

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

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Seven erythrocyte indices were studied in 56 clinically healthy one-humped camels in summer. Twenty-eight of these were males divided into four groups of seven each: upto 4 years old, 5 to 6 years, 6 to 7 years, and above 7 years. The remaining 28 comprised heifers, not-pregnant dry, pregnant-dry, and not-pregnant lactating females with seven animals in each group. Irrespective of sex and age, these camels showed the following overall averages  $\pm$  standard error:

PCV (%)	26.10 $\pm$ 0.45
RBC ( $10^6/\mu\text{l}$ )	7.96 $\pm$ 0.20
Hb (mg/dl)	13.34 $\pm$ 0.17
ESR (mm/8 hr)	8.71 $\pm$ 0.45
MCV (fl)	33.38 $\pm$ 0.83
MCH (pg)	17.27 $\pm$ 0.42
MCHC (g/dl)	52.31 $\pm$ 1.13

Analysis of variance revealed that sex affected none of the seven parameters studied and so was lactation and/or pregnancy. The values of PCV and Hb decreased as the age progressed.

### INTRODUCTION

Because of its outstanding endurance and the many uses to which it could be put, the camel no doubt is indispensable to the people living in deserts, yet it remains one of the least studied among the domestic mammals (Sarwar, 1992). Although the haematological values of this strange animal have been frequently studied in last two decades yet the physiological causes which influence various haematological parameters are still little known. The present investigation was undertaken to study the effects of sex, age, lactation and/or pregnancy on different haematological values of camel.

### MATERIALS AND METHODS

1. Camels: Fifty-six clinically healthy one-humped camels (*Camelus dromedarius*), 28 males and 28 females, were randomly selected from their natural habitat at Sarai Mohajar, Bhakkar (Pakistan). The four age-groups studied among the males were upto 4 years, 5 to 6 years, 6 to 7 years, and above 7 years of age. The other groups consisted of heifers, not-pregnant dry, pregnant dry, or not-pregnant lactating females. The age was estimated by dentition using the system evolved by Rabagliati (1924). The experimental samples were collected in July-August.

**2. 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 was taken directly into a test tube containing a drop of heparin (5000 I.U./ml).

Microhaematocrit method was employed for the estimation of packed cell volume (PCV), as described by Benjamin (1978). The readings are expressed in percentages. Red blood cell (RBC) count was done with the help of a haemocytometer (Kolmer *et al.*, 1959). The count is expressed in millions ( $10^6/\mu\text{l}$ ). Haemoglobin (Hb) was determined in gram per decilitre (g/dl) by Sahl's method after Coles (1980). Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC), were worked out from the above parameters following the formulae described by Jain (1986).

**3. Statistical analysis:** Grand means, group means, their standard errors and ranges were calculated for each parameter separately. In addition, effects of sex were compared by the student 't' test, and the four age groups among males and four lactation and/or pregnancy stages in females were tested by one way analysis of variance. Significantly different group means were compared by Duncan's multiple range test (Steel and Torrie, 1980). All computations were done with the help of PC-Laser-Turbo XT microcomputer using MSTAT program.

## RESULTS AND DISCUSSION

**Packed cell volume:** Mean packed cell volume recorded was  $26.10 \pm 0.45\%$  with a range of 20 to 32% (Table 1). This mean falls in the wide range of 24.00 to 40.00% which has been quoted by Higgins and Kock (1984) using unpublished data of Zoological Society of London. Sex made no effect on

packed cell volume (Table 1). This result seems in agreement with Lakhotia *et al.* (1974) who found mean values of  $30.08 \pm 0.81\%$  and  $31.47 \pm 0.81\%$  in 20 adult males and 20 adult female camels, respectively. However, they did not apply any test of significance. Benerjee *et al.* (1962) studied 20 Indian adult male camels and recorded a mean of 27% PCV which is not much different from the present study (Table 1). However, this mean is much less than  $43.00 \pm 0.10\%$  recorded in 80 Egyptian female camels. This difference, however, is too high and no scientific explanation can be given in support of this variation.

