

Light Treatment and Biological Rhythms

Bulletin of the Society for Light Treatment and Biological Rhythms



Volume 8, Number 3

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SLTBR ANNUAL MEETING JUNE 3-4 IN BETHESDA, MD

"The Practice and Science of Light Therapy and Melatonin" is the focus of SLTBR's 8th Annual Meeting and CME course June 2-4 in Bethesda, MD.

Co-sponsored by the National Institute of Mental Health and accredited by the University of California, San Diego, School of Medicine, the meeting will be held at the Ramada Hotel in Bethesda and at the nearby Natcher Conference Center on the NIH campus.

CME Course

The CME course will be held from 1 to 5 p.m. Sunday, June 2, at the Ramada. J. Christian Gillin, Professor of Psychiatry at the University of California, San Diego, and SLTBR President, will present the welcome and introductions.

Course presentations include: **Optimal Light Treatment for Seasonal Depression**, Raymond Lam, Associate Professor of Psychiatry, University of British Columbia; **The Role of Serotonin in Light Therapy and SAD**, Siegfried Kasper, Chair and Professor of Psychiatry, University of Vienna; **The Use of Light to Help Shift Workers**, Scott Campbell, Associate Professor in Psychiatry, Cornell University Medical College; **The Use of Melatonin for Sleep and Jet Lag**, Josephine Arendt, Professor of Physiology, University of Surrey, and **Rapid Cycling Bipolar Disorder: Biological Rhythms and Light Therapy**, Ellen Leibenluft, Unit Chief, National Institute of Mental Health

Preliminary Program Summary

Monday, June 3

8:15-9:30 am	Registration, Exhibits
9:30-10:30	Poster Discussion - Norman Rosenthal, Chief, Section on Environmental Psychiatry, Na- tional Institute of Mental Health

10:45-12:15

Symposium A

The Role of N-Acetyl Transferase - David Klein, Chief, Laboratory of Developmental Neurobiology, National Institute of Child Health and Human Development
Effects of Light and Other Drugs on Melatonin in Chick Pineal - Martin Zatz, Chief, Laboratory of Cell Biology, National Institute of Mental Health

12:15-1:15 pm
1:15-3:30

Lunch - on your own
Symposium B

The Hunt for the Circadian Photoreceptor - Ignacio Provencio, Uniformed Services University of the Health Sciences
Humoral Phototransduction and Evolution - Dan Oren, Chief,

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Light Treatment and Biological Rhythms
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Unsolicited manuscripts, letters to the editor, and Bulletin Board announcements should be submitted to Dr. Scott S. Campbell, Laboratory of Human Chronobiology, Cornell University Medical Center, 21 Bloomingdale Rd., White Plains, NY 10605 USA, e-mail sscampb@med.cornell.edu. Please submit one double-spaced hard copy and a diskette file (Macintosh: MS Word, MacWrite; IBM: WordPerfect as Textfile). Manuscripts and diskettes will not be returned. We reserve the right to edit and condense letters to the editor.

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Clinical Psychobiology of Mood Disorders Program, National Institute of Mental Health

SAD, Maternity and Evolution -

David Schlager, Assistant Professor of Psychiatry, State University of New York, Stonybrook

Break

Oral Paper Session I (5 speakers)

Banquet at Bish Thompson's Seafood Restaurant

3:30-3:50

3:50-5:30

7-10

Tuesday, June 3

8:20-10 am

Oral Paper Session II (5 speakers)

10-10:50

10:50-11:20

11:20-1

1-2 pm

2-2:30

Break/Posters/Industry Exhibits

SLTBR Business Meeting.

Oral Paper Session III (5 speakers)

Lunch (on your own)

Special Session on NIH Funding - Mary Blehar, Chief, Mood, Anxiety and Personality Disorders Research Branch, NIMH

The University of California, San Diego, School of Medicine is accredited by the Accreditation Council of Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians. The UCSD School of Medicine designates this CME activity for 14 credit hours (3.75 for CME Course, 10.25 for the Meeting) in Category 1 of the Physician's Recognition Award of the American Medical Association and for the Certification program of the California Medical Association.

Registration materials have been mailed to all SLTBR members. Additional information and registration materials may be obtained from SLTBR, 10200 W. 44th Ave., Suite 304, Wheat Ridge, CO 80033-2840, tel (303) 424-3697, fax (303) 422-8894, e-mail sltbr@resourcenter.com.

