Don’t be SAD
How to regulate your internal clock, improve your health and your outlook on life.

By Tamara Mitchell

In autumn and we head into shorter days and watch the trees and plants prepare for the cold. In the depths of winter, the landscape is often bare and unwelcoming. When we go to work it’s dark and when we leave work it’s dark...and in between it's often cold and rainy or snowy. For thousands of people, winter is a time to dread because they suffer from Seasonal Affective Disorder. The symptoms of SAD are feelings of sadness, loss of energy, depression, fatigue, irritability, feeling withdrawn, a tendency to overeat or have food cravings, sleep excessively, and even thoughts of death or suicide. SAD is considered a type of major depression with a seasonal pattern that begins and ends at a specific time of year for at least two years. The diagnosis of SAD is done based on symptoms. There are no medical tests for it. December, January, and February when the days are shortest is the most common time, though there are a few people who experience SAD in the spring and summer months. There is a milder form of SAD called subsyndromal, or S-SAD known as “winter blues”. People who experience the Spring and Summer variety have somewhat different symptoms more related to agitation, insomnia, and even aggression.

Even if you don’t feel symptoms of SAD, nearly every cell in your body has a biological clock that regulates many biochemical and physiological rhythms. Disruption of the circadian rhythm affects many aspects of health. Inflammation, the immune system, cancer, blood pressure, hormone imbalances, and many other disorders and diseases are tied in an integral manner to the rhythms of the body.

By adapting our exposure to light/dark, our eating/fasting times, our activity/rest patterns, and potentially even temperature, noise, and social schedules, we can prevent disruption of the master clock and the other rhythms of the body.

There are other things we can do that don’t affect the biological clock, but they are known to help lift the spirits. A combined approach should help immensely and often doesn’t require pharmaceutical intervention.

Who gets SAD? The number of people who suffer from SAD is likely underreported and underdiagnosed because it can occur along with many other depressive disorders including bipolar, ADD, alcoholism, and eating disorders, and even decreased thyroid function. The following factors are known:

- Four times more women than men experience SAD.
- Onset is generally between the ages of 18 and 30 years old.
- People living farthest from the equator experience SAD.
  - In the U.S. 1% of people in Florida/9% in Alaska.
  - In Canada 15% get the winter blues/ 2-6% get SAD
  - In the U.K. 20% get the winter blues/2% get SAD
- People who do shift work and have limited exposure to sunlight more often experience SAD.
Depression, chronic inflammation, and stress.

The connection between chronic inflammation and depression is fairly well established, though causality has not been determined.\textsuperscript{5,6} Chronic inflammation differs from short-term inflammation which is a healthy response to injury to the body. Long-term inflammation is a systemic response where inflammation has become ongoing and long term. Chronic inflammation and depression are both linked to increased risk of heart disease, type-2 diabetes mellitus, osteoporosis, certain cancers, periodontal disease, arthritis, inflammatory bowel diseases, Alzheimer's disease, auto-immune diseases of many types, lung diseases.\textsuperscript{6,7,8}

Recently, several studies have found that even moderate depression results in a prolonged elevation of interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), key markers in the body's response to disease or injury and indicators of inflammation.\textsuperscript{5,9,10,11} One study found reduced levels of transforming growth factor-beta (TGF-β) which is an anti-inflammation marker.\textsuperscript{5} Comparison of males and females found no difference in the levels of these markers.\textsuperscript{5}

Chronic inflammation is a serious problem if you are suffering from Repetitive Strain Injury (RSI) because it affects nerves, organs, connective tissues, joint, and muscles.\textsuperscript{7} Whether depression is responsible for releasing compounds affecting the inflammatory response or whether inflammation releases compounds that result in depression is unknown, but there is a definite connection. Clearly, if someone is suffering from a chronic illness, depression is often a response to the loss of ability to do all the activities of the past, the necessary treatments required, or a feeling of hopelessness with a poor prognosis.\textsuperscript{8} By taking measures to reduce inflammation and also to reduce depression we should be able to better control symptoms of RSI.

Disruption of the circadian rhythm affects gut permeability and inflammation among other things, but the permeability of the intestine is also affected by other factors such as stress hormones or thyroid hormones that respond to irregular sleep times.\textsuperscript{7} The intestinal lining is damaged when there is repeated increased permeability or leaky gut syndrome. It becomes difficult to process nutrients in food, more partially undigested food, toxins, viruses, yeasts, and bacteria enter the bloodstream and the body responds with inflammation, allergic reactions, and other responses as it attacks these foreign substances.\textsuperscript{7} For these reasons, keeping stress levels low, eating regularly, and managing SAD symptoms can help break the cycle of inflammation and depression that leads to many debilitating health issues.

