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# Hematological and biochemical alterations in goats due to paste des petits ruminant's viral infection

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**Abstract**
The present study was conducted to evaluate the different hematological and serum biochemical alterations in naturally infected Paste des petits ruminant's viral (PPRV) infection in goats of Assam. A total of 26 whole blood samples from infected Assam Local goats and 10 blood samples from healthy local goats of Assam were collected and analyzed. All the test results were subjected to analyze the Analysis of Variance (ANOVA). Analysis of Variance showed significant increase in total erythrocyte count ($P<0.05$), hemoglobin ($P<0.01$), packed cell volume ($P<0.01$) and significant decrease in total leucocytes count ($P<0.01$) in PPRV infected goats in compared with healthy goats. Lymphopenia was constant finding in differential leucocytes count in infected goats in compared with healthy goats. Biochemical study revealed significant decrease in serum protein ($P<0.01$) and significant increase in serum potassium level ($P<0.01$), with non-significant increase of serum sodium level in infected goats in compared with apparently healthy goats. This is due to nephritic damage which cause in permeability of glomerular capillary wall.

**Keywords:** Biochemical, C-ELISA, Hematology, PPRV, ANOVA

## 1. Introduction
India is a vast country with a population of 137.17 million goats and 65.06 million sheep, of which Assam shares 6.16 million and 0.51 million goats and sheep respectively [1]. In India sheep and goat play a major role in sustainable agricultural and employment generation [2, 3]. Sheep and goat husbandry is popular in small, marginal and landless farmers. As in Assam 52% of farmers depend on agriculture, so sheep and goat husbandry play a major role in their livelihood and fulfilling the daily requirements of protein in the form of milk and meat along with high quality manure. Sheep and goat husbandry is frequently affected by some infectious diseases, which may occur in epidemic form. Some of the commonly encountered infectious diseases are enterotoxaemia, Paste des petits ruminants, foot and mouth disease, bluetongue, haemonchosis, mastitis etc. Out of these diseases, PPR is a newly introduced disease to NE India including Assam.
Peste des petits ruminants is a disease of small ruminants specially in sheep and goats. It is a highly contagious and infectious with an economically important disease which causes high morbidity and mortality rate [4]. The disease was first described in West Africa [5]. In India, the disease was first reported in 1987 in the village of Arasur located in the villapurum district of Tamil Nadu [6]. The disease is caused by Peste des petits ruminant's virus, under the genus Morbillivirus of the family Paramyxoviridae. The disease is characterized by pyrexia, dyspnoea, pneumonia, mucopurulent occulo-nasal discharge, errosive rhinitis, necrotic ulcers in mouth, on dental pad, tongue and lips. In early stages there is stomatitis followed by severe enteritis and diarrhea [7]. Since, the virus is a lymphotropic and epitheliotropic in nature [8]. So the present investigation was carried out to evaluate the different parameters of haematological and biochemical alteration of the disease in the naturally infected local goats of Assam.

## 2. Materials and Methods
### 2.1 Ethical approval
Present study was conducted after approved by the Institutional Animal Ethics Committee of College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, and India. The approval number is No. 770/ac/CPCSEA/FVSc/AAU/IAEC/14-15/261 Dated. 20/06/1014.

### 2.2 Sample area, Animals, Sample collection and test procedure

In the present study, a total of 26 samples were collected from clinically affected Assam local goats and 10 samples were collected from healthy Assam local goats from different parts of Assam. The haematological parameters included Total Erythrocyte Count (TEC), haemoglobin (Hb), Packed Cell Volume (PCV), Total Leucocyte Count (TLC) was estimated by automated haematological cell counter (Model: MS 4e) and Differential Leucocyte Count (DLC) was carried out by Wright's staining technique and expressed in percentage. For haematological analysis, 2 ml of blood was collected in EDTA vials from both the naturally and apparently healthy local goats of Assam. For, serum biochemical analysis, 5 ml blood was collected in a sterilized vacutainer from both the naturally and apparently healthy local goats of Assam. Serum samples were separated and all the serum samples were subjected to evaluate total serum protein, sodium ion concentration and potassium ion concentration by using spectrophotometer as per standard protocol given by manufactured company along with kits.

