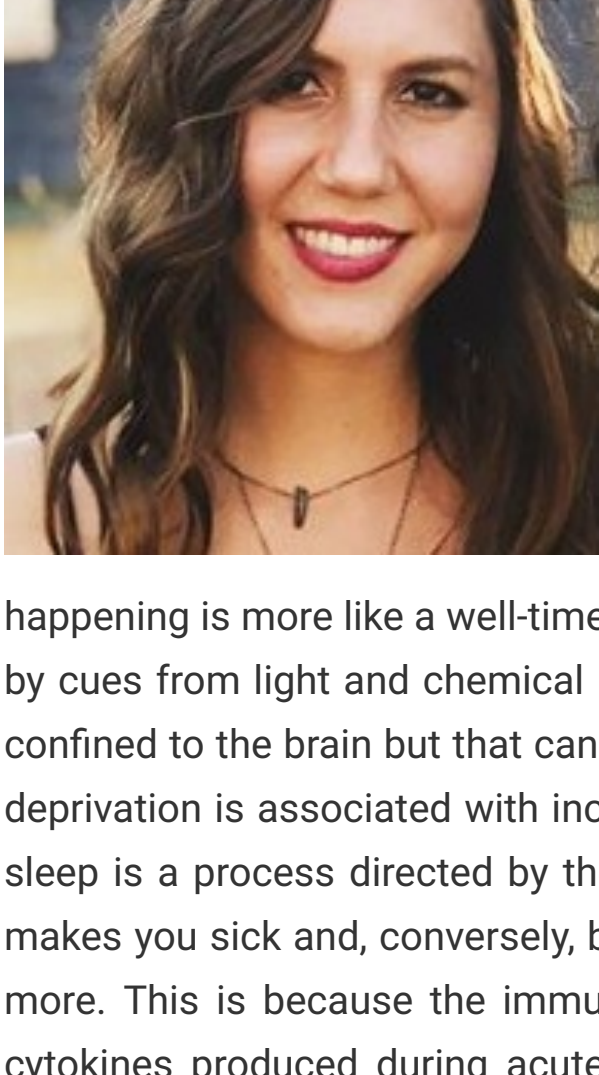
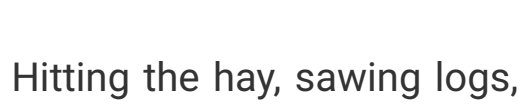


