

## HAEMATOLOGICAL ALTERATIONS IN PNEUMONIC SHEEP OF KURNOOL AND NANDYAL DISTRICTS OF ANDHRA PRADESH

Dr G. Ravi Babu<sup>1</sup>, Dr I. Karthika Lakshmi<sup>2</sup>, Dr P. Dinakar Babu<sup>3</sup>, Dr Kokila Satheesh<sup>4</sup>,  
Dr P. Guru Vishnu<sup>5</sup>, Dr Shirisha<sup>6</sup>, Dr G. Praveena<sup>7</sup>, Dr L. Ratna Kumari<sup>8</sup>,  
Dr K. Gudivada. Srinivas<sup>9</sup> and Dr R. Amarendra Kumar<sup>10</sup>

<sup>1,6</sup>Assistant Director, <sup>2,3</sup>Veterinary Assistant Surgeon, <sup>4</sup>Professor, <sup>5,7</sup>Assistant Professor,  
<sup>8</sup>Joint Director, <sup>9</sup>District Animal Husbandry Officer, <sup>10</sup>Director of Animal Husbandry  
<sup>1,2,3,4</sup>O/o Animal Disease Diagnostic Laboratory, Kurnool, A.P- 518002, <sup>4,5,7</sup>Animal  
Husbandry Polytechnic, Banavasi, A.P.- 518360, <sup>6,7</sup>Veterinary Biological Research Institute,  
Labbipet, Vijayawada, A.P.-520010, <sup>8</sup>O/o District Animal Husbandry office, Kurnool,  
A.P.-518002, <sup>9</sup>O/o Director of Animal Husbandry, Labbipet, Vijayawada, A.P.- 520010  
E-mail: vishnugeneticsl@gmail.com (*Corresponding author*)

**Abstract:** A preliminary study was conducted in Kurnool and Nandyal districts of Andhra Pradesh to delineate the haemogram profile among local breeds of sheep and to extrapolate the association of haematological changes with health status in sheep. A total of 77 sheep involving 38 healthy and 39 pneumonic sheep were included in the present study and the necessary haematological parameters of all the sheep were analyzed by Automated Hematology Analyser at Animal Disease Diagnostic Laboratory (ADDL), Kurnool, Andhra Pradesh, India. The analysis of haematological profile manifested a significant ( $P < 0.001$ ) decrease in the mean value of hemoglobin, red blood cells and packed cell volume in pneumonic sheep, and significant ( $P < 0.001$ ) escalation in the mean value of white blood cells and platelets in pneumonic sheep when compared to healthy sheep. Whereas, the mean levels of MCV, MCH, MCHC, did not varied significantly between healthy and pneumonic sheep. The haematological parameters associated with pneumonia, in conjunction with clinical signs can be used as a diagnostic tool to screen the sheep flocks for the presence of pneumonia at early stage of disease.

**Keywords:** Sheep, Hemogram, Healthy sheep and Pneumonia

### 1. INTRODUCTION

The small ruminants considering its multi-facet utility occupy a prominent role in Indian GDP and provides livelihood to two-third of rural community. Sheep generally known as "Poor Man's Mobile Bank", play a crucial part in improving socio economic conditions among marginal farmers/landless labourers by generating income through sale of meat primarily followed by milk and wool production (Gadekar et al.,2023).

Diseases of respiratory system among sheep especially pneumonia has been identified as important production limiting disease, affecting all ages and breeds resulting in poor live

weight gain and high mortality rate (Naveed et al.,1999). Infectious respiratory diseases contribute up to 5.6% of total diseases among small ruminants. Pneumonia is recognized as the foremost disease causing damage to the sheep industry (Attoh -Kotoku et al., 2018). A variety of predisposing etiological factors trigger pneumonia in sheep, manifesting vast range of clinical symptoms. The potential losses due to respiratory diseases can be minimized by sound diagnostic approach along with sound management programme (Mekibib et al., 2019). The hemogram profile and clinical evaluation are widely employed to diagnose a variety of metabolic and infectious diseases. The haematological findings besides clinical signs and anamnesis would provide a solid foundation for diagnosis of the respiratory diseases like pneumonia. The haematological parameters associated with pneumonia can be used as a diagnostic tool to screen the sheep flocks for the presence of disease at early stages. Therefore as a preliminary step, the present study is designed to ascertain association between hematological parameters and pneumonic infection in sheep.