NEWS NOT FIT TO PRINT?

The following article appeared in the Health Section of the March 6, 1966, issue of *The Wall Street Journal*. We reprint it here (with permission) for those who may have missed it, and, more importantly, to provide background for the Letter to the Editor that follows. *The Wall Street Journal* not only chose not to publish the letter, co-authored by four prominent SLTBR members, but also failed to provide any explanation for this decision.

MORE PEOPLE WARM TO SIMULATED SUNLIGHT BUT SCIENTISTS DOUBT IT CURES WINTER BLUES

By Laura Johannes

Every winter morning, Eric Diamond makes breakfast wearing a battery-powered visor that blazes light down on his face.

Although Mr. Diamond, a 31-year-old Chicago graphic designer, jokes that the visor "looks like some kind of virtual reality thing," he says the "dark depressions" that had plagued him during the winter months are gone.

Once prescribed mainly by psychiatrists and psychologists to treat "seasonal affective disorder," also known as the winter blues, light-therapy devices are coming into mainstream use.

Not everyone is as enthusiastic about the trend as Mr. Diamond, however. Even as more consumers turn to light therapy, more scientists are disputing its effectiveness. "Psychiatrists aren't generally very impressed with the efficacy of light therapy," says Walter A. Brown, a clinical professor of psychiatry at Brown University School of Medicine. "It's interesting in theory, but so far the data haven't supported it."

That hasn't discouraged a whole industry from springing up to treat light deficiency. About a dozen companies now sell things like a \$100 "dawn simulator" lamp timed to brighten slowly like the rising sun, or \$400 "portable" briefcase-sized light boxes, equipped with handles for easy transport.

The Sharper Image retailing chain and Hammacher Schlemmer catalogs recently started selling a dawn simulator called the Sunrise Clock, some health insurers such as Blue Cross of Washington and Alaska, have begun covering light-therapy equipment. Sales of light-therapy products rose about 30% last year and there are at least 100,000 light therapy users, estimates Kirk Renaud, president of the Circadian Lighting Association, a trade group.

It's so much less expensive than Prozac, says Frank Kall, general manager of Sunbox Co., a maker of light-therapy equipment based in Gaithersburg, Md.

The current boom in the use of light-therapy products stems in part from positive early research that gained widespread publicity, culminating in the popular 1993 book *Winter Blues*. Seasonal affective disorder is a psychiatric diagnosis sanctioned by the American Psychiatric Association, though the number of people affected is disputed—ranging from under 1% to 20% of the population. But studies before and since 1993, which have gained little circulation beyond scientific journals, have found no evidence that light therapy cures depression better than dummy treatments.

The U.S. Food and Drug Administration has sent letters to a half-dozen companies in recent years warning them that it is illegal to make medical claims for the products. One company, Medic Light Inc. of Lake Hopatcong, N.J. Says the FDA allows it to operate only under an agreement with the agency that limits its marketing materials.

Light box makers aren't supposed to make medical claims for their products, because the gadgets aren't approved by the FDA. But Bio-Brite Inc. of Bethesda, Md., which makes visors, light boxes and the Sunrise Clock, sends out a press release headlined "Light Visor Combats Winter Blues." Apollo Light Systems Inc. of Orem, Utah, a maker of light equipment, claims in a brochure, "Thousands of individuals, medical centers and clinics have found success by utilizing this therapy for patients with seasonal depression."

The FDA says any medical claims at all are illegal, but Bio-Brite's Mr. Renaud says the assertions are generally "vague enough" to be legal.

Apollo chief of operations Kent Savage says of his marketing material, "It's real borderline isn't it?" He adds, "What we're trying to do is highlight research that has been done without actually making medical claims."

Some of the most negative findings about light therapy, ironically, have appeared under the byline of Norman Rosenthal, the National Institutes of Health psychiatrist who wrote *Winter Blues* and is a leading proponent of the treatment.

At about the time the book came out, Dr. Rosenthal published in the scientific journal *Neuropsychopharmacology* the results of a rigorous test of light visors in 55 patients. To his surprise, an hour a day wearing a dummy visor—a gadget that emitted only very dim white light—cheered up patients just as much as wearing the extra-bright one that he invented. A study published in August by colleagues, with Dr. Rosenthal as a co-author, came to the conclusion that the visor may simply be working as an "elaborate placebo."

