on LINe Seminar

On the mechanism of septo-hippocampal theta synchronization based on paired recordings of putative pacemaker neurons

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on LIN at Freitag 16.10 @ 2pm in Ebbinghaus
on LINe @ 2am LiveVideo link

Abstract:

The medial septum of the basal forebrain plays an important role in the generation of the hippocampal theta oscillation, a 4-12 Hz rhythm implicated in exploratory behaviours, navigation and episodic memory. A number of hypotheses have been proposed on the mechanisms of synchronization within the medial septal network by theoretical accounts; however, these have not been systematically tested experimentally. We recorded multiple medial septal single neurons concurrently, along with hippocampal local field potential in anesthetized rats, anesthetized mice and freely moving mice, and tested potential synchronization mechanisms of putative pacemaker units. We found that a frequency-synchronization mechanism across pacemakers was mostly responsible for generating the theta-rhythmic network output. An optogenetic tagging experiment suggested that the pacemakers are parvalbumin-expressing GABAergic neurons, while most of the enigmatic septal glutamatergic neurons show tonic increase of firing during hippocampal theta, likely providing increased excitation to GABAergic cells. These results suggest that a single homogeneous GABAergic pacemaker population is capable of generating theta-rhythmic medial septal output upon tonic increase of excitation by a simple frequency-synchronization mechanism.