

MINERAL AND VITAMIN CONTENTS IN THE BLOOD OF RACING DROMEDARIES IN THE UNITED ARAB EMIRATES

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ABSTRACT

Mineral and vitamin contents in the blood of racing dromedaries of the United Arab Emirates were tested over the last 5 years (2004-2008) at CVRL for the purpose of establishing reference values.

Key words: Blood, minerals and vitamins, racing dromedaries, United Arab Emirates

Several scientific papers deal with the mineral and vitamin contents in dromedary blood (Abu Damir, 1998; Bengoumi *et al*, 2002; Snow *et al*, 1992; Faye *et al*, 2005; Abbas and Alie, 2001; Wernery *et al*, 2002). When these results are compared with each other, they vary widely, due to several different reasons. These mainly include the breed of the animal tested, the age, sex, feeding practices, environmental and management conditions, as well as, testing methodology. In the United Arab Emirates (UAE) where approximately 250,000 racing dromedaries are kept (Breulmann *et al*, 2007), over the last 2 decades of competitive racing, we have observed a steady increase of many blood values. Typical examples of these changes are the reference values for red blood cells (RBC) and haemoglobin (Hb). The mean values of 10,000 healthy racing dromedaries tested at CVRL in 1990 were $8.0 \times 10^{12}/L$ for RBC and 12.2% for Hb, whereas, these values increased in 2007 to $10.0 \times 10^{12}/L$ for RBC and 14.2% for Hb, respectively. The reasons for these tremendous increased changes in many blood parameters in racing dromedaries are manifold, including improvement in management, veterinary care, feeding, exercise and breeding practices. Another important fact is the common practice of supplementation with vitamins and minerals. Therefore, it is an important task of CVRL to regularly update all blood parameters of racing dromedaries statistically, which is done every 2 to 3 years on several thousand blood samples from racing dromedaries aged 2 to 8 years.

We report here the reference values of important minerals and vitamins obtained from blood of UAE

racing dromedaries over the last 5 years (2004-2008). The calculated reference values include all values within 2 standard deviations (SD), either side of the mean. The number (n) of dromedaries tested varied because, not all tests were always required for each dromedary.

Materials and Methods

The following parameters were tested: Iron (Fe), Calcium (Ca), Magnesium (Mg), Phosphorous (P), Sodium (Na), Potassium (K), Chloride (Cl), Copper (Cu), Zinc (Zn), Selenium (Se), Vitamin B₁, A, E and C. Fe, Ca, Mg, P, Na, K and Cl were photometrically measured in the Hitachi autoanalyser 912 (Japan) from serum, whereas, Cu and Zn were analysed by flame atomic absorption spectrophotometry (FAAS, Thermo Scientific, UK) also using serum. The sera were diluted 10 times with de-ionised water. For Cu, a wavelength of 324.8 nm was used and 213.9 nm for Zn. Three standards were run for both elements for plotting a standard curve. Deuterium background correction was used and a STAT (slotted tube atom trap) to increase the sensitivity of the analysis.

Se in serum was analysed by graphite furnace atomic absorption spectrophotometry (GFAAS, Thermo Scientific, UK). The serum was diluted 10 times with 0.05% triton. Se was measured at a wavelength of 196.0 nm and deuterium was used for background correction. Three standards were run for plotting a standard curve. A matrix modifier solution containing 2% hydroxyl ammonium hydrochloride and 500 mg/l palladium was used to reduce the interferences.

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Table 1. Reference values of minerals and 4 vitamins in racing dromedaries of the UAE.

Parameters Abbreviation	Equipment	(N) Number of samples	Mean with SD (mmol/L)
Iron Fe	Hitachi 912	100,276	20.97±5.63
Calcium Ca	Hitachi 912	62,390	2.67±0.48
Magnesium Mg	Hitachi 912	613	1.04±0.53
Phosphorous P	Hitachi 912	58,979	2.05±0.34
Sodium Na	Hitachi 912	747	149.3±5.03
Potassium K	Hitachi 912	736	4.2±0.40
Chloride Cl	Hitachi 912	764	111.5±6.62
Copper Cu	FAAS	14,237	11.21±2.62
Zinc Zn	FAAS	6190	8.22±2.0
Selenium Se	GFAAS	14,899	1.91±0.61
Vitamin B ₁	HPLC	48,551	0.142±0.039
Vitamin A	HPLC	132	1.14±0.44
Vitamin E	HPLC	1064	4.51±1.63
Vitamin C	HPLC	423	22.18±7.8

FAAS: Flame Atomic Absorption Spectrophotometer
 GFAAS: Graphite Furnace Atomic Absorption Spectrophotometer
 HPLC: High Performance Liquid Chromatography

Vitamin B₁, A, E and C were analysed with the High Performance Liquid Chromatography (HPLC) system (Alliance Waters, 2695 Separation Module, Waters, USA). The test kits for all 4 vitamins were purchased from Chromsystems (Munich, Germany). For B₁ whole blood (EDTA blood) was used, for vitamins A, E and C serum was analysed. The analysis of all 4 elements was carried out according to the methods described by Lee *et al* (1997) and Anonym (1997).

Results

Table 1 shows the mean reference values with SD for the most important minerals and 4 vitamins as calculated between 2004 to 2008 in UAE racing dromedaries aged 2- 8 years old.

Discussion

Although camels do not taxonomically belong to the Suborder Ruminantia, 15 mineral elements that are nutritionally essential for ruminants are also essential for camelids. The macro-minerals are calcium, phosphorous, potassium, sodium, chlorine, magnesium and sulphur. The trace elements or micro-minerals are copper, selenium, zinc, cobalt, iron, iodine, manganese, and molybdenum. Mineral deficiencies together with lack of protein and water are the main obstacles to postnatal growth and reproductive performance in grazing animals in

developing countries. In these countries mineral imbalances in soil and forages are responsible for low production and reproduction problems among grazing animals. However, Bengoumi *et al* (2002) showed that dromedaries are capable of tolerating under-nutrition periods of their life remarkably well.

In the United Arab Emirates (UAE), where camels are kept for racing, the nutritional situation is totally different to the situation in developing countries although, soil and plants of the Arabian Peninsula are also deficient in copper and selenium (Ivan *et al*, 1990). Racing dromedaries receive an optional diet including supplementation with minerals and vitamins on a daily basis. Therefore, all values established at CVRL cannot really be compared with values achieved from dromedaries roaming in desert areas. However, the reference values measured over the last 5 years in the UAE are meant as a guide for racing dromedaries aged 2 to 8 years.

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