The master clock and the effects of light.

The SCN. The body's internal clock, the circadian system, is regulated by a tiny cluster of neurons at the base of the brain called the suprachiasmatic nuclei (SCN).\textsuperscript{12,13} These are located just above the path that carries light and dark signals to the brain, so they
are different from the visual pathways and the light signals to the SCN cannot be perceived.\textsuperscript{12} It is hard to believe that something we aren’t aware of is so powerful. The SCN is continuously monitoring light input and in any 24-hour period, the internal clock may be shifted earlier or later depending on this light input.\textsuperscript{14} It has been found that a single pulse of light can move the internal clock forward or back with two times of day having the strongest effect: late evening/early night, and late night/early morning.\textsuperscript{14} In addition to the separate pathway for light to travel to the SCN, the eye itself has a mechanism to regulate a chemical called melanopsin that activates certain cells in the retina that send the light signals to the SCN.\textsuperscript{15} Even in blind animals, the internal clock is set by exposure to light, so this mechanism in the eye continues to operate even in the absence of vision.\textsuperscript{15} So, the eye itself has an internal clock that regulates how big a response there will be to light over a 24 hour period and that is likely the reason why a single pulse of light at certain times of day can so powerfully shift the circadian rhythm.\textsuperscript{15}

The SCN controls the clocks of almost every cell in the body.\textsuperscript{16} The SCN control is the master clock of the body, but there are peripheral clocks in the tissues and organs of the body that regulate those systems and can be adjusted independently from the master clock by various stimuli.\textsuperscript{17,18}

In mammals, there two interlocking feedback loops that control the circadian clocks.\textsuperscript{19} There are factors carried by the blood that fine tune, stabilize, or adjust the components of these feedback loops.\textsuperscript{19} These factors are proteins or groups of proteins called transcripts and thousands of them have been identified in different organs and tissues.\textsuperscript{19} Some tissues have only a few hundred transcripts while others have a few thousand, but regardless of the number, they all serve to regulate the cells by sensing nutrients, affecting detoxification, stress response, immune response, cellular communication, and much more.\textsuperscript{19} The genetic coding of cells determines the basic function of the cells, but the circadian rhythm regulates the overall health of the cell and can either promote health or increase the risk of disease and aging.\textsuperscript{19} Susceptibility to pathogens or diseases, movement of white blood cells, and the activation of the immune system have all been fairly recently shown to fall under control of the circadian system.\textsuperscript{16}

**Circadian rhythm disruption.**

**Lighting disruption.** Disruption of the circadian cycle or abnormal lighting schedules make way for decreased health and increased risk of various disorders and diseases.\textsuperscript{16} Today, people use electrical lighting at night that suppresses melatonin and delays sleep onset, we often work indoors with lower light levels than normal daylight, and at the same time work often demands that people rise early. The amount and quality of sleep today is often less than in earlier societies.\textsuperscript{19} Two other factors that modify rhythms in some cells are eating/fasting cycles and activity/rest cycles.\textsuperscript{17,20}
Research has shown that circadian rhythm disruption is linked to gastrointestinal disease, irritable bowel syndrome, Crohn’s disease, increased risk of colorectal cancer, acceleration of disease onset, increased inflammation, mortality, and worsened damage done by disease.\textsuperscript{4,21} Chronic circadian rhythm disruption also leads to abnormalities in the reproductive system including irregular menstrual cycle and increased risk for miscarriages.\textsuperscript{19} Research also shows that disruption of circadian rhythm increases gut leakiness or permeability, particularly in the colon section of the intestine, which leads to many gastrointestinal problems and is also associated with many diseases including metabolic syndrome, diabetes, cardiovascular disease, ALS, Parkinson’s disease, and alcoholic liver disease.\textsuperscript{4,19,21} When alcohol is consumed, it also increases the permeability of the intestines. Research has shown that both disruption of circadian rhythms of the body and/or consumption of alcohol result in increased gut leakiness and liver disease.\textsuperscript{4}

When gut leakiness is increased due to circadian rhythm disruption, absorption of pro-inflammatory bacterial substances in the gut is increased and these toxins are circulated throughout the body through the bloodstream.\textsuperscript{4} Metabolic disorders, liver, cardiovascular, and neurodegenerative diseases are all linked to increased gut permeability. These problems are commonly reported in shift workers and people who travel and adapt frequently to different time zones.\textsuperscript{4}

