

The yin and yang of night and day

Light and dark are in cahoots, making a body healthy and balanced: Sunlight (or a reasonable facsimile) is the key to a restful night's sleep—and so much more

BY DEBBIE LEAMAN

Light is essential for humans to function. A healthy dose of sunlight stimulates the body through the skin, producing vitamin D, crucial for bone, muscle, and immune function. Through the eyes, light regulates our daily functions, energy level and moods. As our lifestyles have evolved, we no longer adjust our daily routines to sunrise and sunset; we spend less time outside, live under artificial lights and push our bodies to work late and rise early. Our 24/7 world has seriously messed with our natural biological rhythms.

We humans, like all natural organisms, have evolved to run on roughly a 24-hour schedule, relying on environmental cues for our sleep/wake cycle. But, thanks to Thomas Edison, that has changed. Before the invention of the light bulb, people slept an average of 10 hours a night; today Americans, during the week, average 6.9 hours of sleep.

"Light is crucial for our functioning and survival, but it's so ubiquitous that it's unappreciated," says Howard Leaman M.D., a sleep specialist with the Intermountain Sleep Disorders Center (and, full disclosure, my husband). "Light is one of the most direct interactions between human biology and the environment."

Like all of nature, human beings have innate rhythms which rely on the 24-hour rotation of the Earth.

The field of chronobiology examines the cycles which occur in living organisms and their adaptation to solar and lunar rhythms. The most

important rhythm is the circadian rhythm, the roughly 24-hour schedule of physiologic functions. (Circadian comes from the Latin

circa, meaning "around" and *dian*, "day.") Literally meaning "around a day," our circadian clock is actually longer than 24 hours; if left without external prompts, our internal cycles would get out of sync. Nature has given us *zeitgebers*, German for "time-keepers," cueing us when to wake up, eat, wind down, and sleep. But, because we no longer wake with the sun, wind down at dusk and go to sleep at dark, our lifestyles have put us out of touch with our most essential zeitgeber—the sun.

Sunlight, essential for human functioning, restores the body's circadian clock. "A number of different body functions are regulated through exposure to the sun everyday," says Bradley Katz M.D., Ph.D., an associate professor of Ophthalmology at the Moran Eye Center. "This keeps us synchronized." When we awake in morning light, our bodies immediately suppress the production of melatonin, the "hibernation" hormone, and start producing serotonin, cortisol and other hormones and neurotransmitters, which activate us to get out of bed and kick into gear. As the sun sets, we receive another cue from nature to wind down. At dusk, our bodies start production of melatonin which helps us fall asleep. Our eye is the synchronizer, keeping the clock on time.

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Clean up your sleep

- Use your bedroom only for sleep and sex.
- Make sure your room is dark, quiet and cool.
- Finish eating at least 2-3 hours before bedtime.
- Avoid alcohol, caffeine, and nicotine in the late afternoon and evening.
- Sleep on a comfortable mattress and pillows.
- Have a regular, relaxing bedtime routine.
- Exercise regularly, at least a few hours before bedtime.
- Avoid exposure to bright light before bed.
- Stay off your computer and TV 2 hours prior to bedtime
- Keep a regular bed and wake schedule, including weekends.
- If you have difficulty sleeping, consult your healthcare practitioner.

There's a specific part of the eye "that is not meant for visual formation, but is instead dedicated to keeping our daily rhythm," says Katz. These particular ganglion cells connect to our internal master clock, inside the brain, called a Suprachiasmatic nucleus (or SCN), which controls the rhythms of our bodies. Light, received through the eye, follows a pathway to this master clock, which helps regulate the ebb and flow of hormones which, in turn, governs our daily functioning and moods.

"Our bodies have evolved to set our natural rhythms to light," says Dan Adams, research manager at Apollo Health, an affiliate of Philips Home Healthcare Solutions, developer of therapeutic light products. "Humans are meant to be outdoor animals; we need light in the right sequence or it causes problems." Katz agrees, "We are fighting our natural day/night rhythms that our bodies have evolved to work under."

Turning on a light in the darkness has an immediate suppression effect on melatonin production, as does returning emails or shopping online at midnight. At night, "a computer emits enough light to trick the body into thinking it's day," says Adams. "It's like reaching back into the clock and winding in backwards." You won't be able to fall back asleep easily.

