



Use of modified spectacles and light bulbs to block blue light at night may prevent postpartum depression

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SUMMARY

In 2001 it was discovered that exposing the eyes to light in the blue end of the visible spectrum suppresses the production of the sleep hormone, melatonin. New mothers need to get up during the night to care for their babies. This is the time when melatonin is normally flowing. Exposing their eyes to light can cut off the flow. It may also reset their circadian (internal) clock. On subsequent nights the melatonin may not begin flowing at the normal time making it difficult to fall asleep. Over time, disruption of the circadian rhythm plus sleep deprivation may result in depression. Women suffering postpartum depression were enrolled in a small clinical trial. Some were provided with glasses and light bulbs that block blue light. Others were equipped with glasses and light bulbs that looked colored but did not block the rays causing melatonin suppression. Those with the “real glasses” recovered somewhat more quickly than those with the placebo glasses and light bulbs. The hypothesis that should be tested in large scale clinical trials is that the risk of postpartum depression can be reduced when a new mother avoids exposing her eyes to blue light when she gets up at night to care for her baby. In the meantime, all new mothers may benefit from using glasses and light bulbs that block blue light when getting up at night to care for their babies.

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The Hypothesis

The risk of postpartum depression can be reduced when a new mother avoids exposing her eyes to blue light when she gets up at night to care for her baby.

the time of rising. It has been known for many years that exposing the eyes to light suppresses the flow of melatonin.

Introduction

Most new mothers suffer from the “baby blues” that last for a couple of weeks following delivery. This is thought to be the result of the rapid changes in hormone concentrations that occur immediately after delivery, and is considered to be normal. About 15% of new mothers, however, experience postpartum depression. In addition, 10% or more of fathers suffer from depression after the baby is born. Lack of sleep is known to play a large role in this problem.

The body normally begins producing melatonin, the sleep hormone, at about bedtime. The concentration in the blood reaches a maximum at about 3 A.M. and declines to near zero at about

Recent discoveries in human physiology

In 2001 two independent research groups [1,2] found that the suppression of melatonin, when the eyes are exposed to light, is partially dependent on the color of the light. Regarding melatonin suppression, they found that the eyes are most sensitive to the light in the blue part of the spectrum (about 470 nm). By wearing glasses that block light at wavelength shorter than about 530 nm, Kayumov et al. [3] found that subjects working a simulated night shift under bright lights continued making melatonin much as they had when kept in darkness. Working the simulated night shift without the glasses resulted in a significant delay in when melatonin flow started and a large decrease in the amount of melatonin produced.

In addition to suppressing the flow of melatonin, it has been well established [4–6] that exposing the eyes to light at certain times of day can reset the circadian clock. Exposing the eyes to light in the early morning resets the clock to an earlier time while exposing the eyes in the late evening can reset the clock to a later

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hour. This ability to reset the circadian clock has been shown [7] to be of value in avoiding or minimizing jet lag. In a related way, the use of exogenous melatonin to reset the circadian clock has been demonstrated by Lewy et al. [8]. When given in the late afternoon, it can reset the clock to an earlier hour. This method is of great value to blind people whose circadian clocks are free-running and tend to get out of synchronization with their daily schedule.

Causes of depression

Frequent and erratic resetting of the circadian clock has been described as disruption of the circadian rhythm and is thought by some [9] to lead to depression and is thought to be a cause for episodes of depression or mania in people with bipolar disorder [10,11].

The problems faced by new mothers

Most new mothers will suffer from lack of sleep because of the need to care for their babies during the night. Because a new mother will most likely be exposing her eyes to light at random times during the night, she will also be a likely candidate for disruption of her circadian rhythm. The associated lack of melatonin may make it difficult for her to sleep, even though very tired. This is a classic situation described by women who have experienced postpartum depression. For a nursing mother the problem is compounded. Because the mother's melatonin appears in her breast milk, the infant will suffer from loss of melatonin as much as the mother. This vicious circle ends up disrupting the entire family. Some fathers will also develop postpartum depression, especially if his wife is depressed.

A small trial

A small controlled trial was carried out in which women who approached Dr. Bennett seeking help for postpartum depression were enrolled in the study. They were provided (at random) either with glasses that block blue light at wavelengths shorter than about 530 nm and light bulbs that do not produce blue light or with pla-

cebo glasses and light bulbs that were colored, but did not block the critical wavelengths causing melatonin suppression. Recovery from their depression was rated (as a percentage) by Dr. Bennett after one month and after two months. The Table 1 shows the results.