### 2.3 Statistical Analysis

All the haematological and biochemical data obtained were subjected to statistical analysis following standard statistical procedure using the software SPSS 15.0 available at Biostatics Unit, College of Veterinary Science, Assam Agricultural University, Khanapara, and Guwahati, Assam.

## 3. Results and discussion

The mean values of haematological and biochemical parameters in PPR affected and healthy goats are presented in the table no. 1 and table no. 2 respectively. All the haematological and biochemical parameters included in the investigation were significantly differed between affected and healthy goats at 5% and 1% confidence level. Present investigation showed significant increase in total erythrocyte count ($P$<0.05), hemoglobin ($P$<0.01) and packed cell volume ($P$<0.01) in the PPR affected goats as compared to healthy goats this might be due to severe diarrhoea that leads to dehydration which caused polycythaemia. Similar findings were also reported by other [9]. The total leucocytes count ($P$<0.01) was significantly decreased in PPR affected goats as compared to healthy goats. Similar findings were also recorded by other several workers in PPR affected goats as compared with apparently healthy goats [9-12]. Which was due to the lymphotropic nature of the virus and also the inhibition of peripheral blood lymphocytes proliferation by PPR virus [13]. In differential leucocytes count showed that there was decrease of lymphocytes ($P$<0.01), eosinophils ($P$<0.01), and basophiles count ($P$<0.01) and corresponding increase of neutrophil count ($P$<0.01) in the PPR affected animals as compared to healthy goats. Similar observation was also made by several workers [8, 10-13]. The lymphopenia was due to necrosis of the lymphocytes in lymph nodes, spleen and peyer's patches as the virus was lymphotropic like that of rinderpest virus [14, 15].

In biochemical study, the total serum protein level was significantly lower ($P$<0.01) in PPR affected goats as compared to healthy goats which is due to nephritic damage to the glomeruli that causes increase in permeability of capillary walls of the glomerulus leading to passing of high level of protein from blood to urine. Similar findings were also recorded by others workers [9, 16]. Significance increase in Serum potassium ion level was recorded ($P$<0.01). Similar findings were also reported by others which were due to haemoconcentration as evidenced by diarrhoea [8]. However, an increase in serum potassium level was described in PPRV infected goats which was due to renal disease which causes excessive renal potassium retention. [17]. Non-significant increase of serum sodium level was also recorded.

