Stuctural Changes in Response to Increased Environmental Salinity and Calcium on Corpuscles of Stannius of Teleost Fish Tilapia (O. Mossambicus)

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Abstract-- **The present study has been planned to observe the effects of different salinity and calcium changes in the Corpuscles of Stannius in an eryhaline teleost fish Tilapia (O.mossambicus). during its reproductive. The structure of Corpuscles of Stannius has been elaborately described by various scientists who have not only studied its Cytophysiological details along with some biochemical observation.But have also given the cytoarchitecture (Subhedar and Prasad Rao,1974) of this small and innocent looking structure of the endocrine orchestra.They have reported the architectural pattern and its histomorphology in the Corpuscles of Stannius of the catfish, Heteropneustes fossilis (Bloch)**

Therefore it is planned to study the effect of increased salinity concentration at different time of year especially in calcium regulatory organs. Very little data is available (Shukla, 1993) on this physiological aspect of catfish in our Country.

It is interesting to study the effects of increased salinity at different phases of its reproductive cycle i.e., during pre-spawning, spawning and post-spawning periods specially on calcium regulatory organs. Since not much work is available on this aspects it was planned to explore this line with an eryhaline teleost fish Tilapia. Due to its easy availability and also tenacity, the eryhaline fish Tilapia, was selected. Work on eryhaline is almost rare in this animal with exposure to external stress. This fish was procured during the different periods of the year and a stock was maintained for a continuous supply of these animals.

Key Words: Fish Tilapia, (O. Mossambicus) Corpuscles Stannius Calcium, and Salt Concentration.

I. INTRODUCTION

In *Tilapia* (*O.mossambicus)* the Corpuscles Stannius is located in between the heart and oesophagus. It is situated in the connective tissue mass dorsal to oesophagus and posterior to sinus venosus. Several attempts using either ultimobranchialectomy or calcitonin injection, failed to produce a consistent effect on hypocalcemic regulation in teleosts (yamauchi 1978).

Important work on this putative endocrine gland includes like Alim (1986), who has reported the histoarchitecture cell type,nature and mode of secretion in Corpuscles of Stannius of a hill stream fish *Crossocheilus latius*.He has further described (1986) the microarchitec-tonic blood supply and cell type in the Corpuscles of Stannius of a fresh water teleost *Puntius sophore.*Alim (1988) has shown the number, location, microanatomy, cell types distribution and mode of extraction of secretory material in Corpuscles of Stannius of a hill stream teleost, *Garra mullya*.Alim and Ahmad (1988) have reported the histology, location and function of the Corpuscles of Stannius in fresh water teleost,*Rasbora doniconius*.Later Alim and Ehsan(1988) have also shown the histology, location and fuction of the Corpuscles of Stannius in fresh water fish *Esomus danrica*.

Ahmad et al.(1985) have reported the histophysiological study of the corpuscles of Stannius of *Silonia silonia*.

Ahmad and Swarup (1990) reported the seasonal changes in the structure and behaviour of Corpuscles of Stannius in relation to ovarian cycle and corresponding changes in the serum calcium level of *Myatus vittatus.*

Bhattacharya et al. (1982) have observed the fine structural morphology of the Corpuscles of Stannius in O.mossambicus. They have also reported the cytophysiological investigations and given some morphological evidence of the cellulal dichotomy of the fish.

Previous workers have shown some definite function to the Corpuscles of Stannius in fish (Fenwick, 1991). The Corpuscles of Stannius present in all jawed fishes, is known to be homologous with the calcitonin cells of mammals and is rich source of calcitonin, (swarup et.al.1984

II. MATERIALS AND METHODS

The eryhaline fish *Tilapia, (Oreochromis mossambicus)* was obtained from upper lake Bhopal (M.P.) during different phases of its reproductive cycle i.e, pre-spawing, spawning and post-spawning period.

The nature specimen, ranging 15-20 cm in length, were placed in tap water aquarium to control bacteria and other outbreak. Healthy fish were selected for experimental work. Four fish were selected in each aquarium which contains 12 litres of tap water. They were acclimatized for about a week before starting the experiment and during this period fish were fed with dried shrimps and live earthworm. However, the fishes were not fed throughout the experimental period and the water of each aquarium was renewed twice a week.

A. EXPERIMENT WITH DIFFERENT SALINITY AND CALCIUM CONCENTRATION

Experimental salinities were fixed at different levels, i.e., 1.0 %, 1.5%, 2.0%, 2.5%, 3.0% and 3.5%. The salinity concentration used in our experiment was based on the general fact and also considering the total salinity percentage with that of seawater. 3.0% and 3.5% salt concentration were found lethal as the rate of mortality was noted after 14 hours. At 3.0% and 3.5% salt solution it was found highly he that with very high rate of mortality in *Tilapia*. It was noted that fish died just after a short exposure i.e., within 3-5 hours.