Undaunted, Dr. Rosenthal says that perhaps, "even dim light is effective" so close to the eyes. A winter blues sufferer himself, he typically awakens to a dawn simulator that gets gradually brighter from 4:30 a.m. to 6 a.m., goes back to sleep for another hour in the rays of an even brighter light, and eats breakfast under the glare of another super-bright box.

Larry Price, an associate professor at the Yale School of Medicine, says the visor studies, which were more rigorous than other light-therapy research, "raise questions about the real efficacy beyond placebo of the whole procedure of light therapy." He calls Dr. Rosenthal's opinion about dim light "an interesting post-hoc explanation for a busted study."

Other researchers have been even more critical. Charmane Eastman of Rush-Presbyterian St. Luke's Medical Center

in Chicago compared an hour's exposure to light boxes daily to an hour with a box that patients were told emitted negatively charged ions, another supposed mood elevator. In fact, the boxes were emitting nothing but a hum—and the subjects who used them reported feeling every bit as cheered up as those with light boxes in the 1992 study.

In support of the effectiveness of light therapy, companies that sell the equipment say that a number of researchers, albeit in rather small studies of one or two dozen people, have found bright light to be more effective than dim light. And customers seem happy: Apollo, which offers a 30-day money-back guarantee, points out that only 3% of purchasers return the lights.

Many winter blues sufferers couldn't care less about the research. "I don't need to have statistics to know it works," says Kitty Dukakis, the wife of the former Democratic presidential candidate. Ms. Dukakis, who started using light therapy in 1990 to cheer her up during the long Massachusetts winters, adds, "In my body and in my frame of mind, the light makes a real difference."

To patients, part of the evidence for light's potency is what happens when they overdose. "One time I sat in front of it too long and it made me manic with energy," says John Sulich, a 64-year-old retiree from Salt Lake City. "I got out my address book and started calling up all my lady friends."

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AND A RESPONSE FROM SLTBR

Letters to the Editor
The Wall Street Journal

To The Editor:

We wish to register concern about the last week's article on light therapy ("More People Warm to Simulated Sunlight But Scientists Doubt It Cures Winter Blues," March 6, 1996), which was, in our opinion, biased and misleading. The thrust of the story was that there is little evidence that light therapy is specifically helpful for patients with the winter blues and its more severe variant, seasonal affective disorder (SAD). In our view, this is patently incorrect. In making her argument, the reporter cited as evidence a few studies which failed to demonstrate specific efficacy of light therapy, but ignored the vast literature that supports such efficacy. These controlled studies, which demonstrate the superiority of light

therapy over control or placebo interventions, have been conducted not only in the United States (Maryland, New York, Oregon, Washington, and Minnesota) and Canada, but also in Switzerland, Germany, Japan, Iceland, Sweden, Norway, Finland and the United Kingdom.

On considering the overwhelming evidence in favor of the efficacy of light therapy for SAD, a consensus conference of the Society of Light Therapy and Biological Rhythms (SLTBR) affirmed its use in clinical practice. SLTBR is the international professional organization of researchers in this field. Supporting articles have been published in the *Journal of the American Medical Association* (1993), and in a task force report, "Treatment of Psychiatric Disorders" issued by the American Psychiatric Association (1995). The Public Health Service Agency for Health Care Policy and Research has issued clinical practice guidelines for light therapy in primary care ("Treatment of Major Depression," 1993), and a joint task force of the American Sleep Disorders Association and SLTBR has published a consensus on light therapy for SAD, sleep phase disorders, and disturbances of shift work and jet lag ("Light Treatment for Sleep Disorders," 1995).

SAD is a disabling syndrome that affects more than 10 million Americans for up to half of each year, with twice as many suffering the milder winter blues. Although antidepressant medication offers a viable treatment alternative for some, thousands of patients have found light therapy to be the most acceptable approach, and it has become a mainline intervention. As for all major depressive disorders, SAD should be treated by qualified clinicians, and self-treatment should be avoided. SLTBR (303-424-3697, sltbr@resourcenter.com) offers criteria for diagnosis, selection of lighting apparatus, safety and therapeutic administration.

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LIGHT THERAPY FOR SAD IS NOW REIMBURSED BY MEDICAL INSURANCE IN SWITZERLAND

With surprise and pleasure, I can report that the conservative Swiss are the first in the world (?) to officially designate light therapy as a treatment for SAD. Reimbursement by medical insurance companies is now obligatory.