## **2. MATERIALS AND METHODS**

The present study was conducted among various breeds of sheep distributed in and around Kurnool and Nandyal districts from April, 2023 to March, 2024. The purposive sampling method was done to select sheep from different flocks for identification of symptoms of pneumonia. A total of 77 adult sheep selected based on clinical examination were differentiated into two groups i.e., Group I - healthy (n=38) with no clinical signs of illness and, Group II - pneumonic sheep (n=39) with bilateral nasal discharges, congested mucus membranes, cough, inappetence, dyspnea and harsh sound in lungs during auscultation. The blood from both healthy and pneumonic sheep was collected into tubes with EDTA for hematological examination and stored immediately in igloo box for maintaining cold chain and the samples were maintained under refrigeration conditions until further analysis at Animal Disease Diagnostic Laboratory (ADDL), Kurnool, Andhra Pradesh, India. All the blood samples of sheep were subjected for assessment of hematological parameters like RBC, Hb, PCV, MCV, MCH, MCHC and Platelet count using Nihon-Kohden's Celltac- Automated Hematology Analyser (model no: mek-6550) located at ADDL, Kurnool. The mean values of RBCs, Hb, and PCV were employed to estimate mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC). All the procedures were conducted as per the standard hematological procedures approved by Meyer and Harvey 2004.

The hematological parameters between healthy and pneumonic sheep were analyzed by Univariate Generalized Linear Model Independent samples 't' test using trial version of SPSS 29 (<https://www.ibm.com/products/spss-statistics>). The data was checked for all the assumptions (normality and homogeneity) and was subjected to further analysis only after all criteria were being met. The statistical model for the present analysis was:

$$P_{ij} = \mu + H_i + e_{ij},$$

Where  $\mu$  is population mean,  $P_{ij}$  is value of respective parameter,  $H_i$  is effect due to health status of sheep and  $e_{ij}$  is random error (NID 0,  $\sigma^2$ ).

### 3. RESULTS AND DISCUSSION

All the pneumonic sheep exhibited symptoms like bilateral serous to mucopurulent nasal discharges, hyperthermia, tachycardia, polypnea, pale and cyanosed mucus membrane, in the early stages followed by inappetence, dyspnea, cough, and a harsh sound of lungs during auscultation during later stages of infection.

The comparative study conducted on two groups of sheep revealed that majority of the parameters varied significantly ( $P < 0.05$ ) between healthy and pneumonic sheep (Table 1). The analysis of haematological profile manifested a significant decrease in the mean value of hemoglobin, red blood cells and packed cell volume in pneumonic sheep (Fig 1). Likewise, the mean value of white blood cells and platelets increased significantly in pneumonic sheep when compared to healthy sheep (Table 1). Whereas the mean levels of MCV, MCH, MCHC, did not varied significantly between healthy and pneumonic sheep (Table 1) which corroborated with the findings of Arbaga et al., (2022) and similar findings have been reported by (Saleh and Allam, 2014).

The diminished production of RBC in pneumonic sheep could be due to destruction of red blood cells by microbes (Mondal et al. 2004) or suppression of erythropoiesis because of iron sequestration in bone marrow, macrophages and hepatocytes. The occurrence of leucocytosis and lower PCV in unhealthy sheep might be attributed to the incidence of microbes and their toxins on the hematopoietic system in sheep (Esmaeilnejad et al. 2012). The increased concentrations of WBC cells could be ascribed to invasion of bacteria and subsequent accumulation of various mediators of the inflammatory response, which regulates the circulating WBC concentration (El-Naser and Khamis, 2009).

#### **4. CONCLUSION**

Pneumonia has been considered as one of the noteworthy disease of sheep affecting its production. Therefore identification of any indicator for diagnosis of disease at early stage will have huge impact in controlling the disease and improving the sheep production. The present study aimed to determine the association of haematological changes with health status of sheep and documentation of those pneumonia associated parameters can be used as indicator to screen the sheep flocks for the presence of disease at early age.

Further, grazing patterns like rotational grazing, zero grazing will also help in minimizing the soil borne infections with pulmonary involvement and thereby protecting the target population from life threatening pneumonitis. Some of the emerging retro viral infections like JSRV and OPA will exert an adverse effect on lung parenchyma causing dyspnea, driving sickness and with fatal determination especially in adult flock.

Proper hygiene, sanitation and seasonal administration of vaccines against PPR, Sheep Pox etc will definitely mitigate the infection rate. Hence, it is the need of hour to take stringent action plan or route map by the authorities, which yield fruitful and reliable to prevent and control the diseases. Further, a detailed surveillance is to be carried out on different parameters to obtain a comprehensive data about the risk factors which aids government agencies to formulate strategic approaches towards elimination the disease.

