

SLEEP RESEARCH

Causal evidence for the role of REM sleep theta rhythm in contextual memory consolidation

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Rapid eye movement sleep (REMS) has been linked with spatial and emotional memory consolidation. However, establishing direct causality between neural activity during REMS and memory consolidation has proven difficult because of the transient nature of REMS and significant caveats associated with REMS deprivation techniques. In mice, we optogenetically silenced medial septum γ -aminobutyric acid-releasing (MS^{GABA}) neurons, allowing for temporally precise attenuation of the memory-associated theta rhythm during REMS without disturbing sleeping behavior. REMS-specific optogenetic silencing of MS^{GABA} neurons selectively during a REMS critical window after learning erased subsequent novel object place recognition and impaired fear-conditioned contextual memory. Silencing MS^{GABA} neurons for similar durations outside REMS episodes had no effect on memory. These results demonstrate that MS^{GABA} neuronal activity specifically during REMS is required for normal memory consolidation.

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