FREQUENCY-DEPENDENT NETWORK MECHANISMS OF MULTI-REGIONAL TEMPORAL INTERACTIONS DURING SLEEP SPINDLES

P1494 / #2452

Topic: AS10 Sleep, Biological Rhythms

FIRST NIGHT EFFECT ON SLEEP IN DROMEDARY CAMEL

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The first night effect on sleep architecture is a recognized phenomenon in sleep physiology. In many species, several external factors are known to disrupt the sleep recording at the first night, which creates certainly a bias in the polysomnography (PSG) studies performed for clinical or research purposes. Our objective was to investigate the first night effect in camel by studying the consequence of the installation of a well-used non-invasive PSG device, its accessories and protective tools (mask and protective boxes) on the sleep/wakefulness states-cycles at the first night. The study was conducted on four adult camels for 4 consecutive days. The PSG results revealed the existence of 5 different vigilance states including wakefulness, drowsiness, NREM sleep, REM sleep, and rumination. When comparing the results of the first night to the 4th night, a significant decrease in the rate of wakefulness and drowsiness states duration was observed, where both states respectively drop from 43.7% to 26.85% and from 9.37% to 6.62%, respectively. In addition, a decline from 0.35 to 0.1 hours, and from 1.9 to 1.4 hours were noticed in the time spent drowsy during the day and night respectively. While drowsiness decreased, a significant increase in sleep and rumination duration was observed. Indeed, NREM-sleep occupied 10.38% of the first night and increased to 12.40% for the last night. REM-sleep increased as well from 4.2% to 5.8% and rumination state from 26.3% to 42.8%. In conclusion, our study demonstrates that the use of PSG devices and their accessory induce a first-night effect in camels with less rumination and reduced NREM and REM periods of sleep. Furthermore, our findings highlight the importance of recording multiple nights of PSG to obtain accurate and representative results.

Declaration of Interest Statement: None

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Temporal nesting of cortical slow oscillations (SOs), thalamic spindles and hippocampal ripples indicates multi-regional neuronal interactions required for memory consolidation. However mechanisms underlying the contribution of spindles in cross-regional synchronization remains largely undetermined. Here we develop a minimal hippocampo-cortico-thalamic network to explain the role of sleep spindles in communication between thalamocortical and hippocampal networks depending on long-range multi-regional projections. Further we verify the model predictions experimentally by analyzing simultaneous recordings of anterodorsal thalamus and CA1 as well as medial prefrontal cortex and CA1 in naturally sleeping rodents. Our experimental and computational results indicate enhancement of hippocampal-thalamocortical temporal coordination during slow-frequency long-duration spindles by providing large enough window of opportunity for information processing during sleep. Our simple model provides a quantitative match to several other experimental observations including the nesting of ripples and spindles in the SO trough and larger duration but lower amplitude of the ripples co-occurring with spindles or SOs compared to the isolated ripples. We find that large cortico-thalamic input during the active phase of SO induces spindles with larger duration which in turn coordinate more strongly with hippocampal ripples due to bidirectional projections between thalamocortical and hippocampal networks. In addition, the experimental findings reveal strong coupling of CA1 units to thalamic spindles and increase of this coupling following spatial experience. Our model and experimental findings during slow wave sleep shed light on the mediating role of spindles in the communication between cortex and hippocampus by providing a key processing time window for synaptic plasticity required for memory consolidation.

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EFFECTS OF HIGH FAT DIET AND TIME RESTRICTED FEEDING ON CIRCADIAN GLUCOCORTICOID SIGNALLING IN THE HIPPOCAMPUS

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Diet-induced obesity during adolescence was shown to cause hippocampus-dependent memory impairments. Interestingly, time restricted feeding (TRF) (*e.g.*, food access aligned onto circadian