There is a circadian rhythm associated with the immune cells released from the bone marrow and the regulation of the immune response in response to injury.\textsuperscript{19} The circadian clock regulates acute inflammation required for repair of tissues in an acute injury, but in cases of circadian rhythm disruption, there may be an impaired or excessive immune response that may lead to chronic inflammatory diseases, reduced response to vaccination, and increased susceptibility to infectious diseases.\textsuperscript{19}

Although circadian rhythm disruption was previously considered to be a problem for shift workers, new data on lifestyles indicates that up to 80% of the entire population may be living with a chronically disruptive life schedule and exposure to light at night, so a great many people are at increased risk for all of these associated chronic diseases.\textsuperscript{19} The disruption included not only sleep cycles, but eating and fasting cycles.
Does the wavelength of the light make a difference? Light at the blue end of the spectrum is more effective in activating the circadian system, but repeated research has found that even warm white or soft white light has enough blue light to do a good job of setting the internal clock. Lights sold with promises of more blue light or full spectrum light are unnecessary and they are often quite harsh on the eyes and have shown no particular advantage from a therapeutic standpoint. Tanning lights and tanning beds are absolutely NOT recommended for light therapy as they expose people to dangerous levels of ultraviolet light.

Night time exposure to light at the blue end of the spectrum at night such as looking at computers, light emitting reading devices, or TV, or exposure to LED or fluorescent lighting is likely to not only shift the internal clock, it suppresses melatonin more than light in any other part of the spectrum which also alters the circadian rhythm. Even dim light from a table lamp can alter the circadian rhythm and melatonin production which disrupts sleep and is associated with depression, diabetes, and cardiovascular problems.

There is a very nice little application that can be downloaded to just about any computer, laptop, phone, tablet, or other electronic device. It is then customized to your daily schedule and location on the planet so that it alters the display output to reduce interference with your melatonin production so you’ll sleep better and the light won’t interfere with your biological clock.

If you have exceptional problems with sleeping, you might try wearing blue-blocking glasses in the evening, but do not wear them in the morning or during the day. Use dim red lights as night lights. If you work night shifts, consider wearing blue-blocking glasses (or clip-ons) during your shift if possible. Many automobiles have dash lights that are at the blue end of the spectrum or they are LEDs. Dim the dash lights so they are not at their maximum brightness if you need to drive at night.

Avoid night usage of light-emitting electronic devices or use the f.lux application. Use red night lights with low blue component.

Picture courtesy of Ref. 23

SomniLight Red Night Light – Amazon.com
Wear blue-blocking glasses in the evening, especially when using light-emitting electronic devices.

Dim your dash lights, especially if they are blue.

Melatonin (sleepy hormone).

Melatonin is a hormone secreted by the pineal gland and is a sleep facilitator. The SCN acts like a time clock. The SCN sends an “ON” signal to the pineal gland a couple of hours before it is time to go to sleep, so the pineal gland starts secreting melatonin. The SCN sends an “OFF” signal to the pineal gland somewhat before we wake up in the morning. The pineal gland stops secreting melatonin, levels drop in our system, we wake up, and melatonin is not produced again throughout the day. Bright light immediately suppresses the production of melatonin. During the time of year when days are shorter, light exposure is less and the internal clock gets adjusted so melatonin is secreted for more hours. Although higher levels of melatonin may cause a person to be drowsy or want more sleep, it doesn’t account for the symptoms of SAD alone. We will discuss taking melatonin in more depth later, but over-the-counter melatonin pills are many, many times greater than the amount secreted by the pineal gland and may prove to be either ineffective or, in the case of timed-release melatonin, it may cause drowsiness into the next day.

Serotonin (happy neurotransmitter).

People with SAD have difficulty regulating the neurotransmitter believed to balance the mood, serotonin. As sunlight decreases in fall, serotonin levels decrease because the protein responsible for assisting the transport of serotonin (SERT) is increased. People with SAD were found to have 5% more SERT than the average person in one study. With less sun exposure in winter, people produce less Vitamin D which is also associated with serotonin activity. Low levels of Vitamin D are associated with clinical depression.

Decreased serotonin and increased melatonin work together to alter the body’s internal clock or circadian rhythm and it has been found that people with SAD have more difficulty adjusting their day length timing.

