Seasonal Affective Disorder (SAD): About light, depression & melatonin

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Celebrating the Thanksgiving festival begins our final descent down to the winter solstice, the shortest day of the year. As the last of the leaves fall from the trees and the sun sinks lower and lower on the horizon the spirits of some sink with it; and as the days grow shorter and shorter, shorter too grows the memory of sunshine and warmth. With the New England overcast sky above, the blustery winds and the trees now barren of leaves, how difficult it is for many to keep the inner fires burning. Many become SAD. That is, many may develop *Seasonal Affective Disorder* (SAD). Surely not everyone succumbs to the blahs or the blues in wintertime. The vigor, joy and pleasure of winter skiers; the surge of energy and increased appetites many people feel once the summer's heat has lifted; these surely speak to the happiness and pleasure winter brings for some.

SAD Symptoms

Depression that responds to light

For those who turn within and become SAD with the coming of the cold, dark months the consequences can be very severe. I'll never forget the first patient I saw with severe SAD. It was in the winter of '87 I think, or perhaps it was '88. I was running a Sleep Disorders Center in a New Hampshire psychiatric hospital and had become very interested in SAD as well. The patient in question was a woman who was 35 or so. She was an emergency admission because she had tried to commit suicide, and darned near succeeded. I was shaken. I hadn't realized until then that SAD could be so life threatening. When I talked to her I found out that she felt SAD every winter, but generally was able to hang on until her kids' February vacation from school when the family took a vacation in sunny Florida, which immediately lifted her spirits. "What happened this year " I asked her. "'February' vacation didn't come until the first week of March. I couldn't hold out any longer." On so little did so much hang.

We treated her with bright light, and discovered soon thereafter that she had an unusual amount of company when the lights were on. Even her personal counselor mysteriously re-arranged the scheduling of counseling sessions so they "just happened" to coincide with this woman's bright light sessions! The lights lit up the lives of many people that winter.

Or another patient. A man. I seem to recall he was in his mid-20s. He was admitted to this same hospital year after year, generally for several months at a time so severe was his depression. When we looked back at his history, we realized he always came in more or less the same time of year, usually late September, then mysteriously remitted and was fine to go home some weeks beyond New Years Day. He tells us that at other times of the year, he was just fine. And so we brought light into his life as well. As the nurses tell it, they first noticed that he became more sociable. And then he began to pay better attention to personal hygiene, caring to change his

clothes, to bathe himself and to shave. Or maybe becoming more sociable came first. I don't recall. But what they remember best is that one day they heard the sweetest music coming from his room -- and only then discovered not only that he'd had his violin hidden beneath his bed, but that he was quite a talented musician. Through all the winters he'd been hospitalized, no one had ever known he had a violin at all until that day!

Sadness, anxiety, irritability, and violence

I describe these patients to emphasize that SAD is more than just a case of the blahs. Winter Depressions can be very, very severe. Even if not severe enough to warrant hospitalization as was the case for these two people, the symptoms can still be severe enough to disturb how you function and perhaps even interfere with your personal relationships. Mood certainly changes. Some people become sadder, to the point of experiencing real grief at times. Others become more anxious, and yet others become more irritable. At times the irritability can be so extreme that feelings of violence can erupt. This perhaps is one small part of the reason why the incidence of child abuse seems to increase during the dark months.

Other symptoms.

Physical activity decreases. The person feels very sedentary, and often sluggish. Physical activity, sometimes of almost any sort, seems to be just too much. On the other hand, appetite, and especially craving for carbohydrates (sugars or starches or alcohol) actually increases. Hypersomnia can develop: most people with SAD end up sleeping for very long hours (or wish they could, if life would allow it). In many ways, other than for the sometimes severe emotional symptoms, it is as if a person were hibernating during the cold, dark months.

What causes SAD

Some have given the name "the Holiday Blues" to what we now call SAD, or Winter Depression. The name comes from the fact that problems begin in anticipation of or during the time when the media tells you that you're supposed to feel warmth and love, and to be in the company of dear friends and family around a cozy hearth, with Nat King Cole in the background and roasted chestnuts on an open fire, exchanging gifts and caring. It follows, then, that depression can be the result among those who cannot be with family or who perhaps live far from friends who they might share the holidays with. According to this way of thinking, the depression comes from a deep sadness; from a heightened awareness of not having such a lovely (and perhaps mythical) place to go for the holidays.