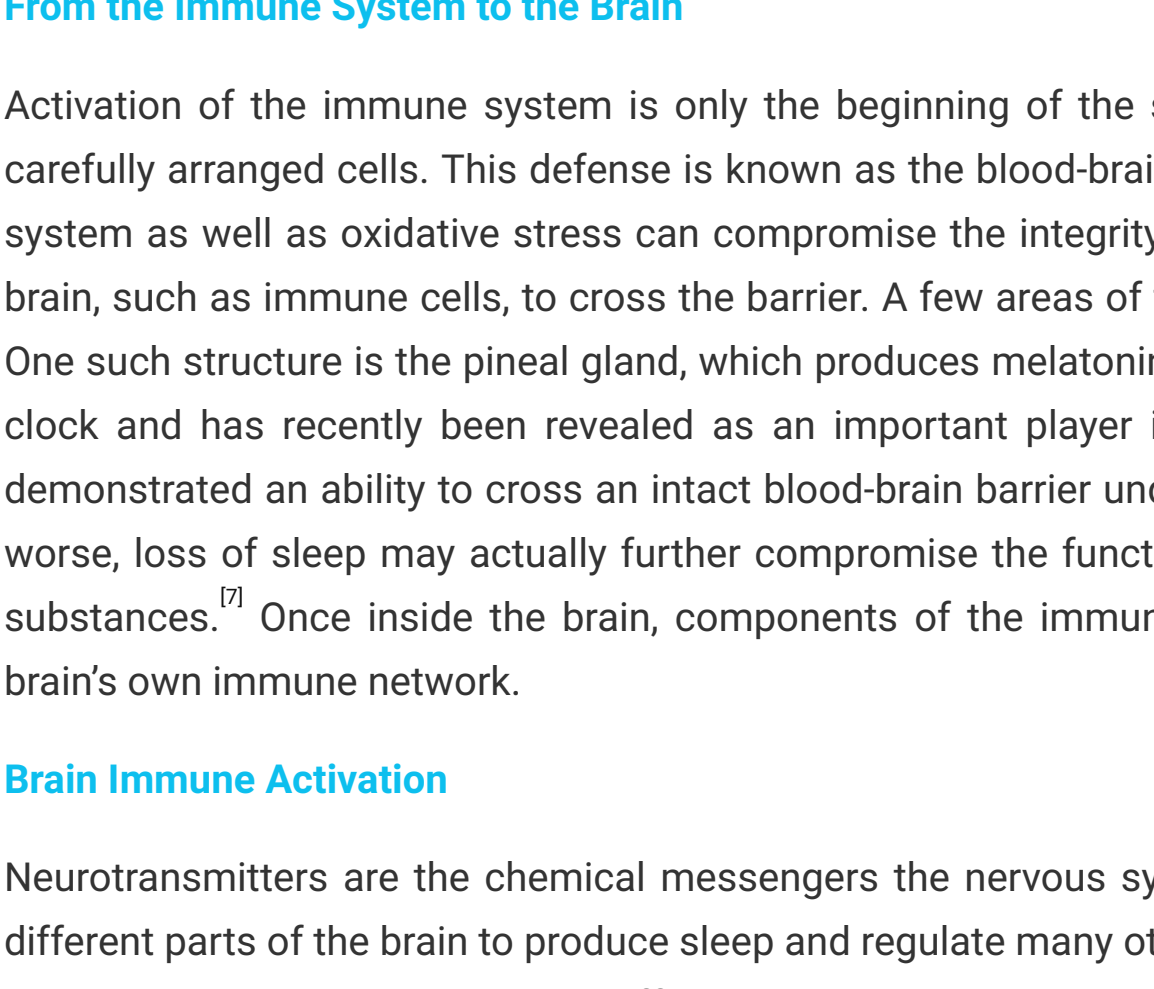
Sleep and the Immune System - Naturopathic Perspectives



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Hitting the hay, sawing logs, catching ZZZs—these are terms we use to describe sleep, but what is happening is more like a well-timed orchestra performance. Areas of the brain work in concert; some turn on and some turn off, directed by cues from light and chemical messengers called neurotransmitters. However, recent research suggests that sleep is not a process confined to the brain but that can receive input from the entire body, most prominently through the immune system. The fact that sleep deprivation is associated with increased risk of high blood pressure, obesity, diabetes, depression, and early death is the first clue that sleep is a process directed by the entire body.^[1] The role of the immune system is suggested by research revealing that not sleeping makes you sick and, conversely, being sick causes you to sleep. Think about having the flu. When you are sick, you feel tired and sleep more. This is because the immune system, like the nervous system, produces its own chemical messengers called cytokines. The cytokines are produced during acute infection cause you to feel sleepy. It turns out that this is true for acute and chronic infections. Invading pathogens like viruses, bacteria, or fungal species carry markers that activate the immune system and begin a cascade of chemical messengers that increase the need for sleep, promote fatigue, and decrease sleep quality. Infections, however, are not the only health conditions to interact with sleep via the immune system. Narcolepsy, for example, has been suggested to be an auto-immune disease, as it is strongly correlated with a genetic variant implicated in many auto-immune conditions. Sleep apnea has also been identified with immune activation, displaying higher levels of the chemical messengers cytokines.



response to exposures of every day life such as food, psychological stress, and environmental toxins.^[8]

