

RELATIONSHIP BETWEEN MINERAL STATUS AND JAW
FRACTURES IN DROMEDARY CAMELS
(*CAMELUS DROMEDARIUS*)

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Summary

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This study was designed to find out the relationship between the blood concentrations of some macro-minerals particularly magnesium, calcium and inorganic phosphate in camels with fractured jaw compared to their concentrations in healthy camels. Twenty camels with jaw fractures were included in this study; another twenty nine apparently healthy camels served as control group. The affected camels were subjected to a detailed physical examination. They showed obvious clinical signs of mandibular fracture. In some cases bilateral fracture was observed, the fractured part of the mandible being dropped ventrally from a site just cranial to the first premolar. Also, there was a wound in the buccal cavity exposing the fractured bone ends, dribbling of saliva from mouth commissure associated with partial or complete loss of appetite. Blood samples were obtained from the affected and healthy camels. The obtained results revealed that the mean values of these macro-minerals concentrations in the blood were significantly lower in camels with jaw fracture (2.85 ± 0.29 mmol/L, 0.92 ± 0.17 mmol/L and 0.13 ± 0.07 mmol/L for calcium, magnesium and inorganic phosphate respectively) compared to respective values in healthy camels.

Key words: blood, camel, jaw fracture, minerals

INTRODUCTION

The population of camels in Saudi Arabia is approximately 820 thousands (Anonymous, 2004), most of which are used to provide meat and milk for a growing number of human population. Jaw fractures are common among camels in Saudi Arabia (Ramadan & Abdin-Bey, 1990). This condition usually occurs during the breeding season where males fight each other to mate females. Sometimes jaw fractures may occur when the male tries to restrain the female before mating (Singh & Nigam, 1982). The two horizontal rami of the mandible get often fractured as the male breeding camel easily

grasps that part of the other male during the fight. The presence of mental canal and alveoli of tusks makes this area more weak and susceptible to fracture (Gahlot & Chouhan, 1992). In females, fracture occur due to car accident or when the animals stumble and fall on its head in an attempt to escape being mounted by a male camel. The clinical signs of mandibular fracture are usually very clear (Ramadan, 1994).

The diagnostic value of cellular and biochemical blood profile in many infectious and non-infectious diseases in different animal species is acknowledged

and well documented. The difficulty in assessing the value of metabolic profiles in camels comes from the very limited published literature with which to compare. Calcium and inorganic phosphate are closely associated in metabolism. In mammals the major portion of dietary calcium is used for bone formation. Inorganic phosphate is the second most abundant element in an animal's body after calcium, with 80% of inorganic phosphate found in the bones and teeth, with the remainder located in the body fluids and soft tissue. There are some reports linking blood mineral status to other bone conditions in camels (Caligiuri *et al.*, 1989; Liu *et al.*, 2003; Liu, 2005; Van Saun, 2006) but not to jaw fracture incidence.

Therefore, the objective of this study was to find out the relationship between the blood levels of calcium, inorganic phosphate and magnesium in camels with jaw fractures compared to their values in healthy camels.

MATERIALS AND METHODS

Animals

Twenty camels having jaw fracture presented to the Veterinary Teaching Hospital, King Faisal University, Saudi Arabia, were examined. Another 29 apparently healthy camels served as control. The affected camels were subjected to a detailed physical examination and the clinical findings were reported. The camels under study aged 6–8 years. Fractures were diagnosed as bilateral involving horizontal rami of the mandible associated with wounds in the gingiva. In all cases, fractures were a result of trauma.

Blood samples

Five mL blood samples were collected from the admitted cases few hours after fractures (approximately 5–6 h) by puncture of the jugular vein in a plain tube. Serum was separated by centrifugation at 5,000 rpm for 15 min and kept frozen for biochemical analysis. Blood sera samples were analysed for calcium, magnesium, inorganic phosphate using a biochemical analyzer (UDILIPSE, Italy).

Data were analysed using the SAS program.

RESULTS

The affected camels showed obvious clinical signs of mandibular fracture. In some cases, a bilateral fracture was observed, the fractured part of the mandible was dropped ventrally from a site just cranial to the first premolar (Fig. 1). Also, there was a wound in the buccal cavity exposing the fractured bone ends, dribbling of saliva from the mouth commissure associated with partial or complete loss of appetite.