So it is felt that there is some connection between all of these things, serotonin, melatonin, and Vitamin D, in the occurrence of SAD, but more research is required. All are affected by exposure to sunlight or
bright light. Both serotonin and melatonin are synthesized from the amino acid tryptophan which is an essential amino acid, meaning that it must be consumed in the diet and cannot be created by the body.27

**Bright light therapy**

At the top of the list of effective treatments for SAD, use of light boxes has been shown by some studies to be as effective for SAD symptoms as some antidepressants, without the side effects of pharmaceuticals. In fact, research has found bright light to be effective in treating depression of many types, attention deficit disorder, general cognitive performance, mood improvement, and may slow cognitive decline in the elderly. CET202 The following characteristics are very important when buying a light. 1,2,3,13,28,29,30 Do not attempt to build your own light box, even though it seems simple.13 All of the variables below need to be correct and tested, including safety of the device. Doing it wrong can be dangerous or ineffective.

- 10,000 lux exposure
- UV filtering
- Smooth diffusion of the light provides even illumination without glare. Avoid lights without diffusion or with prismatic diffusion.
- Sit near the light at an angle so that it reaches your eyes indirectly.
- The light should be 30° or more above the line of sight similar to sunlight. There are many small boxes available that are intended to sit on the desk, but they are generally below eye level and can cause eye strain, headaches, etc. If one of these is purchased, the unit should be raised above eye level (perhaps placed on a shelf above the head) and aiming down toward the eyes.
- A larger light box is better because it ensures that the eyes are within therapeutic range when you move your head and it floods both eyes.
- Follow the manufacturer’s instructions. The light must be close enough to your eyes to be effective. If it is placed too far away, it will not be strong enough to be effective.

**Carex Day-Light Classic Plus Bright Light Therapy Lamp.** $115 from Amazon (Prime)

The time of day light therapy is used makes a difference. Light therapy is most effective immediately upon waking.31 This corresponds to 2 ½ to 3 ½ hours after the midpoint of the person’s sleep cycle. If someone is sleeping longer than 8 hours, they need to get up earlier and use the bright light therapy earlier to shift their internal clock earlier.31 This whole issue goes far beyond treatment of SAD, however. It also has critical implications on the most effective timing for taking many medications so that they correspond to the person’s biological clock rather than the clock on the wall.31

Start with 10 to 15 minutes of light and add a bit every day. Some people require less time and starting off with too much exposure can be problematic. Light exposure in the morning from early fall until spring, can be very effective in just a few days, but may take two weeks or more. It is fine to read, eat, or
do other activities while using the light box. Do not look at the light directly because it can damage your eyes. Certain medications and supplements can make your skin or your retinas more sensitive to light. People with lupus, a history of skin cancer, or eye issues such as cataracts, glaucoma, retinal detachment, and retinopathy should consult a health care practitioner before using light therapy. Some ophthalmologists have warned that light in the blue end of the spectrum could damage the retina and you may find that the bright light bothers your eyes. Blocking most of the blue light with blue blocking glasses when using a light box will result in filtering out the most beneficial light rays. Light boxes these days filter out harmful UV rays, so it is best to try to adapt to the light from the light box even though it seems bright. Do not use the light box in the evening. Use it only in the early morning hours to set your circadian rhythm to a normal daylight clock.

Getting outside more or sitting by a sunny window may help some people with SAD. If symptoms are really severe it may be best to move to a location closer to the equator or at least spend the months that prove problematic in a more southern location.

It should be noted that not all SAD is a result of circadian phase delay. Some people fall asleep too soon after the melatonin onset and the clock needs to be shifted earlier. Melatonin onset varies by up to four hours depending on the individual.

Dawn and Dusk light simulators. Clinical dusk and dawn simulators are still undergoing research and testing, but so far it is quite promising in both inducing sleep at the desired time, waking at the desired time, and successful lifting of severe depression. Most units currently on the market are very small, dim, and unlikely to be effective at all. Simple on/off timers could be used to plug in a bright therapy light, but they don’t gently ramp down and up the lighting, so that will not achieve the desired gentle fading of light or increase of light. There is one light that is now produced for the Center for Environmental Therapeutics and is available through their website. The color balance changes with the time of day and the light outputs 500-1000 lumens, so it is bright, but not as bright as a therapy light. The light is still fairly small, but it is effective. It should be aimed toward a wall for indirect light rather than exposing the face to the intense LED lights. Available at: https://cet.org/product/smart-lamp-dawn-simulator/

