

## Studies on Haematological and Certain Serum Biochemical Values in Young Magaheim Dromedary Camels at Al-Ahsa Province

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**Abstract:** Haematological measurements and certain biochemical parameters were estimated in 50 samples of blood collected at slaughter from young (3-4 months old) Magaheim dromedary camels. Mean values for Haemoglobin (Hb), Packed Cell Volume (PCV) and Red Cells Count (RBC) were  $9.3 \pm 0.3$  g dL<sup>-1</sup>,  $0.33 \pm 0.3$  L L<sup>-1</sup> and  $7.4 \pm 0.3 \times 10^{12}$  L<sup>-1</sup>, respectively. Values for Mean Cell Volume (MCV), Mean Cell Haemoglobin (MCH) and Mean Cell Haemoglobin Concentration (MCHC) were reported. Total and differential leucocyte counts were estimated. The neutrophil was found to be the predominant white cell ( $49.1 \pm 0.15$ ). Mean values for total protein, albumin, blood glucose, calcium and phosphorus were  $52.0 \pm 0.3$  and  $24.0 \pm 0.3$  g L<sup>-1</sup>;  $6.6 \pm 0.4$ ,  $2.6 \pm 0.3$  and  $1.4 \pm 0.2$  mmol L<sup>-1</sup>, respectively. Results of all these parameters were tabulated and discussed in relation to other findings reported in camels.

**Key words:** Magaheim dromedary camels, biochemical values, haematological, PCV, MCV, MCHC

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### INTRODUCTION

The camel population in Saudi Arabia approximates 607,000 Ministry of Agriculture (1984), a number that constitutes slightly <4% of total world camel population. Camels in Saudi Arabia are valuable for their milk and meat production; still much less camels are used for transportation. Traditionally, camels are used in Hijin racing as an inherited hobby and a source of prestige and income. The Magaheim are camels of central Arabia and one of the most important 4 major ecotypes in Saudi Arabia.

They are large, blackish-brown in colour and are considered to be the best local variety available. For a long time camel is a neglected animal in terms of science and research (Wernery and Kaaden, 1995). Knowledge of common disease of camels, health surveillance and prevention of disease is of great importance to camel breeders in Saudi Arabia. Within this context, haematological and biochemical analysis of blood often provides valuable information for diagnosis and surveillance of general health (Nyang'ao *et al.*, 1997).

This study reports, normal haematological and some biochemical values for 50 samples of blood collected at slaughter from young Magaheim dromedary camels brought for slaughter.

### MATERIALS AND METHODS

Blood samples were collected from 50 young camels (3-4 months old) at slaughter at Hofuf slaughter house. Approximately 10 mL of blood was collected from the jugular vein of each camel; 2 mL into vials containing the disodium salt of EDTA (Ethylene-Diamine-Tetraacetic) as anticoagulant for haematological studies and the other 8 mL into Silicon-coated vacuum containers for biochemical studies. Serum was separated from the latter samples by centrifugation at 3000 rpm for 10 min and stored at -20°C until analysis.

**Haematological analysis:** Haematological parameters were estimated with a Vet-5 Haematology analyzer (Danan Electronic Inc., Dallas, TX, USA), an automated system based on the impedance blood counter to determine the Red Blood Cell Counts (RBC), Packed Cell Volume (PCV), Haemoglobin (Hb) concentration, Mean Cell Volume (MCV) and the total blood cell counts (WBC). The Mean Cell Haemoglobin Concentrations (MCHC) were calculated according to the formula of Jain (1986). The blood smears for differential count were made the collected 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.

**Biochemical analysis:** Biochemical analysis was carried out using Roche Hitachi 902 auto analyzer (Hitachi Higher Technologies corporation, Tokyo-Japan).

