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VARIATION IN MAUTHNER NEURON IN TELEOSTS

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The mauthner cells or mauthner neurons or (M-cells) are a pair of neurons found in the medulla oblongata of fishes. The structure of the M-cells were identified and compared between a surface feeding fish, *Rasbora daniconius* and a bottom dwelling one, *Mystus gulio*. Variations are noticed in these two fishes. The differences in the M-cell may be contributed mainly to its feeding habits. The visual feeding habit in *Rasbora doniconius* contribute to the highly developed M-cell than the non visual feeding nature of *M. gulio*.

Key words : Mauthner neurons, variation, teleosts

INTRODUCTION

The mauthner cells or mauthner neurons or (M-cells) are a pair of identifiable neurons found in the brain of teleosts. M-cells are situated in the vertebrate central nervous system especially in the medulla oblongata. Information on the mauthner cell is available from several studies like morphological, behavioral, electrophysiological and startle response studies. The morphological studies mainly comprises the works of (Cajal, 1910; Detwiter, 1933; Bodian; 1937; Stefanelli, 1951). Behavioral and electrophysiological studies mainly includes the works of (Furshpan & Furukawa, 1962; Leghissa, 1941; Oppreheimer, 1942; Swsher & Hibbard, 1967; Celio *et.al.*, 1978; Zottoli, 1978; Kimmel & Model, 1978). The works related with startle response studies are those of (Faber & Korn, 1978; Zottoli *et.al.*, 1995; Hale, 2000; Ritter *et.al.*, 2001; Cioni *et.al.*, 2004; Korn & Faber, 2005). Zottoli (2005) noticed that this neuron is not the same in all teleost. It might be related to fish family and possibly habitat. Identifying M-cell has led to discoveries in the fields such as molecular biology of neurons, behavior and development. The VIIIth nerve fibre which is activated by hair cells in the ear and terminate on the lateral dendrite of the M-cell. Korn & Faber (2005) suggested that M-cell is a critical element in vital escape reflex that can be triggered by threatening events. Stefanelli (1951) noticed the absence of mauthner cell in a number of bottom living fishes.

MATERIALS AND METHODS

Materials for the present study includes fishes like *Rasbora doni conius,* a surface feeder and *Mystus gulio*, a bottom feeder. They were brought to the laboratory in live condition. The brains were dissected out and fixed in 10% neutral buffered formation and for histological studies the method of Cajal's (1910) silver impregnation was adopted.

OBSERVATIONS

The mauthner neurons were identified in the brain of *Rasbora daniconius* and *Mystus gulio* and made comparisons to find out any variations in the M cells between these two fishes. Only two M-cells per single species is noticed. The soma is located in the rostro-

ventral medulla. The hind brain region provides a distinct and conspicous pathway linking the motor neurons of the spiral cord to the VIII nerve fibre. Each mauthner cell in *R. daniconious* is oval shaped structure with a length of 220μ and width of 99μ. The cell body posses dorsal, ventral and lateral dendrite. Only some remnants of the lateral dendrite could be observed. The dorsal (DD) is more profusely branched than the ventral dendrite (VD; Fig. 1). The dorsal dendrite synapses with the cerebello-motorius fibres. The ventral dendrite is connected with the crossed and uncrossed collaterals of decussating fibres of the trigeminal nucleus. The dorsal dendrite is much thicker than the ventral one. The mauthner axon turns caudaly towards the spinal cord and immediately tapers and disappears.

The M-cell in *M. gulio* is shown in Fig. 2. Here the M-cell is about 80μ in length and 50μ width. The nucleus is not distinct. The dorsal, ventral and lateral dendrites are not profusely branched as in the case of *R.. daniconius* and the termination of VIII nerve fibre is also not visible. Comparative studies on M-cell reveal that there is morphological and structural differences noticed in there two fishes.

The differences in the M-cell size might be related to fish family and possibly habitat. Visual feeding habit in *R. danionius* contribute to the highly developed M-cell than the non visual feeding nature of *M gulio*. *M gulio* generally use olfaction and gustation during feeding.

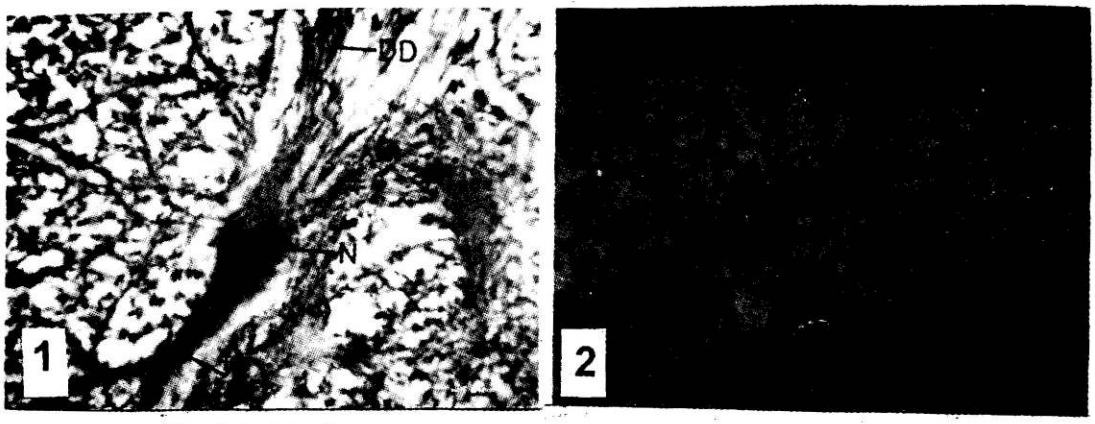

Fig. 1-2. Mauthner neuron. **1.** *Rasbora daniconius*; **2.** *Mystus gulio.*

DISCUSSION

The mauthner neuron in *Rashora daniconius* and *Mystus gulio*_reveals some contrasting features. A wider comparative analysis made it clear that mauthner fibres are not the same in there two teleost. Variation in M-cell size is noticed by Zottoli (2005) fully agrees with my findings as in *R. daniconius* M-cell is of highly developed whereas in *M. gulio* it is moderately developed due to its different feeding habits. *R. daniconius*, a surface feeding and activity moving fish in the surface waters hence due to its actively and aggressive feeding habit and primarily its use in vision for feeding, the mauthner neuron is highly developed. Whereas in *M. gulio* being a bottom feeder the mauthner neuron is moderately developed. Stefanelli (1951) also suggested a wider comparative analysis made it clear that mauthner fibres are not present in all teleost and its absense is noted in a number of bottom feeding fishes. Korn & Faber (2005) suggested M-cell is a critical element in vital escape reflex that can be triggered by threating events.

Eaton *et.al.* (1977) noticed the mauthner initiated startle response was recorded and analysed and stated the mauthner initiated startle response could be elicited by visual stimulation.

In the present study *R. daniconius*, being a visual feeder the visual stimulation resulted in the highly developed mauthner neuron whereas in *M. gulio*, being a bottom feeder not depending on vision for feeding hence the mauthner neuron is moderately developed. Eaton *et.al.* (2001) noticed the M-cell is a command neuron, a neural decision making cell sufficient to trigger a complete behavioral act supports the findings of Korn & Faber (2005).

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