Immobilisation Stress Induces Changes In Sleep Architecture And Core Body Temperature In Telemetered Rats

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Sleep architecture is a translatable biomarker derived from EEG and EMG waveforms recorded preclinically using telemetry and clinically using polysomnography. Alterations in sleep architecture have been observed preclinically following a psychological stressor (e.g. Tang et al., 2007) and clinically in stress related disorders such as Post Traumatic Stress Disorder (PTSD; Ross et al., 1989). An increase in core body temperature (CBT) is another common marker of both preclinical and clinical stress utilised in research, where it can be used to measure the anxiolytic-like effects of psychoactive drugs (Borsini et al., 1989; Vinkers et al., 2008). In this study a rat telemetry assay was established to model these dual symptoms of psychological stress; altered sleep and increased CBT.

30 minute immobilisation of male Sprague-Dawley rats using a perspex restrainer prior to the start of the light cycle resulted in an increase in CBT which was maintained for up to at least 6 hours ($P \leq 0.05$) and an alteration in sleep architecture during the dark (active) phase 12-24h post immobilisation (significant decrease in % WAKE and increase in % NREM; $P \leq 0.05$). In a separate study, 30 minutes immobilisation was also shown to significantly increase plasma corticosterone (CORT) levels (124.6ng/ml ± 13.8ng/ml control, 413.4ng/ml ± 52.8ng/ml immobilised; $P \leq 0.05$).

This study demonstrates the use of telemetry technology to record the effects of psychological stress induced by immobilisation in freely moving rats. Immobilisation for 30 minutes induced time-dependent changes to sleep architecture, core body temperature and circulating CORT levels. The present methodology will prove useful in future studies to identify novel anxiolytic-like compounds. Additionally, these data highlight the necessity for caution when interpreting data from studies involving extended periods of restraint for non-stress paradigms.