Is any type of light during the day

helpful? Yes, and no. Artificial light, especially fluorescent light, doesn't stimulate the pathway. "Artificial light causes havoc with our sleep/wake cycles," says Adams. But, a natural outdoor light, even on an overcast day, is good. According to Katz, "there's still enough light on a cloudy day to keep you in sync." Adams agrees, "Cloudy days are beneficial, brighter than indoor light. Our eyes adjust so we don't see the light. Even 15 minutes a day outside can be therapeutic." Wearing sunglasses (unless very dark) won't affect your circadian rhythm. Even catching some rays by sitting next to a window is a way to get sun exposure during the day.

Light has the ability to heal and produce the neurotransmitter serotonin. Over 100 years ago, Florence Nightingale discovered that patients exposed to light recovered weeks earlier than those who didn't. Over the past 20 years, the study of light and its therapeutic effects has increased; hundreds of research studies have been conducted worldwide and the findings show a correlation that the right type of light in the proper sequence benefits our bodies and our mental health. "Light is as effective as anti-depressant medications are, perhaps more

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so," writes Anna Wirz-Justice, PhD, professor of psychiatry at the University of Basel in Switzerland. "Of course, if you are under a physician's care, consult him or her before exchanging your medication for a sun reflector," says Leaman.

Another study shows that low serotonin levels are associated with winter blues and that exposure to bright light increases the level of serotonin in the brain. Serotonin helps regulate moods, appetite and other bodily functions. In other words, instead of reaching for another cup of Joe, get outside into the

daylight to help stave off the blues.

Over the last 50 years, the rate of winter blues and related energy and mood problems has doubled, and sleep problems have tripled during the same time. As the days grow shorter, the prevalence of winter blues increases. In fact, the National Institute of Health (NIH) estimates that 14% of Americans suffer from this disorder.

The nasty symptoms of winter blues can include: weight gain, carbohydrate cravings, irritable mood, desire to sleep, and lethargy, "the same signs as insufficient total sleep time or sleep disruption," says Leaman. As the days grow short, "one hour of difference in the morning makes us want to hiber-

nate," says Adams. "The most restorative, peaceful time of sleep is one hour before we wake, and when we wake up in the dark, we're not getting the light signal our body needs," he adds.

"If you struggle with winter blues, increase the ambient level of light in your home," says Adams. "But, to get your body clock working properly, you need the proper wavelength and intensity of light for a therapeutic effect."

The specific frequency and intensity of light that targets our master clock is the blue part of the light spectrum (between 470-480 nanometers). Numerous studies have shown that our bodies respond two times faster to this

Vitamin D Deficiency— An Epidemic

Sunlight is vital for the human body to produce vitamin D, key to musculoskeletal, immune system and mental health. This essential vitamin helps maintain bone density and strength, and may also protect against certain cancers, depression, diabetes and other diseases. The bad news? Due to lack of sun exposure, vitamin D deficiency is increasing among the general population.

"...Because people have become frightened of getting skin cancers they are avoiding the sunshine, but sunshine offers one of the best sources of vitamin D which protects the body from a number of diseases." "We have an overzealous fear of the sun," says Todd Mangum, M.D., with the Web of Life Wellness Center in Salt Lake City. We have now reached an "epidemic level of low vitamin D." He argues that lathering up with sunscreen and less time spent outdoors has contributed to this modern day phenomenon.

The latitude where you live, your age and skin color also helps determine vitamin D levels. Daily sun exposure in sunny regions can help produce adequate levels of vitamin D. Those living in northern climates, especially in the winter, have less ability to produce this vitamin through the skin. "In the U.S., only people who live south of a line drawn from Los Angeles to Columbia, S.C., get enough sunlight for vitamin D production throughout the year." Others at risk are the elderly and those with dark skin (dark skin absorbs less sunlight).

There is some controversy surrounding what is a normal vitamin D level. Most experts agree that it's above 30 ng/ml, but others suggest that levels as high as 75 ng/ml are needed to maintain health. "There is a wide range of what's acceptable," says Mangum.

Vitamin D deficiency is a global problem. A study of healthy children 6-21 years old living in Northeastern United States showed that 55% had vitamin D levels less than 30 ng/ml. A study of older adults (65+) in the Netherlands found similar results: 50% of vitamin D levels were less than 20 ng/ml.

What can you do? Get out into the sun. According to WEBMD.COM, "Five to 30 minutes of sun exposure to the face, legs, or back—without sunscreen—at least twice a week should give you plenty of vitamin D." "I'm a huge fan of sunlight," says Mangum.

