

Serum Biochemical Values of Healthy Adult One Humped Camel (*Camelus dromedarius*) Introduced into a Sub-Humid Climate in Shika-Zaria, Nigeria

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Abstract: Eleven adult dromedaries introduced into a sub-humid climate were bled monthly for 36 months to establish mean serum biochemical reference values for the zone. Mean sodium concentration was 144.57 ± 1.31 mmol L⁻¹, potassium 5.03 ± 0.42 mmol L⁻¹ and chloride 104.06 ± 2.05 mmol L⁻¹. Others were bicarbonate 23.57 ± 1.04 mmol L⁻¹, calcium 2.39 ± 0.05 mmol L⁻¹ and phosphate 1.07 ± 0.04 mmol L⁻¹. The urea value was 4.92 ± 0.55 mmol L⁻¹ and that of creatinine was 85.70 ± 8.85 , while glucose had 2.62 ± 0.18 mmol L⁻¹, total protein 64.94 ± 1.55 g L⁻¹ and albumin 33.98 ± 0.98 g L⁻¹. The male camels had significantly ($p < 0.05$) higher potassium and creatinine levels while urea, protein and albumin values were higher ($p < 0.05$) in the she-camels. Wet season samples had higher ($p < 0.05$) blood urea nitrogen, creatinine and glucose values while potassium was insignificantly ($p > 0.05$) higher in the dry season samples.

Key words: *Camelus dromedarius*, serum biochemistry, sub-humid climate, Nigeria

INTRODUCTION

Normal values of serum biochemical constituents and serum proteins of the healthy adult one humped camel (*Camelus dromedarius*) have been reported from different geographical zones of the world (Lakhota *et al.*, 1964; Barakat and Abdel-Fattah, 1971; Abdelgadir *et al.*, 1984; Eldirdiri *et al.*, 1987; Al-Ali *et al.*, 1988; Haroun, 1994; Nyang'ao *et al.*, 1997; Rezakhanki *et al.*, 1997; Al-Busadah and Osman, 2004). Observed variations in values from different climatic zones have been documented (Beaunoyer, 1992). The differences could result from different methods of analysis, breed, season and nutritional factors, effects of sex and the rut (Barakat and Abdel-Fattah, 1971; Bengoumi *et al.*, 2003). Thus values obtained in one country could not be taken as standard in other countries having different climatic conditions. Since the camel is an adaptable specie, the standard serum biochemical values need to be determined in variable environmental conditions (Barakat and Abdel-Fattah, 1970).

Serum biochemical parameters can provide valuable information regarding health, sex, age, nutritional and physiological status of the animals (Osman and Al-Busadah, 2000, 2003). Periodic serum proteins monitoring may also serve as a useful tool in evaluating the growth rate and production potentials of livestock under field

conditions (Rekwot *et al.*, 1989). However, only limited information on serum biochemistry of the one humped camel is available in sub-humid zone of Nigeria where camel husbandry is relatively new (Hassan, 1995; Mohammed, 2000). The objectives of this study therefore were to establish baseline reference values for serum biochemical parameters in healthy adult one humped camels introduced into a sub humid climate and to determine the effect of sex and season on these parameters.

MATERIALS AND METHODS

Study area: This study was carried out at the National Animal Production Research Institute, Ahmadu Bello University, Shika-Zaria, Nigeria located on latitude $11^{\circ}12'N$, longitude $7^{\circ}33'E$ and on altitude of 610 m above sea level. Shika is within the Northern Guinea Savanna zone and has a sub-humid tropical climate.

Animals: The study involved eleven adult camels (6 males and 5 females) aged between 5 and 7 years monitored for 36 months. The camels were managed under a semi-intensive system involving grazing and browsing on improved pastures and the natural range for 6 to 8 h daily and in addition fed 3 kg per head of concentrate supplementation and 0.7 kg head⁻¹ of *kanwa*

(local mineral lick) twice a week and water was available *ad libitum* in the grazing paddocks. They were screened for blood and helminth parasites and other diseases and appropriate treatments carried out before the experiment was started. Each camel was routinely dewormed with Albenda^(R) bolus and sprayed with acaricide solution.

Collection of blood samples: All camels were restrained in a standard cattle crush and bled. During each bleeding, 10 mL blood samples were collected from each camel through jugular venipuncture into plane (without anticoagulant) sterile universal tubes. Serum was harvested by centrifugation of the blood at 2500 rpm for 10 min. The serum was frozen at -20°C until used for biochemical determinations.

Determination of biochemical parameters: The serum was analyzed spectrophotometrically for sodium, potassium, chloride, inorganic phosphate, bicarbonate, urea, creatinine, total protein, and albumin contents with the SMA 12/60 Auto analyser* as described by Coles (1986), Strove and Makarova (1989) and Cheesbrough (1991).

Statistical analysis: Data were analyzed by one-way ANOVA, using GLM procedure of SAS (Goodnight *et al.*, 1986) and Duncan's multiple range test (Duncan, 1955) was used to detect significant differences among means.