Since light is an "orphan drug", we have had no pharmaceutical lobby to prepare all the documents and carry through the complicated negotiations with the Ministry of Social Insurance. The procedure was initiated in 1992 on the one hand by a light manufacturing company near Basel (Wolff Systems), and on the other hand by myself utilizing the SLTBR Insurance Endorsement Packet as one of several documents presented to the Swiss Medical Association as evidence for efficacy. The first round met with a resounding defeat, in spite of active and knowledgeable support from two doctors in this accrediting committee.

In 1995, we updated this presentation of evidence. This time, it worked. Thanks are due to Prof. Hans Ueli Fisch, director of the Psychiatric University Outpatients' Clinic in Bern, who has participated in our SAD studies from the beginning. He met with the full professors of every University Hospital and Outpatients' Clinic in Switzerland, and convinced them all (no mean feat) to sign a consensus letter to the Swiss Medical Association. This letter stated that in Swiss academic psychiatry, light treatment for the diagnosis of SAD had long been incorporated into the therapeutic armamentarium. They considered that, given this evidence-based consensus, clinical acceptance should be formalized. Active support by the President of the Swiss Society for Psychiatry vis-a-vis the Swiss Medical Association was also crucial. Finally, a not unimportant factor in establishing scientific credibility has been the generous financial support, from the very beginning of our SAD and light therapy studies in 1994, by the Swiss National Science Foundation.

In April 1995, the following statement was published (shortened):

"The Ministry of Social Insurance hereby declares, after clarification with the Swiss Medical Association and the Concordat of Swiss Medical Insurance companies, that light therapy for SAD represents an accepted benefit, and therefore a compulsory insurance to be reimbursed. The only

indication for light therapy for other diagnoses, such as seasonal energy syndrome, sleep disorders, psychosomatic syndromes, migraine, premenstrual syndrome, infertility and climacteric symptoms is still controversial and therefore not obligatory."

After a decade of research, this transition into accepted clinical practice is a gratifying moment. It is particularly so, since medical insurance reimbursement in Switzerland is becoming quite restrictive, given the enormous cost explosion in the health services (although the individual private insurance companies recruit new members with the promise of paying for the most amazing array of alternate therapies).

This local success in gaining reimbursement of the costs of light therapy for SAD is a credit to the world-wide network of SLTBR, which has proved its usefulness in continuously coordinating and updating evidence for efficacy and standards for treatment. It is to be hoped that the efforts of the SLTBR/ASDA Task Force to put together a Report on Light Treatment for Sleep Disorders (*J Biol Rhythms*, 1995, 10:2) will soon be rewarded, in that specified circadian-related sleep-wake cycle disturbances will also be covered by insurance. I also hope that this first "official" decision on compulsory medical insurance may trigger acceptance of light treatment for SAD in other countries.

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IN MEMORY OF COLIN S. PITTENDRIGH

Professor Colin S. Pittendrigh, one of the founding fathers of the field of circadian rhythmicity, died on March 19, 1996, at his home in Bozeman, Montana. I wonder whether all of us who are more or less involved in circadian and photic studies realize that the knowledge about the circadian system organization that we now take for granted, has been acquired largely only since the late 1950s, with a substantial contribution of Professor Pittendrigh.

Colin Pittendrigh was born in Whitley Bay, in the north of England, on October 13, 1918. He lost his father, a trade union leader, at a very early age and thereafter was raised only by his mother. Once, he told me that his father had been a very strong personality and I am sure that Colin in-

herited not only his father's strength, but also his deep social feeling. He became interested in biology, namely in botany, when at age 15 he had to pay for a window broken by a soccer ball, and he earned the money by winning a prize offered to local Boy Scouts for the best wild flower collection. Thereafter, he was educated in botany at the University of Durham. During World War II, he was sent to Trinidad to breed vegetables for the North African campaign. There, he became involved with the control of malaria on both the Naval and Air Force bases on the island. During this work he was puzzled by the question of what determined the different timing of the evening peak in activity of various anopheline living on the island.