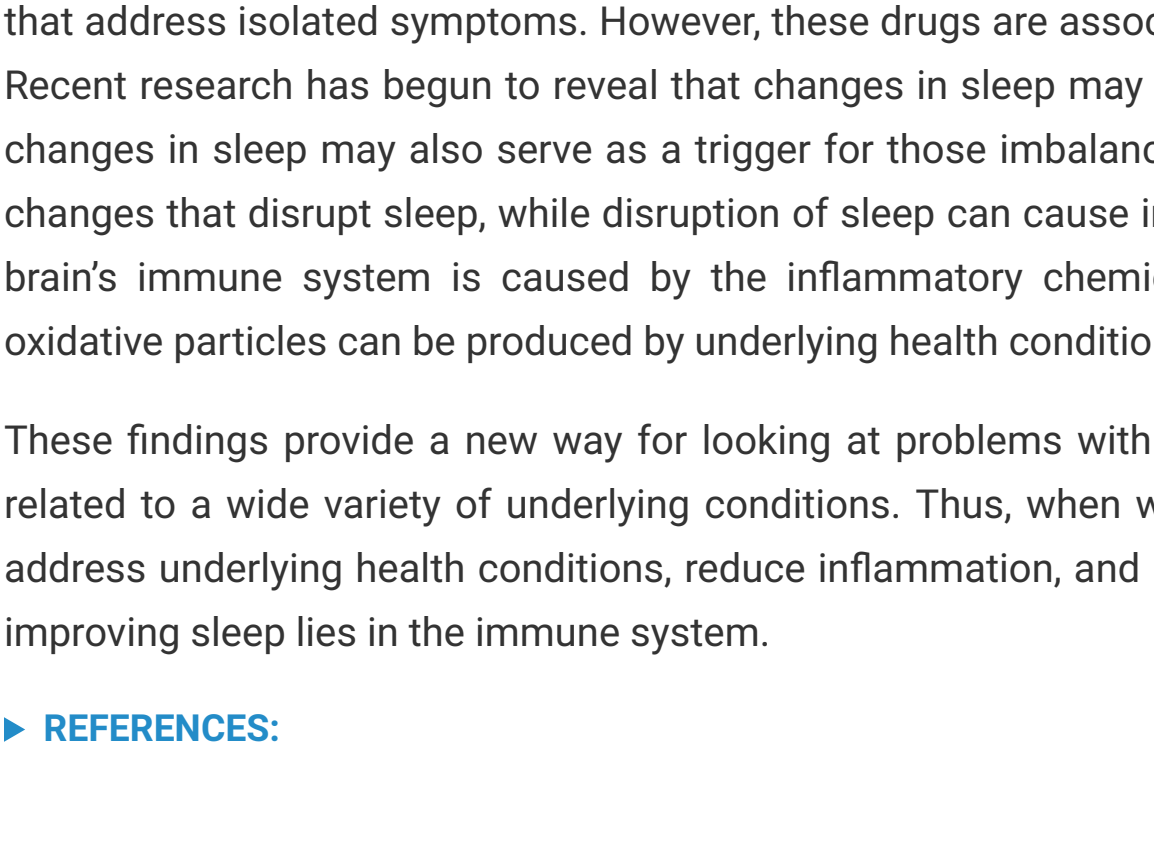
From the Immune System to the Brain

Activation of the immune system is only the beginning of the story. The brain protects itself from chaos in the rest of the body by carefully arranged cells. This defense is known as the blood-brain barrier. The chemical messengers produced by an activated immune system as well as oxidative stress can compromise the integrity of this barrier, allowing cells that do not normally have access to the brain, such as immune cells, to cross the barrier. A few areas of the brain are not protected by this barrier and can be directly attacked. One such structure is the pineal gland, which produces melatonin. Melatonin is the hormone responsible for regulating the body's sleep clock and has recently been revealed as an important player in many immune-related functions.^{[4][5]} Some immune cells have also demonstrated an ability to cross an intact blood-brain barrier under the influence of injury, inflammation, or disease.^[6] To make matters worse, loss of sleep may actually further compromise the function of the blood-brain barrier and make it more permeable to invasive substances.^[7] Once inside the brain, components of the immune system impact the brain's communication network and trigger the brain's own immune network.

