## **Sleep and the Immune System - Naturopathic Perspectives**

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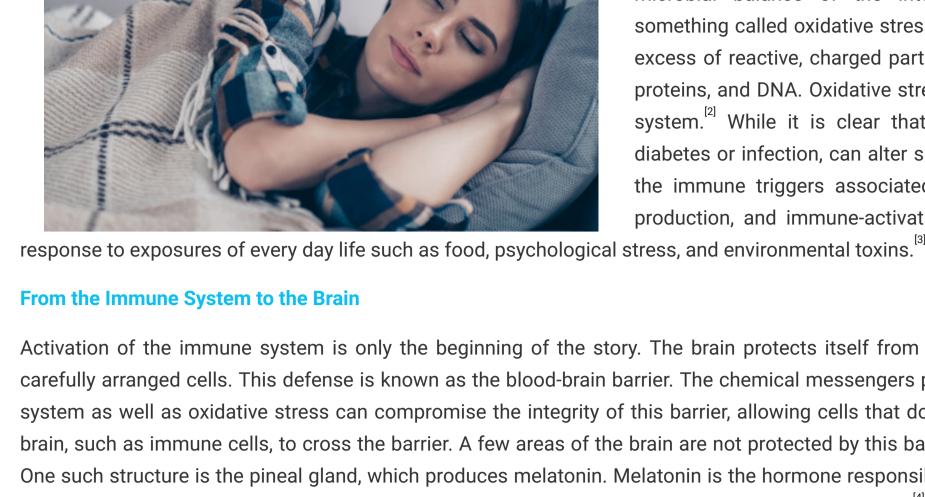
## 17 December 2019 **Language** English + f 🟏 🤊 🖂

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. 11 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 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. Even disruptions in healthy sleep patterns can activate the immune system. Chronically shortened or interrupted sleep, known as fragmented sleep, can induce changes in the cardiovascular and metabolic systems as well as alter the

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

Hitting the hay, sawing logs, catching ZZZs-these are terms we use to describe sleep, but what is



something called oxidative stress, a condition in which there is an excess of reactive, charged particles that attack cell membranes, proteins, and DNA. Oxidative stress, in turn, activates the immune system. [2] While it is clear that discrete health conditions, like diabetes or infection, can alter sleep through the immune system, the immune triggers associated with oxidative stress, cytokine production, and immune-activating markers can be produced in 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. To make matters

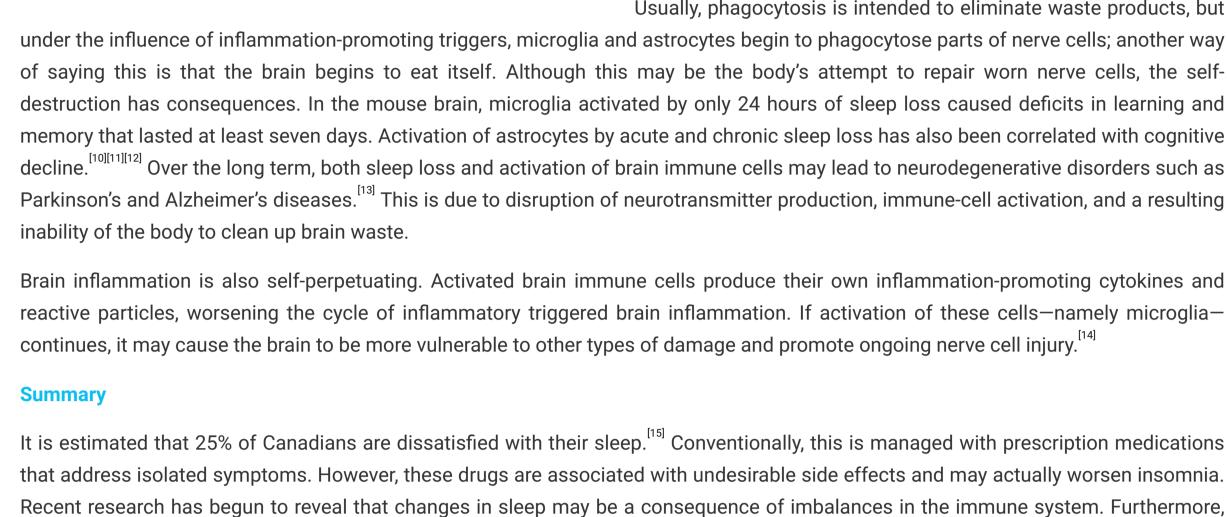
worse, loss of sleep may actually further compromise the function of the blood-brain barrier and make it more permeable to invasive substances. Once inside the brain, components of the immune system impact the brain's communication network and trigger the brain's own immune network. **Brain Immune Activation** 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. [8] Glutamate and dopamine are two additional neurotransmitters that, in excess, have an excitable effect. Activated immune cells can impact dopamine levels, increase glutamate, and create anxiety that disrupts sleep. [9]