After the war, Pittendrigh became a doctoral student of Professor Dobzansky in the Zoology Department at Columbia University in New York. He studied daily activity cycles of *Drosophila pseudoobscura* and *D. persimilis*. Thereafter, he proceeded with his studies and work at universities in the United States. He became a professor of biology at Princeton and later at Stanford. He only returned to England for brief visits. Although he had become an American in this sense, I believe he also remained an Englishman and a European. Once he told me that his career might have been limited if he had stayed in England, since he graduated from neither Oxford nor Cambridge.

It was at Princeton and at Stanford where Colin did most of his studies on the organization and functional analysis of the circadian pacemaker system, its resetting by light, and on photoperiodic phenomena characterizing the system. In the middle of the 1950s, he introduced oscillator language into the discussion of circadian rhythmicity. At about the same time, independently, Professor Juerger Aschoff at the Max Planck Institute in Andechs did the same in Germany. These two great scientists had become close friends and their encounters and discussions were always fruitful for the entire field of circadian rhythmicity.

Colin Pittendrigh was among the first chronobiologists to favor the idea of the endogenous nature of the circadian clock. If a circadian pacemaker is an actual endogenous clock, one property it should possess is temperature compensation. Pittendrigh demonstrated that this was true for *D. pseudoobscura*, and together with V. Bruce, for the unicellular organism *Euglena*. Among Pittendrigh's many studies, the most important involved entrainment of the circadian rhythms by light. He soon became aware that the oscillator driving circadian rhythms must be differentially responsive to light at successive phases of its cycle. Experiments with *Drosophila*, using light pulses to perturb the circadian system led to the first phase response curves (PRCs)

to light. Soon the universal nature of PRCs was recognized. The findings in *Drosophila* were later confirmed in a series of studies on the functional analysis of circadian pacemakers in nocturnal rodents published together with S. Daan. In these studies, the dependence of the shape of the PRC on endogenous period length and on previous light history of an animal was demonstrated and a model of the daily resetting of the pacemaker was proposed.

Colin Pittendrigh also contributed a great deal to the understanding of photoperiod phenomena. He believed that photoperiodic time measurement was mediated through the circadian pacemaker system. He explained and extended E. Bunning's proposal that photoperiodic induction depends on coincidence of light with a limited part of the subjective night, and termed this model "the external coincidence model". Further, he suggested an alternative explanation for photoperiodic phenomena, the so-called "internal coincidence model", in which certain phase-relationship between two variables modulated by photoperiod, becomes the signal for photoinduction.

Pittendrigh was also among the first to suggest a multioscillatory structure of the circadian pacemaker system. He described the phenomenon of "splitting" of locomotor activity in golden hamsters, which served as indirect proof of a multioscillatory system. He coined the term "slave oscillators" for oscillators driven by a circadian pacemaker. Today, we might call them "clock controlled genes". Though Colin himself did not cross the border experimentally between the classical and molecular biological approaches to circadian rhythmicity, he embraced the latter intellectually, and loved and admired the elegant work on the molecular basis of the circadian clock in *Drosophila* and *Neurospora* done mostly in the labs of J. Hall and J. Dunlap.

Colin Pittendrigh trained many brilliant students in his laboratories at Princeton and Stanford: M. Menaker, J. Feldman, L. Edmunds, A. Winfree, D. Saunders, T. Page, S. Daan, J. Elliot, and others. These student, in turn, had their own brilliant students. And so, the entire tree of knowledge has been created, with its roots represented by the ideas and contributions of Colin Pittendrigh. And this is what Colin Pittendrigh was—a thinker, not just about biology but about a host of other subjects. And if we talk about his students, we must also consider the many others who did not work with him, but nevertheless were influenced by his ideas, his papers, his approach to science.

Yes, by his approach. For Colin Pittendrigh, each experiment was an adventure. He was curious in the best sense of the word. Until his last moments, he was trying to figure

out whether, and how, the amplitude of circadian oscillations related to photoperiodic time measurement. But it was not only research; all of life was an adventure to him. This is why he so loved the wilderness. And why he loved life so much. Once, he sent an epitaph that he had read on a tomb:

The wonder of the world,
the beauty and the power,
the shapes of things,
their colors, light and shades.
Look ye also while life lasts.

Here I might end. This might be Colin Pittendrigh's testament. But I still must say that Colin Pittendrigh was not just a great scientist, but also a great human being, with an open and warm heart. He was a kind and thoughtful friend; he was "Pitt" to everyone. And so I would like to accompany our parting with him with a verse from Ezra Pound that Pitt liked.

