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SERUM C-TERMINAL PARATHYROID HORMONE LEVELS IN DROMEDARIES

N. Kataria and A. K. Kataria*

Radioisotope Laboratory, Department of Veterinary Physiology, *Apex Centre for Animal Disease Investigation, Monitoring and Surveillance, College of Veterinary and Animal Science, Bikaner 334 001 , India

ABSTRACT

Serum C-terminal parathyroid hormone (C-PTH) levels were determined by using RIA technique in healthy and drought affected adult dromedaries of either sex of arid region along with calcium and phosphorus levels. The mean values (ng/ml) of C-PTH in healthy males, non-pregnant females and pregnant females were 1.81±0.03, 1.90±0.05, and 2.10±0.02, respectively which were significantly ($p \leq 0.05$) lower than that in the respective subgroups of drought affected animals. Overall mean values of serum calcium and phosphorus were non-significantly ($p > 0.05$) and significantly ($p \leq 0.05$) lower, respectively, in drought affected group than in healthy group.

Key words : Calcium, C-terminal parathyroid hormone, dromedary, drought, phosphorus, serum

Parathyroid hormone (PTH) molecule consists of a single chain polypeptide with 84 amino acids and a molecular weight of approximately 9.4 kd. The principal circulating forms of PTH include intact PTH (1-84) and C-terminal peptides (PTH 35-84). The C -PTH fragments arise both by direct glandular secretion and by peripheral proteolysis of intact PTH and these fragments are present in circulation. Appreciation of the existence of C-PTH receptors on the bone cells and presence of C-PTH in circulation helped to eliminate earlier misconception that C-PTH fragments were biologically inactive. The receptors on bone cells for these fragments appear to mediate biological actions on bone.

Serum levels of PTH are controlled by blood calcium level through calcium sensing receptors (Brown *et al*, 1993). Under normal conditions PTH is the important factor related with minute-to-minute regulation of blood calcium levels and protects the animal against development of hypocalcaemia (Capen and Rosol, 2003). Clinically, the measurement of serum PTH levels has proven to be an extremely helpful and efficient tool in the differential diagnosis and management of hypercalcaemia, hypocalcaemia, tumours and hyperplasia of parathyroid gland, and assessment of status of renal osteodystrophy in renal problems in human patients. Serum PTH increases in renal failure due to negative calcium balance and hyperphosphataemia.

It is a point of concern that many camels die due to undiagnosed renal problems. At times a lack of coordination appears between clinical observations and proper selection of laboratory parameters to support the clinical diagnosis. Increased incidence of rickets and osteomalacia have been reported in camels during drought (Zongping, 2005). Hence, determination of serum PTH can become an important parameter in the management of rickets and osteomalacia in drought affected dromedaries. Estimation of hormones related with calcium homeostasis also plays an important role in judging the responses to bone injury (Meller *et al*, 1984).

The present investigation was taken up to record the levels of serum C-PTH along with some related minerals in the camels.

Materials and Methods

The blood was drawn for preparation of sera in morning hours before feeding in summer during very high ambient temperature, from 36 adult dromedary camels of either sex belonging to farmers' stock of arid region. The animals which were being used for load carrying or farming purposes by farmers in the villages were healthy whereas those in town being used for load carrying were poorly nourished and many of them had history of pica and were considered drought affected. Each group had 18 animals which sub-grouped in equal numbers as males, non-pregnant females and pregnant females.

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The serum C- terminal PTH levels were determined by using RIA kit (C-terminal PTH ^{125}I RIA, DiaSorin, USA) as per the instructions manual supplied with the kit. For the measurement of activity, ^{125}I Gamma counter (ECIL) was used. Serum calcium and phosphorus levels were determined by standard methods (Oser, 1976).

Statistical significance for individual parameters i.e., C-PTH, calcium and phosphorus levels between healthy and drought affected groups i.e. healthy males and drought affected males; healthy females and drought affected females (non-pregnant and pregnant, respectively) was analysed by paired- *t* test (Snedecor and Cochran ,1967).

Results and Discussion

The mean ± SEM values of serum C-PTH, calcium and phosphorus for all groups of animals are presented in table 1.

The overall mean value of serum C-PTH of healthy group was considered as control mean value and compared with the earlier literature on other animals as no literature could be traced on this aspect in dromedaries. It was higher than the reported values in mares (Martin *et al*, 1996); race horses (Chiba *et al*, 2000) and dogs (Meller *et al*, 1984).