### RESULTS

The mean±SEM values of the various haematological parameters studied are shown in Table 1 and 2. Mean values for Haemoglobin (Hb), Packed Cell Volume (PCV) and Red blood cells count were  $9.3\pm 0.3$  g dL<sup>-1</sup>,  $0.33\pm 0.3$  L L<sup>-1</sup> and  $7.4\pm 0.3\times 10^{12}$  L<sup>-1</sup>, respectively. The Mean Cell Volume (MCV), Mean Cell Haemoglobin (MCH) and Mean Cell Haemoglobin Concentration (MCHC) values were  $31.1\pm 0.2$  fL,  $12.1\pm 0.2$  Pg and  $40.7\pm 0.2$  g dL<sup>-1</sup>, respectively. These data will be evaluated and compared with other findings reported in the young dromedary camel. The White Blood series such as total leucocytes (WBC), Neutrophils (N), Lymphocytes (L), Monocytes (M), Eosinophils (E) and Basophils percentage are summarized in Table 2. The neutrophils were the predominant white cells  $49.1\pm 0.1\%$  followed by lymphocytes  $35.8\pm 0.07\%$ . The monocytes and eosinophils percentage were  $7.7\pm 0.4$  and  $2.8\pm 0.6$ , respectively. The basophils showed the lowest percentage of the differential leucocyte count ( $0.69\pm 1.7\%$ ). Table 3 shows the values of certain serum biochemical parameters. In this study, the concentration of glucose, total proteins, albumin, calcium and phosphorus were measured in the blood of young dromedary camels at AL-Ahsa province. The values of these parameters will be discussed in relation to other findings reported in camels.

Table 1: Mean (±SEM) red blood cells values in young Magaheim dromedary camels

Parameters	Value	Range
Haemoglobin (Hb) (g dL <sup>-1</sup> )	$9.3\pm 0.30$	6.9-14.60
Packed Cell Volume (PVC) (L L <sup>-1</sup> )	$0.33\pm 0.3$	0.18-0.44
Red Blood Count. (RBC) ( $10^{12}$ L <sup>-1</sup> )	$7.4\pm 0.30$	4.5-11.20
Mean Cell Volume (MCV) (fL)	$31.1\pm 0.20$	27.0-44.80
Mean cell Haemoglobin (MCH) (Pg)	$12.1\pm 0.20$	7.6-14.40
Mean Cell Haemoglobin Concentration (MCHC) (g dL <sup>-1</sup> )	$40.7\pm 0.20$	30.0-60.00

Table 2: Mean (±SEM) leucocytes values in young Magaheim dromedary camels

Parameters	Value	Range
Total WBC ( $\times 10^9$ L <sup>-1</sup> )	$17.9\pm 0.20$	12.5-22.6
Neutrophils (%)	$49.1\pm 0.10$	38.0-60.0
Lymphocyte (%)	$35.8\pm 0.07$	24.0-40.0
Monocytes (%)	$7.7\pm 0.40$	4.0-12.0
Eosinophils (%)	$2.8\pm 0.60$	1.0-6.00
Basophils (%)	$0.69\pm 1.7$	0.0-3.00

Table 3: Some serum biochemical values in young Magaheim dromedary camels

Parameters	Value	Range
Glucose (mmol <sup>-1</sup> L)	$6.6\pm 0.4$	4.0-14.3
Total protein (g <sup>-1</sup> L)	$52.0\pm 0.3$	32.0-76.0
Albumin (g <sup>-1</sup> L)	$24.0\pm 0.3$	12.0-48.0
Calcium (mmol <sup>-1</sup> L)	$2.6\pm 0.3$	1.6-6.50
Phosphorous (mmol <sup>-1</sup> L)	$1.4\pm 0.2$	1.2-1.60

### DISCUSSION

The current study focused on haematological and biochemical analysis of certain blood constituents of the young Magaheim dromedary camel. This often provides valuable information for diagnosis and surveillance of general health (Nyang'ao *et al.*, 1997; Rezakhani *et al.*, 1997).

Data on haemoglobin (Hb) concentration and total Red Cell Count (RBC) reported in this study are lower than that reported by Nyang'ao *et al.* (1997), Ghaleb (1997), Sarwar *et al.* (1992b). The values for the PCV and MCV in this study were higher than values of Rezakhani *et al.* (1997) for camels <3 years and camels between 3 and 6 years but in accordance with those above 6 years in age. Although, the values reported for MCV, MCH and MCHC in this study were in accordance with that reported by Ghaleb (1997) and AL-Busadah and Usman (2000), these values were lower than the values reported by Sarwar *et al.* (1992a). Mohamed and Hussein (1999), reported similar values for RBC, MCHC and PCV for Hijin racing camels in Kuwait. However, in this study the values of haemoglobin, mean cell haemoglobin and mean cell volume and total white blood cell count were lower than those reported by Mohamed and Hussein (1999).

The variations on red cell indices reported by all these workers could be attributed to either breed differences of camels or age differences or it could be due to the effect of sampling or differences of different laboratory techniques employed. The MCHC in this study is in agreement with the results obtained by Alhadrami (1997) for the dromedary camel in the United Arab Emirates and also to the findings of Mohamed and Hussein (1999) for hijin racing camels in Kuwait, but less than the values reported by Sarwar *et al.* (1992a) and Rezakhani *et al.* (1997) for Turkman camels in Iran. However, the MCHC is higher in camels as compared with man, Turkey, dog, sheep, cattle and horses (Yagil, 1985).