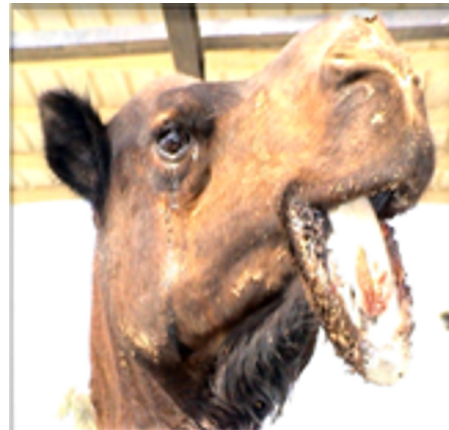


Fig. 1. A camel with bilateral fracture of the lower jaw.

The obtained results from blood biochemical analysis were summarized in Table 1. The results revealed that calcium, inorganic phosphate and magnesium levels were lower in both male and female camels with fractured jaw compared to the healthy ones. The mean blood calcium was 2.85 ± 0.29 mmol/L in camels with jaw fracture while it was 4.35 ± 0.32 in normal ones ($P < 0.0001$). The mean of inorganic phosphate was 0.92 ± 0.17 mmol/L in camels with jaw fractures vs. 1.10 ± 0.17 mmol/L in healthy camels ($P < 0.05$). Mean blood magnesium concentrations also differed significantly between groups (0.13 ± 0.07 mmol/L in camels with jaw fracture and 0.20 ± 0.07 mmol/L in controls; $P < 0.0001$).

DISCUSSION

The main objective of this study was to investigate the relationship between blood concentrations of some macro minerals in camels with jaw fractures compared to their levels in healthy camels. From the

obtained results, it could be observed that the prevalence of jaw fractures was higher in male camels than females. This could be result from fighting between males in the breeding season. The most striking findings in this study were the significantly lower blood calcium, inorganic phosphate and magnesium levels in camels with jaw fractures compared to the healthy ones. Although the main cause of the jaw fracture in the studied animals was trauma, the decreased blood level of these minerals is important and may signal that this decrease contributes to the occurrence of the condition. Bone density tends to decrease with age. The studied camels were above 5 years of age so beside the decreased blood levels of the three minerals, age may be another factor affecting the occurrence of bone fracture.

There is a close relationship between calcium and inorganic phosphate metabolism. Many factors influence calcium and inorganic phosphate absorption, utilization and metabolism, including adequate levels of both minerals. A Ca:P ratio of

Table 1. Blood concentrations of calcium, inorganic phosphate and magnesium (mmol/l) in camels with jaw fractures and healthy camels. Data are presented as mean \pm SEM

Healthy camels (control)		Affected camels with jaw fracture	
<i>Calcium (mmol/L)</i>			
Female (n=20)	4.19 ± 0.35	Female (n=8)	$3.00 \pm 0.38^{***}$
Male (n=9)	4.50 ± 0.69	Male (n=12)	$2.70 \pm 0.40^{***}$
Total (n=29)	4.35 ± 0.32	Total (n=20)	$2.85 \pm 0.29^{***}$
<i>Inorganic phosphate (mmol/L)</i>			
Female (n=20)	0.98 ± 0.20	Female (n=8)	0.90 ± 0.28
Male (n=9)	1.21 ± 0.23	Male (n=12)	$0.93 \pm 0.21^*$
Total (n=29)	1.10 ± 0.17	Total (n=20)	$0.92 \pm 0.17^*$
<i>Magnesium (mmol/L)</i>			
Female (n=20)	0.15 ± 0.08	Female (n=8)	$0.12 \pm 0.12^*$
Male (n=9)	0.25 ± 0.11	Male (n=12)	$0.13 \pm 0.10^{***}$
Total (n=29)	0.20 ± 0.07	Total (n=20)	$0.13 \pm 0.07^{***}$

* $p < 0.05$; *** $p < 0.0001$ between groups.

