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# LEUKOCYTIC COUNTS OF NORMAL ONE-HUMPED CAMEL IN SUMMER: EFFECTS OF SEX, AGE IN MALES AND LACTATION AND/OR PREGNANCY IN FEMALES

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Total and differential leukocytic counts were studied in 56 clinically healthy one-humped camels *(Camelus dromedarius)* in summer. Twenty-eight of these were males aged 4, 5 to 6, 6 to 7, and more than 7 years. The remaining 28 comprised heifers, not-pregnant dry, pregnant-dry, and not-pregnant lactating camels. Each of these groups thus contained seven animals. Irrespective of sex and age, these camels gave the following overall averages ± standard error:

| | | |
|---|---|---|
| TLC ($10^3$ $\mu L^{-1}$) | 19.04 ± 0.56 | 10.40 to 29.68 |
| Neutrophils (%) | 36.66 ± 1.70 | 10.00 to 63.00 |
| Eosinophils (%) | 5.63 ± 0.40 | 0.00 to 14.00 |
| Basophils (%) | 0.61 ± 0.10 | 0.00 to 3.00 |
| Lymphocytes (%) | 51.79 ± 1.84 | 22.00 to 76.00 |
| Monocytes (%) | 4.69 ± 0.22 | 3.00 to 8.00 |

Monocytes were found significantly ($P<0.05$) higher in males (5.21 ± 0.30) than females (4.17 ± 0.28). Age-groups in males and different stages of lactation and/or pregnancy under study did not affect any of the parameters.

## INTRODUCTION

The leukocytes are the mobile units of the body protective system; the granulocytes and monocytes have a special capability to seek out and destroy foreign invaders. This is why, the monitoring of total and differential leukocytic counts has long been used as a valuable aid in the evaluation of health status of an individual animal. Though the camel is indispensable to the desert ecosystem, the quantitative information on blood parameters particularly under the influence of different physiological states is miserably poor. The present study was conducted to ascertain the effects of sex and age in males and different states of lactation and/or pregnancy in females on the blood of one-humped camel.

## MATERIALS AND METHODS

**Camels:** Fifty-six clinically healthy one-humped camels *(Camelus dromedarius)* of either sex: 28 males and 28 females, were randomly selected from their natural habitat at Sarai Mohajar, Bhakkar (Pakistan). The four groups studied among the males were upto 4, 5 to 6, 6 to 7 and above 7 years of age. Other groups consisted of either heifers, not-pregnant dry, pregnant dry or not-pregnant lactating females. Each of

these 8 groups contained 7 privately owned work camels. Samples were collected during the months of July and August.

**Laboratory techniques:** The usual jugular venipuncture method was adopted for collection of blood using 18 gauge, 5 cm long hypodermic needle. About 10 ml of blood were taken directly into a test tube containing a drop of heparin (5000 IU $ml^{-1}$). Blood smears were prepared from fresh whole blood. The air dried slides were fixed in methanol and stained with Hemacolor. Total leukocytic count (TLC) was made by hemocytometer. A 1:20 dilution was obtained in 3% aqueous acetic acid. The count was spread over 4 large squares (Kolmer *et al.*, 1959) which was expressed in thousand microlitre ($10^3$ $l^{-1}$). Differential leukocytic count was obtained by the Battlement technique as described by Kolmer *et al.* (1959). Of the first 100 white cells encountered, those falling under each type showed their respective frequency in percentages.

**Statistical analysis:** Grand means, group means, their standard errors and ranges were calculated for each parameter separately. In addition, effect of sex was compared by the student 't' test, the four age groups among males and four different physiological states in females were tested by one way analysis of variance. All computations were made with the help of PC-Laser Turbo XT microcomputer using MSTAT program.

