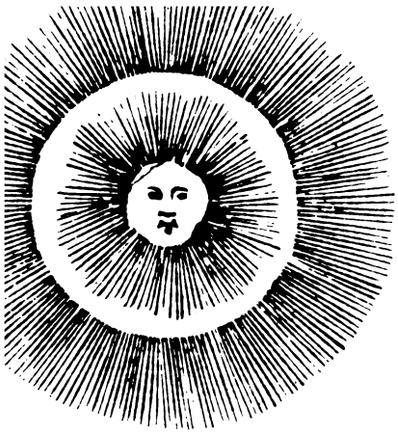

Here Comes the Sun

Scientists shed new light on winter depression

By BRUCE BOWER

A young woman lies asleep on an overcast winter morning. At 4 a.m., a faint glow emanates from a light bulb placed near her bed. The glow gradually gains intensity and bathes the room in soft light by 6 a.m., when the woman awakens.

She has just welcomed the simulated dawn of a new day. After several more mornings brightened with light designed to mimic a bona fide sunrise, the clouds begin to lift from the woman's "winter depression," which appears punctually in late November of every year and abates by the following April.

Preliminary support for the beneficial "sleeper effect" of simulated dawns adds an intriguing new twist to the much-investigated thaw of winter depression following one or two weeks of daily exposure to bright lights. In fact, as the study of seasonally recurring depression — known by the apt acronym SAD, for seasonal affective disorder — enters its second decade, researchers possess an abundance of illuminating new findings that, in true scientific fashion, raise complex new questions.

Much of the latest research was presented at the recent annual meetings of the Society for Light Treatment and Biological Rhythms in Bethesda, Md., and the American Psychiatric Association in Washington, D.C.

Along with feelings of sadness, anxiety, and lethargy, people experiencing SAD often display symptoms not typically seen in cases of nonseasonal depression. These include difficulty awakening in the morning, daytime drowsiness, cravings for sweet or starchy carbohydrate foods, and extreme weight gain. Social withdrawal and a marked drop in work performance also characterize SAD, which usually occurs for the first time in people in their early 20s.

A large segment of the population suffers from winter depression, with the numbers increasing in regions farther from the equator, where winter nights grow longest (SN: 9/23/89, p.198). Several independent studies estimate that the condition affects 1 to 2 percent of Florida's population, about 6 percent of people living in Maryland and New York City, and nearly 10 percent of the residents of New Hampshire and Alaska. The prevalence of mild SAD symptoms ranges from nearly 3 percent in Florida to 11 percent in New Hampshire.

About 15 percent of those hospitalized for severe depression display a regular worsening or reappearance of symptoms in the winter, according to studies conducted in the United States and Europe. However, many SAD sufferers never seek mental health care, apparently deciding to slog through each winter in anticipation of a corrective dose of spring sunshine.

But numerous studies conducted over the past decade promote a faster SAD-busting technique: daily exposure to bright lights for a week or two during the winter. Researchers currently favor two approaches to this treatment: either placing an individual in front of a screen emitting light five times brighter than ordinary room light for two hours each day, or using a screen producing light 20 times brighter than normal room light for 30 minutes each day. Morning sessions often yield the best results, but evening exposures can also provide relief.

Although the proportion of SAD patients whose symptoms disappear in response to bright-light therapy varies widely from study to study, the majority of reports cite strong improvement in at least 60 percent of participants, assert Michael Terman and Jiuan Su Terman, psychologists at the New York State Psychiatric Institute in New York City, in a January 1991 review prepared for the federal government's "depression guidelines panel." A much smaller proportion of seasonally depressed people feel markedly better after placebo treatment with dim lights, the researchers add.

Observations of changes in the daily biological clock, or circadian rhythms, of rats exposed to bright light at specific times inspired the first attempts to treat winter depression with lights. Scientists have no uncontested theory to explain how bright lights help human SAD sufferers, but most assume that the treatment must somehow alter circadian rhythms. One theory holds that SAD often derives, at least in part, from the delayed nightly secretion of melatonin, a hormone involved in the regulation of sleep; some evidence suggests that successful bright-light therapy can initiate melatonin secretion an hour or two earlier. Scientists refer to this readjustment of the biological clock as a "phase advance."