RESULTS

The mean values for serum biochemical parameters are presented in Table 1. Sodium ion (Na⁺) concentration was 144.57±1.31 mmol L⁻¹, potassium (K⁺), 5.03±0.42 mmol L⁻¹ and chloride (Cl⁻) 104.06±2.05 mmol L⁻¹. Others were bicarbonate (HCO₃⁻) 23.57±1.04 mmol L⁻¹, calcium (Ca²⁺) 2.39±0.05 mmol L⁻¹ and phosphate (PO₄) 1.07±0.04 mmol L⁻¹. The urea value was 4.92±0.55 mmol L⁻¹ and that of Creatinine was 85.70±8.85 umol L⁻¹, while glucose had 2.62±0.18 mmol L⁻¹, total protein 64.94±1.55 g L⁻¹ and albumin 33.98±0.98g L⁻¹. The male camels had significantly (p<0.05) higher potassium and creatinine levels while urea, protein and albumin values were higher (p<0.05) in the she-camels. The seasonal variations in serum biochemical values are shown on Table 2. Wet season samples had higher blood urea nitrogen, creatinine and glucose values while potassium was insignificantly (p>0.05) higher in the dry season samples (Table 2).

DISCUSSION

Most of the serum biochemical values obtained in this study were within physiological limits reported previously (Soliman and Shaker, 1967; Abdelgadir *et al.*, 1984; Mehrotra and Gupta, 1989; Al-Ali *et al.*, 1988; Haroun, 1994; Nyang'ao *et al.*, 1997). However, sodium and potassium concentrations obtained in this study were

Table 1: Mean (±SD) and ranges of serum biochemical values of the adult dromedary camels in Shika-Zaria, Nigeria

Parameter	Mean of all camels(n = 11)	Males (n = 6)	Females (n=5)	Range (n = 11)
Na ⁺ mmol L ⁻¹	144.57±1.31	144.61±1.83	144.53±0.27	133-154
K ⁺ mmol L ⁻¹	5.03±0.42	5.32±0.54	4.78±0.17	3.5-8.0
Cl ⁻ mmol L ⁻¹	104.06±2.05	104.92±1.70	103.09±1.84	96-120
HCO ₃ ⁻ mmol L ⁻¹	23.57±1.04	23.91±1.12	23.25±1.07	20-30
Ca ²⁺ mmol L ⁻¹	2.39±0.05	2.42±0.05	2.36±0.05	2.18-2.90
PO ₄ mmol L ⁻¹	1.07±0.04	1.07±0.06	1.05±0.06	0.84-1.32
Urea mmol L ⁻¹	4.92±0.55	4.83±0.67	5.02±0.46	2.4-8.5
Creatinine umol L ⁻¹	85.70±8.85	88.56±10.93	80.94±1.17	47-118
Glucose mmol L ⁻¹	2.62±0.18	2.69±0.21	2.51±0.06	1.4-4.2
Total protein g L ⁻¹	64.94±1.55	64.18±1.81	65.71±1.03	53-75
Albumin g L ⁻¹	33.98±0.98	33.59±0.20	34.53±1.43	23-40

Table 2: Dry and wet season mean (±SD) serum biochemical values of the adult dromedary camels in Shika-Zaria, Nigeria

Parameter	Dry season (n = 11)	Wet season (n = 11)
Na ⁺ mmol L ⁻¹	144.57±4.18	144.55±4.95
K ⁺ mmol L ⁻¹	5.20±1.07	4.87±1.12
Cl ⁻ mmol L ⁻¹	103.46±6.65	104.80±5.50
HCO ₃ ⁻ mmol L ⁻¹	23.42±2.14	23.78±2.32
Ca ²⁺ mmol L ⁻¹	2.37±0.13	2.43±0.13
PO ₄ mmol L ⁻¹	1.05±0.10	1.10±0.12
Urea mmol L ⁻¹	4.56±1.16	5.34±1.43
Creatinine umol L ⁻¹	82.93±18.04	87.90±13.66
Glucose mmol L ⁻¹	2.48±0.41	2.77±0.52
Total protein g L ⁻¹	65.04±4.35	64.82±3.89
Albumin g L ⁻¹	33.57±3.66	34.52±2.90

higher than those reported by Al-Ani *et al.* (1992) in Iraqi camels, similar to those obtained by Rezakhanki *et al.* (1997) in Turkmen camel but lower than those obtained by Al-Busadah and Osman (2004), Al-Busadah and Homeida (2004) for Saudi Arabian camels.

Serum protein, albumin and glucose concentrations were significantly higher in Arabian camels (Al-Busadah and Homeida, 2004) compared to our values. Creatinine concentrations in this present study were higher than those reported in earlier literature but the blood urea nitrogen concentrations were in agreement with the reference values reported for the dromedary camels elsewhere (Abdelgadir *et al.*, 1984; Wahbi *et al.*, 1984; Eldirdiri *et al.*, 1987; Bengoumi *et al.*, 2003). The mean values of serum calcium in this study are in agreement with those reported by Soliman and Shaker (1967), Al-Ani *et al.* (1992) and Rezakhanki *et al.* (1997).

The slight variations observed between the present study and earlier reports may be attributed to differences in breed, nutrition, husbandry, environment, and methods of assay (Beaunoyer, 1992; Osman and Al-Busadah, 2003). This present study may be the first to establish serum biochemical profile for the one humped camel (*Camelus dromedarius*) introduced into sub-humid zone of northern Nigeria where the use of camel is relatively new (Hassan, 1995; Mohammed, 2000).

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