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**PJBS**

ISSN 1028-8880

**Pakistan  
Journal of Biological Sciences**

**ANSI***net*

Asian Network for Scientific Information  
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

## Haematological Parameters of Adult Dry, Lactating and Camel Calves in Saudi Arabia

K.A. Al-Busadah and T.E.A. Osman

Department of Physiology, Biochemistry and Pharmacology,  
College of Veterinary Medicine and Animal Resources, King Faisal University,  
P.O. Box 1757, Al-Ahsa, 31982, Saudi Arabia

**Abstract:** This study was conducted to determine the normal values of haematological parameters in adult dry, lactating and camel calves. The Hb, PCV, RBC, MCV, MCH and MCHC were lowest in young camels (3-12 weeks old). The above values were generally lower in lactating females as compared to adult dry females. The TLC was highest in young camels and lowest in lactating females. The DLC revealed that the neutrophils were the most predominant cells, followed by the lymphocytes, the eosinophils, the monocytes and finally the basophils. However, statistical analysis of the DLC showed no significant differences between the three groups, with the exception of the eosinophils which were significantly lower ( $p < 0.05$ ) in young camels.

**Key words:** Camel Calves, Lactating, Haematological

### Introduction

The population of camels in Saudi Arabia increased steadily during the last two decades from 267000 heads in 1982 to 415000 heads in 1999 (Ministry of Agriculture and Water, 1999). Haematological examination of blood can provide valuable information concerning the general health of animals. Information on haematology of the dromedary camel is available from several African and Asian countries (Lakhota *et al.*, 1964; Holler and Hassan, 1966; Soliman and Shaker, 1967; Barakat and Abdel-Fattah, 1970; Ghosal *et al.*, 1975; Ghodsian *et al.*, 1978; Abdel Gadir *et al.*, 1979; Majeed *et al.*, 1980; Al-Ani *et al.*, 1992; Sarwar *et al.*, 1993; Rezakhani *et al.*, 1997; Sarwar and Majeed, 1997; Nyang'ao *et al.*, 1997). In many of the previous reports information about complete haemogram and the effects of lactation and age of neonates is lacking. The present study was therefore, undertaken on apparently healthy camels a) to determine normal haematological parameters in adult dry, lactating and young animals and b) to compare our results with those reported by other workers.

### Materials and Methods

A total of 22 one humped Saudi camels were used in this study. The camels belonged to the Camel Research Centre, College of Veterinary Medicine and Animal Resources, King Faisal University. The camels were kept under reasonable hygienic conditions and veterinary supervision. The animals were fed on hay and barley. Water was available *ad libitum*. The camels were divided into three groups 1) Six adult dry (not pregnant female camels, 2-15 years old); (2) Eight lactating, 4-20 years old and (3) Eight young (4 males and 4 females), 3-12 weeks of old. Blood samples were collected by jugular venipuncture into clean tubes containing EDTA as anticoagulant. The blood parameters were determined by standard haematological techniques. The haemoglobin (Hb) in grams per decilitre by the cyano-methaemoglobin method. The packed cell volume (PCV) determined as percentages by the microhaematocrit method. The red blood cells (RBC) in millions per microlitre were counted using haemocytometer and total leucocytes count (TLC) in thousands per microlitre was carried out

using Sysmex 820 (Japan) Machine.

Mean corpuscular volume (MCV), mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration (MCHC) were calculated according to the formula of Jain (1986).

The blood smears for differential leucocytes count (DLC) were made from the EDTA-blood on the same day of blood collection. The smears were air dried and stained using Leishman's stain. The cells were counted under a light microscope and the results were expressed in percentage.

**Statistical analysis:** The data were analyzed statistically using analysis of variance (ANOVA). The statistical differences between the means were estimated by Duncan's test. The computation was facilitated by statistical package SAS.

### Results

The Mean  $\pm$  SE values of the various haematological parameters studied are shown in Table 1 and 2. The Hb concentration was significantly lower ( $p < 0.05$ ) in young camels when compared with lactating or adult dry females. On the other hand, the PCV, ABC, MCV and MCH were significantly lower ( $p < 0.05$ ) in young camels when compared with adult dry females. However, differences in the mean values of these parameters were not statistically significant when compared with the lactating camels. The MCHC showed no significant difference between the three groups.

The TLC of young camels was significantly higher ( $p < 0.05$ ) when compared with the lactating camels. Although the mean TLC in young camels was higher as compared with adult dry females ( $20.6 \pm 2.9$  vs.  $14.7 \pm 0.9$ ), the difference was not statistically significant. The DLC revealed no statistically significant differences between the three groups, with the exception of eosinophils which were significantly lower ( $p < 0.05$ ) in young camels, when compared with either one of the other two groups. The neutrophils were the predominant white cells in all three groups (means ranged between  $53.3 \pm 5.2$  and  $61.8 \pm 2.3$ ), followed by the lymphocytes (means ranged

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between  $28.9 \pm 2.7$  and  $36.8 \pm 5.8$ ). The percentages of monocytes and eosinophils were low (the means ranged between  $1.2 \pm 0.4$  and  $4.5 \pm 1.1$ ). The basophils showed the lowest percentage of the DLC the means ranged between  $0.4 \pm 0.2$  and  $0.8 \pm 0.2$ ).

