Similarities and differences of human and rodent neocortical synapses, neurons and networks

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Experiments on animal models showed that the efficacy of chemical transmission between neurons depends on several factors including the number, spatial distribution and size of synapses, presynaptic release mechanisms, postsynaptic membrane properties and synaptic plasticity. Recordings from human synaptic connections indicated species related differences in synaptic properties leading to altered signal propagation in human cortical microcircuits compared to animal models. The presentation will elucidate quantal and structural differences of human and rat neocortical synapses mechanistically explaining why single neurons of the human neocortex can trigger high and low frequency rhythmic activity in local networks. In turn, experiments will be presented from freely behaving animals detecting rhythmic network episodes at various frequencies and the corresponding firing of identified interneurons and pyramidal cells during defined epochs of slow wave sleep. The suggestion that evolutionally conserved network episodes could be differentially recruited in mammalian species will be discussed.