Brain Immune Activation

Neurotransmitters are the chemical messengers the nervous system uses to communicate. They are part of the orchestra that links different parts of the brain to produce sleep and regulate many other functions including mood. Two of the neurotransmitters involved in sleep that tend to have a calming effect and help make melatonin are serotonin and tryptophan. Both cytokines of the immune system and oxidative stress have been identified to decrease available levels of serotonin and to shunt tryptophan away from its normal neurotransmitter pathway to make a brain-toxic chemical instead.^[9] Glutamate and dopamine are two additional neurotransmitters that, in excess, have an excitatory effect. Activated immune cells can impact dopamine levels, increase glutamate, and create anxiety that disrupts sleep.^[8]

NEURONS AND NEUROGLIAL CELLS



under the influence of inflammation-promoting triggers, microglia and astrocytes begin to phagocytose parts of nerve cells; another way of saying this is that the brain begins to eat itself. Although this may be the body's attempt to repair worn nerve cells, the self-destruction has consequences. In the mouse brain, microglia activated by only 24 hours of sleep loss caused deficits in learning and memory that lasted at least seven days. Activation of astrocytes by acute and chronic sleep loss has also been correlated with cognitive decline.^{[10][11][12]} Over the long term, both sleep loss and activation of brain immune cells may lead to neurodegenerative disorders such as Parkinson's and Alzheimer's diseases.^[13] This is due to disruption of neurotransmitter production, immune-cell activation, and a resulting inability of the body to clean up brain waste.

Brain inflammation is also self-perpetuating. Activated brain immune cells produce their own inflammation-promoting cytokines and reactive particles, worsening the cycle of inflammatory triggered brain inflammation. If activation of these cells—namely microglia—continues, it may cause the brain to be more vulnerable to other types of damage and promote ongoing nerve cell injury.^[14]

Summary

It is estimated that 25% of Canadians are dissatisfied with their sleep.^[15] Conventionally, this is managed with prescription medications that address isolated symptoms. However, these drugs are associated with undesirable side effects and may actually worsen insomnia. Recent research has begun to reveal that changes in sleep may be a consequence of imbalances in the immune system. Furthermore, changes in sleep may also serve as a trigger for those imbalances. Congruently, underlying health conditions can cause inflammatory changes that disrupt sleep, while disruption of sleep can cause inflammatory changes that lead to health conditions. Imbalances in the brain's immune system is caused by the inflammatory chemical messengers cytokines and oxidative stress. Both cytokines and oxidative particles can be produced by underlying health conditions, sleep deprivation, and simple exposures of everyday life.

These findings provide a new way for looking at problems with sleep. Instead of being a discrete condition, sleep disruption may be related to a wide variety of underlying conditions. Thus, when working with a naturopathic doctor to improve sleep, it is important to address underlying health conditions, reduce inflammation, and identify sources of oxidative stress in daily life. Perhaps the answer to improving sleep lies in the immune system.

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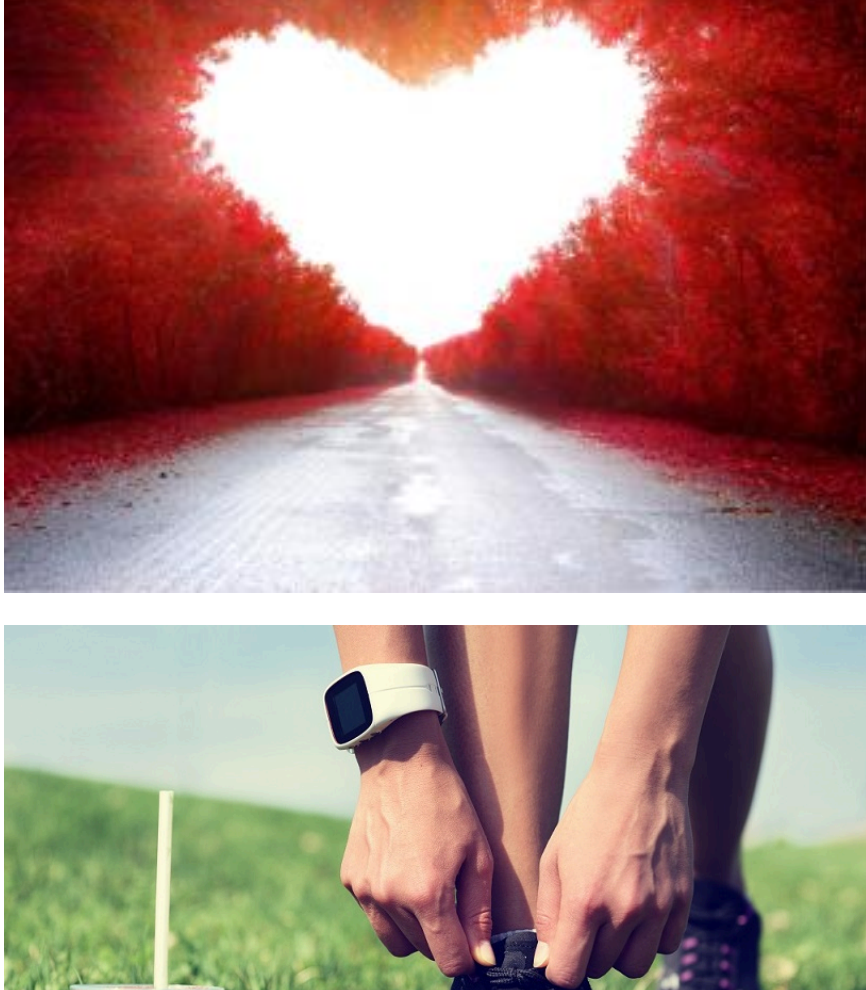


