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Specific Phase Relationships of Neural Oscillations: A Regulatory Mechanism of Reproduction in Higher Vertebrates

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Editorial

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Editorial

Reproduction is one of the most important biological phenomenon among the organisms. A detailed knowledge about the mechanism(s) behind reproductive regulation will be helpful for us to understand this phenomenon in a better way. With the help of this knowledge we can generate new ideas which can able us to control the fertility of economically important species. Various mechanisms regarding the reproductive regulations have been studied. In the vertebrates, physiology of reproduction is actually controlled through the hypothalamo - hypophyseal gonadal (HPG) axis which comprises of higher brain center, hypothalamus, hypophysis and gonad. All the factors either extrinsic or intrinsic that affect the HPG axis can modulate reproduction. Among many of these factors, specific temporal phase relations of neural oscillations have been suggested in higher vertebrates (especially in some birds and mammals). In general, these temporal phase relationships are time dependent rhythmicity of neural/hormonal activity.

Role of the specific phase relationship of circadian hormonal activities (corticosterone and prolactin) in reproductive regulation was first reported in an avian species by Meier [1]. Since corticosterone and prolactin appear to be regulated by serotonin and dopamine or vice versa [2,3], serotonergic and dopaminergic precursors drugs i.e. 5- hydroxytryptophan (5-HTP) and L-dihydroxyphenylalanine (L-DOPA) were tested at different time intervals and it was found that some specific phase relations can significantly affect the reproduction through affecting the gonadal development. After that the temporal phase relation of circadian neural oscillations (serotonergic and dopaminergic) has been established as a mechanism for the reproductive regulation of many avian species [4-9]. On the other hand it was also studied in some mammals like Syrian hamster Indian palm squirrel and mice [10-12].

Recently, some investigations reported that these specific temporal phase neural oscillations have different interactions with the neuronal and peripheral nitric oxide [13,14]. In the mice, it was reported that these oscillations alters the expression of neuronal RFamide-related peptide-3 (RFRP-3) [12]. Further in this context a report suggests that these temporal phase neural oscillation also have some relationship with the apoptotic proteins of the gonads [15].

All these reports suggest that in this neuroendocrine circuitry of reproduction still many things which have to be discovered. Hence more detailed studies and researches are required to understand the clear cut picture of this regulatory mechanism.

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