



Simposio Internacional: Neurociencias Madrid 2012: desde la neurona a las redes, desde los modelos de cerebro hasta la neuroregeneración

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Ritmos cerebrales buenos y malos: estudiando la dinámica neuronal normal y epiléptica

Hippocampal rhythms: the good and the bad of neural dynamics in physiology and epilepsy

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Brain rhythms have a variety of characteristics: band-limited or broad-band, transient or steady-state. In the hippocampus, a brain region involved in learning and memory, high-frequency oscillations (HFOs) may be encountered under physiological or under pathological conditions (pHFO). I will review the underlying mechanisms of oscillations, at the level of cells and networks, investigated in a variety of experimental in vitro and in vivo models. Diverse mechanisms are described, from intrinsic membrane oscillations to network processes involving different types of synaptic interactions. HFOs with similar frequency ranges can differ considerably in their physiological mechanisms. Evidence for pathological HFOs, particularly fast ripples, in experimental models of epilepsy and in human epileptic patients is highlighted. The underlying mechanisms of fast ripples are examined both in the light of animal observations, in vivo and in vitro, and in epileptic patients, with emphasis on single cell dynamics. Experimental observations and computational modeling have led to hypotheses for these mechanisms, namely the role of out-of-phase firing in neuronal clusters, the importance of strong excitatory AMPA-synaptic currents and recurrent inhibitory connectivity in combination with the fast time scales of IPSPs. The statistical spectral behaviour of fast ripple events can provide useful information on the underlying mechanism and can help to further improve classification of the diverse forms of HFOs

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