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Presentation Abstract

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Title:	Role of neuronal reverberation during slow wave sleep in the consolidation of recently acquired memory traces
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Abstract:	Evidence exists to state that the main sleep states, slow wave (SWS) and rapid eye movement (REM) periods perform two complementary roles for post-novelty memory consolidation: respectively neuronal reverberation for short-term recall (PLoS Bio., 2:0126, 2004); and synaptic plasticity for long-term storage (Learn. Mem. 6: 500, 1999). Moreover, memory traces gradually migrate from hippocampus (HP) to primary somatosensory cortex (SI) through consecutive waves of neuronal reverberation during SWS (Frontiers Neurosci., 1:43, 2007). Our goal is to test this hypothesis by assessing the importance of sleep reverberatory phenomena in memory consolidation. Adult male Long Evans rats (n = 3) received implants of electrode array (32 microwires) in SI for multi-site single-unit and local field potential (LFP) recordings; and a bilateral cannula in HP for local neuronal inhibition through muscimol micro-injection (0.5 µl; 1 mg/ml; 0.25 µl/min). Novel tactile stimulation was provided by a 20 minutes exposure to four objects at the end of the first third of a 12 hours recording session. Muscimol was injected after animals reached a criterion of 30 minutes of SWS in the post-exposure period, as assessed by an online state map algorithm (Frontiers Neurosci., 1:43, 2007). Memory consolidation was assessed by comparing exploration times of animals re-exposed to two familiar plus two new objects over several post-novelty days. Firing rates strongly increased during object exploration and remained elevated afterwards during waking. SI single-unit activity during SWS showed even greater Post/Pre differences in firing rates, displaying periodic waves of reverberation yet to be understood. Muscimol application in the hippocampus completely abolished cortical reverberation a few minutes after micro-injection. Hippocampal deactivation by muscimol induced an electrographic rhythm characterized by greater power in the delta band as revealed by LFP recordings. This rhythm was distinctly separated from the SWS spectral cluster in

the state map. Importantly, the time spent in exploration of the new objects was not significantly different from the time spent exploring familiar objects, indicating impairment in the learning of object identities. The results suggest that inhibition of HP neuronal activity 1) impaired SI neuronal reverberation during SWS (possibly by altering slow wave stereotypical brain rhythm) and 2) led to decreased memory consolidation for familiar objects.

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