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SERUM CALCITONIN LEVELS IN DROMEDARIES

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ABSTRACT

Serum calcitonin levels were determined in 52 adult dromedary camels of either sex belonging to farmers' stock of semiarid tract. Calcitonin levels were determined by using RIA technique. The mean values (pg/ml) of calcitonin in healthy males, males with saddle gall or other wounds, non-pregnant females and pregnant females were 80.529±10.81, 203.41 ± 6.98, 129.33 ± 8.78 and 168.34 ± 5.78, respectively. The mean value of calcitonin in healthy male animals was significantly ($p \leq 0.05$) lower than males having wounds and non-pregnant females. Some minerals related to calcitonin were also determined *viz*. calcium, phosphorus and magnesium. Sex effect was non significant ($p>0.05$) on the mineral values. However, the mean values of all the minerals were significantly ($p \leq 0.05$) lower in the males having wounds than healthy males.

Key words: Calcitonin, calcium, dromedary, magnesium, phosphorus, wounds

Calcitonin (CT) is a polypeptide hormone secreted chiefly from parafollicular or C cells in the thyroid gland and it is also synthesised in a wide variety of other tissues, including the lung and intestinal tract. It plays an important role in the regulation of calcium and phosphorus metabolism (Elias and Shainkin-Kestenbaum, 1990). The concentration of ionised calcium in the plasma and extracellular fluids is the chief stimulus for its secretion. Under normocalcaemic condition, calcitonin hormone is secreted continuously and its rate of secretion increases in response to an elevated blood calcium level. Calcitonin interacts with target cells located in bone and kidneys. It suppresses resorption of bone and thus protects against excessive losses of calcium and phosphorus from the maternal skeleton during pregnancy. A large number of diseases are associated with abnormally increased or decreased levels of calcitonin. Increased serum levels of calcitonin precursors have been reported in humans with sepsis (Steinwald *et al*, 1999). Calcitonin is used to treat hypercalcaemia resulting from a number of causes like disorder in bone remodeling etc. Calcitonin also appears to be a valuable aid in the management of certain types of osteoporosis. Serum levels of calcitonin are best measured by radioimmunoassay (Capen and Rosol, 2003). Interpretation of minerals and hormone concentrations in normal or diseased states should be based on normative data specific to sex, age, season and diet (Specker *et al*, 1986). However, there is paucity of literature on this aspect in camel, therefore the present investigation was taken up to record the levels of serum calcitonin and related minerals in the camels.

Materials and Methods

Serum calcitonin (CT) levels along with related minerals i.e. calcium, phosphorus and magnesium were determined in 52 adult dromedary camels of either sex belonging to farmers' stock of semiarid tract. The animals were maintained by individual farmers for the purpose of farming and light load carrying with almost similar feeding and watering regimen in similar habitats. The animals were categorised as healthy males (17), male animals having saddle gall and other types of wounds (10), healthy non-pregnant females (15) and pregnant (2-3 months) females (10).

The serum CT levels were determined by double antibody method by using RIA kit (DPC, USA) as per the manual and manufacturer's instructions supplied with the kit. For the measurement of activity, ^{125}I Gamma counter (ECIL) was used.

Serum calcium and phosphorus were determined by using colorimetric kits (Wipro, India)

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and serum magnesium was determined by titan yellow method (Oser, 1976).

Statistical significance for individual parameters i.e. CT, calcium, phosphorus and magnesium levels between healthy males and healthy females (non-pregnant); non-pregnant females and pregnant females and healthy males and males with saddle gall and other wounds was analysed by paired- *t* test (Snedecor and Cochran, 1967).

Results and Discussion

The mean SEM values of serum calcitonin (CT), calcium, phosphorus and magnesium in healthy males, male animals having saddle gall and other wounds, healthy non-pregnant females and pregnant females are presented in table 1.

The mean values of CT in dromedaries was compared with other species as literature could not be traced for dromedaries. Adeghate (1996) studied the pattern of distribution of calcitonin gene-related-peptide (CGRP) by using immuno-histochemical techniques in the nerves of the camel lacrimal gland. Adeghate and Pallot (1996) studied the distribution of calcitonin gene-related peptide (CGRP) in the pancreas of the camel by immuno-histochemical techniques. It was concluded that the pattern of distribution of these neuropeptides in the camel pancreas is similar to those observed in the pancreas of other mammals.

The mean values of CT in non-pregnant and pregnant females in present study were higher than the reported values in other females like cow, sheep, human etc. (Shappell *et al*, 1987; Elias and Shainkin-Kestenbaum, 1990 and Hillman *et al*, 1981). The mean value of CT in male camels was more or less similar to that reported for race horses (Shigeru *et al*, 2000).

