

Supragranular origin of slow sleep oscillations in the human frontal lobe.

Richárd Csercsa¹, Balázs Dombovári^{1,3}, László Grand^{1,3}, Andor Magony¹, Luca Wittner¹,
Loránd Eröss², György Karmos³, István Ulbert^{1,2,3}
¹MTA-PKI, ²OITI, ³PPKE-ITK

The cortical slow oscillation during non-rapid eye movement (non-REM) sleep is thought to underlie essential restorative processes and facilitate the consolidation of declarative memories. However, its neural mechanisms in humans are poorly understood. We measured action potentials of single cells and synaptic/trans-membrane activity of cell populations in different human frontal cortex layers during deep non-REM sleep. Confirming animal studies, delta waves indexed a slow oscillation between massive widespread cortical activation and profound inactivation. In contrast to animals, the predominant changes in neuronal firing and wideband (10-200Hz) synaptic/trans-membrane activity were located in supragranular layers, and neuronal firing was less than expected. Our results suggest that parameters of human sleep oscillations may have adapted to support the large cortex and extensive long term memories of our species