

Effects of blue light on sleep and circadian rhythm

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Objective: To investigate the effects of different spectra of light exposure on the sleep architecture and sleep circadian rhythm.

Methods: Rats were received different LED light exposures, including the blue light (450 nm ~ 490 nm), orange light (590 nm ~ 635 nm) and red light (620 nm ~ 650 nm) before the light period or before the dark period for 8 hours. The intensity for each light spectrum was 500 lux \pm 100 lux. Sleep-wake activities were recorded.

Results: Our result indicated that rapid eye movement (REM) sleep was suppressed during the 8-h light exposure of blue or red light in light period. However, 8-h orange light exposure exhibited no effect. In the first day after the light exposures, non-rapid eye movement (NREM) sleep was increased in the light period in the groups of rats that previously received blue or orange light, while REM sleep was decreased in dark period when rats previously received orange or red light. In the second day after the blue light exposures, NREM sleep was increased but REM sleep was decreased in light period. REM sleep was decreased in dark period when rats previously received orange light. There was no statistical difference in the second day after rats received red light. In another experiment, we applied the blue or red light exposure during the dark period. NREM sleep was increased in the time of light exposure in dark period. In the first and second days after light exposure, the circadian rhythm shifted almost one hour advanced when rats received blue light. However, there was no statistical difference when the red light was applied.

Conclusion: Our result suggests that the alterations in the sleep architectures and sleep circadian rhythm differ when rats expose to different light spectrum in different zeitgeber times.

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