Results: Diurnal rodents maintained under SP developed depression- and anxiety-like phenotype which includes reduced activity in the forced swim test, reduced preference for sweet solution, reduced aggression and social interactions, and increased anxiety-like behavior in tests such as the elevated plus-maze and the open field. Bupropion and imipramine treatments, as well as physical exercise resulted in amelioration of the SP-induced behavioral changes in the sand rat. When we exposed the sand rats to 3 weeks of morning bright (white) light treatment it ameliorated the behavioral effects of SP, and morning exposure to bright light had a significantly stronger effect than evening exposure to bright light. Morning blue, but not red light treatment, resulted in similar effect. Although a direct comparison between the bright light experiments and the bupropion experiment is impossible (different experiments) we suggest that as in humans, bright light exposure is at least as effective as antidepressants in the model.

Conclusions: Wealth of research results now establishes the validity of diurnal rodents as a model for studying the interactions between circadian rhythms and depression. Diurnal rodents respond to photoperiod manipulation in a similar way to humans, the behavioral outcome is directly related to the circadian system, and treatments that are effective in patients are also effective in the model, whereas less effective treatments in patients are also less effective in the model. We suggest that using diurnal animal models to study circadian rhythms related affective disorders such as depression will produce new insights which will eventually lead to the development of more effective treatments.

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A10

Melatonin Production in Essential Hypertension Under Common and Modified Light Schedules

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Objectives: According to numerous data, the pathogenesis of cardiovascular diseases is associated with desynchronization of biological rhythms. Nowadays many people are exposed to excessive light at night which results in the inhibition of melatonin secretion by the pineal gland. In this study we explored the biosynthesis of epiphyseal melatonin under extended light exposure in essential hypertension.

Methods: Experiments were carried out on male rats of SHR (hypertensive) and Wistar (normotensive) strains. Two different light-dark schedules were modeled: 12 hour light / 12 hour darkness with light on at 7.00 a.m. and off at 7 p.m. (12:12) and 16 hour light / 8 hour darkness with light on at 5.00 a.m. and off at 9.00 p.m. (16:8). Wistar rats were kept under 12:12 light-dark schedule, SHR rats were exposed to both 12:12 and 16:8 schedules. Melatonin production was assessed by measuring urinary concentrations of its stable metabolite – 6-Sulfatoxymelatonin (6-SMT). Urine collection was performed in metabolic cages twice for 24 hour period – during the daytime and nighttime. It is well known that urinary concentration of 6-SMT correlates with the total melatonin blood level [Griefahn et al., 2001; Rapoport S.I. et al., 2009]. Concentration of 6-SMT in animal urine was determined using ELISA kit for 6-Sulfatoxymelatonin (Buhlmann Laboratories AG, Switzerland).

Results: It was found that daytime urinary concentration of 6-SMT was significantly lower in comparison with the nighttime values in hypertensive rats exposed to both 12:12 and 16:8 light-dark schedules. Daytime 6-SMT concentration was 25.5 ± 1.49 ng/ml in normotensive Wistar rats and it was significantly decreased to 16.27 ± 1.23 and 14.55 ± 1.32 ng/ml in SHR hypertensive rats kept under 12:12 and 16:8 light-dark schedules respectively. There was also an increase in the difference between day and night 6-SOMT in hypertensive rats kept under both light-dark regimens compared with controls. Meanwhile no difference in daytime 6-SMT urine contents was seen under light regimen 12:12 in comparison with 16:8 between the two groups of SHR rats. As regards nighttime, the values of urinary 6-SMT in Wistar rats, SHR rats under 12:12 and 16:8 light-dark regimens were as follows: 32.74 ± 2.78, 30.37 ± 2.54 and 26.08 ± 2.35 ng/ml with no significant differences between animal groups.

Conclusions: The study results suggest the rate of daytime epiphyseal melatonin production is markedly lower under increased blood pressure. There was no significant effect of extending light exposure from 12 to 16 hours within the 24 hour period on melatonin biosynthesis by the pineal gland in essential hypertension.

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Photoreception for Circadian, Neuroendocrine and Neurobehavioral Regulation

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Over the past twenty years, there have been fundamental advances in the understanding of photoreceptive input for physiological and behavioral regulation in humans and other mammals. Neural signals conveying information about environmental light are transmitted from the retina through the retinohypothalamic tract to the hypothalamic suprachiasmatic nuclei (SCN), master oscillators in the circadian system. In turn, the SCN transmit information about lighting and circadian time to diverse loci in the nervous system, including the pineal gland where the hormone melatonin is synthesized. In the early 2000's, analytical action spectra identified 446–477 nm as the most potent wavelength region for melatonin suppression in healthy humans. Those data indicated that a novel ocular photosensory system, distinct from the canonical visual rods and cones, is primarily responsible for regulating mela-