

S U M M A R Y

*Ophicephalus punctatus*, a fresh water teleost belonging to actinopterigii, partially air-breathing 'snake headed' amphibious fish, is widely available in marshy lands and swamps of tropical countries. Considering its strategic position in the evolution from aquatic to terrestrial habitats, easy maintenance in the laboratory aquarium and the possibility of utilizing its intestine for bioassay of acetylcholine and serotonin, some morphological, physiological and pharmacological studies of the isolated intestine of this fish were undertaken in the present study.

1) The alimentary canal consisted of short muscular tube - typical characteristics of carnivorous habit with a loop at its middle portion and two pyloric caeca along with a sac like stomach which is being capable of storing food under emergent situation.

2) The histomorphological features of the gut closely resembled with that of mammalian intestine, which consisted of well developed villous mucous folds with minimum lamina propria, submucous connective tissue studded with glands, blood vessels, nerve plexuses and well-defined circular and longitudinal muscle coats ensheathed by overlying serous coat. Numerous taste buds were found in the mucous folds of oesophagus and stomach. The muscle layer of oesophagus was chiefly composed of striated variety, while it was mostly smooth type in intestine. Rich nerve plexuses intermingled with each other were present abundantly in between the muscle layers.

3) The isolated intestine under perfused condition showed characteristic spontaneous rhythmic and peristaltic contractions and were subjected to a great variation by changes of temperature, pH and  $O_2$  - saturation, while it was abolished following revival after prolonged cooling.

4) A contractile response of the isolated perfused intestine was always obtained with very small concentration of acetylcholine and serotonin. The acetylcholine responses were seen with isolated strips of stomach, oesophagus, swim bladder and pyloric caeca, although they did not show any spontaneous motility.

5) The sensitivity towards acetylcholine and serotonin was remarkably pronounced with the foregut, even at the ranges of picogram and nanogram level respectively. Such a characteristic response was repeatedly demonstrable and reproducible.

Comparative analysis of the action of acetylcholine on the intestine of the fresh water and air-breathing fishes of allied species indicated that the sensitivity towards acetylcholine was more specific with the fore-gut of *O. punctatus*.

6) The contractile response of the foregut towards acetylcholine was more pronounced in hypocalcium media and was potentiated by physostigmine pretreatment but inhibited by atropine, epinephrine, procaine, and remained unaffected by curare or nicotine pretreatment. The pharmacological analysis of the action of nicotine, histamine, barium, magnesium, morphine, ATP etc strongly attested the view that the action of acetylcholine was normally mediated as neurotransmitter through the nerve plexuses which were mostly cholinergic in nature.

7) The contractile effect of serotonin was partially blocked by morphine and greatly inhibited by methysergide treatment while it remained unaffected by atropine. Evidences have also been accrued that acetylcholine and serotonin might act

directly or through specific receptors but not via activation of adrenergic elements.

8) Utilising the sensitive response of the isolated foregut of *O. punctatus* towards acetylcholine and serotonin which could be specifically blocked by atropine and methysergide pretreatment respectively, an easy and reliable method for bioassay of both the substances simultaneously was developed. Evaluating the comparative sensitivity of such a method with other classical techniques, its applicability for routine estimation of acetylcholine content from the biological fluids or tissues could be justified.

9) Employing isolated foregut of *O. punctatus* the acetylcholine content of the rat brain was determined following parenteral caffeine administration which was found to be greatly increased, as much as 20%, and the time course of the increased acetylcholine corresponded roughly to that of its pharmacological effect on the cerebral cortex.