## RESULTS AND DISCUSSION

**Total leukocytic count (TLC):** Total leukocytic count averaged 19.04 ± 0.56 $10^3$ $\mu L^{-1}$ in 56 camels under study, showing a rather wide range of 10.40 to 29.68 $10^3$ $\mu L^{-1}$ (Table 1). This observation was in close agreement with Soni and Aggarwala (1958) who reported a mean value of 20.07 ± 0.3 $10^3$ $mm^{-3}$ in 95 Indian adult camels in the months of May through July. Benerjee *et al.* (1962) came up with an average of 18.1 $10^3$ $mm^{-3}$ among 20 Indian adult male camels. Confirming Duke (1955), the TLC was the highest in camel among several other domestic animals (Figure 1). As reported by Majeed *et al.* (1980), no significant difference was seen in TLC between male and female camels (Table 1). Mean values of TLC recorded at various ages in males and different physiological states in females under investigation were not different from each other (Table 1).

**Neutrophils:** Neutrophils formed 36.66 ± 1.70% of TLC ranging from 10 to 63% (Table 1). This compared favourably with Soni and Aggarwala (1958) who reported mean value of 38.7% in 95 adult male camels during months of May through July. Majeed *et al.* (1980) recorded an average count of 41.3 ± 2.8% which was also in line with that of the present study. Sex made no significant effect on neutrophils in camels. This finding is supported by that of Majeed *et al.* (1980). There were no significant differences amongst neutrophil means recorded in different age-groups in males and various physiological states in females (Table 1).

**Eosinophils:** Eosinophils were 5.63 ± 0.40% showing a wide range of 0 to 14% in the present study (Table 1). This value was slightly lower than Banerjee *et al.* (1962) and Majeed *et al.* (1980) who reported means of 6.5 ± 0.85% and 7.22 ± 0.40%, respectively. However, contrary to the present results, Majeed *et al.* (1980) found significantly higher percentage of eosinophils in females (7.7 ± 0.51%) than in males (6.7 ± 0.7%). Soni and Aggarwala (1958) recorded 9.5% eosinophils in 95 adult camels in summer. Soliman and Shaker (1967) reported mean value of 2.2 ± 0.4% in Egyptian she camels which is relatively lower than the present findings (Table 1). Neither age group in

**Table 1.** **Grand means ± SE, and ranges of white blood cells in one-humped camel: Effect of sex was ascertained by 't' test; and effect of age groups in males as well as lactation and/or pregnancy in females by the analysis of variance test**

