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Short Note: Melatonin-dependent infertility

T. Partonen

Department of Psychiatry, University of Helsinki, Helsinki, Finland

Summary Melatonin may be a key factor in the regulation of seasonal variation in gonadal activity. The circadian disturbances related to reproduction are probably subsequent to the seasonal change. Moreover, melatonin might also be considered essential for both spermatogenesis and folliculogenesis. Exposure to bright light, suppressing the concentration of melatonin in circulation, is hypothesized to be useful in treatment of both male and female infertility in couples with abnormal melatonin metabolism.

INTRODUCTION

In men, there is seasonal variation in the concentrations of gonadotrophins and gonadal steroids (1). Melatonin may affect sperm motility and production, and its receptors from spermatozoa have been characterized. In addition, there is circadian variation in the concentrations of gonadotrophins and melatonin measured in plasma or seminal plasma, being abnormally high in the evening among infertile men.

In women, the seasonal variation observed in the concentrations of gonadotrophins and gonadal steroids is associated with melatonin synthesis (2). The number of irregular menstrual cycles with anovulation is increased in winter compared to summer. Melatonin may affect menstrual regularity and ovulation by stimulating the activity of oocyte maturation inhibitor. In addition, there is circadian variation in the time of ovulation, occurring usually in the morning during summer and in the evening during winter.

DISCUSSION

Constant short photoperiod causes gonadal arrest and reduction in the transcriptional activity of the cyclic AMP-responsive element modulator (CREM) gene in hamsters (3). Restoration of long photoperiod results in recovery of spermatogenesis. This modulation is dependent on the photoperiod, associated with the change in melatonin production, and can be reproduced by artificial lighting. Melatonin may be involved in the regulation of spermatogenesis or oogenesis during development and act as the hormonal messenger whose function would be to connect germ cells and Sertoli or follicular cells respectively. I hypothesize that melatonin may remain to be a shared key factor in the regulation of seasonal variation in gonadal activity in adult individuals of both sexes. Further, I suggest that the circadian disturbances related to reproduction would be subsequent to the seasonal change.

Bright light can regularize the length of the menstrual cycle in women with menstrual irregularity and possibly influence the time of ovulation (4). To date, there are no data available on the effect of light on sperm motility or production. I hypothesize that the timed exposure to bright light, suppressing the concentration of melatonin in circulation, could be promising for treatment of both male and female infertility in couples with abnormal melatonin metabolism. Exposure to light would have either a direct effect on the transcriptional activity of CREM gene, or the effect of light exposure would be mediated via the influence on melatonin synthesis.

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Correspondence to: T. Partonen, Department of Psychiatry, University of Helsinki, Tukholmankatu 8C, FIN-00290 Helsinki, Finland.
(Phone: +358 9 471 3506; Fax: +358 9 471 5478)

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