**Table 1:** Haematological Values of Group- A and Group-B Goats

| Animal No | TEC($10^{6/}$ µl) | | TLC($10^{3/}$ µl) | | Hb (g/dl) | | PCV (%) | | | | | | DLC (%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Neutro (%) | | Lymp (%) | | Mono (%) | | Eosi (%) | | Baso (%) | |
| | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B |
| GT/1 | 12.61 | 11.88 | 6.93 | 9.5 | 12.4 | 9 | 28.3 | 28 | 70 | 36 | 22 | 55 | 5 | 3 | 3 | 4 | 0 | 3 |
| GT/2 | 16.59 | 12 | 9.74 | 8.7 | 10.2 | 9.2 | 34.1 | 29 | 76 | 37 | 21 | 57 | 2 | 4 | 1 | 3 | 0 | 2 |
| GT/3 | 13.59 | 12.5 | 5.71 | 7.94 | 12.8 | 10.19 | 28.7 | 29.81 | 78 | 37 | 16 | 56 | 5 | 5 | 1 | 5 | 0 | 1 |
| GT/4 | 13.05 | 12.3 | 11.61 | 8.21 | 10.9 | 8.79 | 24.7 | 29.89 | 74 | 38 | 19 | 62 | 4 | 4 | 2 | 2 | 1 | 3 |
| GT/5 | 11.28 | 11.7 | 6.81 | 8.93 | 11.1 | 9.87 | 22.9 | 28.9 | 69 | 37 | 27 | 59 | 3 | 2 | 0 | 4 | 0 | 3 |
| GT/6 | 9.7 | 13.9 | 13 | 9.67 | 11.6 | 9.97 | 24.3 | 28.97 | 62 | 36 | 34 | 57 | 3 | 3 | 1 | 3 | 0 | 3 |
| GT/7 | 12.44 | 13.01 | 4.12 | 9.81 | 12.5 | 9.13 | 19.5 | 29 | 61 | 35 | 36 | 62 | 1 | 2 | 1 | 4 | 1 | 2 |
| GT/8 | 19.52 | 11.8 | 9.28 | 10.01 | 11.2 | 8.9 | 38.6 | 29.1 | 74 | 36 | 24 | 58 | 1 | 4 | 1 | 1 | 0 | 3 |
| GT/9 | 21.93 | 12.35 | 6.61 | 9.03 | 14.4 | 9.1 | 39.3 | 28.65 | 73 | 37 | 25 | 59 | 2 | 3 | 1 | 2 | 0 | 3 |
| GT/10 | 18.35 | 11.9 | 4.66 | 8.96 | 12.8 | 9.37 | 37.5 | 28.67 | 75 | 38 | 19 | 61 | 2 | 5 | 3 | 3 | 0 | 2 |
| GT/11 | 11.88 | | 6.51 | | 11.2 | | 34.8 | | 67 | | 27 | | 2 | | 3 | | 1 | |
| GT/12 | 15.83 | | 4.27 | | 13.9 | | 36.5 | | 65 | | 32 | | 2 | | 1 | | 0 | |
| GT/13 | 15.22 | | 6.2 | | 13.8 | | 36.7 | | 74 | | 22 | | 1 | | 3 | | 0 | |
| GT/14 | 13.86 | | 6.79 | | 12.6 | | 35.6 | | 65 | | 29 | | 3 | | 2 | | 0 | |
| GT/15 | 9.24 | | 5.97 | | 14.1 | | 32.1 | | 77 | | 19 | | 2 | | 1 | | 0 | |
| GT/16 | 18.94 | | 5.24 | | 14.2 | | 38.9 | | 71 | | 25 | | 2 | | 2 | | 0 | |
| GT/17 | 17.4 | | 5.42 | | 13.4 | | 37.6 | | 66 | | 28 | | 4 | | 1 | | 1 | |
| GT/18 | 21.7 | | 5.23 | | 16.5 | | 42.5 | | 72 | | 24 | | 1 | | 3 | | 0 | |
| GT/19 | 15.54 | | 5.19 | | 13.8 | | 37.7 | | 62 | | 35 | | 2 | | 1 | | 0 | |
| GT/20 | 13.24 | | 6.1 | | 12.8 | | 36.4 | | 62 | | 36 | | 1 | | 1 | | 0 | |
| GT/21 | 11.56 | | 6.91 | | 14.2 | | 34.5 | | 62 | | 34 | | 3 | | 1 | | 0 | |
| GT/22 | 12.11 | | 4.52 | | 14.2 | | 36.7 | | 72 | | 21 | | 2 | | 4 | | 1 | |
| GT/23 | 10.14 | | 7.13 | | 12.8 | | 38.2 | | 59 | | 34 | | 6 | | 1 | | 0 | |
| GT/24 | 11.78 | | 6.23 | | 12.5 | | 36.8 | | 63 | | 32 | | 4 | | 1 | | 0 | |
| GT/25 | 16.43 | | 7.96 | | 14.2 | | 38.4 | | 57 | | 33 | | 7 | | 3 | | 0 | |
| GT/26 | 18.35 | | 4.66 | | 15.1 | | 39.8 | | 71 | | 21 | | 4 | | 3 | | 1 | |
| Mean | 14.70* | 12.33 ± | 5.91** | 9.07 | 13.04** | 9.35 | 34.27** | 28.99 | 68.36** | 36.70 | 26.73** | 58.60 | 2.84 | 3.40 | 1.69** | 3.10 | 0.23** | 2.10 |

| ± SE | ± 0.70 | 0.21 | ±0.2 | ± 0.21 | ± 0.25 | ± 0.15 | ±1.08 | ± 0.17 | ±1.19 | ±0.30 | ±1.21 | ±0.77 | ± 0.31 | ±0.30 | ± 0.20 | ±0.37 | ± 0.08 | ± 0.27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

NB: Group- A = Affected animal Group- B = Control animals TEC = Total Erythrocyte Counts TLC = Total Leucocytes Counts, HB = Haemoglobin PCV = Packed Cell Volume DLC = Differential Leucocytes Count, Neutro = Neutrophils Lymph = Lymphocytes Mono = Monocytes Eosino = Eosinophils Baso = Basophils SE = Standard error

Means bearing superscripts * indicates significant at 5% level and ** indicate significant at 1% level.