And if you ask how I regret that parting
It is like the flowers falling at Spring's end
Confused, whirled in a tangle.
What is the use talking,
There is no end of things in the heart.

I dedicate this remembrance to Mikey Pittendrigh, the lifelong beloved companion of C.S. Pittendrigh.

Helena Innerova, RNDr, Czech Academy of Sciences, Institute of Physiology, Videnska 1083, 142 20 Prague 4, Czechoslovakia, Tel 42-2-4752437, Fax 42-2-4719517.

HOW TO USE LIGHT AND DARK TO ADJUST TO SHIFT WORK

(The following is a draft of the SLTBR publication on shift work, which will be publicized and made available to the lay public through the SLTBR office.)

One problem with night shift work is having to work at night when the body is geared for sleep. This leads to sleepiness on the job, poor performance, and an increased risk of accidents. This condition is exacerbated by being forced to sleep during the day when the body is physiologically set for waking activity and alertness. This leads to shortened or disrupted sleep. These problems can be solved by resetting the circadian body clock so that the time that the body is ready for sleep is shifted into the daytime. Correspondingly, the time for waking activity will be shifted into the night.

For example, let's say that you have to work the night shift and won't get home to bed until 9 a.m. If you usually go to sleep at midnight, then you need to phase delay your sleep schedule by 9 hours, to shift it 9 hours later. Ideally, you would also want your body clock to delay by 9 hours, so that your sleep would occur at the normal time on your body clock, i.e., at the correct phase of your circadian cycle. The more your clock phase delays, the more the time of your sleep becomes normal (relative to your body clock), and the better daytime sleep becomes. If you prefer to sleep in the evening, before the night shift, this would require that your body clock shift earlier, or phase advance. For example, if you plan to go to sleep at 4 p.m. instead of your usual bedtime of midnight, you will be advancing your sleep schedule by 8 hours. In this case, the more you can get your body clock to phase advance, the better your sleep will become.

Circadian adaptation, i.e., shifting the body clock to match the new sleep schedule, has rarely been achieved by real shift workers, but has been achieved by subjects in simulated shift-work experiments. Therefore, it may not be easy to reset the body clock, but it is possible. To shift your body clock you will need to create a light-dark (LD) cycle composed of light during the night shift and dark during your daytime sleep period. This new LD cycle has to compete with the natural outdoor 24-hour LD cycle and other possible 24-hour time cues, or zeitgebers, for control over the setting of your body clock. Because it is the "job" of the 24-hour zeitgebers to keep the body clock synchronized to the 24-hour day, and locked into the normal diurnal phase for humans, the zeitgebers will oppose any phase-shifting of the body's clock. Therefore, the stronger the new LD cycle that you create for yourself (the brighter the light and the darker the dark), the more likely your body clock is to phase shift to align with the new LD cycle. Bright light from special light boxes has been shown to be better at shifting the clock than ordinary indoor light. However, the body is most sensitive to the phase shifting effects of light when the light is seen during the time we are usually asleep, i.e., during the night shift. Therefore, even ordinary light will have some effect, especially in people who are more sensitive to lower light levels.

The timing of light during the night, and the timing of dark (sleep) during the day, determines the direction that the body clock will shift. Light at the beginning of the night facilitates phase delays, and light at the end of the night facilitates phase advances. The dividing point between delays and advances is estimated to occur at about the time of the minimum of the daily body temperature cycle. Your temperature minimum occurs at the time of night when it is most

difficult to stay awake during the night shift, and is about 2-3 hours before your body's natural wake-up time. The average temperature minimum occurs at about 5-6 a.m., but can vary by several hours depending on the individual, and can be unpredictable in shift workers whose body clocks may have partially phase-shifted. It is best to tailor the schedule of light and dark to the individual and to the time of the night shift. However, the following recommendations should work in most cases.

To phase delay your body clock for night work you should arrange to:

1. Sleep in a dark room as soon as possible after the night shift, and at about the same time of day, for several days in a row.
2. Be exposed to as much light as possible during the night shift, but preferably not all near the end of the night shift.
3. Reduce sunlight exposure on the way home from the night shift.

