



## EFFECTS OF CATECHOLAMINES ON BRAIN AND PLASMA VASOTOCIN LEVELS IN THE CATFISH *HETEROPNEUSTES FOSSILIS*

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### Introduction:

Vasotocin(VT) is the basic neurohypophysial nonapeptide hormone in non-mammalian vertebrates having the ring structure of oxytocin and side chain part of Arg (8) – vasopressin and hence showing biological activity of both vasopressin and oxytocin. Vasotocin is involved in various functions like osmoregulation, metabolism, reproduction and behavior [2]. The peptide was characterized in catfish brain and ovary and showed seasonal activity [6]. In the ovary VT is involved in stimulating steroidogenesis, follicular maturation and ovulation [7]. The role of catecholamines in the release of vasopressin has been demonstrated in the past [3, 4]. McNeill *et al.* [5] have described the interaction between the monoamine – and neurophysin – containing pathways. Studies in rat of the vasopressin response to dopamine have yielded varied results (increase, decrease or no effect). However, studies on the catecholaminergic regulation of VT in lower vertebrates (teleosts) are meagre. In teleosts, central catecholamines are involved in the regulation of gonadotropin secretion. The objective of the present study was to investigate the role of catecholamines in VT secretion in the catfish *Heteropneustes fossilis*, since VT has a gonadotropin-like role.

### Methods:

Adult female catfish *Heteropneustes fossilis* were collected from local fish markets during preparatory (previtellogenic) phase and acclimatized in laboratory conditions for 48hr. After acclimatization, the fish were injected intraperitoneally with different concentrations of  $\alpha$ -methylparatyrosine ( $\alpha$ -MPT; 25, 50, 100 and 250 $\mu$ g/g BW), catecholamines – dopamine (DA), norepinephrine (NE), epinephrine (E) (0.5, 1.0, 10 and 100ng/g BW) and L-DOPA (0.5, 1.0, 10 and 100ng/g BW) alone or in combination. After 24hr of the injection, blood samples were taken by caudal puncture and plasma was separated. The fish were sacrificed by decapitation and brains along with pituitary were removed and dropped into cold anhydrous acetone and stored at -70°C. Tissues were processed for VT extraction and quantification by an EIA kit (Bachem Peninsula Laboratories, California, USA; Catalogue No. S- 1239, EIAH - 8121). Data were presented as mean  $\pm$  SEM and analyzed by one way ANOVA, followed by Tukeys' test.

### Results and Discussion:

In the present study the administration of L-DOPA, DA, NE, E and  $\alpha$ -MPT (an irreversible inhibitor of CA, rate –limiting enzyme) produced overall significant effects on brain and plasma VT levels ( $P \leq 0.05$ ). In the brain and plasma L-DOPA and DA inhibited VT levels in a concentration – dependent manner. Norepinephrine exhibited biphasic effects, low dose (1ng/g BW) stimulated and higher doses (10 and 100ng/g BW) inhibited VT levels in a concentration – dependent manner. Epinephrine stimulated VT levels in a concentration – dependent manner in both brain and plasma.  $\alpha$ -MPT inhibited VT levels in a concentration – dependent manner in both brain and plasma. The administration of  $\alpha$ -MPT (250 $\mu$ g/g BW), L-DOPA and DA (10ng/g BW) significantly decreased the VT levels in comparison to the control groups. The percentage decrease was 78.43, 27.78, 22.27 in the brain and 89.05, 32.69 and 29.47 in the plasma, respectively. In the  $\alpha$ -MPT + L-DOPA and  $\alpha$ -MPT + DA groups, the brain VT level was significantly decreased compared to the  $\alpha$ -MPT, L-DOPA or DA groups, although the percentage decrease was not significant in plasma. In the  $\alpha$ -MPT + L-DOPA + DA group, the VT level was decreased further significantly. On the other hand, the administration of NE and E (5ng/g BW) significantly increased VT levels in comparison to the control groups. The percentage increase was 31 and 46 in the brain and 16 and 32 in the plasma, respectively. In the  $\alpha$ -MPT + NE and  $\alpha$ -MPT + E groups, the VT level was significantly decreased compared to the NE or E alone groups, but the level was significantly higher than  $\alpha$ -MPT alone group. In the  $\alpha$ -MPT + NE + E group, the VT level was significantly increased in comparison to the control group, amine alone group or combination group. Thus, the present study suggests that brain and plasma VT levels (synthesis and release) are differentially modulated by catecholamines, NE stimulating and DA inhibiting. The physiological significance of the inhibitory effect of DA has been reported by Baggio and Ferrari [1] who demonstrated that DA could influence water handling by the kidney and decrease AVP concentration in animals undergoing maximal diuresis. The functional significance of the catecholaminergic regulation of VT, however, needs further study.

**Conclusion:**

In conclusion, the present data suggests that catecholamines act differentially to modulate vasotocin secretion in the catfish, as in mammals

**References:**

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