability of cyst were also recorded. The carcasses included in this study were inspected carefully by visual examination. The presence of cysts in lung organ was examined by naked eye and careful palpation. Cysts of infected organs were counted and their size was measured by special callipers measuring scale. Infected organs were transported to the laboratory at Division of Veterinary Pathology, R.S. Pura (SKUAST-Jammu) over ice.

**Statistical analysis :** The data generated was subjected to one way ANOVA employing Duncan descriptive statistical analysis as per method described by Snedecor and Cochran (1994).

## RESULTS

The animals after post mortem examination revealed both parasitic and pathological conditions of lungs. About 25.75% of lungs examined were found to have parasitic infestation of Hydatidosis, Myiasis and *Mullerius capillaris* and about 31.81% of selected lungs had pathological conditions of pneumonia, abscess and haemorrhage in sheep. The parasitic and pathological conditions of same nature in goats were 21.30% and 29.13% respectively. Over all prevalence of pathological condition (Pneumonia, abscess and haemorrhages) (30.71%) were found to be higher than parasitic (Hydatidosis, Myiasis and *M. capillaries*) (23.92%) in sheep and goats (table 1).

The data on average haematological values in sheep with lung diseases has been summarised in Table 2. Diseased sheep reflected significant ( $P < 0.05$ ) decrease in haemoglobin, PCV, RBC and MCV in parasitic infestation of Myiasis as compared to control while non significant alteration in these parameters was observed in conditions of Hydatidosis, *M. capillaris*, pneumonia, abscess and haemorrhage. No significant change was observed in MCH and MCHC haematological indices in diseased sheep as compared to normal one. WBC count increased significantly in sheep affected with Hydatidosis, Myiasis, pneumonia, abscess and haemorrhage. The values of neutrophils, monocyte and eosinophil increased significantly in all adverse parasitic and pathological conditions while significant decrease in lymphocytes was observed in all these

**Table 1.** Species wise prevalence (%) of lung diseases in sheep and goats (N= 560).

Diseases	Sheep (N=330)		Goats (N=230)		Total (N=560)	
	n	Prevalence(%)	N	Prevalence(%)	n	Prevalence (%)
Parasitic infestation (Hydatidosis, Myiasis, M. Capillaries)	85	25.75	49	21.30	134	23.92
Pathological conditions (Pneumonia, abscess, haemorrhages)	105	31.81	67	29.13	172	30.71

N= Total number of lung samples examined, n =total number of infected lung samples, P (Prevalence %) =  $n/N * 10$

**Table 2.** Haematological parameters (Mean  $\pm$  SE) in lung diseases of sheep. Means within row with different superscripts differ significantly ( $P < 0.05$ ).