The Experiments were set in following groups.

1. Direct transfer in different concentration of saline solution during pre-spawning period.
2. Direct transfer in different concentration of saline solution during spawning period.
3. Direct transfer in different concentration of saline solution during post-spawning period.
4. Direct transfer (each step lasted for a week) in different concentration of Calcium during pre-spawning period.
5. Direct transfer (each step lasted for a week) in different concentration of Calcium during spawning period.
6. Direct transfer (each step lasted for a week) in different concentration of Calcium during post-spawning period.

III. RESULTS AND DISCUSSION

Table: – 1 Changes in corpuscles of Stannius of *Oreochromis mossambicus.*

S.N.	Conct. %	Days/Hrs.	During pre-spaw. period	During spawning period	During post-spaw. period
1	1.0 % Saline Solution	41 days	Follicles were observed with slightly granular cytoplasm. The nuclei are enlarged.	The smaller follicles are clearly observed. Slightly granular cytoplasm with smaller nuclei can also be seen.	In the corpuscles of Stannius tissue in discreet follicles are observed. Slightly granular cytoplasm with smaller nuclei were also noted.
2	1.5 %	21 days	Cytoplasm is almost opaque. The cell wall is ruptured and the nuclei are indistinct and reduced in size.	The corpuscles of Stannius gland possesses deformed follicles. Cytoplasm is slightly granular cell wall is ruptured and the nuclei are reduced in size follicle cells are large in size.	The corpuscles of Stannius tissue possess in distinct follicular structure. Poorly granular cytoplasm was observed. Nuclei are reduced in size compared to that of pre-spawing and spawning phases.
3	2.0 %	15 days	Follicle are Comparatively smaller. The smaller nuclei are also visible in few follicle.	The follicles are very small when compared to earlier concentration. Smaller nuclei are observed at few places in the follicles. Poorly	In corpuscles of Stannius tissue, the follicles becomes very small in size. Enlarged nuclei were clearly observed in follicular cells. Opaque

				granular cytoplasm is seen.	cytoplasm was evident.
4	2.5 %	8 days	The Follicle are not clearly observed. Enlarged nuclei are seen. Poorly cytoplasmic granulation was also noted.	In the corpuscles of Stannius tissue, follicles are distinct, poorly granular cytoplasm was evident while the size of the follicles were large, smaller nuclei can also be observed.	In corpuscles of Stannius tissue, the follicles cannot be clearly observed. Enlarged nuclei with poorly granular, cytoplasm were noted.
5	3.0 %	15-20 hrs.	Corpuscles of Stannius tissue was highly compact, cytoplasm was poorly granular, while nuclei could not be observed.	In the corpuscles of Stannius tissue, the highly vascularised follicles were observed but the whole glavel is in very compact form. Cytoplasm become poorly granular. Small nuclei can clearly be observed.	In ultimo gland, highly deformed follicles are seen while the whole gland is in compact form. cytoplasm is poorly granular while very few nuclei can be observed.
6	3.5 %	4-5 hrs.	The fish do not survive beyond this duration. Important changes were observed. The cell wall was ruptured and follicles get deformed. The nuclei are small in size. Cytoplasmic vacuolization is very clear.	Cell wall is ruptured and follicles get deformed. Shrunken nuclei were not observed. Cytoplasmic vacuolization is clearly seen.	Follicles can be clearly observed. Shrinked nuclei were seen. Poorly granular cytoplasm was also noted.
7	2.5 m.mol l^{-1} Calcium Solution	1 week	In the corpuscles of Stannius , the follciles are clear with indistinct boundaries. Poorly granular cytoplasm with large nuclei were also seen.	In the corpuscles of Stannius , the follicles were clearly observed with distinct boundaries, slightly granular cytoplasm with large nuclei were also noted.	In the corpuscles of Stannius , the follicles were clearly observed but size of the follicles is small.
8	5.0 %	1 week	In the corpuscles of Stannius , the large and distinct follicles were clearly observed. Slightly granular cytoplasm with large nuclei were also noted.	In corpuscles of Stannius , normal follicles are observed with slightly granular cytoplasm. Centrally placed and smaller nuclei were also seen.	In the corpuscles of Stannius , large follicles were clearly observed. Poorly granular cytoplasm with enlarged nuclei can also be seen.
9	7.5 %	1 week	In corpuscles of Stannius , distinct follicles with enlarged nuclei were observed when compared to the control group.	The corpuscles of Stannius is distinct and large follicles with centrally placed nuclei were observed. Cytoplasmic vacuolization is very prominent.	Distinct follicles with comparatively smaller nuclei were observed. While in the cytoplasm remain vacuolar.
10	10 %	1 week	In corpuscles of Stannius, the highly enlarged follicles with prominent nuclei can be seen.	The corpuscles of Stannius possesses very large and distinct follicles. Necytoplasm were clearly observed.	In the corpuscles of Stannius , indistinct follicles with centrially placed nuclei can be seen. Size of follicles is small compared .