### Discussion

The present data on total RBC count, Hb concentration and PCV were comparable with those reported in previous studies (Custer *et al.*, 1977; Majeed *et al.*, 1980;

Table 1: Mean ( $\pm$  SEM) red blood cells values in adult dry (n = 6) lactating (n = 8) and camel calves (n = 8)

Parameter	Adult dry	Lactating	Calves
Hb (g/c/1)	$13.3a \pm 0.6$	$12.0a \pm 0.2$	$10.15 \pm 0.8$
PCV	$30.3a \pm 1.3$	$27.3ab \pm 0.4$	$23.9b \pm 1.7$
RBC ( $\times 10^6/\mu 1$ )	$10.8a \pm 0.5$	$10.0ab \pm 0.1$	$9.1b \pm 0.5$
MCV (pg)	$28.3a \pm 0.2$	$27.3ab \pm 0.6$	$26.2b \pm 0.6$
MCH (pg)	$12.4a \pm 0.1$	$12.0ab \pm 0.2$	$11.35 \pm 0.2$
MCHC (%)	$43.9s \pm 0.2$	$44.1a \pm 0.3$	$42.2a \pm 0.6$

Means in a row followed by the same letter do not differ significantly at p-0.05

Table 2: Mean ( $\pm$  SEM) leucocytes values in adult dry (n = 6) lactating (n = 8) and camel calves (n = 8)

Parameter	Adult dry	Lactating	Calves
TLC ( $\times 10^3/\mu 1$ )	$14.7ab \pm 0.9$	$12.4b \pm 2.1$	$20.6a \pm 2.9$
Neutrophils (%)	$53.3a \pm 5.2$	$61.8a \pm 2.3$	$57.6a \pm 3.1$
Lymphocytes (%)	$38.8a \pm 5.8$	$28.9a \pm 2.7$	$37.8a \pm 3.9$
Monocytes (%)	$1.2a \pm 0.4$	$1.8a \pm 0.6$	$2.0a \pm 0.6$
Eosinophils (%)	$4.5a \pm 1.1$	$4.1a \pm 1.0$	$1.55 \pm 0.4$
Basophils (%)	$0.5a \pm 0.2$	$0.8a \pm 0.2$	$0.4a \pm 0.2$

Means in a row followed by the same letter do not differ significantly at p-0.05

Mehrotra and Gupta, 1989; Al-Ani *et al.*, 1992; Rezakhani *et al.*, 1997; Nyang'ao *et al.*, 1997; Sarwar and Majeed, 1997). However, figures on RBC, Hb and PCV obtained in the present study were higher than those reported by Lakhotia *et al.* (1964) and Ghodsian *et al.* (1978). These differences may be attributed to age and sex of experimental animals, the climatic and geographic conditions, the genetic variation in population and the effects of sampling and laboratory techniques employed. Abdalla *et al.* (1988) reported higher PCV and I-Ib values in the racing camel. These high values were attributed to the good level of nutrition and regular exercise. In the present study Hb, PCV and RBC values were lower in young camels as compared to adults. This is in line with Rezakhani *et al.* (1997) who reported that these three blood parameters increased steadily with age. The RBC of the camel are elliptical and thin water like (Jain and Keeton, 1974; Singh *et al.*, 1997). This may explain the lower PCV value in camels, in spite of the higher RBC count, in comparison with haematological values for horses and cattle. Compared to other species, camel RBC will withstand lower ionic concentrations such as water loading-highly desirable physiological asset in desert species (Higgins and Kock, 1984).

The MCV, MCH and MCHC obtained in the present study were in accordance with those obtained by Higgins and Kock (1984), Rezakhani *et al.* (1997) and Sarwar and Majeed (1997). The figures on MCV obtained in this study were lower than those reported Lakhotia *et al.* (1964), Soliman and Shaker (1967), Ghodsian *et al.* (1978) and Al-Ani *et al.* (1992). The MCHC is higher in camels as compared with man, turkeys, dogs, sheep, cattle and horses (Yagil, 1985). This high MCHC of camel's RBC reflects the potential oxygen-carrying capacity. In the present study the MCV and

MCH values were significantly lower in young camels with compared with adults. The MCHC did not change with age or physiological status of animals. These findings are in agreement with Rezakhani *et al.* (1997) who reported similar results.

The data on TLC obtained in this study fall within the normal ranges established by previous workers (Soliman and Shaker, 1967; Barakat and Abdel-Fattah, 1970; Ghodsian *et al.*, 1978; Mehrotra and Gupta, 1989; Sarwar and Majeed, 1997; Nyang'ao *et al.*, 1997). However, Higgins and Kock recorded much lower TLC in camels  $12.9$  to  $9.7 \times 10^3/\mu 1$ ). The TLC in young camels used in the present study were higher when compared with adults. This finding is in agreement with Rezakhani *et al.* (1997) who reported that the TLC decreased with advancement of age. The differential leucocyte counts obtained in the present study revealed that relative numbers of neutrophils were dominant, which is not typical of most ruminants. The percentage of lymphocytes came next, followed by eosinophils and monocytes. The basophils were rarely seen. These findings are comparable to those of Higgins and Kock (1984) and Ghodsian *et al.* (1978). In contrast to the present findings, other workers reported percentages of lymphocytes and neutrophils which are typical of ruminant animals (approximately 2:1 lymphocyte neutrophil ratio: (Barakat and Abdel-Fattah, 1970; Soliman and Shaker, 1967). A third group of workers reported a nearly 1:1 lymphocyte neutrophil ratio (Majeed *et al.*, 1980; Al-Ani *et al.*, 1992; Rezakhani *et al.*, 1997). These differences could be due to the different breeds of camels used or stress prior to sampling (Higgins and Kock, 1984). In the present study relative numbers of monocytes and basophils showed no differences between the three groups but relative numbers of eosinophils were higher in adult camels. More or less similar results were recorded in cattle (Jain, 1993) and camels (Rezakhani *et al.*, 1997).

### Acknowledgments

Authors wish to thank Dr. Sahar Mandally for her technical and laboratory assistance, Dr. B.M. Osman for statistical analysis of data and Mr. Ayaz Ahmed for typing this manuscript.

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