The packed cell volume in the present study demonstrated gradual decrease in dromedaries with progressive age (Table 1). The highest value of packed cell volume was found in youngest age-group of upto 4 years ( $29.28 \pm 0.8\%$ ) which was significantly higher ( $P < 0.05$ ) than the remaining three age-groups under study such as 5 to 6 ( $26.00 \pm 12.6\%$ ), 6 to 7 ( $25.28 \pm 6.74\%$ ) and above 7 years ( $24.28 \pm 1.12\%$ ) of age. These observations are in accordance with those of Wingfield and Tumbleson (1973) who reported an age related decline in RBC, Hb and PCV values in cattle between 1 and 10 years of age. The reason for this trend may be higher metabolic rate in the younger ages. No significant changes have been observed among different physiological states such as lactation/pregnancy on packed cell volume among females (Table 1).

**Red blood cell count:** The overall average red cell count was  $7.96 \pm 0.20$  million/ $\mu\text{l}$  of blood which ranged from 4.29 to 12.15 million/ $\mu\text{l}$  (Table 1). Barakat and Fattah (1970) reported a comparable mean of  $7.78 \pm 0.19$  million RBC per  $\text{mm}^3$  of blood in a herd of 60 adult Egyptian camels sampled in both the dry and green seasons.

In line with the present study, Majeed *et al.* (1980) also found no significant

Table 1. Grand means  $\pm$  SE and ranges of the seven red cell indices in one-humped camel. Effect of sex was ascertained by 't' test and effect of age in camels, as well as lactation and/or pregnancy in females by the analysis of variance test

Variables/Groups	n	Mean $\pm$ SE						
		PCV (%)	RBC ( $10^6/\mu$ l)	Hb (g/dl)	ESR (mm/8 hr)	MCV (fl)	MCH (pg)	MCHC (g/dl)
<b>a. Grand means</b>								
Mean $\pm$ SE	56	26.10 $\pm$ 0.45	7.96 $\pm$ 0.20	13.34 $\pm$ 0.17	8.71 $\pm$ 0.83	33.38 $\pm$ 0.83	17.27 $\pm$ 0.42	52.31 $\pm$ 1.13
Range		20.00 - 32.0	4.29 - 12.15	10.40 - 16.20	6.00 - 12.00	23.95 - 51.28	12.40 - 27.95	40.00 - 64.70
<b>b. Effect of sex</b>								
Male	28	26.21 $\pm$ 0.59	8.20 $\pm$ 0.32	13.09 $\pm$ 0.24	8.78 $\pm$ 0.33	32.55 $\pm$ 1.30	16.50 $\pm$ 0.58	51.58 $\pm$ 1.80
Female	28	26.00 $\pm$ 0.67	7.73 $\pm$ 0.25	13.59 $\pm$ 0.22	8.64 $\pm$ 0.29	34.19 $\pm$ 1.01	17.99 $\pm$ 0.58	53.03 $\pm$ 1.39
<b>c. Effect of age in males</b>								
Upto 4 years	7	29.28 $\pm$ 0.80 a	8.77 $\pm$ 0.71	13.88 $\pm$ 0.40 a	8.43 $\pm$ 0.75	31.77 $\pm$ 1.95	16.32 $\pm$ 1.09	52.88 $\pm$ 6.08
5 to 6 years	7	26.00 $\pm$ 1.23 b	8.63 $\pm$ 0.65	13.50 $\pm$ 0.35 a	8.42 $\pm$ 0.68	30.94 $\pm$ 2.26	16.12 $\pm$ 1.14	54.58 $\pm$ 2.69
6 to 7 years	7	25.28 $\pm$ 0.74 b	8.02 $\pm$ 0.42	13.12 $\pm$ 0.39 a	9.57 $\pm$ 0.42	30.90 $\pm$ 1.13	16.63 $\pm$ 1.02	54.32 $\pm$ 2.16
Above 7 years	7	24.28 $\pm$ 1.12 b	7.40 $\pm$ 0.78	11.85 $\pm$ 0.42 b	8.71 $\pm$ 0.81	36.36 $\pm$ 4.09	16.95 $\pm$ 1.56	46.56 $\pm$ 1.89
<b>d. Effect of lactation and/or pregnancy in females</b>								
Heifers	7	25.57 $\pm$ 1.57	7.54 $\pm$ 8.33	13.20 $\pm$ 0.45	9.35 $\pm$ 0.69	33.91 $\pm$ 1.35	17.68 $\pm$ 0.95	52.35 $\pm$ 2.54
Not-pregnant dry	7	26.14 $\pm$ 1.55	7.92 $\pm$ 0.55	13.80 $\pm$ 1.21	8.14 $\pm$ 0.34	33.65 $\pm$ 2.55	17.80 $\pm$ 0.45	53.74 $\pm$ 3.31
Pregnant dry	7	28.28 $\pm$ 1.30	8.39 $\pm$ 0.60	14.00 $\pm$ 0.49	8.78 $\pm$ 0.75	34.31 $\pm$ 1.93	17.07 $\pm$ 1.09	50.12 $\pm$ 2.70
Not-pregnant lactating	7	24.00 $\pm$ 0.53	7.05 $\pm$ 0.45	13.37 $\pm$ 0.40	8.28 $\pm$ 0.40	34.90 $\pm$ 2.52	19.43 $\pm$ 1.52	55.95 $\pm$ 2.71