Simulated dawns may also prompt phase advances of melatonin, body temperature, or other circadian processes, suggests David Avery, a psychiatrist at the University of Washington School of Medicine in Seattle. Low-intensity lights turned on early in the morning advance melatonin secretion in rats by a couple of hours, but no comparable studies have been done in humans, Avery notes.

In 1990, Michael Terman reported the first pilot study of simulated-dawn treatments. After two weeks of awakening to synthetic sunrises, six of eight SAD patients experienced total relief from symptoms of depression.

Avery's team also reports encouraging results with dawn simulation. In two studies, a total of 23 SAD patients spent one week with a special incandescent bulb in their bedrooms that gradually produced light comparable to a natural dawn between 4 and 6 a.m. Another 18 SAD recruits received one week of placebo treatment with either 30-minute dawns that peaked at a level comparable to moonlight or two-hour dawns of slightly greater intensity. Symptoms of depression largely cleared up only among those receiving full-scale dawn exposures.

Yet the ways in which bright light rewinds the human biological clock remain unclear. For instance, a report in the January/February NEUROSCIENCE LETTERS indicates that bright light does not reset an important type of circadian rhythm in healthy adults in a pattern consistent with what most SAD researchers had assumed.

Researchers led by physiologist David S. Minors of the University of Manchester, England, administered 15-minute pulses of bright light to 15 college students at various times during the day or night. Exposure to light significantly advanced the onset of daily increases in body temperature when administered up to five hours after the participants' average body temperature minimum, at around 5 a.m. Investigators had assumed that morning doses of bright light could spur phase advances in SAD patients only if administered by 8 a.m.

On the other hand, doses of light in the evening did not delay the drop in body temperature — another unexpected finding for researchers, who had assumed that evening light would have such an influence on the biological rhythms of SAD patients. Only very late — at 3 or 4 a.m. — did bright light detain the circadian clock in the British study.

"For now, I'd say that as long as you fail

to get a circadian phase delay, light therapy probably works with SAD patients," Michael Terman maintains. "But getting a phase advance with morning light therapy is not essential."

The eye's sensitivity to light may play a key role in winter depression, according to Terman. Preliminary studies in his laboratory indicate that SAD individuals, compared with nondepressed controls, report much more difficulty seeing a dim light after sitting for awhile in a dark room, but only during the winter. Animal studies find that the eye normally adapts to low levels of light during the day by increasing the amount and sensitivity of light-absorbing pigments on the retina, which transmits visual information to the brain.

SAD patients may have retinas incapable of squeezing more light out of shorter winter days, Terman suggests. Or the activity of their retinal receptors that process daylight may plummet during the winter in a fashion that exaggerates decreases in retinal activity observed among hibernating animals, he theorizes.

In any case, some aspect of simulated dawns other than modest light intensity – perhaps their timing, gradual progression, or presentation at particular times of year or latitudes – serves to normalize light sensitivity among winter depressives even while they sleep and their eyelids are closed, Terman proposes.

Other studies, directed by Raymond W. Lam of the University of British Columbia in Vancouver, add to the evidence of light insensitivity during winter among SAD patients. One investigation, involving 19 SAD patients and 19 nondepressed controls, measured electrical activity across the retina in response to a short dose of bright light. The retinas of persons with SAD generated weaker electrical responses to light, Lam reports.

A second study measured electrical waves on the cornea that respond in characteristic ways to light. Lam's group placed delicate gold-foil electrodes on the anesthetized corneas of 24 SAD patients and 22 nondepressed volunteers. Overall, the two groups displayed the same electrical-wave patterns following exposures to light. But the 18 seasonally depressed women generated smaller waves than the 16 female controls – indicating weaker light sensitivity in the former group – and the six seasonally depressed men responded with larger waves than the six male controls.

Lam offers no explanation for this sex difference because he used fairly crude measures of light sensitivity in a small sample. Premenopausal women make up the large majority of SAD patients seen by clinicians, but it remains unclear whether premenopausal women in general stand a greater chance of suffering from the disorder.