How to Keep Your Family Healthy During Cold and Flu Season - Naturopathic Perspectives

09 Mar 20

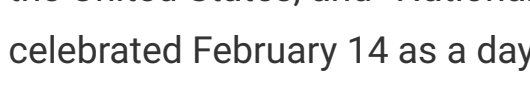


The viruses that cause colds and the flu can be spread easily by coughing and sneezing. While there is no way to guarantee you won't get sick this winter, there are things you can do to reduce the severity of your sickness.



Anxiety and Depression Due to Sleep Deprivation? Exploring the Links Between Lack of Sleep and Mental Health

09 Mar 20



The link between sleep and mental health has been seen and studied for decades by doctors and researchers. People who don't get their regular 7–9 hours of sleep per night are at 10x greater risk of depression and 17x greater risk of anxiety. To go one step further, the more frequently one wakes in the night due to insomnia, the higher the chances of developing depression.[1] Before considering pharmaceutical sleeping aids, it is important that we consider all aspects of health that can be contributing to a sleep disorder.



Finally, Some Shut Eye - Naturopathic Treatments for Insomnia and Sleep Disturbance

05 Jun 17



Most people, at some point or another, have experienced poor sleep; feeling too warm, tossing and turning before a big event, thoughts buzzing through the mind after an argument with a loved one, or maybe restless legs.



Parkinson's Disease Associated Sleep Disorders - Novel Treatments

13 Apr 17

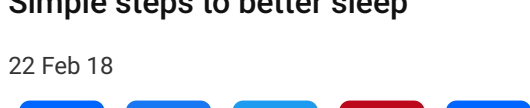


Parkinson's disease (PD) is one of the most common neurodegenerative disorders, affecting 1–2% of the population over the age of 65.



Naturopathic Approaches to Heart Health

26 Feb 21



Long before February was declared "Heart Month" in Canada, "American Heart Month" in the United States, and "National Heart Month" in the United Kingdom, children and adults celebrated February 14 as a day of love and affection.



Adrenal Fatigue

02 Sep 15

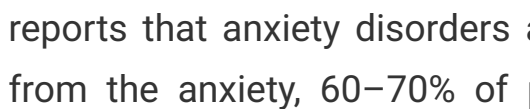


Do you ever feel like the hardest part of your day is getting out of bed in the morning, no matter how much sleep you have had? Ever catch yourself dozing off at work and gaze up at the clock to realize that you still have a few more hours of your workday to go?



Sleep Hygiene - Naturopathic Perspectives

02 Aug 19

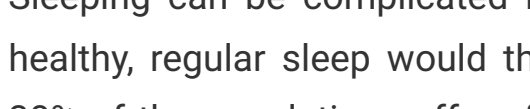


Something everyone has in common is the need for sleep. We spend about one-third of our lives sleeping. Since we all need sleep, we all have different strategies and techniques in order to ensure a restful night's sleep. Sleep hygiene are the habits one does in order to try to sleep well on a consistent basis.