It is very important to sleep during the day for several days in a row. If your body clock shifts at all, it will shift slowly, by a few hours a day. Therefore, it will take a few days for the clock time of your day sleep to become normal relative to your body clock time. You cannot achieve circadian adaptation with a rapidly rotating shift work schedule, because then the time available for sleep changes radically every few days, and the body clock cannot shift fast enough to keep up. Similarly, if you work permanent nights, but revert to sleeping at night on days off, your sleep schedule may consist of large frequent changes that the body clock cannot follow. Slowly rotating schedules and permanent night work schedules with days off concentrated in large blocks are best for attempting circadian adaptation. It should be noted that if you do manage to shift your body clock for daytime sleeping, then it will also take a few days for it to shift back for sleeping at night.

The reason for going to bed as soon as possible after the night shift is to minimize the amount your body clock needs to phase delay to produce circadian adaptation. You can also minimize the change by going to bed as late as possible on other days, including on your days off. Although the ideal is to always sleep at the same clock time regardless of the work shift or whether it's a day off, the more you approach this ideal, the better you will feel.

The bedroom should be made as dark as possible for daytime sleep for two reasons. It will keep light from directly disturbing your sleep, and will create the dark part of the new light-dark cycle designed to phase shift your clock. Several layers of black plastic garbage bags can be taped to

the bedroom windows if a more aesthetic permanent solution cannot be found.

In general, the more light during the night shift the better (i.e., longer durations, higher intensities). However, if most of the light is concentrated after your temperature minimum, it will signal your body clock to advance and oppose the desired phase delay. The possibility that light at the end of the night shift will be detrimental depends on the phase of your body clock and the total pattern of light and dark (which includes the timing of the daytime sleep period). However, in most situations light throughout the night shift favors phase delays. Furthermore, when your body clock phase delays as desired, then your temperature minimum and the dividing point between delays and advances will also phase delay. After a few days of phase delaying, light most anytime during the night shift will facilitate phase delays, because it will occur before your temperature minimum.

Sunlight exposure on the way home from the night shift will tend to keep your body clock from phase delaying because it will probably occur after your temperature minimum, and therefore signal your clock to advance. Sunlight intensity can be reduced by wearing dark sunglasses, the darker the better. Some forms of welder's goggles are useful for this purpose, but then caution must be used when driving.

To phase advance your body clock for night work the same basic principles apply. Once again you need to sleep at about the same time, for several days in a row. Again, you should be exposed to as much light as possible during the night shift. However, in this case you want to avoid getting most of the bright light before your temperature minimum, i.e., during the first few hours of the night shift. Bright light at the wrong time during the night shift can be a serious problem when you want your clock to advance, compared to when you want it to delay. On the other hand, for a phase advance you don't have to worry about sunlight on the way home from the night shift. However, in general it is easier for the human body clock to delay than advance because the natural tendency is to delay, in technical terms, to free-run with a period greater than 24 hours. Therefore, it is usually better to arrange to phase delay to achieve circadian adaptation.

If you find it impossible to follow the recommendations outlined above, you may still be helped by increased levels of illumination during the night shift. Brighter light can be a mild stimulant, like coffee, to help you stay awake. However, if you want to feel daytime alert during the night shift and have normal good sleep during the day, you must phase shift your body clock. You cannot do this by simply increasing light exposure during the night shift. You also have to have the right type of sleep schedule. This in turn depends on your work schedule. For this reason the path to

circadian adaptation often starts with work schedule changes by management.

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REFERENCES

- Campbell SS, Dijk D-J, Boulos Z, Eastman CI, Lewy AJ, Terman M (1995) Light treatment for sleep disorders: Consensus report III. Alerting and activating effects. *J Biol Rhythms* 10:129-132.
- Eastman CI (1994) Light treatment for circadian and sleep disturbances of shift work. *Light Treatment Biol Rhythms (Bulletin of the Society for Light Treatment and Biological Rhythms)*. 6:55-62.
- Eastman CI, Boulos Z, Terman M, Campbell SS, Dijk D-J, Lewy AJ (1995) Light treatment for sleep disorders: Consensus report VI. Shift work. *J Biol Rhythms* 10:157-164.

FLASHLIGHT POLL

BY THE DAWN'S EARLY LIGHT

In their landmark article describing Seasonal Affective Disorder and its treatment with light therapy, Rosenthal, et al., employed a light exposure schedule in which patients were instructed to "sit in front of the lights for three hours before dawn and three hours after dusk . . ." The treatment was effective.