How scientists discovered that light is the key to SAD

But can it be that we become more vulnerable to feelings of aloneness and other sad thoughts because of the decreasing hours of daylight and that it is the shorter day's length which sets the stage for depression Very probably so, think the scientists. In a now classical research paper authored by Norman Rosenthal and his colleagues, then at the National Institute of Mental

Health (NIMH), SAD found its first description and received its name; and preliminary findings regarding a form of treatment with light was documented.

These investigators found they could predict how many of the people they studied would develop SAD symptoms on the basis of how brief the daylight hours were. As day light began noticeably decreasing in September, some people were affected. By the time the days bracketing the winter solstice came, almost everyone in the study group was affected. Then, as the season moved away from the solstice toward spring with lengthening daylight hours, the number of affected people began to decline. By the end of May, almost everyone was back to their old selves, some unfortunately even switching into what psychiatrists call mania.

To make sure that this association between change in mood and amount of light was more than just mere coincidence, the next step was to supply light to see if it they could reverse the SAD mood. They used two different kinds of light, just to make sure the extra attention paid to the SAD patients wasn't what helped resolve the depression. The dimmer, yellow light they used had no effect. However, the brighter light with a frequency spectrum more or less simulating the frequencies in sunlight, produced a marked change in mood in most (but not all) the patients who received that treatment. Their mood lightened, as it were, with the administration of light.

Since then, there has been quite an accumulation of evidence that it is indeed the decreasing length of the photoperiod (duration of the light part of a 24-hour period) which produces SAD in affected individuals.

Holidays and festivals of light

Is it any wonder then that there are so many festivals of light which gather in the valley of the year This is the celebration of Christ's birth on the 25th day of December on the Julian calendar; Christmas-time, celebrated by clothing tree and home with twinkling lights, by warm gatherings of family and friends with candles glowing on the dinner table and media images of warm, cozy fires burning in the hearth. And there is Chanukah, the Festival of Lights, at different times in different years according to the Julian calendar, but always celebrated on the 25th day of Kislev of the Hebrew calendar, and always close to Christmastime. It is celebrated by the lighting of candles on the Chanukeya on eight consecutive nights, and by the warm smell of potato latkes -- potato pancakes -- coming from the kitchen. Coincidence? Probably not. The NIMH research suggests that it very likely is something about the time of year rather than the actual timing of historical events which dictate when these holidays of light occur. Historians tell us, for instance, that Christ was probably born at a time very different from when his birthday is celebrated. And who knows when during the year the true reclamation of the Temple from its desecration by the ancient Romans occurred, that historical event culminating in what oral tradition refers to as the Miracle of Lights

There are many who now believe that the most important reasons for festivals of light collecting cross-culturally in the trough of the year has more to do with the cycle of seasons than with true historical dates. According to this thinking, the more important reason for the holidays occurring when they do is to light up the spirits during the darkest days. Just as a cat tracks the moving slivers of sunshine across the brief winter days, frequently changing its sleeping place so it

remains with some sun on its fur, many people as well seek light of all kinds to keep their spirits lit; and they seek warm company, warm glowing fires and perhaps even warm liqueurs to push the winter's cold away. The literal and the figurative are not so far apart! It was only a step away, to think of treating SAD with lights that simulate broad daylight.

About light, depression and melatonin

According to my own research with just a handful of people, the first thing that changes with bright light treatment is energy level. People begin to report feeling less sluggish and less fatigued, and shortly thereafter report having more energy. They also report that colors begin to seem brighter and the world stops seeming as faded as it did when they were in the depths of their SAD experience. And then, and only after all this has occurred, does the actual depression begin to lift. Working backwards, we began to think that perhaps the feeling of depression came only after energy levels became depleted, and the sleep need increased. For some reason, it was being unable to function well because of the feelings of lethargy which seems to have led to depression. And so this turns us once again to light, but with a different kind of question. What does light have to do with sleepiness and sluggishness? Well, that's where melatonin may come in, if it comes in if at all.

The master biological clock

Here is our current understanding. We are biological creatures and in general the human race depends a great deal upon being able to see. When primates and then humanity were evolving, before electricity was discovered, of course, but also before the discovery of fire, we could not see well when it was dark out. What better time, then, to sleep; to find a safe place to hole up in and get rest so one's batteries could be recharged by sun-up for the next day's hunting and gathering And so it became necessary to synchronize our internal biological clocks to the light-dark cycle in the geophysical world so that we'd be alert by daylight, and become sleepy as the sun began to set.