This high MCHC of camels RBC reflect the potential oxygen-carrying capacity. The data of differential leucocyte count in this study were given in Table 2. The total leucocyte count reported in this study is higher than that reported by Higgin and Kock (1986) and Nyang'ao *et al.* (1997) for the Somali-type camels in Kenya. In this study, the neutrophil was found to be the predominant white cell, while, the findings of Nyang'ao *et al.* (1997) and Majeed *et al.* (1980) disclosed that the lymphocyte was the most frequent white cells in the camels blood not the neutrophil. In the present report, the eosinophils, monocytes and basophils were found to be higher than that reported by AL-Busadah and Usman (2000). These differences in total leucocyte count could be due to breed differences or could be due to stress prior to sampling (Higgin and Kock, 1986).

The present study showed values for total protein, albumin and blood glucose (Table 3), which are comparable with the results of Nyang'ao *et al.* (1997) for the dromedary camel in Kenya. The findings of Rezakhani *et al.* (1997) for total protein, albumin were higher than that reported in this study. The total protein concentration varied from 3.2-7.6 g dL<sup>-1</sup>. This observation is close to a previous report from Sudan Abdelgader *et al.* (1979) and also to that reported by Mohamed and Hussein (1999). The serum albumin concentrations reported in this study were comparable to the results of Little *et al.* (1970) and Mathur *et al.* (1981). The mean serum albumin concentration is higher in camels than in other ruminants (Zongping, 2003). Albumin plays a regulatory role in maintaining the colloidal osmotic pressure in the camels blood, it plays a major role in conservation of water in camel by attracting water, thus, reducing water loss from the blood. This explains the abundance of albumin as the main serum protein fraction (Sarwar *et al.*, 1992b). The mean values for serum calcium in this study is in agreement with the previous reports of Sarwar *et al.* (1997), Mohamed *et al.* (1999) and Rezakhani *et al.* (1997). AL-Busadah (2003) reported higher calcium values than that reported in this study. However, Serum phosphorous concentration in this study is lower than the values reported by Rezakhani *et al.* (1997), Mohamed and Hussein (1999) and AL-Busadah (2003). However, higher values for serum phosphorus in camels i.e., 8.4±1.7 mg dL<sup>-1</sup> was reported by AL-Ali *et al.* (1988). The low phosphorus observed in this study could be attributed to breed or age differences. However, Barkat and Abdel-Fattah (1971) observed a significant seasonal difference in calcium and phosphorus, however, sex had no significant effect. The concentration of blood glucose reported in this study agreed with the previous reports of Mohamed and Hussein (1999), Nyang'ao *et al.* (1997) and Faye *et al.* (1995), but it was higher than that reported by Sarwar and Majeed (1997). The investigation of Abdel-Fattah *et al.* (1999) provided evidence that the glucagon level in camels is higher than that in other ruminants and in man and suggested a probable species specificity, which would explain the higher level of glucose in the blood of camels than in that of other ruminants (Elmatidi *et al.*, 1997) attributed the high glucose in the blood of camels to poorer insulin response and/or a reduced tissue sensitivity to insulin.

### CONCLUSION

This study provided a valuable data on the haematology and some biochemical parameters of the Majaheim dromedary camel. There are some differences between the present findings and those from previous

workers that may be attributed to breed differences, environmental difference, type of husbandry or due to differences in methods of analysis. The data obtained could be used as a base -line data for future research in the blood of the Majaheim dromedary camel.

