2011

The Side Effects of Sleep Deprivation

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THE SIDE EFFECTS OF SLEEP DEPRIVATION

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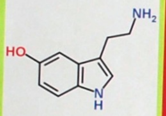
CHEMICALS INVOLVED IN THE PROCESS OF SLEEP

SEROTONIN



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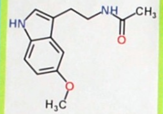

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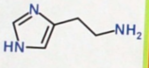
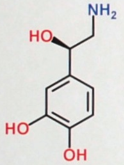
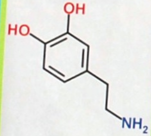


NOREPINEPHRINE

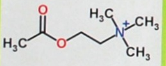


DOPAMINE

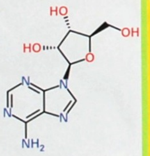


http://www.chemspider.com/Search.aspx?q=Dopamine

ACETYLCHOLINE



ADENOSINE



INTRODUCTION

Sleep is one of the most analyzed subjects on the planet. As scientists learn more over the years, there is still so much that they do not understand. This is the process where our body goes into a separate state of consciousness where it heals and replenishes itself. It is an intricate and interesting phenomenon, that it will be continually studied until the end of time.

CHEMICALS

There are many different brain chemicals and hormones that function in the process of sleep. The formulas for some of the active chemicals that are involved with the process of sleep are shown to the left.

Melatonin regulates the circadian rhythm, or 24-hour cycle for the human "body-clock" that we run on everyday. It helps in making a person sleepy.

Serotonin is the chemical that keeps the body's muscles relaxed to minimize movement during sleep.

Histamine, a Nitrogen compound that controls the body's immune response levels, sending out neurotransmitters, in other words how alert or awake we are.

Norepinephrine is also a brain chemical that keeps the body still during sleep. It acts as a neurotransmitter for the sympathetic neurons which affects the heart.

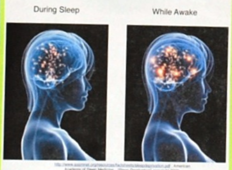
Dopamine is a chemical related to communication between cells in the brain. This chemical also has effect on the sleep cycles of the body.

Acetylcholine the chemical related to learning and memory that has been linked to sleep apnea.

Adenosine is a chemical that is directly related to the transfer of energies in the brain and body.[2]

[2] http://www.emedicinehealth.com/sleep_understanding_the_basics/article_em.htm, eMedicinehealth, "Sleep: Understanding the Basics", copyright 2011

BRAIN ACTIVITY



http://www.aasmnet.org/resources/factsheets/sleepdeprivation.pdf, American Academy of Sleep Medicine, "Sleep Deprivation", copyright 2006

SLEEP!!!

We all need it, and most of us love it! BUT, why do we need to sleep? What brain chemicals make us sleep? What affects our quality of sleep?

In earlier times, people didn't give to much thought about sleep. Today, researchers have had amazing breakthroughs that lead scientists to discover many new findings about the science of sleep and the brain chemistry and nerve-signaling chemicals that control sleep in the human body.

Sleep involves a complicated process where neurons that are in the brainstem produces the necessary chemicals needed to cause a person to fall asleep, keep the brain active while the person sleeps, and repair and refresh the body while sleeping. There are five stages of sleep including REM (Rapid Eye Movement) sleep where dreams are had. Normally we go through these stages several times each night however, when the body is sleep deprived it skips the first four stages and goes straight to REM sleep, altering the affects of the nights rest. Due to the brain chemicals and hormones released in sleep, outside factors such as smoking, room temperature, medicine, or caffeine, can also affect the quality of sleep.

Even with all the studies and research that has been done to investigate the process of sleep, researchers still don't fully understand everything that is involved with the process of sleep.[1]

[1] http://www.ninds.nih.gov/disorders/brain_basics/understanding_sleep.htm, National Institute of Neurological Disorders and Stroke, "Brain Basics: Understanding Sleep", copyright 2007.

