

REM sleep-dependent short-term and long-term hourglass processes in the ultradian organization and recovery of REM sleep in the rat

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Abstract

Study Objectives: To evaluate the contribution of long-term and short-term REM sleep homeostatic processes to REM sleep recovery and the ultradian organization of the sleep wake cycle.

Methods: Fifteen rats were sleep recorded under a 12:12 LD cycle. Animals were subjected during the rest phase to two protocols (2T2I or 2R2I) performed separately in non-consecutive experimental days. 2T2I consisted of 2 h of total sleep deprivation (TSD) followed immediately by 2 h of intermittent REM sleep deprivation (IRD). 2R2I consisted of 2 h of selective REM sleep deprivation (RSD) followed by 2 h of IRD. IRD was composed of four cycles of 20-min RSD intervals alternating with 10 min of sleep permission windows.

Results: REM sleep debt that accumulated during deprivation (9.0 and 10.8 min for RSD and TSD, respectively) was fully compensated regardless of cumulated NREM sleep or wakefulness during deprivation. Protocol 2T2I exhibited a delayed REM sleep rebound with respect to 2R2I due to a reduction of REM sleep transitions related to enhanced NREM sleep delta-EEG activity, without affecting REM sleep consolidation. Within IRD permission windows there was a transient and duration-dependent diminution of REM sleep transitions.

Conclusions: REM sleep recovery in the rat seems to depend on a long-term hourglass process activated by REM sleep absence. Both REM sleep transition probability and REM sleep episode consolidation depend on the long-term REM sleep hourglass. REM sleep activates a short-term REM sleep refractory period that modulates the ultradian organization of sleep states.

Palabras clave

Palabras clave de autor: [REM sleep homeostasis](#); [ultradian sleep cycle](#); [REM sleep deprivation](#); [REM sleep propensity](#); [REM sleep rebound](#); [hourglass process](#)

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