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### REFERENCES

- Abdel-Fattah, M., H. Amer, M.A. Ghoneim, M. Warda and Y. Megahed, 1999. Response of one-humped camel (*Camelus dromedaries*) to intravenous glucagon injection and to infusion of glucose and volatile fatty acids and the kinetics of glucagon disappearance from the blood. *Zentralbl. Vet. A.*, 46 (8): 473-481.
- Abdelgader, A.W., E.A. Salahedin, A.A. Neimat and F.I. Omer, 1979. Plasma electrolyte and minerals of normal camels in the Sudan. In: IF'S Provisional Report No. 6. Camels International Foundation for Science, Stockholm, pp: 355-364.
- AL-Ali, A.K., H.A. Husayni and D.M. Power, 1988. A comprehensive biochemical analysis of the blood of the camel (*Camelus dromedaries*). *Comparative Biochem. Physiol. B.*, 89: 35-37.
- AL-Busadah, K.A., 2003. Some aspects of calcium and magnesium metabolism in camel calves. *J. Camel Pract. Res.*, 10 (2): 111-114.
- AL-Busadah, K.A. and T.E.A. Osman, 2000. Haematological Parameters of adult dry, lactating and camel calves bin Saudi Arabia. *Pak. J. Biological Sci.*, 3 (10): 1749-1751.
- Alhadrami, G.A., 1997. Comparative haematology in the camel calf and adult racing camel (*Camelus dromedaries*). *J. Camel Pract. Res.*, 4: 13.
- Barkat, M.Z. and M. Abdel-Fattah, 1971. Seasonal and sexual variation of certain constituents of normal camel blood. *Zentrablatt fur Veterinarmedizin A*, 18: 174-178.
- Elmatidi, B., H.P. Sallmann, H. Fuhrmann, W. Von Engelhardt and M. Kaske, 1997. Comparative aspects of glucose tolerance in camels, sheep and ponies. *Com. Biochem. Physiol. A. Physiol.*, 118 (1): 147-151.
- Faye, B., M. Ratovonahary, J.P. Chacornac and P. Soubre, 1995. Metabolic profiles and risks of disease in camels in temperature conditions. *Com. Biochem. Physiol. A Physiol.*, 112 (1): 67-73.
- Ghaleb, A.A., 1997. Compative haematology in the camel calf and adult racing camel. *J. Camel Prac. Res.*, 4 (1): 13.

- Higgin, A.J. and R.A. Kock, 1986. A guide to the clinical examination, chemical restraint and medication of the Camel. Br. Vet. J., 140: 485-450.
- Jain, N.C., 1986. Schalm's Veterinary Haematology. 4th Edn. Philadelphia, USA, Lea and Febiger.
- Little, A., A.J. McKenzie, R.J.H. Morris, J. Robert and J.V. Evans, 1970. Blood electrolytes in the Australian camel. Aust. J. Exp. Biol. Med. Sci., 48: 17-24.
- Majeed, M.A., Z. Rehman and A. Ahmed, 1980. Effects of sex and season on to haematological values of normal adult one-humped camel. Rev. Elev. Med. Vet. Pays. Trop., 33 (2): 135-141.
- Mathur, G.N., A.K. Ghosal and J.S. Bhatia, 1981. Note on certain blood constituents in the Indian Camel. Ind. J. Anim. Sci., 51: 1179-1180.
- Ministry of Agriculture, 1984. Ann. Rep. Agric. Saudi Arabia. Min. Agric. Riyadh, Saudi Arabia.
- Mohamed, H.A. and A.N. Hussein, 1999. Tayr. Syndrome: A neurological disorder in a racing camel (*Camelus dromedarius*). Camel Newsletter.
- Nyang'ao, J.M.N., W. Olahu-Mukanio, J.M. Maribe and J.K. Omuse, 1997. A study of some haematological and biochemical parameters of the normal dromedary camel in Kenya. J. Camel Pract. Res., 4: 31-33.
- Rezakhani, A., S.N. Habibabadi and M.M. Ghojogh, 1997. Studies on normal haematological and biochemical parameters of Turken camel in Iran. J. Camel Pract. Res., 4: 41-44.
- Sarwar, A. and M.A. Majeed, 1997. Interrelationships between 30 parameters of blood in normal 1 humped camel in summer. J. Camel Pract. Res., 4: 35-39.
- Sarwar, A., M.A. Majeed, M.N. Chaudhry and I.R. Khan, 1992a. Erythrocyte indices in normal one-humped camel. Effect of sex, age in males and lactation and/or pregnancy in females. Pak. J. Agric. Sci., 12 (4): 348.
- Sarwar, A., M.A. Majeed, M.N. Chaudhry, I.R. Khan and 1992b. Studies on the serum transferase and electrolytes of normal one-humped camel in summer. Pak. Vet. J., 12 (4): 178-182.
- Wernery, U. and O.R. Kaaden, 1995. Infectious Diseases of Camelids (Blackwell Wissenschafts-Verlag, Berlin).
- Yagil, R., 1985. The desert camel. Comparative Physiology Adaptation. Karger Press. New York.
- Zongping, L., 2003. Studies on the haematology and trace elements status of adult Bactrian camels (*Camelus bactrianus*) in China. Vet. Res. Commun., 27 (5): 397-405.