Different letters in a column indicate significant differences between the means at 5% level of probability.

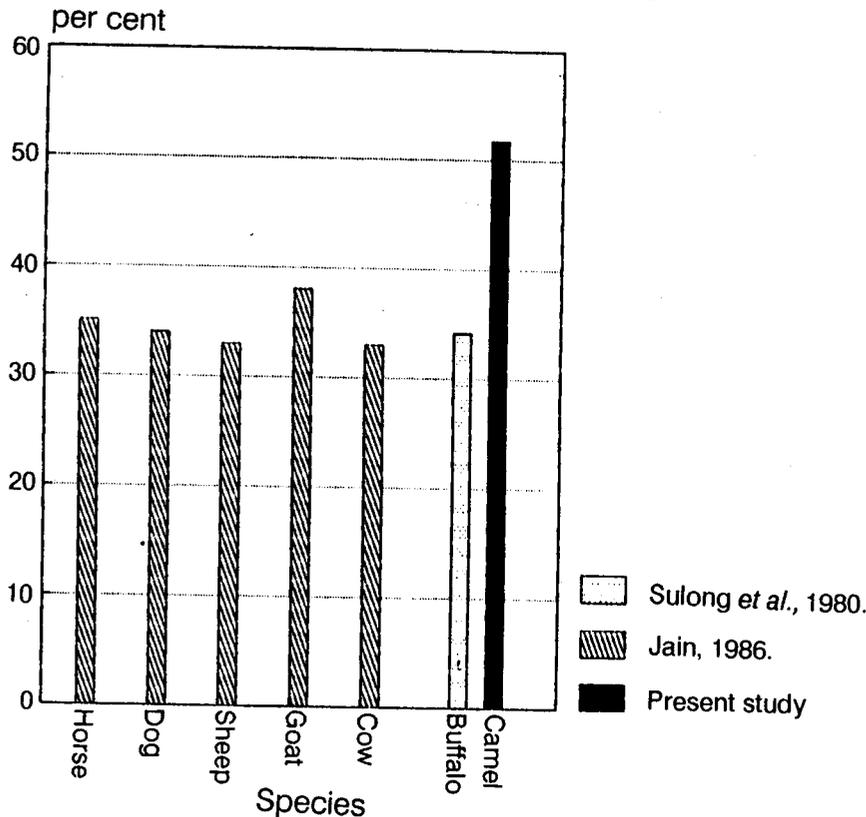


Fig. 1. Comparison of MCHC among different domestic species.

difference in RBC count between 10 male and 10 female camels, sampled consistently during the three seasons; summer, autumn and winter. Soliman and Shaker (1967) observed a mean of  $7.20 \pm 0.08$  million/mm<sup>3</sup> in 80 adult females from the same area. Age-groups in males and different physiological states among females made no significant effect on RBC count in camel (Table 1).

