Bolm. Zool., Univ. S. Paulo
8:25-28, 1984

MORPHOLOGICAL MODIFICATIONS OF CORPUSCLES OF STANNIUS OF FRESHWATER MUD EEL, AMPHIPNOUS CUCHIA IN RESPONSE TO CALCIUM - RICH MEDIUM

AJAI KUMAR SRIVASTAV

Department of Zoology, University of Gorakhpur, Gorakhpur - 273001, India. (recebido em 27.VI.1983)

RESUMO - Os corpúsculos de Stannius de *Amphipnous cuchia* após tratamento com cloreto de cálcio 0.8% mostram perda de conteúdo citoplasmático, células binucleadas e em degeneração.

ABSTRACT - The corpuscles of Stannius of *Amphipnous cuchia* after treatment with 0.8% calcium chloride exhibit loss of cytoplasmic content, binucleated and degenerating cells.

INTRODUCTION

The corpuscles of Stannius (CS) are putative endocrine glands located on the kidneys of holostean and teleostean fishes. Only recently there has aroused considerable interest especially for their role in calcium homeostasis. Stanniosomatiectomy evokes hypercalcemia (Fontaine, 1964; Butler , 1969; Chan, 1970; Pang, 1971; Pang *et al.*, 1973; Fenwick , 1974; Schreibman and Pang, 1975; Kenyon *et al.*, 1980) and injection of CS homogenate or autotransplantation of CS lowers the serum calcium level. In this communication, light microscopic observations on the cytological changes undergone by the CS of *Amphipnous cuchia* in response to calcium - rich medium have been described.

MATERIAL AND METHODS

Adult fish (*Amphipnous cuchia*), weighing from 320-380 g, were maintained under laboratory conditions in all glass aquaria for two weeks prior to use. They were then divided into two groups. Fish in the one group were maintained in tap water and employed as control. Specimens from the other group were kept in 0.8% calcium chloride solution (prepared in tap water) Fish from both the groups were sacrificed after 1, 5, 10 and 15 days following the initiation of the experiment. Corpuscles of Stannius (along with the adjoining

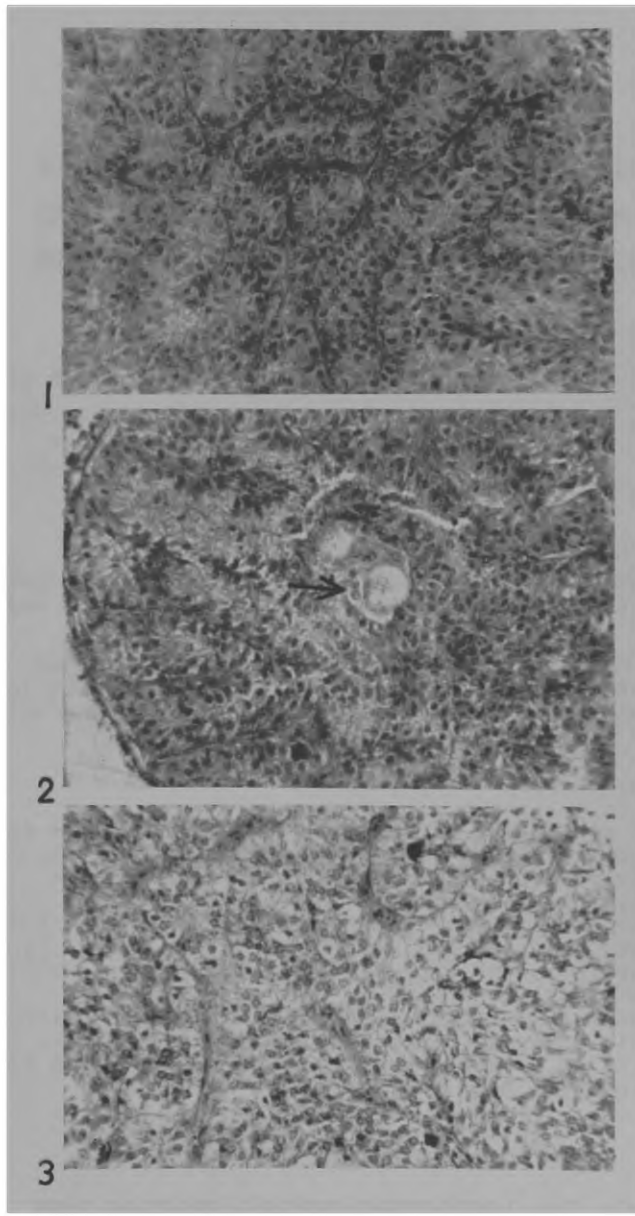

Figure 1 - CS of control fish. HE x 397.
Figure 2 - CS from 5 days calcium chloride treated fish showing loss of cytoplasmic content and binucleated cells(arrow) HE x 397
Figure 3 - CS from 15 days calcium chloride treated fish depicting pycnotic nuclei. HE x 397

portion of the kidney) from both the groups (4 specimens from each group) were fixed in Bouin's solution on each respective day. After processing by the routine paraffin method, serial sections of 4 - 6 µm thickness were stained with hematoxylin/eosin.