Parameters	Control (Healthy)	Hydatidosis	Myiasis	<i>M. capillaris</i>	Pneumonia	Abscess	Haemorrhage
Hb (g %)	11.20 $\pm$ 0.35 <sup>a</sup>	10.20 $\pm$ 0.24 <sup>a</sup>	8.00 $\pm$ 0.35 <sup>b</sup>	10.40 $\pm$ 0.21 <sup>a</sup>	11.18 $\pm$ 0.24 <sup>a</sup>	10.35 $\pm$ 0.24 <sup>a</sup>	10.20 $\pm$ 0.14 <sup>a</sup>
PCV (%)	35.30 $\pm$ 1.00 <sup>a</sup>	33.00 $\pm$ 0.42 <sup>a</sup>	24.30 $\pm$ 3.00 <sup>b</sup>	31.00 $\pm$ 0.22 <sup>a</sup>	34.00 $\pm$ 0.42 <sup>a</sup>	33.00 $\pm$ 0.62 <sup>a</sup>	33.00 $\pm$ 0.12 <sup>a</sup>
RBC( $10^6$ /cu.mm)	11.20 $\pm$ 0.68 <sup>a</sup>	11.00 $\pm$ 1.20 <sup>a</sup>	8.56 $\pm$ 1.00 <sup>b</sup>	10.00 $\pm$ 1.00 <sup>a</sup>	11.00 $\pm$ 1.40 <sup>a</sup>	11.19 $\pm$ 0.40 <sup>a</sup>	10.00 $\pm$ 1.20 <sup>a</sup>
MCV (fl)	31.51 $\pm$ 0.40 <sup>a</sup>	30.00 $\pm$ 0.21 <sup>a</sup>	28.38 $\pm$ 0.78 <sup>b</sup>	29.00 $\pm$ 0.11 <sup>a</sup>	31.00 $\pm$ 0.21 <sup>a</sup>	31.00 $\pm$ 0.21 <sup>a</sup>	30.00 $\pm$ 0.81 <sup>a</sup>
MCH (pg)	10.24 $\pm$ 0.32 <sup>a</sup>	9.27 $\pm$ 0.52 <sup>a</sup>	9.34 $\pm$ 0.57 <sup>a</sup>	8.17 $\pm$ 0.32 <sup>a</sup>	10.22 $\pm$ 0.52 <sup>a</sup>	10.20 $\pm$ 0.72 <sup>a</sup>	09.37 $\pm$ 0.52 <sup>a</sup>
MCHC (g/dl)	31.72 $\pm$ 0.42 <sup>a</sup>	30.90 $\pm$ 0.90 <sup>a</sup>	30.92 $\pm$ 0.18 <sup>a</sup>	29.10 $\pm$ 0.70 <sup>a</sup>	31.60 $\pm$ 1.90 <sup>a</sup>	30.68 $\pm$ 0.90 <sup>a</sup>	30.95 $\pm$ 0.90 <sup>a</sup>
WBC( $10^3$ /cu.mm)	8.50 $\pm$ 0.30 <sup>a</sup>	11.20 $\pm$ 0.16 <sup>b</sup>	13.20 $\pm$ 1.10 <sup>c</sup>	10.20 $\pm$ 0.06 <sup>a</sup>	12.30 $\pm$ 1.30 <sup>b</sup>	13.44 $\pm$ 1.10 <sup>c</sup>	12.20 $\pm$ 1.10 <sup>b</sup>
Neutrophil (%)	32.10 $\pm$ 0.21 <sup>a</sup>	42.01 $\pm$ 0.50 <sup>b</sup>	50.00 $\pm$ 1.60 <sup>c</sup>	40.01 $\pm$ 0.70 <sup>b</sup>	51.00 $\pm$ 1.20 <sup>c</sup>	53.00 $\pm$ 1.60 <sup>c</sup>	51.00 $\pm$ 1.20 <sup>c</sup>
Lymphocyte (%)	60.30 $\pm$ 0.46 <sup>a</sup>	40.60 $\pm$ 0.22 <sup>b</sup>	41.00 $\pm$ 2.08 <sup>b</sup>	39.30 $\pm$ 0.12 <sup>b</sup>	42.00 $\pm$ 1.08 <sup>b</sup>	42.00 $\pm$ 1.08 <sup>b</sup>	41.32 $\pm$ 2.18 <sup>b</sup>
Monocyte (%)	2.00 $\pm$ 0.26 <sup>a</sup>	4.00 $\pm$ 0.62 <sup>b</sup>	5.10 $\pm$ 0.20 <sup>b</sup>	3.90 $\pm$ 0.72 <sup>b</sup>	5.32 $\pm$ 0.10 <sup>b</sup>	5.40 $\pm$ 0.20 <sup>b</sup>	5.20 $\pm$ 0.30 <sup>b</sup>
Eosinophil (%)	5.00 $\pm$ 0.60 <sup>a</sup>	9.50 $\pm$ 0.62 <sup>b</sup>	8.00 $\pm$ 4.30 <sup>b</sup>	9.10 $\pm$ 0.42 <sup>b</sup>	8.30 $\pm$ 2.30 <sup>b</sup>	9.00 $\pm$ 2.30 <sup>b</sup>	8.12 $\pm$ 3.30 <sup>b</sup>
Basophil (%)	0 $\pm$ 0.24 <sup>a</sup>	1 $\pm$ 0.13 <sup>a</sup>	0 $\pm$ 0.25 <sup>a</sup>	1 $\pm$ 0.13 <sup>a</sup>	0 $\pm$ 0.25 <sup>a</sup>	0 $\pm$ 0.22 <sup>a</sup>	0 $\pm$ 0.23 <sup>a</sup>

parasitic and pathological conditions of lung as compared to healthy one. No significant change in basophils was observed in any of these parasitic and pathological conditions of lungs in sheep.