SLEEP DEPRIVATION

When a person fails to get the proper amount of sleep, the person becomes sleep deprived. There are mental effects, physical effects, and medical effects that occur when a person fails to get adequate sleep. Sleep loss can be cumulative, for example, someone losses one hour of sleep per night for a month or more, or sleep deprivation can be a lack of sleep for many hours in a row. Either type is considered sleep deprivation, and most of the negative side effects happen with both types.

The picture to the left shows the difference in a sleeping brain and an awake brain. Scientists have researched the subject extensively and determined there are numerous side effects from sleep deprivation. As the graph to the right shows, people who were more sleep deprived scored lower on an arithmetic exam, and their scores became worse the more sleep deprived they became.

Some of the other negative effects only affect the person's health or grades, but many of the side effects can put the person and/or other people in danger. Operating machinery or driving a car, or making serious safety decisions when in charge of other people can impose the negative side effects on innocent people which can sometimes be deadly.[3]

[3] http://www.aasmnet.org/resources/factsheets/sleepdeprivation.pdf, American Academy of Sleep Medicine, "Sleep Deprivation", copyright 2006

CONCLUSION

Sleep is an extremely intricate and complex subject that scientists are still learning about and researching. It is a fascinating process, but some things are clear, such as the importance of sleep to our well-being.

Many different brain chemicals are involved with sleeping. As we learn more about the stages of sleep, you will see that at times our brains are active while we are asleep, and there are many different things involved with the process. With all the various chemicals released during sleep, repairs to our body occur and adequate sleep is essential to a healthy life.

Sleep deprivation decreases productivity in various activities such as reaction time, alertness, poor health, impaired problem solving, and many other negative effects. It is very important for everyone to pay attention to getting adequate sleep every night to prevent any of the consequences of sleep deprivation.

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PHYSICAL, MENTAL, AND MEDICAL SIDE EFFECTS OF SLEEP DEPRIVATION

- Decreased power of the body's immune system.
- Impairs cognitive ability and performance.
- Impairs coordination.
- Impairs reaction times and problem solving.
- Increases risk of motor vehicle accidents.[1]
- Alters normal brain energy chemicals.[2]
- Increased sensitivity to pain.[3]

[1] http://www.emedicinehealth.com/sleep_understanding_the_basics/article_em.htm, eMedicinehealth, "Sleep: Understanding the Basics", copyright 2011

[2] Petit, J.M.; Tobler, I.; Kopp, C.; Morgenthaler, F.; Borbely, A.A.; Magistretti, P.J. *Sleep* **2010**, 33, pp 901-908

[3] Smith, M.T.; Haythornthwaite, J.A. *Sleep Medicine Reviews* **2004**, 2, pp 119-32

- May produce hallucinations and/or mood swings.
- Adversely affects judgement.
- Magnifies the effects of alcohol on the body.[4]
- Alters normal sleep rhythms affecting the next sleeping session.[5]
- Increases risk for cardiovascular diseases.[6]
- Impairs ability to concentrate.
- Associated with increased risk of diabetes.

[4] http://www.ninds.nih.gov/disorders/brain_basics/understanding_sleep.htm, National Institute of Neurological Disorders and Stroke, "Brain Basics: Understanding Sleep", copyright 2007

[5] Marzano, C.; Ferrara, M.; Curcio, G.; DeGennaro, L. *Journal of Sleep Research* **2010**, 19, pp 260-268

[6] van Leeuwen, W.M.A van; Lehto, M.; Karisola, P.; Lindholm, H.; Lukens, R.; Sallinen, M.; Harma, M.; Porkka-Heiskanen, T. *PLoS ONE* **2009**, 4, e4589

- Associated with increased risk of obesity.
- Increased distractibility.
- Increases depressed feelings.
- Reduces the level of energy.
- Increases anxiety.
- Increases a lack of motivation.
- Increases personal irritability.[7]
- Impairs ability to recognize human facial emotions.
- Impairs ability to recognize normal social cues.[8]

[7] http://www.aasmnet.org/resources/factsheets/sleepdeprivation.pdf, American Academy of Sleep Medicine, "Sleep Deprivation", copyright 2006

[8] van der Helm, E.; Guar, N.; Walker, M.P. *Sleep* **2010**, 33, pp 335-342