



POSTER PRESENTATION

B532 Cholinergic tuning of excitability and synaptic communication switches network activity in the in vitro hippocampus from sharp wave ripples to gamma oscillation

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Sharp-waves ripples and gamma oscillations are two characteristic states of the awake hippocampus. These activity patterns can be reproduced in thick mouse hippocampal slices. As the default state, the hippocampal CA3 network generates sharp-wave ripples (SPW-Rs) that can be quickly and reversibly switched to gamma oscillations by cholinergic receptor activation (5microM carbachol). Both states can be considered as returning, transient high activity, synchrony, in the network. Using electrophysiological and neuronal network modelling tools we show that the state switch is the result of a concurrent increase in cellular excitability and a decrease in the strength of synaptic connectivity, induced by cholinergic modulation. The dual effect influences both incidence and length of the highly synchronous state. While the generation of gamma oscillation is set primarily by a refractory process, there is a strong stochastic element in the initiation of SPW-Rs. If a sufficiently high number of pyramidal cells are active at the same time buildup of synchrony starts in the recurrent collateral system of the CA3 area, resulting the highly synchronous SPW-Rs. The high activity period is longer and the synchrony is higher during the SPW-Rs then during gamma cycles, suggesting that distinct network dynamics possibly implement different information processing modes.

Session Details

Session Title: 19. Neuroelectronics & neurorobotic interfaces

Session Date: Saturday, July 16