In their discussion, the authors speculated on the mechanism underlying the response: "Is it photoperiodic, i.e., dependent on light exposure during a critical part of the 24-hour day, as is the case with certain animals, or is it a direct response to light regardless of when during the day a person is exposed."

That was in 1984. Over a decade later, we're still debating the point. Well, some of us are anyway. Fifty of us to be exact. That's how many people responded to the latest Flash(light) Poll issue:

"Everything else being equal, I would prefer to treat SAD with light exposure administered a) in the morning, b) in the afternoon, c) in the evening, or d) another time."

We received responses from 22 clinicians, 10 researchers, 10 researcher/clinicians, 5 patients/consumers, 2 manufacturers/distributors, and a student. Twenty states in the US were represented, as were 2 Canadian provinces and 10

countries in Europe and Asia.

The results were unequivocal. Almost three-quarters of the respondents (N = 36) indicated that morning light exposure is preferable for the treatment of SAD. Neither afternoon exposure alone, nor evening exposure alone, was viewed as preferable by even a single respondent. Thirteen individuals (26%) chose "other" times, and a single respondent was unwilling to commit, citing a lack of sufficient data on which to base a decision. While these results are impressive enough, they become more so when it is realized that 7 of the 13 "other" responses included morning light exposure in their preferences, but did not specify AM exposure exclusively (e.g. "morning and evening light"). Thus, morning light exposure was involved in 86% of all responses.

Comments from those who thought morning was the most appropriate time for light exposure included the following:

"more consistent improvement with AM use."

"1) possibility of the entraining effect of light in the morning, 2) greater sensitivity to lower light intensity in the morning."

"... using lights in the late afternoon or evening makes me so alert that I have a hard time falling asleep."

"Although most patients I see do not have a specific time-of-day response, I have seen a few that preferentially respond to morning light (perhaps 15-20%), whereas I have never treated a specific evening responder. Thus, I usually start with AM light, then if they respond, I have them experiment with light at more convenient times of the day if they wish."

"Also helps stabilize sleep/wake rhythm."

"Have had good response to dawn simulators since these seem to make it easier for the patient to get up and going."

"... I would inquire, however, if the patient was a morning or evening type (lark or owl)."

"I find that morning is a little bit more effective, but inconvenient for most of my patients."

The question of convenience, and lack of data indicating AM superiority, were the primary reasons respondents gave for "other" times of light exposure:

"[in response to] the social circumstances of the patient."

"when convenient [to the patient] . . . the difference between times of exposure are apparently not significant."

"I would treat SAD with light exposure at the most comfortable time of day for the patient to be compliant for 2 weeks of treatment . . . my chronobiological heart says 'in the morning', [but] my data say 'it doesn't matter so much'."

—SSC

BULLETIN BOARD

CIRCADIAN LIGHTING ASSOCIATION NEWS

The Circadian Lighting Association (CLA) is the trade group that represents manufacturers of specialty lighting equipment. In its third years of operation, the CLA and its members work hard to support the field of light therapy. The group's mission is to:

- 1) Market high quality products that therapists, researchers, and consumers can count on.
- 2) Provide excellent customer service, including a 30-day money back policy if customers are dissatisfied for any reason.
- 3) Support the expansion of general awareness and education about light therapy.

As part of its mission, the CLA recently completed a round of independent product testing. The purpose of the testing exercise is to provide objective data on product light intensity so that the public can have confidence that a company's claims are accurate and consistent with a standardized measurement system. The methodology and results of the test program will be presented at the June SLTBR meeting.

The CLA membership includes the following companies:

- Apollo Light Systems, Orem, UT, (800) 545-9667
- Bio-Brite, Inc., Bethesda, MD (800) 621-LITE
- Enviro-Med, Inc., Vancouver, WA (800) 222-DAWN
- Lighting Resources, Columbus, OH (800) 875-8489
- Northern Light Technologies, St. Laurent, PQ, Canada (800) 263-0066
- Outside In, Cambridge, England 44-1-954-211-955
- SunBox Co., Gaithersburg, MD (800) 548-3968.

Welcome New Members

Welcome to the following new members of the Society who have joined since publication of the February issue of *LTBR*.

David B. Altman
Timothy D. Brewerton
Ole Falch-Schmidt
Ruth Kelson
Lawrence Morin
Linda C. Schaffer

Christine C. Arthur
Leah Davidson
Ewa Habrat
Clarke Miracle
Kevin P. Rhinehart
Mary O. Wiley