In recent years, a small cluster of brain cells (i.e. neurons) dubbed the *suprachiasmatic nucleus (SCN),* has been identified as the master biological clock's probable site. Not surprisingly, in retrospect, one kind of information the SCN receives has to do with the amount of light coming in through the eyes. In fact its name simply means that it lies above (supra-) the optic chiasm (chiasmatic) -- the place in the brain where tracts of fibers originating at the retina of the left eye cross over fiber tracts originating from the right retina. That is, the master clock lies right above an important part of the visual system! With this visual information, the SCN is in a position to coordinate the rhythms of our inner world with the rhythm of the light-dark cycle in the outer world.

Where does the SCN send the information it receives about the amount of light or darkness Following a complicated pathway which involves a part of the nervous system called the Sympathetic Nervous System, the SCN eventually sends that information to a small gland at the base of the brain called the Pineal Gland. And it is melatonin, a hormone, that is produced by this gland. The amount of light seems to determine how much pineal melatonin is actually released from the pineal and secreted into the blood stream. The more light, the more release is

suppressed. The less light, the more melatonin the blood carries. Light suppresses melatonin release.

What does that mean for the changing seasons?

During those seasons when the photoperiods are long, in the spring and summer, melatonin secretion is at its lowest since it can only be secreted at a significant rate during the relatively fewer hours of darkness. On the other hand, the closer we move toward the winter solstice, the fewer hours of light there are each day and, correspondingly, the longer the period of time each day when melatonin can be released into the blood stream.

What does melatonin do?

Once melatonin is in the bloodstream, what is the result? There are no very, very clear answers right now, for this quite a new field of research. However, one result found over and over again is that melatonin indirectly causes body temperature to drop. And what does that have to do with loss of pep, loss of energy, with sluggishness and perhaps with eventual depression The answer to that is not completely clear either. However, it is instructive to know that when we fall asleep, our body temperature drops. We also know that a drop in body temperature, sleep, and high blood levels of melatonin go together. Perhaps we might one day discover that the elevation of melatonin blood levels brought about by the dousing of light at night, in its creation of lowered body temperatures, is the event which actually brings about sleep. Scientific evidence does not yet permit us to make that statement, but it is a good possibility to speculate on!

A way, perhaps, to conceptualize all this is in some respects we operate as if we were solar powered, at least where sleep and wakefulness are concerned. Light powers the battery, in part by preventing too much melatonin from entering the blood stream, and as light disappears, melatonin release begins and possibly plays a role in triggering sleep. Then, as the sun once again begins to rise above the horizon, melatonin release is once again slowed, body temperature rises, and the movement toward wakefulness begins. If all of this were true, then we would predict that as the nights get longer and melatonin is present more often in the blood, then the amount of time we spend either sleeping or feeling sleepy will also increase. We don't know why this is not true of everyone, for it definitely is not.

However, it does seem to be true of those who are vulnerable to SAD. A study published in the July 1994 issue of the journal Arctic Medical Research suggested that elevated daytime blood levels of melatonin might characterize those who are in fact vulnerable. They found that a decline in daytime levels of melatonin correlated with a decrease in carbohydrate craving in those affected by SAD. And that would make sense, since carbohydrates create instant energy and increase in body temperature. As melatonin levels decrease, and with it presumably the effect of decreased body temperature also begins to go away, the need to take in carbohydrates to heat yourself up if you choose to be awake when melatonin levels are "too high" would also go away.

Melatonin as a sleeping pill?

But if "too much" melatonin due to "not enough" daylight seems to be a characteristic of those with SAD, what is the possibility that taking melatonin pills will actually be a treatment for SAD? Essentially nothing is written about this. Most of the treatment for SAD which is actively discussed has to do with supplying bright, broad spectrum light with its associated effect of decreasing the amount of melatonin in the blood. I raise the issue of melatonin as a possible treatment for SAD largely because many people ask me about it. Right now, there is a great deal of publicity about the use of melatonin as a kind of sleeping pill, and from there some people come up with the question whether it might help other things that ail them as well, such as SAD.

Well, here's the basis for thinking of melatonin administered to the body in pill form (vs. the melatonin which the pineal itself produces) as a possible a sleeping pill. That idea, different from using melatonin for SAD, came from press coverage of work done at MIT, published in March of 1994. The researchers observed that very low oral doses of melatonin (0.1 to 10 mg.) administered at 11:45 AM, i.e. in the late morning when blood levels of melatonin generally are quite low, led to sleepiness and decreased alertness. They concluded that melatonin may be a very potent hypnotic agent, i.e. sleep inducer. From there, the idea caught on that perhaps taking melatonin pills at night could help people with insomnia. However, recognize if you will that the MIT group had administered melatonin in the daytime, when blood levels of melatonin are generally low. This is different from administering melatonin after dark, in the night, at bedtime, when melatonin levels should be spontaneously increasing.

