# STUDIES ON BLOOD PROFILE OF HEALTHY AND INFECTED HANUMAN LANGUR (*PRESBYTIS ENTELLUS)*

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## ABSTRACT

A study was conducted on healthy (n=19) and infected (n=15) hanuman langurs of Gujarat state to establish the normal hematological and biochemical values in the species. In both the sexes of healthy langurs hematological values were noted within the normal range. Hb, TEC, PCV and TLC values in diseased conditions (stomatitis, diarrhoea and respiratory infections) were apparently higher and in disorder conditions (infected wound, electrocution and road accident) they were significantly lower than the values of healthy animals in both the sexes. Blood glucose, BUN, calcium, AST and ALT levels were found to be higher in the healthy female langurs than in the males whereas the levels of total protein, albumin, globulin, creatinine and phosphorus were higher in males than in females. The values of globulin, calcium and AST in the infected animals (infected wound, electrocution and road accident) were found to be lower than those in the healthy animals of both the sexes. The present findings on haemato-biochemical values in healthy langurs would serve as guideline.

**KEY WORDS:** Biochemical values, Hematological values, Hanuman langur, Healthy, Infected, Gender effect.

## INTRODUCTION

Hematology and serum biochemistry serve as indicators of the status of health. Non Human Primates (NHPs) act as reservoir for several infections and zoonotic bacterial, viral and parasitic organisms. Hematology helps to establish the diagnosis for many disorders in many species (Moore, 2000). Thorough clinical evaluation in zoological and wildlife medicine may be limited because of insufficient knowledge of species biology and ability of wild animals to mask clinical symptoms and stress. Only few reports are available pertaining to the hematology and serum biochemical values of NHPs of India and there is no scientific study on this aspect in the Gujarat state, hence the purpose of present study was to establish the reference hematological and biochemical values in healthy and infected hanuman langurs (*Presbytis entellus*) of either sexes of Gujarat state.

## MATERIALS AND METHODS

A total of ten healthy (5 males and 5 females) and twenty infected (12 males and 8 females) with diseases (stomatitis, diarrhoea, and respiratory infection) or disorders (infected wound, electrocution and road accident) hanuman langurs were included in hematological study. Whereas, 19 healthy (11 males and 8 females) and 15 infected (9 males and 6 females) hanuman langurs were included for biochemical study. Approximately 5 ml of whole blood was collected aseptically from the saphenous/tail vein in sterile heparinized vaccutainer vial. Hematological evaluation was carried out by using blood analyser (Auto-analyser Medonic CA 620) in the laboratory of Government Polyclinic, Vadodara as per the method described by Jain (1993).

For separation of serum, approximately 6 ml of blood was collected aseptically from the saphenous/ tail vein of hanuman langurs and transferred to sterile serum clot activator vaccutainer vial (Hi-media). Serum was transferred to sterile storage vials and stored at -20 ºC until use. Serum biochemical parameters were analyzed in semi auto-analyser (Secoman, Made in France) using