Chemicals that carry messages from one brain cell to another, such as dopamine and serotonin, are also present on the retina and take part in communication between the eyes and the brain, Lam notes. Disturbed retinal function may interfere with visual processing mediated by these chemical couriers.

"Surely the connections between eye and brain are the key to understanding seasonal affective disorder," says psychiatrist Norman E. Rosenthal of the National Institute of Mental Health in Bethesda, Md., one of the pioneer SAD researchers.

Unfortunately, those connections start to dissolve when researchers outfit SAD patients with "light visors" rather than sitting them in front of light screens. The visors, only a few years ago considered a promising treatment advance, encase two small incandescent bulbs powered by a rechargeable battery. Study participants don a visor and receive a 30-minute daily light dose for two weeks.

Two new studies suggest that light visors may function merely as elaborate placebos, improving winter depression for reasons unrelated to light exposure, Rosenthal asserts. In one project, directed by psychiatrist Martin H. Teicher of McLean Hospital in Belmont, Mass. – which included Rosenthal on the research team – a dim, red-light visor designed to be ineffective reversed SAD symptoms slightly more than a bright, white-light visor in a sample of 49 seasonally depressed patients.

And a study of 105 SAD patients in five Canadian and U.S. cities indicated that dim, low-intensity and high-intensity light visors all worked about equally well. About 40 percent of those receiving each of the visor intensities recovered fully from symptoms of depression, and 60 percent in each group improved substantially, says Anthony J. Levitt of the Clarke Institute of Psychiatry in Toronto.

"We don't yet know what physical aspects of light have positive effects on SAD patients," Levitt remarks. "That's disconcerting."

Michael Terman finds it more disconcerting that researchers have not measured how much light from visors, screens, and simulated dawns actually reaches the retina. With visors, light may focus on or above the eyelid rather than on the eye itself, depending on the angle of the headgear and the participant's direction of gaze, Terman points out. He argues that the low level of full recovery in Levitt's study, compared with that in "light box" studies, suggests that volunteers wearing high-intensity visors may actually have received the least light on their retinas due to squinting, lowering their gaze, or automatically contracting their pupils in response to unavoidable bright light.

Moreover, the amount of light entering the retina during any type of light therapy may fluctuate from one person to another, Terman asserts. Tiny light meters attached to the foreheads of volunteers in his laboratory reveal large individual differences in the amount of light exposure from the same light screen.

"Light is a complex stimulus that has been inadequately specified, given the intense clinical experimentation of the last five years," Terman contends.

Nevertheless, light – and the lack of it – can really get under our skin. For instance, rapid changes in day length greatly modify the daily cycle of sleep and melatonin secretion, report researchers led by psychiatrist Thomas A. Wehr of the National Institute of Mental Health. Their findings with humans match those already observed in rats.

In Wehr's study, healthy adult volunteers spent one week in a "summer" condition (16 hours of light per day, eight hours of sleep in a dark room) and then lived for four weeks in a "winter" condition (10 hours of daily rest or sleep in a dark room). The shortened day resulted in participants sleeping more, reporting more sleepiness while awake, experiencing a longer period of lowered body temperature each night, and secreting more melatonin while asleep.

"Brain mechanisms that detect and respond to seasonal changes in day length may have been conserved in the course of human evolution," Wehr suggests. "Artificial light may have profoundly modified patterns of human sleep, temperature regulation, and hormone secretion."

Artificial light may also profoundly influence seasonal depression, perhaps as much as shifts in day length among people who rarely venture outside on winter days. People with full-blown and milder forms of SAD often spend less time outdoors than individuals without seasonal problems, asserts Anna Wirz-Justice, a psychologist at the Psychiatric University Clinic in Basel, Switzerland. She finds that SAD sufferers often improve as much by taking a daily one-hour walk in normal winter sunlight as they do by soaking up a daily two-hour dose of bright light indoors. The amount of sunshine available at a given latitude may prove less important than the amount of time one actually spends outdoors during the day, Wirz-Justice proposes.

Ongoing studies of light treatments, the biological clock, and the eye's sensitivity to light herald the dawn of a better understanding of seasonal depression, Michael Terman contends. "We're at a point where a new set of subtler questions about SAD and light treatment has come to the fore," he remarks. □