#### **REFERENCES**

- [1] Arbaga, A., Hassan, H., Anis, A., &Osthman, N. (2022). Hematological changes and serum minerals concentrations in pneumonic sheep. Benha Veterinary Medical Journal, 42(2), 143-146.
- [2] Attoh-Kotoku, V., Emikpe, B.O., Obuadey, D., Ishola, O., Emmanuel Kwesi, O., Donkoh, A., &Folitse, R. (2018). Patterns and direct financial implications of contagious pleuropneumonia in cattle slaughtered in Kumasi Abattoir, Ghana. Animal Research International, 15(1), 2937-2943.
- [3] Clinicohaematology and pathology of caprinemycoplasmal pneumonia in rain fed tropics of West Bengal. Small Ruminant Research 51:285–295.
- [4] El-Naser EMA, KhamisGFA 2009. Some hematological and blood serum biochemical indices associated with respiratory affections by camels. Assiut Veterinary Medical Journal, 55(123), 1-10.

- [5] Esmailnejad B, Tavassoli M, Asri-Rezaei S, DalirNaghadehB 2012. Evaluation of antioxidant status and oxidative stress in sheep naturally infected with Babesiaovis. *Veterinary Parasitology* 185:124–130.
- [6] Gadekar, Y. P., Shinde, A. K., Banerjee, R., &Barbuddhe, S. B. (2023). Present status and future prospects of meat production from small ruminants: An overview. *Indian Journal of Small Ruminants (The)*, 29(2), 185-197.
- [7] Mekibib, B., Mikir, T., Fekadu, A., &Abebe, R. (2019). Prevalence of pneumonia in sheep and goats slaughtered at ElforaBishoftu export abattoir, Ethiopia: A pathological investigation. *Journal of veterinary medicine*, 2019.
- [8] Meyer DJ, Harvey JW 2004. *Veterinary laboratory medicine*. 3rd. Edn, London, W B Saunders Co, PP 17– 24
- [9] Naveed, M., Javed, M.T., Khan, A., &Kausar, R. (1999). Haematological and bacteriological studies in neonatal lambs with reference to neonatal lamb mortality. *Pakistan Veterinary Journal*, 19(3), 127-131.
- [10] Saleh, N.S., &Allam, T.S. (2014). Pneumonia in sheep: bacteriological and clinicopathological studies. *American Journal of Research Communication*, 2(11), 70-88.

### **Conflict-Of-Interest**

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

**Table 1: Mean values (Mean  $\pm$ SEM) of Hematological parameters between groups**

| Parameter                             | Healthy                         | Unhealthy                      | P-value |
|---------------------------------------|---------------------------------|--------------------------------|---------|
| Hb (g/dl)                             | 9.76 $\pm$ 0.12 <sup>a</sup>    | 6.84 $\pm$ 0.15 <sup>b</sup>   | <0.001  |
| WBCS (10 <sup>3</sup> / $\mu$ l)      | 7.46 $\pm$ 0.35 <sup>b</sup>    | 12.32 $\pm$ 0.59 <sup>a</sup>  | <0.001  |
| RBCS (10 <sup>6</sup> / $\mu$ l)      | 4.43 $\pm$ 0.06 <sup>b</sup>    | 6.21 $\pm$ 0.34 <sup>a</sup>   | <0.001  |
| PCV (%)                               | 29.28 $\pm$ 0.35 <sup>a</sup>   | 21.92 $\pm$ 0.6 <sup>b</sup>   | <0.001  |
| MCV (fl)                              | 29.01 $\pm$ 0.36                | 28.38 $\pm$ 0.36               | 0.221   |
| MCH (pg)                              | 9.6 $\pm$ 0.21                  | 9.28 $\pm$ 0.11                | 0.197   |
| MCHC (%)                              | 32.21 $\pm$ 0.29                | 32 $\pm$ 0.24                  | 0.576   |
| Platelets (10 <sup>3</sup> / $\mu$ l) | 419.51 $\pm$ 21.31 <sup>a</sup> | 182.5 $\pm$ 12.83 <sup>b</sup> | <0.001  |

\*P<0.05-statistically significant; \*\*P<0.01-highly significant; \*\*\*P<0.001-strongly significant

<sup>a, b</sup> Means sharing different superscript in the same row differ significantly (t-test)

Hb; Hemoglobin, RBCS; red blood cells, WBCS; white blood cells, MCV; mean corpuscular volume, MCH; mean corpuscular hemoglobin, MCHC: mean corpuscular hemoglobin concentration

**Fig 1: Bar diagram depicting changes in Mean values (Mean  $\pm$ SEM) of Hematological parameters between groups**