Depression in Adulthood - Naturopathic Options

14 Nov 19



College; it's sometimes called "the best time in your life." You have new people, new situations, a huge variety of extracurricular activities to choose from, all while learning about yourself and the world... It is a time full of potential!

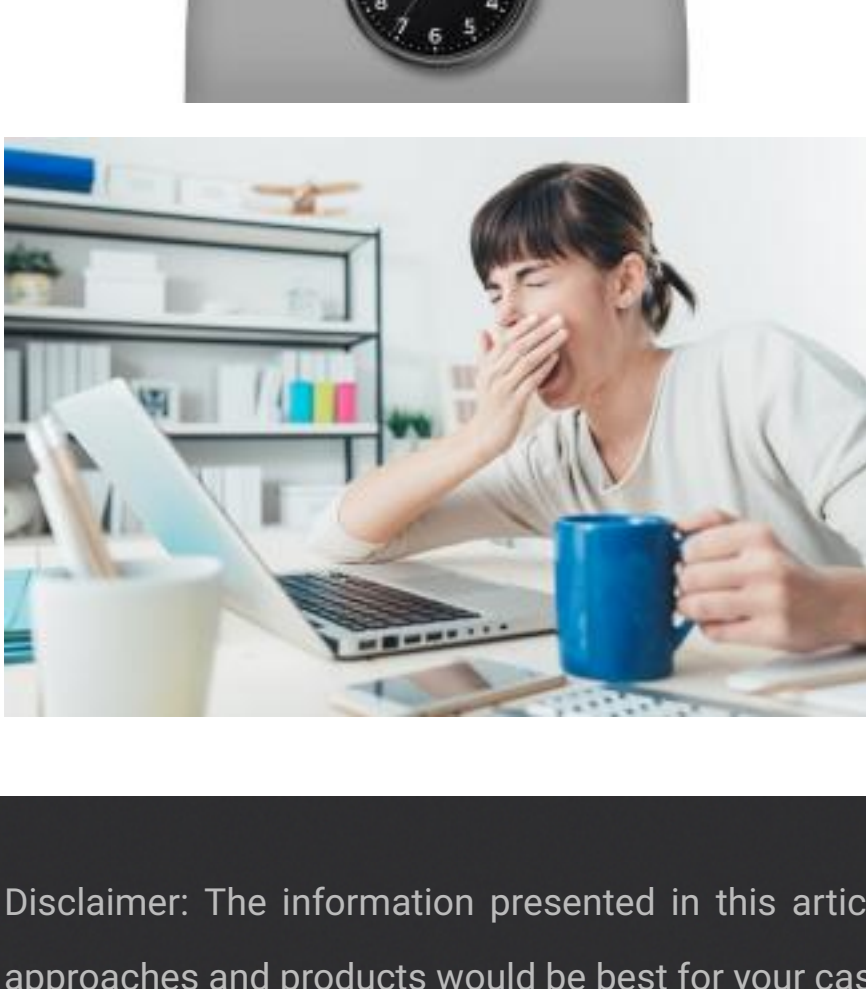


Cell-Phone Use - Five Health Impacts

16 Apr 18

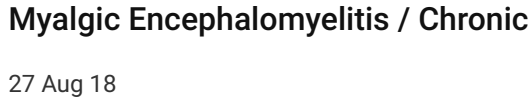


Every time I turn around, someone else has published a news article saying that cell phones are rewiring our brains, stealing our creativity, and making us unable to focus and by some measures, even decreasing our intelligence—but are they really?



Pediatric snoring and obstructive sleep apnea

20 Feb 18



Sleep problems are very common in children. Those between the ages of 2-8 years-old often exhibit snoring or breathing difficulties, which can be a sign of obstructive sleep apnea (OSA). The main reason for this is due to the size of the adenoids and/or tonsils relative to the diameter of the upper airway at this point of physical development. The consequences of this go beyond being a "noisy" sleeper as apnea