1:1 to 2:1 is usually recommended; the ratio being critical if inorganic phosphate intake is marginal or inadequate (McDowell, 1992). Hypomagnesemia affects calcium metabolism in two ways: by reducing parathyroid hormone (PTH) secretion in response to hypocalcemia and by reducing tissue sensitivity to PTH. PTH secretion is normally increased in response to even slight decreases in blood calcium concentration. However, hypomagnesemia can blunt this response (Rude *et al.*, 1978; Littledike *et al.*, 1983). Our results are in agreement with these concepts and the decreased concentrations of three minerals occur simultaneously.

No data are available with regard to the effect of calcium and inorganic phosphate deficiency on jaw fracture incidence in camels, but there are data on other bone conditions with calcium and phosphorous deficiency. Osteomalacia is reported to occur in mature Bactrian camels and is characterised by fragile bones, general weakness, lameness, emaciation and stiffness (Zhang *et al.*, 1986; Faye *et al.*, 1992; Liu *et al.*, 1994). It could be concluded that the decreased blood concentrations of calcium, inorganic phosphate and magnesium could be predisposing factors in the occurrence of jaw fracture.

REFERENCES

- Anonymous, 2004. Ministry of Agriculture and Water. Annual Bulletin of complete of specialized farms (corps & livestock) 1985/1986, Department of Economic Studies of Statistics. Kingdom of Saudi Arabia, Riyadh, pp. 25–27.
- Caligiuri, R., V. G. Kollias & C. Spender, 1989. Metabolic bone diseases in dromedary camels (*Camelus dromedarius*). *Journal of Zoo and Wildlife Medicine*, **20**, 482–487.
- Duncan, D. B., 1955. Multiple range and multiple F-test. *Biometrics*, **11**, 1–42.
- Faye, B., G. Saint-Martin, R. Cherrier & M. Ali Ruffa, 1992. The influence on high dietary protein, energy and mineral intake on deficient young camels. I. Changes in growth performance and metabolic profiles. *Comparative Biochemistry and Physiology*, **102**, 409–416.
- Gahlot, T. K. & D. S. Chouhan, 1992. *Camel Surgery*, 1st edn, Gyan Prakashan Mandir, Bikaner, India.
- Littledike, E. T., J. A. Stuedemann, S. R. Wilkinson & R. L. Horst, 1983. Grass tetany syndrome. In: *Role of Magnesium in Animal Nutrition*. Virginia Polytechnic Institute and State University, Blacksburg, VA, p. 173.
- Liu, Z., 2005. Studies on rickets and osteomalacia in Bactrian camels (*Camelus bactrianus*). *The Veterinary Journal*, **169**, 444–453.
- Liu, Z., Z. Ma & Y. J. Zhang, 1994. Studies on the relationship between sway disease of Bactrian camels and copper status in Gansu province. *Veterinary Research Communications*, **18**, 251–260.
- Liu, Zong-Ping, Y. L. Qu, X-J. Ma, Y-J Zhang, S-Z. Cao, D-B. Yang, B. Chi & Q-D Hu, 2003. Aetiology and pathogenesis studies on osteoporosis in Bactrian camels. *Agricultural Science in China*, **1**, 85–90.
- McDowell, L. R., 1992. *Minerals in Animals and Human Nutrition*. Academic Press, Inc., New York. pp. 26–76.
- Ramadan, R. O. & M. R. Abdin-Bey, 1990. Mandibular fractures in camels: A study of 47 cases. In: *Proceedings of the International Conference on Camel Production and Improvement*. Tobruk, Lybia, 11–13 March.
- Ramadan, R. O., 1994. Rectal Prolapse, Surgery and Radiology of the Dromedary Camel Al Ahsa. Saudi Arabia, King Faisal University, p. 103–23.
- Rude, R. K., S. B. Oldham, C. F. Sharp Jr. & F. R. Singer, 1978. Parathyroid hormone secretion in magnesium deficiency. *Journal*

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nal of Clinical Endocrinology and Metabolism, **47**, 800–806.

Singh, A. P. & J. M. Nigam, 1982. Radiography of some disorders of head and neck region in camels. *Indian Veterinary Journal*, **59**, 153–155.

Van Saun, J. R., 2005. Nutritional diseases of South American camelids. *Small Ruminant Research*, **61**, 153–164.

Zhang, C. L., J. L. Su & Y. O. Feng, 1986. Treatment and prevention of selenium deficiency in Bactrian camels. *Chinese Journal of Veterinary Medicine*, **12**, 17–18 [CH].

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