

# EFFECT OF BREED ON HAEMOGRAM OF ADULT DROMEDARY CAMELS IN SAUDI ARABIA

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## ABSTRACT

Two breeds of camels, namely Almegaheem and Alshoul camels, were used for the determination of normal haematological parameters. The parameters were haemoglobin (Hb), packed cell volume (PCV), total erythrocytes count (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), total leucocytes count (TLC) and differential leucocytes count (DLC). The Hb, PCV, RBC, MCV, MCH, MCHC and TLC were significantly higher in Almegaheem breed in comparison with values obtained in Alshoul breed. The DLC revealed no significant differences between the two breeds.

**Key words:** Breed, camel, haemogram

Data on the haemogram of the camel are available from different countries (Lakhotia *et al*, 1964; Holler and Hassan, 1966; Soliman and Shaker, 1967; Barakat and Abdel-Fattah, 1970; Ghosal *et al*, 1975; 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; Al-Busadah, 1998; Mohammed and Hussein, 1999 and Al-Busadah and Osman, 2000). In spite of the published studies, the effects of breed on the haemogram of the dromedary camel is scanty. These numerical data on the haemogram of different camel breeds provide useful information for diagnosis of diseases and surveillance of general health (Nyang'ao *et al*, 1997; Rezakhani *et al*, 1997 and Mohamed and Hussein, 1999).

The present study reports the normal haematological values of two camel breeds in Saudi Arabia. To our knowledge, this may be the first time that the effect of breed on the haemogram of the dromedary camel in a certain geographical area has been studied.

## Materials and Methods

Two breeds of adult one-humped camels were used in this study. Almegaheem breed is the largest breed of camels in Saudi Arabia. These camels have black hair and are widely distributed all over the provinces of Saudi Arabia. The second breed used, Alshoul breed has dark red colour and is also

found in different areas of Saudi Arabia. The camels belonged to the Camel Research Centre, King Faisal University. The camels were kept under reasonable hygienic conditions and veterinary supervision. The camels were fed on hay and barley. Water was available *ad libitum*. Five camels from each breed were used in this study.

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) was determined as percentages by the micro-haematocrit method. The red blood cells (RBC) in millions per microlitre were counted using haemo-cytometer and total leucocytes count (TLC) in thousands per microlitre was carried out using Sysmex 820 (Japan) machine.

Mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), 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.

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## Statistical analysis

The data were analysed statistically using analysis of variance (ANOVA) and least significant differences (LSD) were performed using SAS (2000).

## Results

The mean  $\pm$  SD values of the various haematological parameters studied are shown in tables 1 and 2. The Hb, PCV, RBC, MCV, MCH, MCHC and TLC were significantly higher ( $P < 0.05$ ) in Almugaheem breed when compared with values obtained in Alshoul breed. Concerning the DLC, the differences between the two breeds were not statistically significant.

## Discussion

In the present study Almugaheem camels indicated significantly higher Hb, PCV, RBC, MCV, MCH, MCHC and TLC in comparison to Alshoul

camels. These differences may be attributed to the genetic variation, since other variables such as age, sex, climatic conditions, nutrition, method of blood collection and analytical technique were maintained nearly constant between the two breeds of camels.

The Hb and PCV values obtained in Almugaheem camels were similar to those reported by Abdalla *et al* (1988), Al-Busadah (1998) and Mohamed and Hussein (1999). Abdalla *et al* (1988) reported average Hb and PCV values as  $15.2 \pm 1.3$  g/dl and  $31.3 \pm 2.3\%$ , respectively in adult camels of both sexes in the United Arab Emirates. These authors reported that the higher PCV value in their study may be due to the good level of nutrition and regular exercise. However, the Hb, PCV and RBC values observed in Almugaheem camels are higher than those reported in most studies.

The present data on Hb, PCV and total RBC count found in Alshoul camels are comparable with those reported in previous studies (Custer *et al*, 1977; Majeed *et al*, 1980; Mehrotra and Gupta, 1989; Al-Ani *et al*, 1992; Rezakhani *et al*, 1997; Nyang'ao *et al*, 1997; Sarwar and Majeed, 1997; Nazifi *et al*, 1998 and Al-Busadah and Osman, 2000). However, figures on Hb, PCV and RBC obtained in Alshoul camels are higher than those reported by Lakhotia *et al* (1964) and Ghodsian *et al* (1978). Ghodsian *et al* (1978) reported that age has no effect on mean values of RBC, Hb and PCV in Iranian camels. The RBC of the camel are elliptical and thin water-like (Jain and Keetan, 1984; 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, a highly desirable physiological asset in desert species (Higgins and Kock, 1986).

The average MCV, MCH and MCHC values obtained in both breeds, used in the present study, are in accordance with those reported by Higgins and Kock (1986), Rezakhani *et al* (1997); Sarwar and Majeed (1997) and Al-Busadah and Osman (2000). The figures on MCV obtained in this study are lower than those reported by Lakhotia *et al* (1964), Soliman and Shaker (1967), Ghodsian *et al* (1978); Al-Ani *et al* (1992) and Al-Busadah (1998). The MCHC is higher in camels, as compared with man, dog, sheep cattle and horses (Yagil, 1985). This high MCHC of camel's RBC reflects the potential oxygen-carrying capacity. In the present study average values of MCV, MCH and MCHC in Almugaheem camels were significantly higher in comparison with values obtained in Alshoul