In our experiment of *Tilapia*, (*oreochromis mossambicus*) with different salinity, it was observed that size of the nuclei of corpuscles of Stannius partially increased with the increase in salinity concentration i.e.,

from 1.0 % to 2.5 % during pre-spawning and spawning periods but decrease during post-spawning period. During the spawning and pre-spawning periods in 3.0 % and 3.5 %, the follicular wall becomes indistinct with large nuclei.

In Calcium exposure, there was no effect when the concentration was 2.5 m mol l^{-1} and 5.0 m mol l^{-1}. As the concentration increased to 7.5m mol l^{-1}, the nuclear size as well as follicular cell size increase but at the time maximum concentration i.e:, 10 m mol $l^{-1}$the follicles becomes enlarged with moderately large nuclei and degenerated cytoplasm.

These changes indicated that in experiment group the gland shows hyperactivity during pre-spawning and spawning periods and gland is active during post-spawing period also in both salinity and calcium oxposure, whereas the gland in control group is highly active during late pre-spawning than post-spawning period.

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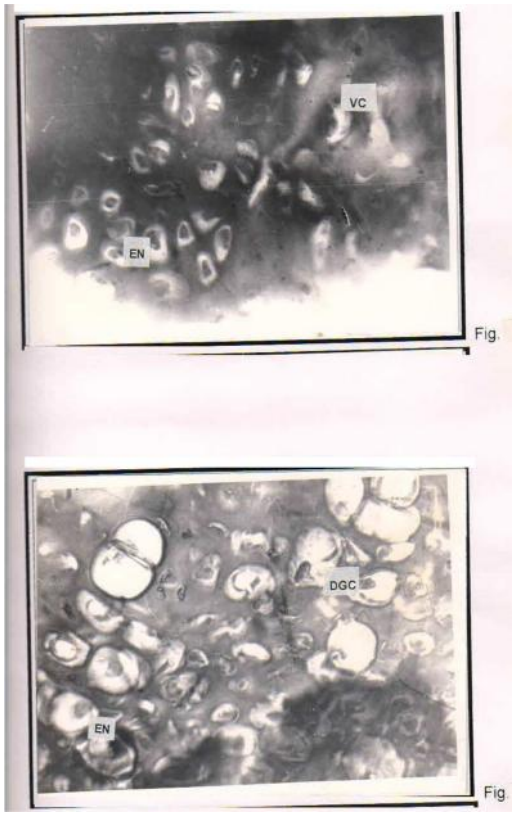

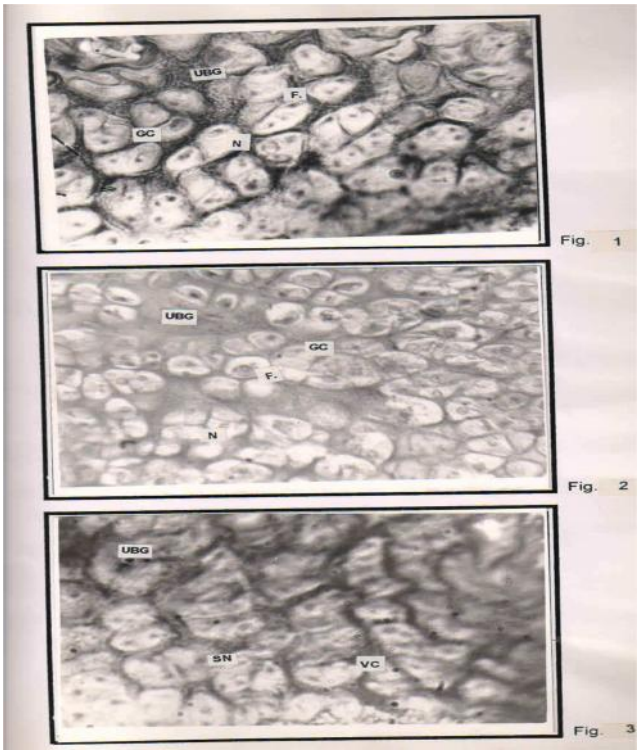
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