| Variables/Groups | Mean ± standard error | | | | | | |
|---|---|---|---|---|---|---|---|
| | n | TLC $10^3\ \mu l^{-1}$ | Neutrophils (%) | Eosinophils (%) | Basophils (%) | Lymphocytes (%) | Monocytes (%) |
| **a. Grand means** | | | | | | | |
| Mean ± S.E. | 56 | 19.04 ± 0.56 | 36.66 ± 1.70 | 5.63 ± 0.40 | 0.61 ± 0.10 | 51.79 ± 1.84 | 4.69 ± 0.22 |
| Range | | 10.40 - 29.68 | 10.00 - 63.00 | 0.00 - 14.00 | 0.00 - 3.00 | 22.00 - 76.00 | 3.00 - 8.00 |
| **b. Effect of sex** | | | | | | | |
| Male | 28 | 18.97 ± 1.00 | 34.64 ± 2.42 | 5.75 ± 0.55 | 0.60 ± 0.18 | 53.42 ± 2.49 | 5.21 ± 0.30 A |
| Female | 28 | 19.13 ± 0.58 | 38.67 ± 2.44 | 5.50 ± 0.60 | 0.60 ± 0.10 | 50.14 ± 2.73 | 4.17 ± 0.28 B |
| **c. Effect of age in males** | | | | | | | |
| Up to 4 years | 7 | 17.83 ± 1.32 | 30.57 ± 5.73 | 5.00 ± 1.17 | 0.57 ± 0.29 | 57.71 ± 6.36 | 4.85 ± 0.40 |
| 5 to 6 years | 7 | 16.33 ± 1.27 | 34.56 ± 4.40 | 4.42 ± 0.89 | 0.85 ± 0.40 | 54.00 ± 3.98 | 6.14 ± 0.59 |
| 6 to 7 years | 7 | 20.05 ± 2.12 | 31.00 ± 5.24 | 6.28 ± 0.74 | 0.85 ± 0.55 | 56.28 ± 5.19 | 5.71 ± 0.52 |
| Above 7 years | 7 | 21.67 ± 2.53 | 42.42 ± 3.37 | 7.30 ± 1.37 | 0.14 ± 0.14 | 45.71 ± 3.72 | 4.14 ± 0.70 |
| **d. Effect of lactation and/or pregnancy in females** | | | | | | | |
| Heifers | 7 | 19.72 ± 1.11 | 36.42 ± 3.67 | 7.28 ± 1.17 | 0.57 ± 0.20 | 50.28 ± 5.16 | 4.14 ± 0.55 |
| Non-pregnant dry | 7 | 20.84 ± 0.92 | 35.00 ± 3.77 | 5.28 ± 1.62 | 0.42 ± 0.20 | 53.85 ± 4.57 | 4.14 ± 0.73 |
| Pregnant dry | 7 | 18.64 ± 1.41 | 43.00 ± 6.50 | 5.00 ± 0.65 | 0.85 ± 0.26 | 45.28 ± 6.74 | 4.85 ± 0.59 |
| Non-pregnant lactating | 7 | 17.30 ± 0.86 | 40.28 ± 5.55 | 4.42 ± 1.17 | 0.57 ± 0.20 | 51.14 ± 5.90 | 3.57 ± 0.36 |

Different letters in a column indicate significant differences between the means listed therein (at 5% level).

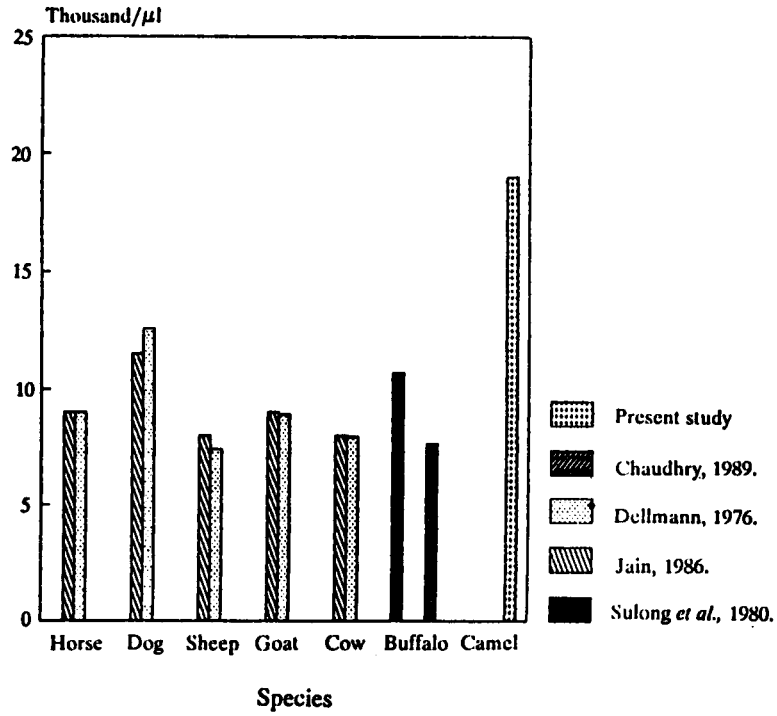


Figure 1. Means of total leukocytic counts in different domestic species.

males nor different physiological states in females affected eosinophils significantly.