Discussion of result

The percent recovery is shown in the columns of the chart at one month and after two months for patients who received the "real" glasses and light bulbs (the ones that block melatonin-suppressing light) and placebo (the ones that allow melatonin-suppressing light to pass through). All of the patients in the test showed improvement. It would have been helpful if the initial degree of illness had been estimated. Two patients showed initial improvement and then relapsed somewhat. The average improvement in the patients using the real glasses at one and two months was 67% and 87.5% compared to the averages for the placebo group of 63% and 75%. While not compelling evidence, the results are at least in the anticipated order suggesting some effect. While the difference in the results after one month are not judged significant when applying the *T* test, the difference after two months is significant ($p = 0.044$) after two months. All of the women were instructed to put on their glasses at about the same time every evening a few hours in advance of their intended bedtime. Simply getting on a regular schedule is one of the well established factors known to improve sleep. This might partially account for the improvement shown by the group using the placebo glasses and light bulbs. Since all the women in the trial had been depressed for a long time, it would be expected that the benefit would be more easily shown if the depression were avoided by early use of the glasses rather than cured, after suffering for some time. Future trials should look at avoidance statistics for women who use the glasses beginning at the time of delivery or sooner.

Conclusions

Based on the logic of the method and the favorable results of the small trial, it would be appropriate to carry out larger trials if funding were made available. While compliance is frequently a problem in clinical trials, it is not likely a problem in this case. In the small trial many of the women volunteered how they loved using their glasses; how they helped them relax in the evening. By installing blue-blocking light bulbs in the nursery and bathroom the mother need not continue wearing the glasses once she is in the safe area. The baby will also benefit in that his/her melatonin will not be suppressed. Even if no further testing were done, it would seem that using low blue light bulbs that don't produce the damaging light or using glasses that block the damaging blue rays produced by ordinary light bulbs would be common sense for all new mothers. The risk is in being exposed to the damaging blue rays produced by ordinary light bulbs when used during the night. The use of low blue light glasses and bulbs allows new mothers to avoid this risk.

Implications for all mothers

Experience over the past four years has shown that many people with sleeping problems can benefit from the use of blue-blocking glasses and light bulbs. Because they are the equivalent of being in darkness, the glasses may be used to advance the circadian cycle. Putting on the glasses well in advance of bedtime, at about the same time every evening, will reset the circadian clock to an earlier hour. This allows the flow of melatonin to start before going to bed. This results in quickly falling asleep and in more restful sleep [12]. It also makes it possible to maximize the time when

Table 1
Postpartum depression study (Dr. Bennett).

Real		Placebo	
1 month	2 months	1 month	2 months
70	90	70	85
85	80	100	100
65	100	80	100
70	85	40	50
60	75		55
80	90		80
90	70	60	60
20	100	50	90
90	100	40	55
90	100	63	75 (ave.)
40	80		$n = 9$
70	80		6 no data or quit (2)
70	70		
40	80		
30	85		
40	90		
100	100		
100	100		
67	87.5 (ave.)		
	$n = 18$		
	6 no data or quit (4)		
	Std dev = 11		Std dev = 18

$p = 0.044$.

melatonin is present in the bloodstream. A study by Czeisler [13] showed that melatonin can flow for up to about 11 h for subjects held in darkness. In the clinical trial described above the mothers were encouraged to put on the glasses during the evening in advance of intended bedtime to improve their sleep through both the earlier start of the flow and increased time when melatonin is flowing. For mothers nursing their babies the benefit also flows to the baby in the mother's milk. This is thought to be one of a number of reasons that breastfed babies are known to sleep better. For breastfed babies, having the melatonin cycle locked to the nighttime may help the baby develop a pattern of sleeping more during the night and less during the day. This will also help to give the mother more and better quality sleep.

Recommendations

Based on the above it is recommended that NIH consider funding studies to determine whether the hypothesis is true that avoiding blue light at night will reduce the risk of postpartum depression in new mothers. It is also recommended that obstetricians and pediatricians encourage pregnant and postpartum women to avoid blue light in the hours before bedtime and during the night by using blue-blocking glasses or light bulbs.

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