When inflammation or oxidative stress activates the brain's own **NEURONS AND NEUROGLIAL CELLS** immune network, it enters into a delicate dance with sleep patterns. Inflammatory processes in the brain occur through two types of cells unique to the brain: astrocytes and microglia. While these cells wear many hats, they function to repair and maintain Oligodendrocytes nerve cells. Astrocytes are also directly involved in sleep Myelin sheath processes. A body of research has studied how these cells behave when activated. These special cells can be activated by sleep deprivation, oxidative stress, and immune chemical messengers

Neuron

cytokines.

## Dendrite



improving sleep lies in the immune system.

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 selfdestruction 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. 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. This is due to disruption of neurotransmitter production, immune-cell activation, and a resulting 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-

In the presence of these triggers, brain cells generate excess

waste and undergo changes in their cell surfaces that place an

extra "clean-up" burden on microglia and astrocytes. Brain clean-

up is accomplished through a process called phagocytosis.

Usually, phagocytosis is intended to eliminate waste products, but

do to reduce the severity of your sickness.

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

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

oxidative particles can be produced by underlying health conditions, sleep deprivation, and simple exposures of everyday life.

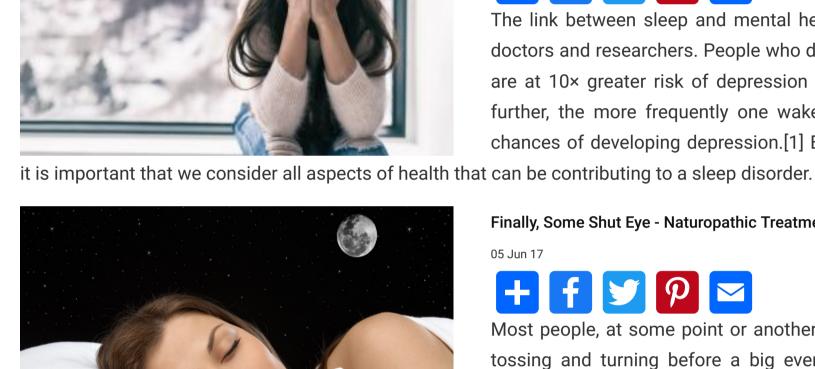
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argument with a loved one, or maybe restless legs.

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does in order to try to sleep well on a consistent basis.

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are at 10× greater risk of depression and 17× 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,

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

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by some measures, even decreasing our intelligence—but are they really?

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

Cervical Vertibrae (Lordosis) C1-7

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individual's dissatisfaction with quality of sleep.

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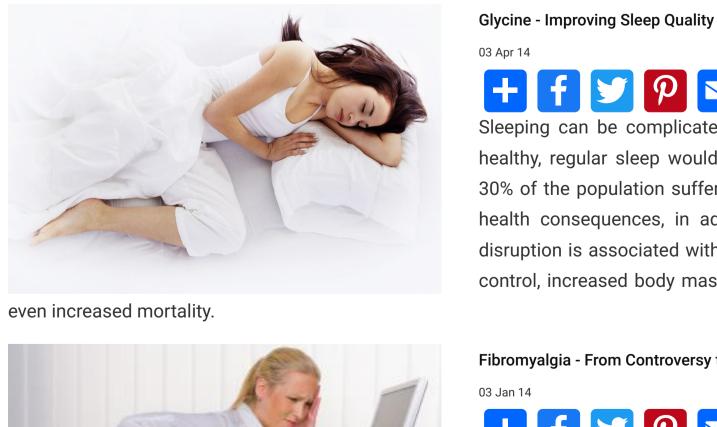
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symptoms.