The overall mean values of serum calcium and phosphorus in the present study in healthy male and female animals corroborated the earlier findings in dromedaries (Sarwar and Majeed, 1997; Kataria *et al*, 2002 and Kataria and Kataria, 2004).

The overall mean value of serum C-PTH in drought affected animals was significantly ($p\leq0.05$) higher than that of healthy group and the mean serum C-PTH value of each subgroup was also higher significantly ($p\leq0.05$) than the corresponding mean value in healthy group. The mean value of serum calcium was non-significantly ($p>0.05$) and that of serum phosphorus was significantly ($p\leq0.05$) lower in drought affected animals than in healthy group. Zongping (2005) also reported higher value of serum PTH and lower phosphorus contents in drought affected bactrian camels than in controls. Kataria and Kataria (2004) reported non-significant ($p>0.05$) changes in dromedaries due to drought regarding serum calcium, however, serum phosphorus levels were significantly ($p\leq0.05$) lower in the drought affected animals.

The calcium levels in drought affected animals could have been maintained by increased serum PTH levels through active bone resorption (Capen and Rosol, 2003) but if such conditions persist for a longer period it could be detrimental to animals predisposing them to bone affections. In present investigation no clinical sign of disease was observed in the drought affected animals except the history of pica.

The levels of serum C-PTH in our study revealed that drought tended to decrease calcium

Table 1. Serum levels of C -terminal parathyroid hormone (C-PTH), calcium and phosphorus in camels.

S.No.	Groups	C-PTH (ng/ml)	Calcium (mg/dl)	Phosphorus (mg/dl)
I.	Healthy (21, Overall)	1.94± 0.03	10.72±1.21	5.04±0.42
a.	Male (7)	1.81± 0.03	11.32±1.12	5.21±0.32
b.	Non-Pregnant female (7)	1.90± 0.05^{d}	10.98±1.2	5.00±0.46
c.	Pregnant female (7)	2.10± 0.02$^{d\ e}$	9.88±1.3	4.91±0.43
II.	Drought affected (21,Overall)	2.87± 0.04^{b}	9.42±1.3	3.85±0.28^{b}
a.	Male (7)	2.6± 0.07^{c}	10.17±1.4	4.12±0.23^{c}
b.	Non-Pregnant female (7)	2.7± 0.03^{cd}	9.11±1.2	4.00±0.29^{c}
c.	Pregnant female (7)	3.3± 0.02$^{cd\ e}$	9.00±1.3	3.41±0.21^{cd}

1. Overall mean of drought affected group within a given parameter superscribed by letter 'b' differs significantly ($p\leq0.05$) from respective overall mean value of healthy group . No superscription indicates non-significant ($p>0.05$) differences.
2. In drought affected group the means of each sub-group were compared with respective sub-group means in healthy group. Mean value superscribed by letter 'c' differ significantly ($p\leq0.05$) from respective subgroup mean value of healthy group.
3. Within each group the means of non-pregnant and pregnant have been compared from respective male mean value. No superscription indicates non significant ($p>0.05$) differences. Mean value superscribed by letter 'd' differ significantly ($p\leq0.05$) from respective male mean value.
4. Within each group the means of non-pregnant and pregnant have been compared from each other. No superscription indicates non-significant ($p>0.05$) differences. Mean value superscribed by letter 'e' differ significantly ($p\leq0.05$) from respective non-pregnant female mean value.
5. Figures in the parentheses indicate number of animals.

levels in camels which in turn increased secretion of C-PTH and its increased levels prevented a possible drastic lowering of serum calcium levels. The lower phosphorus levels could have been due either to dietary deficiency of phosphorus or to higher PTH levels as PTH decreases blood phosphorus level by increasing its excretion. But in contrast, Meyer *et al* (1979) in a study on intact-PTH and C-terminal PTH in normal calves found that C-fragments were secreted in greater amounts than intact hormone and the relative amount of C-fragment increased with induced hypercalcaemia. The ability of high extracellular calcium to augment release of C-PTH fragments relative to that of intact PTH were also confirmed by other workers (Morrissey *et al*, 1980; Kubler *et al*, 1986 and Tanguay *et al*, 1991).