During the experiment the fish were not fed and the media of the aquaria were changed on alternate days

OBSERVATIONS

Each CS is enveloped by a thick capsule of connective tissue which isolates it from the renal tissue. From the capsule, connective tissue layers extend into the gland. The glandular parenchyma consists of a large number of cords or lobules of epithelial cells (Fig. 1)

In one day calcium chloride-treated fish, no perceivable histological changes are noticed in the corpuscular cells.

The specimens following 5 days treatment display loss of cytoplasmic content of corpuscular cells. A few binucleated cells are also observed (Fig. 2)

After 10 and 15 days following the treatment, the content of the cytoplasm of corpuscular cells is greatly reduced. Moreover, the gland displays a few degenerating cells with empty cytoplasm and pycnotic nuclei (Fig. 3)

DISCUSSION

In *Amphipnous cuchia* the CS exhibit increased activity as a result of hypercalcemic challenge. The increased activity is evidenced by the loss of cytoplasmic content of the corpuscular cells. This derives support from the observations of Cohen *et al.* (1975) who state that the differences in the granular activities of the CS cells are due to calcium alone. The activity is also evidenced by the occurrence of binucleated cells. The division of corpuscular cells (Ahmad and Swarup, 1979) and binucleated cells in the ultimobranchial body (Swarup and Krishna, 1980) have also been reported as a result of hypercalcemic challenge.

The degenerative changes observed in the corpuscular cells may be attributed to the functional exhaustion of these cells due to the hyperactivity of the gland to face the experimental hypercalcemia.

REFERENCES

AHMAD, N. & K. SWARUP, 1979. Corpuscles of Stannius of *Mystus vittatus* in relation to calcium and sodium rich environments. *Arch.Biol. 90:*1-22.

BUTLER, D.G. 1969. Corpuscles of Stannius and renal physiology in the eel (*Anguilla rostrata*) *J.Fish.Res.Bd.Canada 26:*639-654.

CHAN, D.K.O. 1970. Endocrine regulation of calcium and inorganic phosphate balance in freshwater adapted teleost

fish, *Anguilla anguilla* and *A. japonica*. *Proc.3rd Int. Congr. Endocrinol. Excerpta Med. 184:*709-716.

COHEN, R.S., P.K.T. PANG & N.B. CLARK, 1975. Ultrastructure of the Stannius corpuscles of the Killifish, *Fundulus heteroclitus*, and its relation to calcium regulation. *Gen. Comp.Endocr. 27:*413-423.

FENWICK, J.C. 1974. The corpuscles of Stannius and calcium regulation in North American eel (*Anguilla rostrata* Le - Sueur) *Gen.Comp.Endocr. 23:*127-135.

FONTAINE, M. 1964. Corpuscles de Stannius et regulation ionique (Ca, K, Na) de milieu interieur de l'anguilla *(Anguilla anguilla* L.). *C.R.H.Acad.Sci. 259:*875-878.

KENYON, C.J., I. CHESTERJONES & R.N.B. DIXON, 1980.Acute responses of the freshwater eel (*Anguilla anguilla*) to extracts of the corpuscles of Stannius opposing the effects of Stanniosomatiectomy. *Gen.Comp.Endocr. 41:*531-538.

PANG, P.K.T. 1971. The relationship between corpuscles of Stannius and serum electrolyte regulation in Killifish , *Fundulus heteroclitus*. *J.Exp.Zool. 178:*15-22.

PANG, P.K.T., R.K. PANG & W.H. SAWYER, 1973 Effect of environmental calcium and replacement therapy on the Killi - fish, *Fundulus heteroclitus*, after the surgical removal of the corpuscles of Stannius *Endocrinology 93:*705-710.

SCHREIBMAN, M.P. & P.K.T. PANG, 1975. The histophysiology of transplanted corpuscles of Stannius in the Killifish, *Fundulus heteroclitus*. *Gen.Comp.Endocrinol. 26:*186-191.

SWARUP, K. & L. KRISHNA, 1980. Studies of ultimobranchial body of *Rana cyanophlyctis* in response to experimental hypercalcaemia. *Z.mikrosk.anat.Forsch. 94:*818-824.