**Haemoglobin:** Mean Hb concentration of  $13.34 \pm 0.17$  g/dl with a range of 10.40 to 16.20 g/dl was observed (Table 1). This observation was in line with the average of  $13.25 \pm 0.12$  in a mixed herd of 60 adult camels of Egyptian origin (Barakat and Fattah, 1970). Like Barakat and Fattah (1971) and Majeed *et al.* (1980), no significant difference was seen in Hb concentra-

tion between male and female camels in the present study (Table 1). In 80 Egyptian she camels, Soliman and Shaker (1967) came up with an average of  $13.20 \pm 0.81$  gram % Hb concentration which is also much closer to that of  $13.10 \pm 0.50$  g/100 ml recorded in 20 Indian adult male camels (Benerjee *et al.*, 1962). Table 1 shows that Hb concentration was significantly ( $P < 0.05$ ) lower in the oldest age-group studied i.e., above 7 years than the remaining three younger age groups viz., upto 4 ( $13.88 \pm 0.4$  g/dl), 5 to 6 ( $13.50 \pm 0.35$  g/dl) and 6 to 7 ( $13.12 \pm 22.89$  g/dl) years of age. It may be noted that the Hb concentration gradually decreased as the age increased. However, this change was not significant each time. No significant difference was seen in different physiological states among females (Table 1).

**Erythrocyte sedimentation rate:** Erythrocyte sedimentation rate averaged  $8.71 \pm 0.22$  mm/8 hr ranging from 6.00 to 18.00 mm/8 hr in the present study (Table 1). Comparable to the present observation, Majeed *et al.* (1980) recorded a mean value of  $8.71 \pm 0.36$  mm/hr, whereas erythrocytes sedimented at a rate  $0.64 \pm 0.4$  mm and  $1.53 \pm 0.9$  mm after first and second hours, respectively, in 60 Egyptian adult camels of either sex (Barakat and Fattah, 1970). None of the variables under study showed any significant effect on erythrocyte sedimentation rate in camels (Table 1).

**Mean corpuscular volume:** Mean corpuscular volume averaged  $33.38 \pm 0.83$  fl with a range of 23.95 to 51.28 fl (Table 1). Salaheldin *et al.* (1979) gave a slightly higher value of MCV in 96 dromedaries from Sudan. This difference is of no significance in the context that the osmotic fragility of the camel's erythrocytes is outstandingly low and the cells are capable of swelling to over twice their volume (Livne and Kuiper, 1973). Sex was found to make no significant effect on MCV (Table 1). Lakhota *et al.* (1974) studied this parameter in 20 adult males ( $53.0 \pm 1.29$  fl) and 20 adult females ( $43.3 \pm 1.73$  fl) but they did not test their results statistically. Mean values of MCV at various ages under investigation manifested no significant change in Hb concentration. Likewise, none of the four lactation and/or pregnancy stages under study could alter the average MCV in female camels (Table 1).

**Mean corpuscular haemoglobin:** Average mean corpuscular haemoglobin of  $17.75 \pm 0.42$  pg and a range of 12.40 to 27.95 pg, were observed in the present study. This observation was in close agreement with the mean value  $18.4 \pm 2.1$  pg reported by Salaheldin *et al.* (1979) in 96 Sudanese camels. Sex made no significant effect on MCH (Table 1). Lakhota *et al.* (1974) studied MCH in 20 adult male ( $21.49 \pm 0.34$  pg) and

20 adult female ( $18.90 \pm 0.53$  pg) camels. They, however, did not apply any test of significance. Age-groups in males and different physiological states studied did not show any significant effects on MCH in camels (Table 1).

**Mean corpuscular haemoglobin concentration:** Mean corpuscular haemoglobin concentration averaged  $52.31 \pm 1.13$  g/dl with a range of 40.00 to 64.70 g/dl (Table 1). This observation was in agreement with the mean value of  $47 \pm 0.76\%$  recorded in 10 Indian adult male camels (Benerjee *et al.*, 1962). It is interesting that this value was much higher than the range of 30 to 40% found in other domestic animals, confirming Jain (1986) (Fig. 1).

There was no significant difference between male and female camels (Table 1). This finding was supported by Lakhota *et al.* (1974). Age-groups in males and lactation and/or pregnancy among females made no significant effect on MCHC (Table 1).

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