The mean values of serum calcium, phosphorus and magnesium in the present study in healthy male and female (non-pregnant) animals corroborated the earlier findings in dromedaries (Sarwar and Majeed, 1997 and Kataria *et al,* 2002). In the pregnant animals serum calcium levels were significantly ($p \leq 0.05$) lower than non-pregnant animals. Serum CT levels were higher in pregnant animals. Calcitonin inhibits bone resorption through depression of osteoclastic activity and prevention of osteoclast formation (Dickson, 1996). Therefore it protects the maternal skeleton. This could be the probable reason for the increased serum CT concentration and lowered calcium levels in pregnant animals in the present study.

The mean value of the calcitonin in male camels having wounds was higher than that of healthy male camels. This probably reflected towards the role of calcitonin in the disease process. CT is a neuroendocrine (NE) peptide that was once thought to be exclusively a hormone of thyroid origin. Its principal function appears to be the conservation of body calcium stores in certain physiological states such as growth, pregnancy and lactation and the maintenance of bone mineral in emergency situations by means of attenuation of the activity of osteoclasts (Stevenson *et al*, 1979). Further studies have revealed that CT is produced extrathyroidally by NE cells throughout the body and may have multiple functions (Nylen *et al*, 1987). Increased levels during tissue injuries may be taken as a marker to help in the diagnosis. Serum levels of ProCT as well as its component peptides are massively elevated in burns (Nylen *et al*, 1992), heat stroke (Nylen *et al*, 1997), systemic infections (Whang *et al*, 1998) and other inflammatory states (Assicot *et al*, 1993). In the present investigation the higher levels of calcitonin in the cases of wounds were accompanied by hypocalcaemia. Persson *et al* (2004) used procalcitonin as one of the inflammatory markers for early detection of bacteraemia in patients with febrile neutropenia. For non-CNS bacteraemia the highest negative predictive value was found for procalcitonin.

The effect of sex was also found on CT mean values that being higher in female camels than male counterparts. Calcitonin may be considered as a mediator of oestrogen action on bone (Agnusdei *et al*, 1990). The plasma CT levels are influenced by ovarian steroid hormones and both estradiol and progesterone have been shown to cause an increase of CT release from the thyroid C cells (Greenberg *et al*, 1986). Probably due to this fact in the present study the mean value was recorded higher in females than males. In humans, based on this fact, oestrogen replacement therapy is effective in the prevention of rapid bone loss in postmenopausal individuals due to elevated levels of calcitonin (Agnusdei *et al*, 1990). Serum calcitonin (CT) levels in fractured racehorses were measured by human calcitonin radio-immunoassay kits and were found elevated (Chiba *et al*, 2000). Meller *et al* (1984) estimated blood levels of CT in dogs before and after fracture and reported significant rise in the levels from 140 pg/ml to 180 pg/ml during fracture repair with hypocalcaemia

Table 1. Serum levels of calcitonin, calcium, phosphorus and magnesium in dromedaries.

S.No.	Category (No. of animals)	Calcitonin pg/ml	Calcium mg/dl	Phosphorus mg/dl	Magnesium mg/dl
1.	Healthy male (17)	80.529 ± 10.81	10.22 ± 0.199	4.45 ± 0.112	2.00 ± 0.044
2.	Male with wounds (10)	203.41^{d} ± 6.98	6.75^{d} ± 0.189	3.65^{d} ± 0.111	1.26^{d} ± 0.021
3.	Non-pregnant female (15)	129.33^{b} ± 8.78	10.15 ± 0.212	4.32 ± 0.193	1.98 ± 0.031
4.	Pregnant female (10)	168.34^{c} ± 5.78	8.98^{c} ± 0.193	4.00 ± 0.102	1.95 ± 0.035

i) Superscript 'b' on the mean value of a parameter of healthy female non-pregnant camels indicates that the mean value difffers significantly ($p \leq 0.05$) from the respective mean value of healthy male camels.

ii) Superscript 'c' on the mean value of a parameter of healthy female non-pregnant camels indicates that the mean value difffers significantly ($p \leq 0.05$) from the respective mean value of healthy female non-pregnant camels.

iii) Superscript 'd' on the mean value of a parameter of male with wounds indicates that the mean value difffers significantly ($p \leq 0.05$) from the respective mean value of healthy male camels.

immediately after fracture. Much of the studies regarding CT are centralised to cows, rats, dogs, monkeys, humans etc. In this regard no literature could be traced on the camels. The use of CT as a therapeutic agent in the bone disorders require establishment of its own norms in these animals. Much more studies are required to measure CT levels in circulation and tissues as well. CT levels and related components can be good markers in the cases of fracture, infections and other ailments.

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