Meal time, diet and supplements

There are other mechanisms for setting our internal clocks in addition to light exposure. Eating times operate through the liver to set the clock, but it is not the master clock controlled by the SCN. Research has shown that rodents who have continuous access to a calorie-dense diet eat randomly and spread their caloric intake over 24 hours rather than eating at night as mice with regular non-fattening food do. Random eating disrupts the circadian rhythm of the metabolic processes. Controlled eating times appears to operate independently from the SCN and the light/dark stimuli. Mice who were fed for just 4 hours during a 24 hour period during the light portion of the day increased wheel-running activity several hours before feeding time (in the dark) and the release of liver enzymes was shifted 10 hours by the body in just two days. Mice don’t normally eat in daylight hours, so this schedule was disrupting to their natural body rhythms. When feeding time was increase to 8 hours, wheel-running activity was significantly reduced and the liver enzymes showed a 12-hour shift.
after 7 days of the 8-hour feeding regimen. Apparently reducing food availability on a forced, unnatural schedule increased stress levels and resulted in greater activity and quicker shifting of the liver’s rhythm.

The rhythm of the liver may be in response to several signals such as the taste of food, the distension of the stomach, the nutrients released by the food, or the change in insulin levels. More research is needed to understand how the rhythms of the liver operate and whether they are primarily under the control of the SCN or whether they are influenced more directly by the environment. Research has shown that, at least in mice, the size of the liver, size of cells in the liver, RNA levels, and production of proteins by the liver all increase significantly during the feeding cycle of mice (which is during the dark phase or night, since mice are nocturnal) and decrease during the day and non-feeding part of the cycle. The interesting finding, however was that this change in liver size did not occur when the mice were fed during the day or light phase of the cycle. Diurnal changes in liver size have been observed in other species also, specifically humans and hummingbirds. The feeding/fasting cycles appear to play a more important part than the master circadian clock controlled by the SCN in the process of producing proteins in the liver. The details of this process and how it interacts with the light/dark cycle are not yet well understood. Production of proteins is stimulated by feeding regardless of the light/dark cycle. This whole mechanism is quite different from other cells in the body.

There is also evidence that feeding and fasting rhythm is important in maintaining healthy bone tissues through the bone circadian clock.

With this preliminary knowledge, we suggest that regular meal times may be fairly important in maintaining healthy biological rhythms of the digestive system and may also indicate appropriate timing of medications.

**Melatonin.** Use of over-the-counter melatonin supplements needs to be approached with caution. The dosage of most melatonin supplements is many times greater than the amount released by the pineal gland. Research has shown that a very tiny amount of melatonin mixed into particles that result in timed release over several hours works well to bring on sleep and keep people asleep throughout the night, yet allows the hormone to wash out of the system before morning. The pill is taken about 6 hours before the desired sleep time, which is about four hours before the pineal gland normally starts secreting melatonin. Microdose melatonin is still undergoing research and testing, so is not available for use, but if you email the Center for Environmental Therapeutics and let them know you are interested, they will keep you updated on its availability: melatonin@cet.org. Until this is available, it is probably best to avoid commercially available melatonin pills due to their heavy-handed approach to this hormone, or use timed-release melatonin and try using just a tiny part of a pill.

**Tryptophan and 5-HTP.** Serotonin is synthesized by the body in a 2-step process from the amino acid tryptophan. Melatonin is synthesized from serotonin. Serotonin is more sensitive to diet than any other neurotransmitter in the brain. Carbohydrates can increase the levels of tryptophan in the body and they trigger the release of insulin which causes the body to absorb all amino acids except tryptophan. As a result, tryptophan remains in the bloodstream until it crosses into the
A lack of tryptophan in the diet and a diet too full of sugar, white bread, refined carbs, etc. may result in not only a lack of serotonin, but an imbalance with melatonin, both of which are important in keeping a positive mood, regulating sleep cycles, and preventing depression. Avoid simple carbohydrates like white rice, white bread, sugar, and honey that can and associated mood swings. Simple carbs can increase the levels of tryptophan in the body caused by spikes in insulin levels and as a result, all amino acids in the blood except tryptophan are absorbed. Substitute the good carbs found in veggies, fruit, and beans for sweets and refined starches. Keep healthy snacks on hand such as fruit, veggies, cheese, nuts, deli meats, peanut butter, and popcorn. Avoid caffeine or consume it moderately only after eating.

Diet is always preferable to using supplements when trying to improve imbalances, though supplements for both 5-HTP (5-hydroxytryptophan) and Tryptophan are available. People with heart problems should definitely not take 5-HTP supplements and they should not be taken by anyone for more than a few days. There is some indication that people with SAD have low levels of 5-HTP, but more research is needed. The problem with taking these supplements in an attempt to remedy depression and/or sleep problems is that low levels of serotonin and melatonin may NOT be the source of your problems. Interestingly, it should be obvious fairly quickly because if a person has tryptophan depletion, mood should improve a lot when it is provided. If there is not a deficiency in tryptophan, mood will not be affected. Providing the building blocks will only be helpful if your body is deficient in them and it is so much better to simply eat a diet rich in the healthy foods that will naturally provide the needed nutrients. Eat foods rich in tryptophan, primarily meat, fish, and soybeans. Other good sources include dairy products, seeds, nuts, and beans.