In goats, lungs infested with Myiasis showed significant decrease of Hb and PCV while no significant change was observed in other disease conditions as compared to control (Table 3). TEC decreased in conditions of Myiasis and Haemorrhage with no change in other parasitic and pathological conditions. MCV value changed only in haemorrhagic conditions of lungs of goats. Values of MCH and MCHC revealed non-significant changes in all the adverse parasitic and pathological conditions of lungs of goats. WBC and neutrophils significantly increased in all the diseased conditions of lung with more significant increase was observed in the pathological condition of abscess. Concentration of lymphocytes decreased significantly in all the conditions with more

significant decrease observed in parasitic condition of Myiasis. As compared to healthy lungs, monocytes and eosinophils increased significantly in all adverse parasitic and pathological conditions of lungs in goats.

## DISCUSSION

Significant decrease in Hb, PCV, TEC in sheep and goats infected with Myiasis and a non-significant decrease in these parameters in hydatidosis, *Mulleriuscapillaris*, pneumonia, abscess and haemorrhage was observed. These results are supported by the study conducted by Lipecka *et al.* (2010) in lambs and ewe who observed significant decrease in various blood parameters in parasitic as compared to pathological affections. Similarly, Khan and Khan (1996) observed non-significant difference in haematological parameters in lungs (pneumonic) conditions of small ruminants. Non significant decrease in these parameters were also reported by

**Table 3.** Haematological parameters (Mean  $\pm$  SE) in lung diseases of goats. Means within row with different superscripts differ significantly ( $P < 0.05$ ).

Parameters	Control	Hydatidosis	Myiasis	<i>M. capillaris</i>	Pneumonia	Abscess	Haemorrhage
Hb (g %)	10.50 $\pm$ 0.25 <sup>a</sup>	9.50 $\pm$ 0.14 <sup>a</sup>	8.35 $\pm$ 0.65 <sup>b</sup>	9.20 $\pm$ 0.24 <sup>a</sup>	10.20 $\pm$ 0.24 <sup>a</sup>	10.35 $\pm$ 0.24 <sup>a</sup>	9.20 $\pm$ 0.14 <sup>a</sup>
PCV (%)	31 $\pm$ 1.00 <sup>a</sup>	30.00 $\pm$ 0.20 <sup>a</sup>	25.00 $\pm$ 2.00 <sup>b</sup>	30.00 $\pm$ 0.42 <sup>a</sup>	30.00 $\pm$ 0.42 <sup>a</sup>	30.00 $\pm$ 0.62 <sup>a</sup>	28.00 $\pm$ 0.12 <sup>a</sup>
RBC( $10^6$ /cu.mm)	13.00 $\pm$ 0.48 <sup>a</sup>	12.86 $\pm$ 0.10 <sup>a</sup>	10.67 $\pm$ 1.00 <sup>b</sup>	12.00 $\pm$ 1.20 <sup>a</sup>	11.00 $\pm$ 1.40 <sup>a</sup>	11.56 $\pm$ 0.40 <sup>a</sup>	10.00 $\pm$ 1.20 <sup>b</sup>
MCV (fl)	23.84 $\pm$ 0.12 <sup>a</sup>	23.32 $\pm$ 0.13 <sup>a</sup>	22.43 $\pm$ 0.10 <sup>a</sup>	22.00 $\pm$ 0.21 <sup>a</sup>	22.00 $\pm$ 0.21 <sup>a</sup>	21.00 $\pm$ 0.21 <sup>a</sup>	20.00 $\pm$ 0.81 <sup>b</sup>
MCH (pg)	8.07 $\pm$ 0.12 <sup>a</sup>	7.38 $\pm$ 0.02 <sup>a</sup>	7.82 $\pm$ 0.52 <sup>a</sup>	7.27 $\pm$ 0.52 <sup>a</sup>	7.27 $\pm$ 0.52 <sup>a</sup>	7.29 $\pm$ 0.72 <sup>a</sup>	07.37 $\pm$ 0.52 <sup>a</sup>
MCHC (g/dl)	33.87 $\pm$ 1.00 <sup>a</sup>	33.33 $\pm$ 0.41 <sup>a</sup>	32.40 $\pm$ 0.01 <sup>a</sup>	32.90 $\pm$ 0.90 <sup>a</sup>	31.90 $\pm$ 1.90 <sup>a</sup>	30.68 $\pm$ 0.90 <sup>a</sup>	30.95 $\pm$ 0.90 <sup>a</sup>
WBC( $10^3$ /cu.mm)	9.56 $\pm$ 0.47 <sup>a</sup>	11.50 $\pm$ 0.37 <sup>b</sup>	10.00 $\pm$ 1.65 <sup>b</sup>	11.20 $\pm$ 0.16 <sup>b</sup>	12.23 $\pm$ 1.30 <sup>b</sup>	13.04 $\pm$ 1.10 <sup>c</sup>	10.20 $\pm$ 1.10 <sup>b</sup>
Neutrophil (%)	39.00 $\pm$ 0.24 <sup>a</sup>	44.10 $\pm$ 0.90 <sup>b</sup>	51.00 $\pm$ 1.31 <sup>c</sup>	43.01 $\pm$ 1.50 <sup>b</sup>	50.00 $\pm$ 1.20 <sup>c</sup>	54.00 $\pm$ 1.60 <sup>c</sup>	45.00 $\pm$ 1.20 <sup>c</sup>
Lymphocyte (%)	47.00 $\pm$ 0.29 <sup>a</sup>	41.30 $\pm$ 0.62 <sup>c</sup>	32.00 $\pm$ 2.00 <sup>b</sup>	40.60 $\pm$ 0.22 <sup>b</sup>	42.20 $\pm$ 1.08 <sup>c</sup>	41.12 $\pm$ 1.08 <sup>c</sup>	36.32 $\pm$ 2.18 <sup>b</sup>
Monocyte (%)	3.00 $\pm$ 0.76 <sup>a</sup>	5.00 $\pm$ 0.42 <sup>b</sup>	6.00 $\pm$ 0.91 <sup>b</sup>	5.00 $\pm$ 0.92 <sup>b</sup>	5.32 $\pm$ 0.10 <sup>b</sup>	5.30 $\pm$ 0.20 <sup>b</sup>	5.20 $\pm$ 0.30 <sup>b</sup>
Eosinophil (%)	3.00 $\pm$ 0.10 <sup>a</sup>	9.60 $\pm$ 0.66 <sup>b</sup>	9.82 $\pm$ 4.31 <sup>b</sup>	9.40 $\pm$ 0.52 <sup>b</sup>	8.30 $\pm$ 2.30 <sup>b</sup>	9.00 $\pm$ 2.30 <sup>b</sup>	6.12 $\pm$ 3.30 <sup>b</sup>
Basophil (%)	0 $\pm$ 0.20 <sup>a</sup>	0 $\pm$ 0.22 <sup>a</sup>	0 $\pm$ 0.25 <sup>a</sup>	1 $\pm$ 0.03 <sup>a</sup>	0 $\pm$ 0.24 <sup>a</sup>	0 $\pm$ 0.23 <sup>a</sup>	0 $\pm$ 0.23 <sup>a</sup>

