

# HISTAMINE CONTENT OF THE DIGESTIVE TRACT OF A CATFISH *CLARIAS BATRACHUS* (LINN.) IN RELATION TO SPAWNING, SEX AND SEASONAL VARIATION

M. OVAIS AND S.S. GUPTA

*Department of Pharmacology, Gandhi Medical College, Bhopal (M.P.)*

**Summary:** Histamine content of the digestive tract of a catfish *Clarias batrachus* has been estimated biologically on the atropinized guinea pig ileum. A significant decrease of histamine content has been observed with the decrease of gonosomatic index (G.S.I.) during breeding season in female fishes, while no such type of change in histamine content of male fishes during breeding season has been noted. In the summer histamine content of both the sexes was significantly lowered in comparison with the histamine content during breeding season in both the sexes. It is concluded that higher histamine content in prespawning female fishes during breeding season may be due to the inhibition of the enzyme histaminase by gonadotrophins. It is also suggested that the route of inactivation of histamine during breeding season may be different in both the sexes, while in summer a common factor may be involved in depletion of histamine content of both the sexes.

**Key words:** *Clarias batrachus* gut histamine spawning depletion  
histamine inactivation

## INTRODUCTION

The metabolism of histamine in mammals has been extensively studied (3, 4, 6 & 7). There are also reports on the sexually oriented histamine metabolism in mammals (7 & 14). It is also known that histamine content varies greatly from species to species and that variations in histamine content also occur with age, weight and hormonal conditions of the body (4). In mammals histamine is inactivated mainly by two enzymes, the diamine oxidase or histaminase and imidazole-N-methyltransferase. These agents differ quantitatively from species to species and even within the same species depending on the sex (6 & 16).

Comparatively little information on the histamine metabolism in lower vertebrates is available in the literature, (14) although there are few reports on the histamine content of the various fishes and in certain lower vertebrates (12, 13, 14 & 15). The diamine oxidase and imidazol-N-methyltransferase also has been reported in certain species of fishes (1, 2 & 5). But none of these reports provide any information about the effects on histamine metabolism of fishes due to age, weight, sex and hormonal conditions of the body. This paper deals with the variations of histamine content of the digestive tract of a catfish *Clarias batrachus* due to spawning and seasonal variations in both the sexes.

### MATERIAL AND METHODS

Living mature fish ranging in weight from 40-100 gs were procured from the local fish market and transported to the laboratory. They were sacrificed on the next day of their arrival in the laboratory. Each fish was weighed just prior to the decapitation and after sacrifice the gonads were removed, weighed to calculate the gonosomatic index (G.S.I.) as per method of Lehri (9 & 10), to evaluate the state of sexual maturity and spawning. The gut was dissected out immediately after decapitation and cut separately into stomach, duodenum and ileum. Each separated portion was chopped in small pieces by Mc Ilwain tissue chopper and extracted with trichloroacetic acid for estimation of histamine content as per method of Parratt and West (11). Investigations were carried out during the breeding season August-September, 1973 and in the summer, April, 1974.

### RESULTS

Tables I & II show histamine content of various portions of the gut during the breeding season and in the summer in female and male fish respectively. It would be observed from Table I that during the breeding season, the fish having higher G.S.I., i.e., the fish having mature ova but not spawned, the histamine content is also higher in all the three portions of gut. As the fish spawned (G.S.I.  $0.778 \pm 0.714$ ) the histamine content was also decreased. This inhibition in histamine content was statistically significant ( $P < 0.05$  to  $0.01$ ). When the histamine content was estimated during the summer month (April) the histamine content was found to be further decreased in all the three parts of the gut. The difference of histamine content between the breeding season and in the summer was also significant.

TABLE I: Histamine content of the digestive tract of a catfish *Clarias batrachus* during breeding season and in the summer. Histamine content  $\mu\text{g/g}$  of wet tissue  $\pm$ S.E.

Sl. No.	Season and date	Sex	G.S.I.	Stomach	Duodenum	Ilem
1.	Breeding season August-September, 1973	Pre-spawning Female (5)	7.658 $\pm 0.898$	4.328 $\pm 0.413$	2.573 $\pm 0.288$	2.152 $\pm 0.207$
2.	Breeding season August-September, 1973	Spawned Female (5)	0.778* $\pm 0.114$	1.382* $\pm 0.122$	1.211 $\Delta$ $\pm 0.117$	1.137 $\Delta$ $\pm 0.141$
3.	Summer April, 1974	Female (8)	0.682* $\pm 0.037$	0.595* $\pm 0.109$	0.261* $\pm 0.028$	0.300* $\pm 0.073$

Note : Number in parenthesis indicates the number of fish used

\* $P < 0.01$

$\Delta P < 0.05$



Table II shows the histamine content in male fish during the two seasons. There was no significant difference in histamine content of the prespawning and postspawning male fish during the breeding season, hence the results of the breeding season for male fish were pooled. However, in the summer, a significant change in the histamine content of the gut in male fish too was observed. The inhibition of histamine content of male fish during the summer was also statistically significant.

TABLE II: Histamine content of the digestive tract of the male catfish *Clarias batrachus* during breeding season and in the summer. Histamine content  $\mu\text{g/g}$  of wet tissue  $\pm$  S.E.

Sl. No.	Season and date	Sex	G.S.I.	Stomach	Duodenum	Ileum
1.	Breeding season August-September, 1973	Male (8)	0.287 $\pm 0.041$	5.079 $\pm 0.618$	3.902 $\pm 0.293$	3.907 $\pm 0.275$
2.	Summer, April, 1974	Male (8)	0.171 $\Delta$ $\pm 0.029$	0.589* $\pm 0.102$	0.228* $\pm 0.028$	0.375* $\pm 0.053$

Note : Number in parenthesis indicates the number of fish used.

\*P < 0.01       $\Delta$ P < 0.05

## DISCUSSION

Lehri (9 & 10) has studied the reproductive cycle and its correlation with the cyclical changes in the pituitary gland in *Clarias batrachus*. He has shown that the cyclical changes in the gonads are associated with the cyclical changes in the pituitary gonadotrophes. The variations in the histamine content which have been observed in *Clarias batrachus* also seems to be related to pituitary gonadal cycle. The variations in the histamine content were more pronounced in females than males during the breeding season, while depletion of histamine during the summer in both the sexes was of equal order. So, it may be concluded that in females some other factor in breeding season is also involved besides a common factor which is responsible for the depletion of histamine content during the summer in both the sexes. In mammals histamine catabolism mainly takes place through diamine oxidase or histaminase and imidazol-N-methyltransferase, while both the substances have been reported in the various organs of fishes including digestive tract with some quantitative differences (1, 2 & 5). Presumably, either of the two enzymes or both of them may be involved in higher histamine content in pre-spawning fishes and its depletion after spawning and in the summer. Kapellar-Adler (8) has shown that gonadotrophins inhibit the enzyme histaminase which results in the higher histamine content in the body. If the condition is same in fish, then at least in female fish the higher histamine content in pre-spawning fishes and its subsequent depletion after spawning may be due to the depletion of the histaminase in the pre-spawning fish by the gonadotrophins and its recovery after spawning. The histamine content of male fish during the breeding season and in the summer was significantly different. However, the histamine content of both the

sexes was equally decreased during the summer. This common feature indicates the occurrence of a common factor for the depletion of histamine during the summer in both the sexes, which is yet unknown. It is also possible that during the breeding season route of inactivation of histamine in female and male fishes may be different as in rats (16), while during the summer it may be by a common mechanism. The problem in male fishes is complex and requires further investigation.

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