**Table 1: Hematological values of the hanuman langur (*Presbytis entellus*)**

| Sr. no. | Parameters | Healthy (n=10) | | Infected male (n=12) | | Infected female (n=8) | |
|---|---|---|---|---|---|---|---|
| | | Male (n=5) | Female (n=5) | Diseases (n=5) | Disorders (n=7) | Diseases (n=4) | Disorders (n=4) |
| 1 | Hb (g/dl) | ... | 12.57 + 0.15 | 17.50 + 0.23* | 10.46 + 0.36* | 13.35 + 0.13* | 10.68 + 0.17* |
| 2 | TEC ($\times 10^6$/µl) | 5.66 + 0.12* | 5.10 + 0.04 | 7.36 + 0.17* | 4.24 + 0.33* | 5.53 + 0.05* | 4.39 + 0.12* |
| 3 | PCV (%) | 42.4 ± 1.80 | 38.86 ± 0.41* | 53.50 ± 0.85 | 31.80 ± 1.20 | 39.33 ± 0.74* | 33.50 ± 0.42* |
| 4 | MCV(fl) | 66.43 ± 1.79* | 66.48 ± 0.73* | 70.85 ± 0.82 | 72.42 ± 2.10 | 69.56 ± 0.65* | 73.23 ± 0.58* |
| 5 | MCH (pg) | 22.14 ± 0.31 | 22.76 ± 0.14 | 23.31 ± 0.24 | 23.74 ± 0.87 | 23.11 ± 0.13 | 23.99 ± 0.29 |
| 6 | MCHC (%) | 31.65 + 0.44 | 30.58 + 0.12 | 32.81 + 0.41 | 32.15 + 0.84 | 30.64 + 0.22 | 32.67 + 0.18 |
| 7 | TLC ($\times 10^3$/µl) | 10.12 + 0.04 | 12.12 + 0.02 | 14.22 + 0.04 | 12.22 + 0.02 | 12.22 + 0.04 | 11.27 + 0.04 |
| 8 | N (%) | 50.24 ± 0.43 | 46.04 ± 1.59* | 60.65 ± 1.74 | 69.60 ± 0.74 | 59.83 ± 0.87 | 69.33 ± 0.67* |
| 9 | L (%) | 38.88 ± 0.28* | 44.26 ± 1.84* | 31.52 ± 1.26* | 24.20 ± 0.86 | 31.83 ± 0.40 | 23.17 ± 0.65* |
| 10 | E (%) | 5.84 ± 0.28* | 4.88 ± 0.27 | 3.83 ± 0.31* | 2.80 ± 0.20 | 3.83 ± 0.31 | 3.17 ± 0.65 |
| 11 | M (%) | 5.03 ± 0.10* | 4.82 ± 0.21 | 3.83 ± 0.31* | 3.40 ± 0.40* | 4.33 ± 0.33 | 4.33 ± 0.49 |
| 12 | B (%) | 0 | 0 | 0.17 + 0.17 | 1.80 + 0.68 | 0.17 + 0.17 | 0 |

(*P<0.05 = Significant at 5% level, n indicates total number of animals, Hb- Haemoglobin, TEC- Total erythrocyte count, PCV- Pack cell volume, MCV- Mean corpuscular volume, MCH-Mean corpuscular haemoglobin, MCHC- Mean corpuscular haemoglobin concentration, TLC- Total leucocyte count, N- Neutrophil, L- Lymphocyte, E-Erythrocyte, M-Monocyte, B-Basophil).

**Table 2 : Serum biochemical values of the hanuman langur (Presbytis entellus)**

| Sr. no. | Parameters | Healthy (n=19) | | Infected (n=15) | |
|---|---|---|---|---|---|
| | | Male(n=11) | Female(n=8) | Male (n=9) | Female(n=6) |
| 1 | Blood Glucose (mg/dl) | 102.89 ± 1.61 | 108.78 ± 1.22 | 110.08 ± 1.19 | 95.00 ± 0.92 |
| 2 | Total Protein (g/dl) | 6.94 ± 0.03 | 6.82 ± 0.01 | 6.91 ± 0.03 | 6.90 ± 0.02 |
| 3 | Albumin (g/dl) | 4.44 ± 0.02 | 4.38 ± 0.04 | 4.47 ± 0.02 | 4.49 ± 0.02 |
| 4 | Globulin (g/dl) | 2.50 ± 0.05 | 2.44 ± 0.03 | 2.44 ± 0.02 | 2.41 ± 0.02 |
| 5 | Blood Urea Nitrogen (mg/dl) | 31.44 ± 0.63 | 34.22 ± 0.70 | 46.25 ± 0.33* | 34.40 ± 0.30 |
| 6 | Creatinine (mg/dl) | 1.18 ± 0.02 | 1.10 ± 0.01 | 2.21 ± 0.01* | 2.18 ± 0.01* |
| 7 | Calcium (mg/dl) | 10.33 ± 0.05 | 10.72 ± 0.09 | 9.28 ± 0.05 | 10.51 ± 0.05 |
| 8 | Phosphorus (mg/dl) | 5.70 ± 0.11 | 4.91 ± 0.08 | 9.06 ± 0.03 | 8.83 ± 0.02 |
| 9 | AST (IU/ml) | 36.78 ± 0.68 | 43.22 ± 1.30 | 36.17 ± 0.76 | 33.30 ± 0.80 |
| 10 | ALT (IU/ml) | 23.00 ± 0.25 | 26.00 ± 0.38 | 30.50 ± 0.68 | 27.60 ± 0.87 |
| 11 | Cholesterol (mg/dl) | 128.78 ± 1.97 | 129.56 ± 1.71 | 129.25 ± 1.70 | 169.70 ± 2.04 |