**Basophils:** The basophils, by and large, formed the smallest proportion (0.61%) of TLC in the present study, ranging between 0 to 3% (Table 1). This observation was in line with previous records of less than 1% in 60 Egyptian camels of either sex and 0.1% in 20 adult camels of either sex (Majeed *et al.*, 1980). Higgins and Kock (1984) using unpublished data of Zoological Society of London reported a range of 0 to 3% in British camels from two different climatic zones which is exactly similar to the present study. As shown in Table 1, sex made no significant effect on basophil count in camels. Also, age in males and different physiological states in females did not affect basophil count.

**Lymphocytes:** On average, lymphocytes constituted the largest proportion i.e. 51.79 ± 1.84% among all types of leukocytes ranging from 22 to 76% (Table 1). The findings of Majeed *et al.* (1980) favourably compare with those of the present study in this respect. Higgins and Kock (1984) also reported a wide range of 21 to 62% which fell within the range observed in the present study.

Sex appeared to make no significant difference in lymphocyte counts (Table 1). Those workers who used only one sex, they observed 46% among 95 adult males (Soni and Aggarwala, 1958) and 39.7 ± 1.28% in 20 adult males (Banerjee *et al.*, 1962). No significant differences were seen among age-groups and different physiological states of females in lymphocyte counts.

**Monocytes:** Monocytes formed 4.69 ± 0.22% of TLC with a range from 3 to 8% in the present study (Table 1). This finding was in agreement with Soni and Aggarwala (1958) and Salaheldin *et al.* (1979). Monocytes were significantly higher ($P<0.05$) in male (5.21 ± 0.30%) than in female camels (4.17 ± 0.28) (Table 1). The higher mean value of monocytes in male camels indicates that male camels are probably more prone to the use of unpalatable and toxic substances. Consequently, they need relatively higher number of monoytes to substantiate their macrophage-monocyte system. Age groups and different states of lactation and/or pregnancy did not show any significant effect on monocytes.

## REFERENCES


Banerjee, S., R.C. Bhattacharjee and T.I. Singh. 1962. Haematological studies in the normal adult Indian camel *(Camelus dromedarius)*. Amer. J. Physiol. 203: 1185-1187.

Chaudhry, N.M. 1989. Effects of season, lactation and pregnancy of physico-chemical properties of buffalo blood. Ph.D. Thesis, Univ. of Agri., Faisalabad.

Duke, H.H. 1955. The Physiology of Domestic Animals. Comstock Pub. Co. Inc., Ithaca, NY, USA.

Dellmann, H.D. and E.M. Brown. 1976. Textbook of Veterinary Histology. Lea & Febiger, Philadelphia, USA.

Higgins, A.J. and R.A. Kock. 1984. The camel in health and disease. Brit. Vet. J. 140 (5): 485-506.

Kolmer, J.A., E.H. Spaulding and H.W. Robinson. 1959. Approved Laboratory Techniques. 5th Ed., Applenton-Century Grofts Inc., NY, USA.

Majeed, M.A., G. Hur, Z. Rahman and A. Ahmad. 1980. Effects of sex and season on haematological values of normal adult one-humped camel. Rev. Elev. Med. Vet. Pays Trop. 33 (2): 135-141.

Soni, B.K. and A.C. Aggarwala. 1958. Studies in the physiology of the camel *(Camelus dromedarius)*. 1. Cellular blood constituents. Indian Vet. J. 35: 209-214.

Soliman, M.K. and M. Shaker. 1967. Cytological and biochemical studies on blood of adult she camel. Indian Vet. J. 44: 989-995.

Salaheldin, E., Abdelgadir, Wahbi A.G.A. and O.F. Idris. 1979. A note on the haematology of adult Sudanese dromedaries. Proc. Khartoum Workshop on Camel. December 1.

Sulong, A., M. Hilmi and M.R. Jainuddin. 1980. Haematology of the Malaysian swamp buffalo *(Bubalus bubalis)*. Partnika, 3 (2): 66-70.