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HYPOMAGNESEMIC RESPONSE OF PORCINE CALCITONIN IN *VARANUS FLAVESCENS* (GRAY)

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A. K. Pandey and K. Swarup (1986) Hypomagnesemic response of porcine calcitonin in *Varanus flavescens* (Gray). *Bull. Inst. Zool., Academia Sinica* **25**(1): 53-56. Intraperitoneal (i. p.) injection of porcine calcitonin (0.5 MRC unit/100 gm body weight daily) stimulated hypocalcemia and hypomagnesemia in the yellow monitor, *V. flavescens*, on 1st and 3rd day, respectively. Serum calcium displayed maximum value on 3rd day and returned to normal by 7th day while hypomagnesemic peak was attained on 7th day and by 14th day, there was normomagnesemia.

The endocrinology of magnesium metabolism has been relatively neglected in spite of its essential role in the proper functioning of many enzyme systems (Dacke, 1979). In mammals, there seems to be a close relationship between the serum regulation of calcium and magnesium ions (Clark and Rivera-Cordero, 1973; Cooper, 1975; Livingstone *et al.*, 1976—cited by Dacke, 1979; Habner and Potts, 1976; Mayer and Hurst, 1978). Recent studies have demonstrated calcitonin to be a hypomagnesemic principle in rats (Munson, 1976—cited by Dacke, 1979) and eels (Hirano *et al.*, 1981). So far, there is no record about the role of calcitonin on the serum magnesium homeostasis in reptiles. An attempt has been, therefore, made to see the effect of the hormone in the regulation of Mg^{2+} ions.

MATERIALS AND METHODS

Fifty male *Varanus flavescens* (Gray) (body weight 450-700 gm) were acclimatized under the laboratory conditions (during August) for a week before experimentation. Then, they were divided into two equal groups:

a) calcitonin-injected (experimental)—The animals were injected i. p. with procine calcitonin (Armour Pharmaceutical Company, U. S. A.; Lot No. K 700-1470, dissolved in 0.6% NaCl containing 0.1% of gelatin solution) at a dosage of 0.5 MRC unit/100 gm body weight daily.

b) vehicle-injected (control)—They were injected i. p. with 0.1% gelatin at a dosage of 0.1 mg/100 gm body weight daily. Animals of both the groups were not fed during the entire course of investigation. To avoid the effects of circadian rhythm, the injections were administered at the same time and the blood samples were collected at approximately the same hour of the day.

Blood samples from both the groups were collected (2 hrs after the last injection) under ether anaesthesia by cardiac puncture at 1, 3, 5, 7 and 14 days following onset of the experiment. The analysis of serum was made by Neill and Neely (1956) method.

The differences between vehicle-injected and calcitonin-injected specimens were evaluated for statistical significance using Student's 't' test.

RESULTS

The serum magnesium value of the experimental animals records a decline on

3rd day ($p<0.001$). This hypomagnesemic response of calcitonin reaches its peak on the 7th day ($p<0.001$). By 14th day, there was normomagnesemia.

A significant hypocalcemia ($p<0.001$) was recorded on 1st day, on 3rd day the response was on the peak ($p<0.001$). By 7th day, normocalcemia ($p<0.001$) was achieved.

DISCUSSION

Dacke (1979) remarked 'As yet, no hormonal system has been demonstrated as having a specific action concerned with the regulation of magnesium metabolism' (p. 188). So far as the hypermagnesemic regulation is concerned the situation is becoming clear. However, Anast *et al.* (1972) remarked the failure of parathormone in the regulation of Mg^{2+} ion. But, the recent experiments (in mammals) by Targovnik *et al.* (1971), Habener and Potts (1976), Mayer and Hurst (1978) have led to the conclusion that Mg^{2+} is as equipotent in the secretion of PTH as Ca^{2+}. Even in the toad, *Bufo andersonii*, bovine parathormone (bPTH) administration stimulated an increase in the serum magnesium value on 3rd day (Pandey and Swarup, 1985). However, the situation regarding the hypermagnesemic regulation is not very clear in anuran tadpoles and urodele amphibians where parathyroid gland has not yet completely taken over the function of Ca^{2+} and Mg^{2+} metabolism. In this group of vertebrates, pituitary gland (Oguro and Uchiyama, 1975) and, particularly, prolactin (Sasayama and Oguro, 1982) is the likely candidate of hypermagnesemic regulation.

Much less work has been done in the field of hypomagnesemic regulation. Serum Mg^{2+} value of rat recorded a significant decline after calcitonin administration (Munson, 1976—cited by Dacke, 1979). However, eels are slightly hypomagnesemic to the similar treatment (Hirano *et al.*, 1981).

A significant decrease in the serum Mg^{2+} level in *V. flavescens* indicates the involvement of the hormone in the homeostasis of Mg^{2+} ion in this lizard. The hormone also induces hypocalcemia in the monitor but the hypocalcemic response was smaller as compared to that of hypomagnesemia. This might be due to the differences between the donor and recipient hormones because Kline (1981) wrote 'extracts of reptilian ultimobranchial gland have a hypocalcemic effect on mammalian plasma calcium levels, mammalian calcitonin has no effect on blood calcium in reptiles' (p. 477). The problem of calcium metabolism in lizards has been further complicated with the detection of a potent hypocalcemic principle from the lung (Ravazzola *et al.*, 1981). Using immunoperoxidase and immunofluorescent techniques workers have localized calcitonin in the pituitary gland of mammals and fishes (Deftos *et al.*, 1978a, 1978b; Burton *et al.*, 1979; Wolfe *et al.*, 1979; Cooper *et al.*, 1980) and Kulchitsky (K-) cells

TABLE 1
Effect of procine calcitonin administration on serum calcium and magnesium level (mg/100 ml) of *Varanus flavescens*

Day	Serum calcium		Serum magnesium	
	Vehicle-injected	Calcitonin-injected	Vehicle-injected	Calcitonin-injected
1	11.290±0.040	10.550±0.272*	4.608±0.171	4.470±0.238
3	11.490±0.198	9.904±0.498*	4.450±0.244	3.282±0.235*
5	11.340±0.116	10.600±0.284*	4.490±0.245	2.890±0.284*
7	11.310±0.110	11.700±0.324	4.448±0.206	2.340±0.161*
14	11.340±0.504	11.120±0.398	4.450±0.153	4.535±0.179

The values are mean±S.D. of 5 animals.
* Indicates significant response ($p<0.001$)

of the human lungs (Becker *et al.*, 1979, 1980a). This extra thyroidal calcitonin is reported to play a major role in the calcium metabolism of the thyroidectomized monkeys (Becker *et al.*, 1980b).

It is pertinent to remark that when we compared the relative effect of calcitonin on on the serum Ca^{2+} and Mg^{2+}, we found that the hypocalcemic peak was attained earlier (on 3rd day) as compared to the hypomagnesemic peak (see Table 1). The data, on one hand, demonstrates that the effect of the hormone on Mg^{2+} metabolism is relatively delayed as compared to that on Ca^{2+} in the monitor, while on the other, it endorses Dacke (1979) hypothesis 'the disperate biochemical and physiological functions of the two ions, however, indicate a need for separate and specific regulatory system' (p. 188).

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猪降鈣激素促使蜥蜴 *Varanus flavescen* 血中鎂濃度降低反應

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以猪降鈣激素，腹腔洋射（0.5 MRC Unit/100 g 體重，一日劑量；第一日與第三日注射）至蜥蜴(V. flavesceues) 血鈣濃度在第三日最高值，第七日回復正常值；而血鎂濃度在第七日達最高值，第十四日回復正常。