Vegetarian diet. One study found that vegetarians have three to four times the occurrence of SAD. Cause and effect is not implied, but there is an association between a meatless diet and SAD and poorer mental health in general. There are commonalities between the diets of people with SAD and vegetarians, specifically they both eat more carbohydrates that the average person. Vegetarians are actually healthier than the average person, while people with SAD tend to have dysfunctional eating habits, appetite and seasonal weight issues, and body dissatisfaction. Research found that SAD was a predictor of vegetarianism and that vegetarianism showed a significant relationship to seasonal loss of energy. Since meat and fish are excellent sources of tryptophan, it is possible that this essential amino acid is in short supply in vegetarians. People who do not eat animal food are also often at risk for low levels of Vitamin B12 which is associated with feelings of fatigue since it is required for the production of red blood cells which carry oxygen in the blood.

Fish oil/Omega-3 fatty acids. The theory that low levels of Omega-3 fatty acids in comparison to Omega-6 fatty acids started in 1996 and a rigorous population study has since found a statistically significant negative association between fish consumption and depression, meaning that low fish consumption is associated with higher levels of depression. Other studies have found low blood levels of DHA and EPA in depressed patients. There are many different theories as to why Omega-3 fatty acids may affect depression, but more research is needed to understand the mechanism.

Some studies have shown a significant decrease in depression even in very low doses of Omega-3s during a month period, while others have found no significant effect. Unfortunately, brands, doses, and balance of EPA/DHA have varied widely as have populations being tested, so it is very difficult to determine if it is effective as a treatment. It is quite possible that people who are seniors, people who have cancer, and people who are diagnosed with clinical depression with no physical ailments react differently to this treatment. What appears to be the bottom line: lower doses of pure EPA or supplements with at least 60% EPA appear to be more effective. One study looked at doses of pure EPA of 1 g, 2 g, or 4 g. It found that the lowest dose of 1 g was the most effective in reducing depression. Although dietary consumption
of fish high in Omega-3s should help, it has been found in one study that people who ate very high amounts developed an increased risk for mental illness.\textsuperscript{42} This is possibly due to the high levels of mercury found in fish which causes neurological damage.\textsuperscript{42} Most fish oil, krill oil, or green lipped mussel oil supplements are of pharmaceutical grade and purified, so this is one case where supplements may be a better choice than whole food consumption.

Bottom line, taking Omega-3 supplements is associated with lower chronic inflammation, eating a diet with a healthy ratio of Omega-3 to Omega-6 fatty acids is also critical in lowering chronic inflammation. We don’t know why they seem to help reduce depression in some cases. Eating a proper diet high in fatty fish, taking supplements, or a bit of both if you are depressed or suffer from SAD cannot hurt and it might help.

\textit{St. John's Wort (Hypericum perforatum).} Use of this herb has long been used in folk medicine to treat depression. In Germany, it is the most commonly prescribed antidepressant agent.\textsuperscript{43} It has now been shown through clinical trials to be similar or more useful than Prozac as an antidepressant and useful in cases of SAD.\textsuperscript{3,43} Hypericum treatments lower the amount of light necessary to obtain a therapeutic effect, making normal daylight as effective as intensive light therapy when incorporated with St. John's Wort treatments. A typical dose is 300 mg of an extract standardized to 0.3\% hypericin 3 times daily should become effective in about 8 weeks.\textsuperscript{3} St. John’s Wort has a low incidence of adverse reactions and is quite safe in most cases.\textsuperscript{33} There are different formulations of St. John’s Wort, some available only through prescription and interaction with other pharmaceuticals is possible, so follow the instructions of a physician or pharmacist when taking this herb.\textsuperscript{44}

\textit{B Vitamins (including folic acid)} work directly with your nervous system, so they play a direct role in emotional wellbeing and mental health.\textsuperscript{45} A good diet with plenty of proteins, fruits and vegetables, whole grains, and healthy fats generally provide enough B-complex vitamins.\textsuperscript{45} A lot of foods are fortified with B vitamins such as breads and cereals.\textsuperscript{45} If your diet is less healthy, if you drink a lot of alcohol, or you have kidney disease, B vitamin supplements may be helpful in beating depression.\textsuperscript{45} Low levels of B vitamins in general are associated with depression and behavioral changes, so a multivitamin containing high dose of all B vitamins should be considered.\textsuperscript{45} B vitamins are water soluble, so your body eliminates excess through the urine and side effects are rare.\textsuperscript{45}

