Abstracts on Jet Lag

Burgess HJ, Crowley SJ, Gazda CJ, Fogg LF, Eastman CI.

Preflight adjustment to eastward travel: 3 days of advancing sleep with and without morning bright light. J Biol Rhythms. 2003 Aug;18(4):318-28.

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Jet lag is caused by a misalignment between circadian rhythms and local destination time. As humans typically take longer to re-entrain after a phase advance than a phase delay, eastward travel is often more difficult than westward travel. Previous strategies to reduce jet lag have focused on shaping the perceived light-dark cycle after arrival, in order to facilitate a phase shift in the appropriate direction. Here we tested treatments that travelers could use to phase advance their circadian rhythms prior to eastward flight. Thus, travelers would arrive with their circadian rhythms already partially re-entrained to local time. We determined how far the circadian rhythms phase advanced, and the associated side effects related to sleep and mood. Twenty-eight healthy young subjects participated in 1 of 3 different treatments, which all phase advanced each subject's habitual sleep schedule by 1 h/day for 3 days. The 3 treatments differed in morning light exposure for the 1st 3.5 h after waking on each of the 3 days: continuous bright light (> 3000 lux), intermittent bright light (> 3000 lux, 0.5 h on, 0.5 off, etc.), or ordinary dim indoor light (< 60 lux). A phase assessment in dim light (< 10 lux) was conducted before and after the treatments to determine the endogenous salivary dim light melatonin onset (DLMO). The mean DLMO phase advances in the dim, intermittent, and continuous light groups were 0.6, 1.5, and 2.1 h, respectively. The intermittent and continuous light groups advanced significantly more than the dim light group ($p < 0.01$) but were not significantly different from each other. The side effects as assessed with actigraphy and logs were small. A 2-h phase advance may seem small compared to a 6- to 9-h time zone change, as occurs with eastward travel from the USA to Europe. However, a small phase advance will not only reduce the degree of re-entrainment required after arrival, but may also increase postflight exposure to phase-advancing light relative to phase-delaying light, thereby reducing the risk of antidromic re-entrainment. More days of preflight treatment could be used to produce even larger phase advances and potentially eliminate jet lag.

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Jet lag: minimizing it's effects with critically timed bright light and melatonin administration. J Mol Microbiol Biotechnol. 2002 Sep;4(5):463-6.

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The symptoms of jet lag cause distress to an increasing number of travelers. Potentially they may impair sleep, mood and cognitive performance. Critically timed exposure to bright light and melatonin administration can help to reduce symptoms. Bright light is one of the most powerful synchronizers of human rhythms and melatonin serves as a "dark pulse" helping to induce night time behaviors. Thus, enhancing day and night signals to the brain, appropriate to the environmental light/dark cycle of the new time zone, can serve to reestablish adaptive timing relationships between the body's internal biological rhythms and the external environment, and thereby reduce the symptoms of jet lag. Specific recommendations using bright light and melatonin for eastward and westward travel before and after departure are provided for time zone changes of up to 6, 7-9 and 10 or more hours.

N.B. Melatonin is not available for sale in the UK.

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The influence of light on circarhythms in humans. J Physiol Anthropol Appl Human Sci. 2002 Mar;21(2):87-91.

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The present review discusses two types of biological rhythms, namely, circadian rhythms and circannual rhythms. Humans possess a circadian rhythm of approximately 24 hours, which is regulated by neural and hormonal processes. The synchronisation of this rhythm with the solar day and night is maintained through entrainment mainly by light. Dark environments completely lacking windows may have a negative effect on well-being and work capacity. During shift work the biological clock tends to maintain its normal 'diurnal' rhythm, which may lead to extreme tiredness and increased risk of accidents. Negative effects such as these may be partially alleviated by means of bright light during the night. During air travel across several time zones there is little time for the biological clock to adjust, but the resulting 'jet lag' may possibly be overcome by means of appropriately timed exposure to bright light. In countries situated far from the equator, the biological clock may become seriously disrupted during the short days of the dark season. Characterised by fatigue, sadness and sleep problems, these seasonal affective disorders may be cured or alleviated by means of regular periods outdoors, better lighting indoors, or, in the most serious cases, light therapy.