**Table 2:** Biochemical Values of Group-A (Affected) and Group-B (Control) Animals

| ID numbers of sample | Total Serum Protein (g/dl) | | serum sodium (m mol/L) | | serum potassium (m mol/L) | |
|---|---|---|---|---|---|---|
| | Group-A | Group-B | Group-A | Group-B | Group-A | Group-B |
| GT /1 | 6.62 | 7.20 | 142.84 | 142.50 | 4.50 | 6.10 |
| GT /2 | 6.24 | 6.80 | 146.94 | 145.20 | 6.05 | 5.30 |
| GT /3 | 5.04 | 6.40 | 150.65 | 143.80 | 8.40 | 6.20 |
| GT /4 | 6.40 | 6.80 | 161.49 | 143.30 | 8.06 | 6.10 |
| GT /5 | 5.96 | 7.10 | 161.49 | 144.10 | 7.02 | 5.70 |
| GT /6 | 6.16 | 7.40 | 160.55 | 143.60 | 6.96 | 6.30 |
| GT /7 | 5.44 | 7.20 | 153.76 | 142.30 | 8.27 | 6.10 |
| GT /8 | 5.90 | 6.90 | 147.93 | 141.70 | 7.77 | 5.80 |
| GT /9 | 6.64 | 7.30 | 146.63 | 142.10 | 6.96 | 6.80 |
| GT /10 | 7.02 | 7.10 | 144.37 | 145.10 | 6.67 | 6.10 |
| GT /11 | 6.44 | | 138.11 | | 9.75 | |
| GT /12 | 7.10 | | 136.42 | | 7.83 | |
| GT /13 | 6.85 | | 154.52 | | 7.99 | |
| GT /14 | 5.97 | | 146.41 | | 8.58 | |
| GT /15 | 6.62 | | 137.56 | | 7.53 | |
| GT /16 | 5.92 | | 137.18 | | 9.19 | |
| GT /17 | 4.96 | | 139.25 | | 8.19 | |
| GT /18 | 6.38 | | 145.66 | | 6.48 | |
| GT /19 | 5.04 | | 139.95 | | 7.71 | |
| GT /20 | 5.01 | | 146.04 | | 4.65 | |
| GT /21 | 6.28 | | 138.31 | | 6.64 | |
| GT /22 | 4.90 | | 142.20 | | 7.01 | |
| GT /23 | 5.20 | | 139.42 | | 7.54 | |
| GT /24 | 5.42 | | 136.96 | | 7.77 | |
| GT /25 | 5.62 | | 139.90 | | 6.90 | |
| GT /26 | 4.90 | | 140.04 | | 6.94 | |
| MEAN ± S.E. | 5.92** ±0.13 | 7.02 ± 0.09 | 145.17 ± 1.52 | 143.37 ± 0.38 | 7.36** ± 0.23 | 6.05 ± 0.12 |

NB: Mean bearing superscript ** indicates significant at 1% level between the groups

## 4. Conclusion

The result of the present study revealed that the hematological and biochemical parameters included in the investigation were significantly differed between affected and healthy goats. The total erythrocyte count, hemoglobin, packed cell volume and neutrophil count was significantly increase, total leucocytes count, lymphocytes counts, eosinophil count and basophile count was decreased in affected goats as compared with healthy goats respectively. Significant alteration were also recorded in total serum protein ($P$<0.01), serum potassium level, with non-significant increase of serum sodium level in naturally infected goats as compared with healthy goats.

## 5. Acknowledgement

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