**P<0.05 = Significant at 5% level between group for sex. n- indicates total number of animals, AST- Aspartate Transaminase, ALT- Alanine Transaminase.*

standard procedures and assay kits (Coral Clinical systems), at the laboratory of Animal Disease Investigation Office (ADIO), Vadodara.

## RESULTS AND DISCUSSION

The hematological data of male and female hanuman langur in healthy and infected conditions are presented in Table 1. The hematological profile of healthy male langur was found within the normal range. On comparison of the values of healthy, disordered (infected wound, electrocution, road accident) and diseased (stomatitis, diarrhoea, respiratory infection) groups of male and female langurs, it was found that values of Hb, TEC, PCV and TLC in diseased group were higher than those in healthy and disordered groups. The values of Hb and TEC differed significantly (P<0.05) from each other in all the conditions. Significant (P<0.05) increase in neutrophil count and decrease in lymphocyte count was found in disordered group as compared to healthy male and female langurs. TLC values were higher in both disordered and diseased groups as compared to healthy male animals. In both the sexes, the higher Hb, PCV and TEC values were recorded in diseased group than those observed in healthy and disordered group. The higher value might be due to various disease conditions like stomatitis, diarrhoea and respiratory infection and it may also be due to dehydration status of monkeys which causes haemoconcentration. The higher TLC levels in diseased group like stomatitis, diarrhoea and respiratory infection might be due to existence of chronic conditions causing the primary and secondary cell line of defense to come into play. Holly and James (1983) reported an increase in hemoglobin concentration in Skyes monkey due to stress of high altitude with significant difference between males and females. Significantly lower RBC, Hb and PCV in females than males has been reported by Joana *et al.* (2006) in free living colony of Mandrill species.

The values of various biochemical parameters in healthy (n=19) and infected (n=15) male and female langurs are presented in Table 2. The data obtained were compared with the normal reference values. For lack of availability of literature, the comparison was done with other species of Non Human Primates. The biochemical parameters (glucose, cholesterol, BUN, Ca, AST and ALT) were found to be higher in the healthy female hanuman langurs than in the males except

for total protein, albumin, globulin, creatinine and phosphorus. The ratio of albumin **:** globulin was 1.8 **:** 1 and 1.78 **:** 1 in healthy female and male langurs whereas it increased non significantly to 1.86 **:** 1 and 1.83 **:** 1 in infected female and male langurs.

The BUN level in infected males was significantly ($P<0.05$) higher than that in healthy males, whereas the creatinine level was significantly ($P<0.05$) higher in both infected males and females as compared to healthy males and females. The high levels of creatinine in infected females and males as compared to the healthy females and males which may be due to muscular degeneration in infected wound. Videan *et al.* (2007) reported that decrease in kidney function causes significant increase in BUN and creatinine levels in chimpanzees while Harewood *et al.* (1999) noted significantly ($P<0.05$) higher creatinine levels in older infected baboons. AST and ALT activity indicates the functional status of the liver. Whenever infection occurs the liver is affected. This may be the probable reason of variations in AST and ALT levels in the blood. Lewis (1977) reported that creatinine, AST and ALT were higher than normal in infected rhesus macaque. The values in healthy male and female hanuman langurs found in the present study may serve as baseline data for future studies.

## CONCLUSION

The study on hematological and serum biochemical values in healthy and infected hanuman langurs of both the sexes in Gujarat is reported first time,which may serve as guidelines for future studies for the same species.

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