Vitamin D is mainly produced through our skin in response to the sun, but it is also absorbed into our intestines through the food we eat. Some foods that contain this important vitamin are: cod liver oil, salmon, sardines, egg yolks and cheese. Milk, breakfast cereals and some brands of orange juice have been fortified with vitamin D. Supplements may be warranted, but because it's a fat soluble vitamin (along with A, E and K) you can get too much of a good thing. Work with your physician or registered dietician; get a blood test to determine your vitamin D level. Discuss the results with your doctor and figure out how to increase your vitamin D intake without overdoing it.

—Debbie Leaman

Additional Resources:

- For more information on sleep related issues: WWW.SLEEPFOUNDATION.ORG.
- WWW.LIGHTTHERAPY.COM for further information on light therapy and Apollo light therapy products.
- "No More Sleepless Nights," by Peter Hauri and Shirley Linde. This comprehensive book is based on sleep disorder studies from Mayo Clinic's insomnia program, of which Hauri is the director. Along with a companion workbook, "No More Sleepless Nights" provides strategies for managing and overcoming insomnia.
- For an alternative approach to sleep therapy, check out the sleep device: DreamKeeper on WWW.HBIUSA.COM. According to the biomedical device company HBI, DreamKeeper uses proprietary technology to rebuild the user's biological clock and improve sleep quality.

wavelength. Blue light triggers the photoreceptors in the eye which are responsible for our circadian rhythms. Because of its effectiveness, it's called the action spectrum of light.

We could just step outside everyday. Easier said than done. As a society we get less than an hour a day of sunlight. But, what has become a manmade problem can be fixed with a manmade device: a light box. Therapeutic light devices, or light boxes, have been around for years and there are many types available. If you start light therapy, make sure that your light device has a UV filter to screen out harmful rays. Katz says, "although blue light therapy may be more efficient, be judicious in how you use it." If the blue light is too intense, having a light that most closely replicates the sun might be less irritating.

Says Katz: "The best light is sunlight. Period. But if you can't get into the sun, artificial lights, with special wavelengths, when used at the appropriate time of day, can work pretty well to stimulate the part of your brain which keeps you awake." He cautions, "some individuals should never use light therapy, such as those with bipolar disorders or migraines, or anyone taking medication which makes them photosensitive." And, "if your sleep is disturbed by a primary sleep disorder [such as sleep apnea, snoring, leg movements or restless legs], that must be treated first." Consult your physician before starting any type of light therapy program.

Having researched this topic for weeks, I decided to take a free Circadian Rhythm Assessment. Logging onto WWW.LIGHTTHERAPY.COM I took a few minutes to answer some questions about my sleeping habits, mood and energy levels. I get tired in the late afternoon, but push through until my kids' homework, dishes and everything else gets done, morphing into the mom-from-hell by 9 p.m.

According to my personal Circadian rhythm test results, I have "Circadian Amplitude Disorder." I thought I was just cranky.

I was provided with three pages of information about my disorder and instructions on how to use a Bluewave technology light. Being that I'm married to a sleep specialist, we happened to have an Apollo goLite on our breakfast table. I was ready to start the next morning, but unfortunately I couldn't begin my light therapy program because the rest of my family fought to get in front of the device at breakfast. Finally I wrestled it away, explaining that my research took priority. The first day, as I ate my cereal, the azure blue LED lights shone in my face, reminiscent of a Lite-Brite childhood toy. I was supposed to sit there for a half-hour, but could only squeak in 15 minutes before it got snatched away. Call it the placebo effect, but I was actually cheerier that day, (dare I say it? I had a sunny disposition) not requiring additional caffeine. That night I was less tired than usual. Over the next few days, I was hooked, craving my time with the light at breakfast. With morning light therapy, I stayed up later, drank less caffeine and was less irritable at night (my family might disagree on that one).

One evening, in late September, before I started my light therapy regimen, our power went out. By 9 p.m., it was pitch black. Neither computers nor TV beckoned. There was no hum of the printer or ambient noise from kitchen appliances; the crickets chirping outside in darkness was the only sound we heard. With our emergency flashlights low on batteries, we did something novel—went to sleep when the sun went down. And, as if we lived prior to 1879, (the year of the light bulb was invented) we slept 10 hours. We awoke in the morning, feeling great. □

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