**Table 1.** Mean ( $\pm$ SD) red blood cells values of Almugaheem (n = 5) and Alshoul (n = 5) camels.

Parameters	Breed	
	Almugaheem	Aishoul
Hb (g/dl)	15.4 <sup>a</sup> $\pm$ 1.3 (13.6 - 17.0)	10.7 <sup>b</sup> $\pm$ 0.8 (9.7 - 11.4)
PCV (%)	34.0 <sup>a</sup> $\pm$ 3.2 (30.0 - 38.0)	24.8 <sup>b</sup> $\pm$ 1.3 (23.0 - 26.0)
RBC ( $\times 10^6/\mu\text{L}$ )	11.2 <sup>a</sup> $\pm$ 1.0 (10.0 - 12.5)	9.0 <sup>b</sup> $\pm$ 0.5 (8.7 - 9.8)
MCV (fl)	30.3 <sup>a</sup> $\pm$ 0.2 (30.1 - 30.6)	27.5 <sup>b</sup> $\pm$ 1.4 (26.4 - 29.8)
MCH (pg)	13.7 <sup>a</sup> $\pm$ 0.2 (13.6 - 14.1)	11.9 <sup>b</sup> $\pm$ 0.8 (11.1 - 12.8)
MCHC (%)	45.4 <sup>a</sup> $\pm$ 0.6 (44.7 - 46.1)	43.1 <sup>b</sup> $\pm$ 1.4 (41.6 - 45.2)

**Table 2.** Mean ( $\pm$ SD) leucocytes values of Almugaheem (n = 5) and Alshoul (n = 5) camels.

Parameter	Breed	
	Almugaheem	Aishoul
TLC ( $\times 10^6/\mu\text{L}$ )	16.2 <sup>a</sup> $\pm$ 3.6 (10.8 - 20.5)	10.4 <sup>b</sup> $\pm$ 0.8 (9.8 - 11.7)
Neutrophils (%)	65.6 <sup>a</sup> $\pm$ 4.9 (60.0 - 72.0)	68.2 <sup>a</sup> $\pm$ 7.7 (57.0 - 76.0)
Lymphocytes (%)	28.8 <sup>a</sup> $\pm$ 6.9 (26.0 - 39.0)	23.8 <sup>a</sup> $\pm$ 7.2 (15.0 - 29.0)
Monocytes (%)	0.6 <sup>a</sup> $\pm$ 1.3 (0.0 - 3.0)	0.8 <sup>a</sup> $\pm$ 0.8 (0.0 - 2.0)
Eosinophils (%)	3.0 <sup>a</sup> $\pm$ 1.5 (1.0 - 5.0)	3.4 <sup>a</sup> $\pm$ 1.7 (2.0 - 6.0)
Basophils (%)	0.4 <sup>a</sup> $\pm$ 0.5 (0.0 - 1.0)	0.2 <sup>a</sup> $\pm$ 0.4 (0.0 - 1.0)

camels. These differences could be attributed to the differences found in Hb, PCV and RBC values between the two breeds of camels.

The average values of TLC obtained in the two breeds of camels used in the present study fall within the normal range established by previous workers (Solian 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; Al-Busadah, 1998; Nazifi *et al*, 1998; Al-Busadah and Osman, 2000). However, Higgins and Kock (1986) recorded much lower TLC in camels (2.9 to 9.7 × 10<sup>3</sup>/μl). The TLC in Almugaheem camels used in this study were significantly higher when compared with average value found in Alshoul camels. Again, this may be attributed to the genetic variation between the two breeds of camels. The differential leucocyte count revealed no significant differences between the two breeds. The DLC showed that relative numbers of neutrophils were dominant, which is not typical of most ruminants. The percentage of lymphocytes come next followed by eosinophils. The monocytes and basophils were rarely seen. These findings are comparable to those of Ghodsian *et al* (1978); Higgins and Kock (1986); Al-Busadah (1998) and Al-Busadah and Osman (2000). In contrast to the present findings other workers reported percentages of lymphocytes and neutrophils which are typical of ruminants 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 attributed to the different breeds of camels used or stress prior to sampling (Higgins and Kock, 1986).

In conclusion, the present findings revealed clear differences between the two breeds of camels in respect to the haematological parameters investigated. Thus the data obtained in the present study form a useful baseline for subsequent haematological studies in Saudi Arabia.

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**Transmission dynamics of the  
*Echinococcus granulosus* sheep-dog strain (G1 genotype)**

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Cystic echinococcosis, caused by *Echinococcus granulosus*, is highly endemic in North Africa and the Middle East. This paper examines the abundance and prevalence of infection of *E. granulosus* in camels in Tunisia. No cysts were found in 103 camels from Kebili, whilst 19 of 188 camels from Benguerden (10.1%) were infected. Of the cysts found 95% were considered fertile with the presence of protoscolices and 80% of protoscolices were considered viable by their ability to exclude aqueous eosin. Molecular techniques were used on cyst material from camels and this demonstrated that the study animals were infected with the G1 sheep strain of *E. granulosus*. Observed data were fitted to a mathematical model by maximum likelihood techniques to define the parameters and their confidence limits and the negative binomial data. The infection pressure to camels was somewhat lower in comparison to sheep reported in an earlier study. However, because camels are much longer lived animals, the results of the model fit suggested that older camels have a relatively high prevalence rate, reaching a most likely value of 32% at age 15 years. This could represent an important source of transmission to dogs and hence indirectly to man of this zoonotic strain. In common with similar studies on other species, there was no evidence of parasite induced immunity in camels.

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