When combined with antidepressant pharmaceuticals, B-complex vitamins can help effectiveness.\textsuperscript{46} Short-term use of B vitamins wasn’t found to improve major depression in adults taking citalopram, but long-term supplementation was found to have significant positive effects on the reduction, remission, and prevention of clinical depression.\textsuperscript{46} It should be noted that a placebo also achieved significant remission just slightly lower than treatment with B vitamins, so results are difficult to interpret.\textsuperscript{46}

\textit{Vitamin D.} About 25\% of the population is deficient in Vitamin D.\textsuperscript{47} Most people use sunscreen, many work indoors during daylight hours, we are told to avoid sun exposure, and during the dark winter days, the sun is generally low in the sky and available for fewer hours, so it is not possible for most people to naturally generate enough Vitamin D from the sun.\textsuperscript{47} A review of 14 studies and 31,424 participants found a strong direct correlation between depression and low levels of Vitamin D.\textsuperscript{47} The lower the level of Vitamin D, the greater the chance of depression.\textsuperscript{47} Levels of Vitamin D have been found to be low in people with SAD and some studies showed positive effects from taking Vitamin D supplements, but the research is mixed.\textsuperscript{2,32} It is easy to be tested for your Vitamin D level and if it is low, supplements would likely be helpful even for people not dealing with depression. The amount of Vitamin D required needs to be determined from a blood test.
**Activity and exercise.**

*Exercise* is always beneficial to deal with depression. Exercise uses other pathways than the SCN to set the internal clock. Exercise has significant effects on circadian rhythms partly by entraining skeletal muscle clocks. A sedentary lifestyle may contribute to circadian rhythm disruption.

Exercise not only helps to regulate cardiovascular functioning, but also influences and regulates hormones, blood pressure, and heart rate which certainly affects overall health. Regular exercise and the associated resynchronization of the circadian clock and hormonal regulation, result in improved sleep quality, lower heart rate, lower blood pressure. The duration, time of day, and intensity of exercise required to alter circadian rhythms has not yet been determined, but preliminary research with mice has found that even low-intensity endurance exercise over four weeks is sufficient. Research also suggests that metabolic processes within bone is regulated by circadian rhythm, so the healthy maintenance of bones and bone remodeling is dependent upon healthy a biological clock. Other research indicates that low intensity exercise doesn’t regulate circadian rhythm of bone resorption or metabolism in women, though moderate to high intensity regular exercise may affect bone health positively through factors associated with circadian rhythm.

**Other factors affecting SAD and biological rhythms.**

Other agents probably affect biological rhythms, including factors such as environmental temperature, noise, and social cues signal the body and can work to train the internal clocks in our cells. Much more research is needed to understand the effect of these other factors.

**Therapeutic Factors Reducing Depression**

The following factors have been shown to reduce depression, but do not affect the biological clock. In an integrated approach to dealing with SAD, S-SAD, and other depressive states, it may be helpful to consider adopting one or more of these therapeutic measures.

**Negative ions.**

When the air is suffused with negative ions, all types of pathogens such as smoke, dust, pollen, molds, pet dander, etc. clump together and fall to the floor or they take on a negative charge and attach to grounded surfaces. Electric storms, ocean waves, and negative ionizers all work to relieve people of these numerous sources of allergy, headache, lethargy, and depression. One double-blind study has found that the use of high-density negative ionizers with people experiencing SAD had the same amount of improvement as bright light therapy. Mood, energy, work productivity, sleep quality, and even libido was improved for all of these people. People with chronic depression were also tested and they also experienced very positive results. More research is needed. The reason negative ions seem to work has not been identified, but there is enough evidence to indicate that negative ion therapy is another very promising way to combat both SAD and general depression. Timing of the use of negative ions doesn’t appear to be important as it is with bright light therapy since it is not affecting the biological clock. Most ionizers on the market are too small and lack power to be effective. The units used in laboratory testing were high-density negative ionizers. The Center for Environmental Therapeutics sells a unit which is rather pricey, but it is effective. [https://cet.org/product/naturair-ionizer/](https://cet.org/product/naturair-ionizer/)

There is a very small risk of producing hypermania, so individuals should monitor their response to the use of the negative ionizer and back off if agitation occurs. Some ionizers produce quite a bit of ozone, which is undesirable and has a distinct odor. If ozone is detected, the ionizer should be used with opened windows and doors to increase air circulation.
Using a negative ionizer simultaneously with bright light therapy should probably be avoided since the negative ions will be attracted to the light box ground if it is nearby. Some units are actually sold combining the two technologies. More research is needed, but if both bright light and negative ion therapy are used, they should be used at separate times of day.