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03 Apr 14 Sleeping can be complicated business! Those individuals with no difficulty achieving healthy, regular sleep would think it the simplest of physiologic phenomena. Roughly 30% of the population suffers from insomnia, however,<sup>[1]</sup> which has real and important health consequences, in addition to affecting quality of life. Even short-term sleep disruption is associated with metabolic problems, insulin insensitivity, poor blood-sugar control, increased body mass index (BMI), increased pain and inflammation levels, and

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Syndrome (ASPS). ASPS is one of a group of sleep disorders

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neurologic illness.

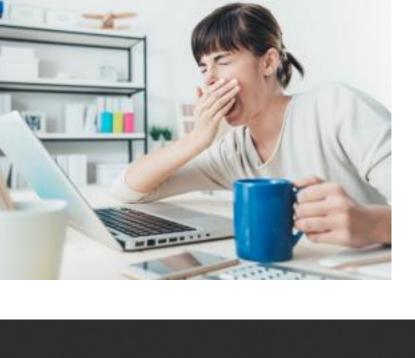
health benefits. It contains all the nutrients that a newborn requires, except for vitamin D, and life protecting antibodies that are custom made by mom in response to the unique dangers of her environment. However, recent research continues to uncover hidden treasures within this elixir of life. This article will review new studies and discuss the implication for infant development. **Setting Your Internal Clock** 28 Feb 18 + | f | y | P | w

Do you find yourself tired in the early evening? This is certainly not uncommon if you

have just had an intense workout, eaten a large meal or had an exceptionally exhausting

day. However, if you find that you are very tired at an unusually early hour, around 6pm or

7pm, you may be suffering from a sleep disorder known as Advanced Sleep Phase



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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

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.

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?

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

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

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 ....

**Build Confidence in Your Posture** 11 Mar 16 Walk down a busy street and you'll see some atrocious body language and posture. Most people are hunched over, head down, eyebrows furrowed, and probably typing

away on their cell phones. Anybody who is sitting is almost guaranteed to be hunched

over: driving, eating, talking, on the phone, going to the toilet, working at a desk, studying,

Sleeping disorders are quite common among the population. The term insomnia has

been used as a general term in literature and society in a variety of ways to describe

sleeping disorders. Insomnia is defined as an individual's difficulty with sleep or an

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etc.

Anxiety and Insomnia - Breaking the Sleep/Anxiety Cycle

Anxiety is extremely common; in fact, the Centre for Disease Control and Prevention

reports that anxiety disorders are the most common class of mental disorders. Aside

from the anxiety, 60-70% of people with anxiety also report that they have trouble

sleeping. This is problematic, because the worse someone's emotional distress is the

worse they sleep, and having bad sleep may be contributing to worsening anxiety

Attention deficit hyperactive disorder (ADHD) is a neuropsychiatric disorder characterized by inattention, impulsiveness, and hyperactivity. The condition is commonly treated with stimulant therapy (methylphenidates or amphetamines in various forms). Stimulants tend to increase dopamine activity in the brain, and it is speculated that this may help with ADHD symptoms.

Fibromyalgia - From Controversy to Clarity + f y P =

The value of breastmilk continues to grow as we discover additional properties and

Fibromyalgia syndrome (FMS) is a condition characterized by chronic widespread pain

and extreme fatigue. It has long been considered a controversial diagnosis, largely

because its pathophysiology is poorly understood. Some have thought it to be a form of

malingering, or a psychosomatic condition; others have viewed it as a rheumatologic or

Myalgic Encephalomyelitis / Chronic Fatigue Syndrome - An Overview and Options for Management 27 Aug 18 According to the Public Health Agency of Canada, as of 2010, the diagnosis of myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) applied to roughly 1.4% of the Canadian population aged 12 and over. Unfortunately, because it is often poorly understood by the medical system, it also likely goes undiagnosed in many patients.