Very recently it has been postulated that the C-PTH is a bi-functional regulator of calcium stores in bones. In event of low dietary calcium or low vitamin D availability, the bone resorption can occur through PTH 1 receptor activation while at the times of surplus or normal calcium the skeletal calcium stores are repleted through the activities of C-PTH receptors **(**Murray *et al*, 2005). PTH peptides currently are being introduced as therapeutics for osteoporosis and other bone disorders.

In healthy and drought affected groups a significant ($p \leq 0.05$) variation in serum C-PTH was observed among their respective sub-groups. In male animals it was lowest and in pregnant females the highest, which elucidated the role of serum C-PTH in maintaining the calcium homeostasis. It was noticed that in pregnant females the serum calcium was lowest comparatively although non-significantly ($p > 0.05$).

The significantly higher values for serum C-PTH in drought affected animals showed the endocrine response of animal and in consequence the maintenance of mineral metabolism during adversity. The interaction between PTH and minerals also emphasizes the need to select the laboratory parameters carefully in assessment of the mineral status of the individual animal, as in our study estimation of only calcium would not have given the true picture of the health status.

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BOOK-REVIEW

Title : Terrestrial Animal Health Code – 2005

Year – 2005; Language : English, French and Spanish; Pages : 634; ISBN : 92 –9044 –635 – 8

Publisher : OIE, 12, rue de prony, 75017, Paris, France; Edition : Fourteenth

Sanitary safety of international trade in terrestrial animals (mammals, birds and bees) and their products is the need of the day. The OIE has rightly fulfilled its obligations towards this, through publication by detailing the health measures to be used by the veterinary authorities of importing and exporting member countries to avoid the transfer of agents pathogenic for animals and human beings. These health measures, include standard guidelines and recommendations, formulated by the OIE terrestrial animal health, standards, commission and formally adopted and recommended by the OIE International Committee in May 2005.

The World Trade Organisation agreement on the application of sanitary and phyto-sanitary measures (SPS agreement) has also endorsed these standards guidelines and recommendation developed under the auspices of the OIE as the International standards for animal health and zoonosis.

The publication has been divided into four parts. The part – 1 deals with general provisions which include, under different sections, the general definitions, notification of animal diseases, obligation and ethics of international trade, risk analysis, import/export procedures, risk analysis for biological and veterinary use. The part – 2 deals with recommendation applicable to specific diseases which include OIE listed diseases, multiple species diseases including cattle, sheep, goat, equine, swine , avian, lagomorph, bees and other diseases. Part – 3 deals with appendices which include diagnostic test for international trade purposes, collection and processing of semen, collection and processing of embryo/ ova , biosecurity in establishments, quarantine recommendation, inactivation of pathogens and vectors, animal welfare, general guidelines and surveillance.The part – 4 deals with and include models international veterinary certificates for live animals and for products of animal origin.

Thus by publishing this international code guide, the OIE has made a step forward to assist the veterinary administration of it's members countries in developing their animal health measures applicable in imports and exports of animals and animal products.

Title: Plurithematic issue of the Scientific and Technical Review, 2005

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The Scientific and Technical Review of the OIE is published every four months for the use of veterinary and medical professions and particularly for national veterinary services. The volume 24 (3) of this Scientific and Technical Review is spread over 27 articles from world scientists of repute under the broad heading – epidemiology and veterinary economics, organisation of veterinary services and service delivery, reports and communication.

The insight of articles describe global status of animal diseases, control and eradication of important diseases, economic impact of animal diseases on global trade apart from veterinary public health organisational models and veterinary diagnostic laboratory and quality control.

The Review also constitutes a unique vehicle for the publication of reports on the situation of various animal diseases in the world, in particular in countries whose animal health situation receives little or no publicity otherwise(e.g. brucellosis in Nigeria). Last but not the least, readers of this issue of the review will find articles by internationally renowned researchers on diagnostic methods (brucellosis, FMD, campylobacteriosis) as well as articles on diverse subjects, such as the organisational aspects of the translation of the OIE Manual of Diagnostic tests and vaccines for terrrestrial animals into Spanish. This publication will certainly be helpful particularly to the epidemiologists attached to national veterinary services of different countries towards formulation of control and eradication strategies of different diseases in their country.

Reviewed by:
Dr. R.K. Tanwar,
Head, Department of Epidemiology and Preventive Medicine,
College of Veterinary and Animal Science, Bikaner 334001 INDIA