**Psychotherapy.** Cognitive Behavioral Therapy (CBT) is effective in dealing with SAD and it may be even more effective than light boxes. By identifying negative thoughts and replacing them with positive thoughts people with SAD can develop a more positive outlook. Another technique called behavioral activation helps to identify activities that they find interesting, engaging, and pleasant and engage in them to improve the outlook on winter.

**Positive emotions: Gratitude, Awe, and Wonder.**

Taking the focus off one’s self, fostering a feeling of being a small part of something greater and a feeling of interconnectedness, and engendering feelings of humility, value, and security are all ways that appear to increase feelings of satisfaction, well-being, generosity, and happiness. Gratitude, reflecting on things we are grateful for, keeping a gratitude journal have been studied and have shown consistently to be associated with an increased sense of well-being, to directly foster social support, happiness, and may be associated with reduced psychopathology. In one study, people were asked to keep a daily journal of things they were grateful for, daily irritations, or simply account events that had happened. After 10 weeks, the people who had written daily about gratitude were more optimistic, happier with their lives, and even had fewer visits to the doctor. Gratitude makes you appreciate what you already have instead of reaching for something you don’t have that you believe will make you happy. Thank people verbally, with a thank-you note, or mentally, keep a daily gratitude journal, identify 3-5 things every week that are blessings in your life, pray or meditate to reflect on the moment and things you are grateful for.

The concept of awe has been studied only recently with regard to psychological reactions, but generally, experiences of awe are self-transcendent, they shift attention away from ourselves, make us feel like we are part of something greater, and they make us more generous toward others. Experiences of awe can be positive or negative (threatening), but they have the quality of vastness, often mystical, often transformative in a very lasting sense. In fact, awe is regarded as a core element of transformative change. Experiences of awe usually require that our usual concept of the world must shift or expand because they don’t fit into our way of understanding the world. A positive experience of awe may occur in the presence of a great person, a beautiful natural scene, an amazing work of art, etc. Most recently, a more nuanced definition of awe has been examined because it is such a complex construct. There are sometimes quick moments of awe, but there also deeper times of awe that are not actually emotions, but are experiences. Virtual reality has been used to recreate this deeper experiential aspect of awe in the laboratory and it may prove to be a great way to provide repeated experiences to patients of many types, but in our case, to foster a feeling of well-being that is difficult to achieve in those who are experiencing depression.
One study looked at the effect of seven different positive emotions and their effect on inflammation. Awe was the only emotion that was associated with reduced levels of interleukin-6 (IL-6), which is associated with inflammation and all of the associated inflammatory diseases and conditions.\textsuperscript{48}

**Pharmaceuticals.**

Antidepressants may be prescribed in severe cases, but research has shown that use of Prozac (Fluoxetine) alone is not more effective than a placebo in Nonseasonal Major Depressive Disorder.\textsuperscript{55} A combination of treatments including both bright light therapy and Fluoxetine showed the greatest improvement in Montgomery-Åsberg Depression Rating Scale (MADRS) over the 8-week trial, while light therapy alone showed a significant improvement in this measure of depression.\textsuperscript{55} So, while light therapy alone works well for most people, some do not respond and in such cases, addition of Prozac may be helpful in cases of severe depression and probably also in cases of SAD.\textsuperscript{55}

There are other pharmaceuticals such as citalopram that are prescribed in cases of depression. If the other measures in this article are not effective in relieving symptoms of SAD, a multifaceted approach is warranted.

U.S. prescription-related drug mortality rates from use of antidepressant medications rose by 130\% from 1999 to 2003.\textsuperscript{43} Herbal medicine has been found to be 10 times safer than synthetic antidepressants and are limited primarily to skin reactions and gastrointestinal upsets.\textsuperscript{43}

This article and all of our articles are intended for your information and education. We are not experts in the diagnosis and treatment of specific medical or mental problems. When dealing with a severe problem, please consult your healthcare or mental health professional and research the alternatives available for your particular diagnosis prior to embarking on a treatment plan. You are ultimately responsible for your health and treatment!

**REFERENCES:**