Khalaf (2013) in hydatidosis infestation of mice. The parasitic infestation in general are responsible for inflammatory activities resulting from the movements, secretions, and toxins of the larvae and bacteria (secondary infection) which can cause anaemic condition and these events especially toxin formation virtually can lead to decrease in haematocrit values (Ipek *et al.*, 2012).

Leucocytes (WBCs), neutrophil and eosinophil counts were significantly ( $P < 0.05$ ) higher in the parasitic (Hydatidosis, Myiasis and *M. Capillaries*) and pathological conditions (Pneumonia, abscess and haemorrhage) of sheep and goats. These results are in agreement with various parasitic and pathological diseases of lungs (Roitt *et al.*, 2002; Yacob *et al.*, 2004). The studies of Al – Nasiri (2006) and Moraitaki *et al.* (2010) found an increase in the number of leukocytes and eosinophils as our study depicted. However, in contrary to our studies, they reported significant increase of lymphocytes and decrease in the number of neutrophils. The above changes may be considered as a defense mechanism against the inflammatory processes in the body especially in the liver, spleen and kidneys where the inflammation stimulates the bone marrow to produce a large number of WBC (Maclaren and Lacani, 1982). The increase of the eosinophil count could be attributed to the long period of the disease. Nguyen and Diamond (2000) explained eosinophilia in humans is produced due to the ability of parasites to infect the tissue and this agreed with the findings of Al – Humairy (2010).

## Conclusion

Sheep and goat slaughtered routinely as a source of food in Jammu region were found to have parasitic infestation of Hydatidosis, Myiasis and *Mullerius capillaries* along with pathological conditions of pneumonia, abscess and haemorrhages. Ante-mortem examination of blood revealed significant decreased of Hb, PCV and RBC in Myiasis infestation of lungs in sheep and goat. MCV decreased significantly in Myiasis of sheep and haemorrhagic lungs of goats. Significant decrease was observed in WBC in sheep and goat having both parasitic and pathological affections of lungs. Significance of present study revolves round the ante-mortem examination of blood before post mortem inspection for public health importance.

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