And melatonin as a treatment for SAD?

Personally, I would recommend caution. A great deal of caution. Sleepiness in the daytime is not what a SAD person seeks. Perhaps there is something to using melatonin for SAD, because another effect orally administered melatonin may produce is to shift the timing of the sleep-wake cycle. So it is possible, but definitely not tested, that administration of melatonin at just the right time might shift the sleep-wake cycle enough so that sleepiness during the time of day when most people would like to be active does not occur. However, it could well go in the opposite direction and actually make the depression worse by adding to the already-existent lethargy and sluggishness in those affected by SAD.

The sleep-wake cycle: SAD, melatonin, body temperature

But, to sum things up, the most important association of melatonin to SAD, or Winter Depression, has to do with the relationship among blood levels of melatonin, body temperature and the sleep-wake cycle as related to the number of daylight hours. Melatonin appears to have some kind of important relationship to sleep-wake cycle regulation, possibly having to do with its effect of lowering body temperature. Falling asleep is associated with lowered body temperatures, and waking up (for most people, once the sun has come up) is associated with increasing body temperature. Melatonin is suppressed by daylight, so that in the spring and summer when the photoperiods are long, there is less time in a 24-hour period for melatonin to be secreted in the blood, and therefore less time for it to be involved in the lowering of body temperature. On the other hand, as we approach the winter solstice and the daylight hours grow shorter, melatonin has fewer hours of daylight to suppress it, and more hours when it can lower body temperature and possibly have some involvement in the triggering of sleep and perhaps

sleepiness. In turn this may offer an explanation of why in some people -- but not in others -- their moods drop as the number of sunshine hours per day drop, and their moods come back up again as we move toward spring, away from the shortest day of the year.

And here's to keeping light in our lives.

Tips for avoiding the winter blahs, blues, or SAD

- Pay attention to your moods and energy levels. If you realize that your spirits begin to sink at the end of the summer, take pre-emptive action. A good offense is better than after-the-fact defense.
- Plan active events for yourself in advance of the fall.
- Expose yourelf to as much bright light as you can. If it is a sunny day, go outside as much as you can. If it is grey and overcast, use as much light indoors as you can.
- Stay physically active, and begin your physical activity *before* the blahs get you.
- Try to establish a mental set that will help you to enjoy the wintertime. It is going to happen, so gear yourself to get pleasure out of it.
- By all means, if you feel yourself sinking and realize you are losing control, don't feel ashamed or try to hide it. You are in good company. Many people feel this way. Seek competent professional help. What you learn for this season is something you can probably do for yourself in all the falls and winters to come.

Bright light therapy (BLT)

- BLT is the most established treatment for SAD.
- BLT consists of looking at special broad spectrum bright lights from one-half to three hours a day, generally in the early morning hours. One should not stare directly into the lights because of possible eye damage.
- A substantial amount of light is needed, which means the distance from the lights to your eyes needs to be monitored---close enough to give you the best amount of light, but distant enough so you don't hurt your eyes.
- The timing and length of the exposure per day are highly individual.
- BLT is unlikely to help in certain situations because depressed mood is not always related to the decreasing number of daylight hours. Other possibilities are that you may have an ongoing depression, unlikely to be helped by BLT. Your increasing irritability may be due to your spending more hours in the house cooped up, isolated from friends and neighbors. Or it might be due to keeping your dogs or cats in the house more than you do in the summertime and spring. If you are allergic to cats and dogs, doing this will produce allergy symptoms, which can produce poor sleep, which in turn can produce the impression of SAD--but such a mood change then will definitely not respond to BLT. There are many other sources of depressed mood unrelated to light exposure.
- If a few days of a light trial don't make a difference in your depression, seek a different kind of help.
- Light sources are available commercially.

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Editor's note: Symptoms of depression should be taken very seriously. Proper diagnosis is essential to treatment. Where sleep disorders and seasonal factors are a possible factor (SAD, sleep apnea), you may need support and professional help. It should be clear from Dr. Lindsley's clear and incisive discussion that the use of bright lights therapy should be under the direction of a qualified professional. And that self-treatment with melatonin is not wise because of the risk and lack of sufficient information.

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