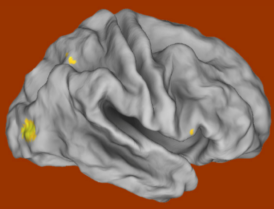
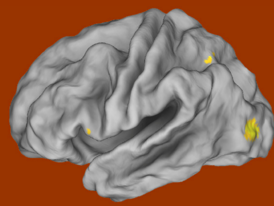


Keddi Idegtudományi Előadássorozat



Időpont: Kedd, máj. 18. 16h

Helyszín: Pázmány P. Kat. Egyetem - ITK (1083, Práter utca 50/a) Kari Tanácsterem (204-es szoba)

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http://www.mtapi.hu/index.php?mi=204&lang=hu

Laminar analysis of slow wave activity in humans

The most distinctive features of brain electrical activity is that it is composed of cyclic patterns with various characteristic recurrence frequencies. These electrical brain rhythms are shown to be hierarchically organized and take an important role in both pathological and physiological functions. One of the most fundamental cortical electrical rhythms is the one that emerges in the deepest stage of non rapid eye movement sleep, called the slow wave activity. It was shown in animal models that it gives rise to a variety cyclic brain activity including delta, theta, spindle, alpha, beta, gamma and ripple oscillations establishing itself as the common orchestrator of brain electrical rhythms in sleep.

Cortical slow wave activity is shown to enhance epileptic manifestations, but it is also thought to underlie essential restorative processes and facilitate the consolidation of declarative memories. Animal studies show that slow wave activity is composed of rhythmically recurring phases of widespread, increased cortical cellular and synaptic activity, referred to as active- or up-state, followed by cellular and synaptic inactivation, referred as silent- or down-state. However, its neural mechanisms in humans are poorly understood since the traditional intracellular techniques used in animals are inappropriate for investigating the cellular and synaptic/trans-membrane events in humans.

To elucidate the intracortical neuronal mechanisms of slow wave activity in humans, novel, laminar multichannel microelectrodes were chronically implanted into the cortex of patients with drug resistant focal epilepsy undergoing cortical mapping for seizure focus localization. Intracortical laminar local field potential gradient, multiple unit and single unit activities were recorded during slow wave sleep, related to simultaneous electrocorticography, and analyzed with current source density and spectral methods.

We found that slow wave activity in humans reflects a rhythmic oscillation between widespread cortical activation and silence. Cortical activation was demonstrated as increased wideband (0.3-200 Hz) spectral power including all bands of cortical oscillations from spindle to ripple, increased multiple and single unit activity, and powerful inward transmembrane currents, mainly localized to the supragranular layers. Neuronal firing in the up-state was sparse and the average discharge rate of single cells was less than expected from animal studies. Action potentials at up-state onset were synchronized within ±10 ms across all cortical layers, suggesting that any layer could initiate firing at up-state onset.

These findings provide strong direct experimental evidence that slow wave activity in humans is characterized by hyperpolarizing currents associated with suppressed cell firing, alternating with high levels of oscillatory synaptic activity associated with increased cell firing. Our results emphasize the major involvement of supragranular layers in the genesis of slow wave activity.

Az előadás után kötetlen beszélgetésre invitáljuk Önöket kávé *és* süti *kíséretében!*

Szervezők