

# Narcolepsy: Why So Sleepy?

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Topics in Biology

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July 17, 2010

Narcolepsy is a chronic neurological disorder caused by the brain's inability to regulate sleep-wake cycles normally. It causes excessive daytime sleepiness and is usually accompanied by paralysis and hallucinations. In narcolepsy, the order and length of non-rapid eye movement (NREM) and rapid eye movement (REM) sleep periods are disturbed, with REM sleep occurring almost immediately in the sleep cycle instead of after NREM sleep (the norm). Thus, narcolepsy is a disorder in which REM sleep appears at an abnormal time. The cause is unknown, though many agree that low levels of hypocretin—chemical that helps control wakefulness—may have something to do with it. The top four signs and symptoms are: extreme daytime sleepiness, cataplexy, sleep paralysis, and hallucinations. Narcolepsy can be diagnosed by 3 tests: a polysomnogram, a multiple sleep latency test, and a hypocretin test. Although narcolepsy has no cure, medicines and lifestyle changes can help relieve some of the symptoms. There have been many recent advancements in the study of narcolepsy, so a cure may be seen sometime in the near future.

### **Narcolepsy: Why So Sleepy?**

Narcolepsy is defined as being “A chronic neurological condition marked by transient attacks of deep sleep, with symptoms of cataplexy, hypnagogic hallucinations, sleep disruption, and sleep paralysis” (Institute of Medicine, 2006). Narcolepsy affects between 50,000 to 2.4 million people in the United States. The disorder can develop in children, but normally begins between the ages of 15 and 25, though it can become apparent at any age. It affects both men and women (US Dept of Health and Human Services, & National Institute of Health, 2010). It is caused by the brain’s inability to regulate sleep-wake cycles normally. The main characteristic of narcolepsy is excessive and irresistible daytime sleepiness, even after adequate nighttime sleep. It is usually accompanied by paralysis and hallucinations. Throughout the day, people with narcolepsy experience these irresistible bouts of sleep. Sometimes, the urge becomes overwhelming and individuals will fall asleep for periods lasting from just a few seconds to several minutes. If it’s extreme, some people may remain asleep for an hour or longer. Though it’s rare, people with this disorder may suddenly fall asleep, even if they’re in the middle of an activity, such as eating or talking (US Dept of Health and Human Services, & National Institute of Health, 2010). Also, nighttime sleep for narcoleptics may also be disrupted with frequent awakenings. In many cases, narcolepsy is considered a side effect of medicine or hormone changes. Because of this, it is usually undiagnosed, and therefore, untreated.

Usually, when an individual is awake, brain waves show a regular rhythm. The brain waves become slower and less regular when a person first falls asleep. This sleep state is called non-rapid eye movement (NREM) sleep. After about 90 minutes of NREM sleep, the brain waves begin to show a more active pattern again, though the person is still in deep sleep. This

sleep state, called rapid eye movement (REM) sleep, is when dreaming occurs. During REM, your muscles normally become limp. This prevents you from acting out your dreams. In narcolepsy, the order and length of NREM and REM sleep periods are disturbed, with REM sleep occurring almost immediately in the sleep cycle, periodically during the waking hours and after a period of NREM sleep. Thus, narcolepsy is a disorder in which REM sleep appears at an abnormal time. Also, some of the aspects of REM sleep that normally occur only during sleep, such as lack of muscle tone, sleep paralysis, and vivid dreams, occur at other times in people with narcolepsy. For example, sleep paralysis and vivid dreams can occur while falling asleep or waking up, instead of during REM. (Talk About Sleep, 2000-2010)

The cause of narcolepsy is unknown, but most scientists agree that narcolepsy involves multiple factors interacting together to cause neurological dysfunction and sleep disturbances. Most people who have narcolepsy have low levels of hypocretin. This is a chemical in the brain that helps control levels of wakefulness. Although what causes these low levels of hypocretin isn't well understood, researchers think that certain factors may work together to cause this deficit. These factors may include: heredity, infections, brain injuries, contact with toxins, and autoimmune disorders (Perlis, & Lichstein, 2003). As far as heredity goes, some people may inherit a gene that affects hypocretin. Up to 10 percent of people who have narcolepsy have a relative with the same symptoms (US Dept of Health and Human Services, & National Institute of Health, 2010). Heredity alone doesn't cause narcolepsy. Brain injuries due to conditions such as tumors/strokes and contact with toxins and pesticides may also play a part in developing narcolepsy.

## Signs and Symptoms

The four major signs and symptoms of narcolepsy are extreme daytime sleepiness, cataplexy (muscle weakness) while awake, hallucinations, and sleep paralysis. All people who have narcolepsy have extreme daytime sleepiness (EDS). It is usually the most obvious symptom of the disorder. EDS interferes with normal activities on a daily basis, even if a person with narcolepsy has sufficient sleep at night. People who have this symptom often complain of mental cloudiness, memory problems or problems focusing, lack of energy or extreme exhaustion, and depression ("Narcolepsy," 2005-2010.) Rarely, people who have narcolepsy have "sleep attacks" in which they fall asleep suddenly. This is more likely to occur when they're not active, like while reading or watching TV. Cataplexy is the second most obvious symptom of narcolepsy. It consists of a sudden loss of muscle tone that leads to feelings of weakness and a loss of voluntary muscle control ("Narcolepsy," 2005-2010). It may cause one to drop things, fall, and have slurred speech. It is often triggered by intense emotions, such as laughter, surprise, and anger.

Narcoleptics may sometimes have vivid dreams while falling asleep, waking up, or dozing. These dreams, called hypnagogic hallucinations, can feel very real and are frequently frightening. They may also get sleep paralysis, which is the temporary inability to move or speak while falling asleep or waking up ("Narcolepsy," 2005-2010). It usually just lasts a few seconds or minutes and people rapidly recover their full capacity to move and speak after it, but it can be very scary. Most people who have narcolepsy also don't sleep well at night and may have trouble falling/staying asleep. Scary dreams may disturb sleep, and not sleeping well at night worsens daytime sleepiness. Though it's rare, sometimes people who fall asleep in the middle of an activity, such as eating, continue that activity for a few seconds or minutes. This is called

automatic behavior and during this the person is not aware of their actions, and therefore doesn't perform them well (US Dept of Health and Human Services, & National Institute of Health, 2010). For example, if the person was writing before falling asleep, he/she may scribble rather than form words. Most people with this symptom don't remember what happened while it was going on.

## **Diagnosis**

It can take as long as 15 years after the first symptoms appear before narcolepsy is diagnosed. This is because the disorder is fairly rare and many of the symptoms are like symptoms of other illnesses, such as infections and depression. It is also sometimes mistaken for learning problems, seizure disorders, and laziness, especially in teenagers (US Dept of Health and Human Services, & National Institute of Health, 2010). The results of two tests, a polysomnogram (PSG) and a multiple sleep latency test (MSLT), are used to diagnose narcolepsy (US Dept of Health and Human Services, & National Institute of Health, 2010). A polysomnogram records brain activity, eye movements, breathing, heart rate, and blood pressure. This test can help find out if the patient goes into REM sleep soon after falling asleep, which is a characteristic of narcolepsy. A multiple sleep latency test measures how sleepy the patient is. It is usually done after a PSG. During the test, the patient relaxes in a quiet room for about 30 minutes while a technician checks the patient's brain activity. The test is repeated three or four times throughout the day. An MSLT finds out how quickly a person falls asleep during the day after a full night's sleep and also shows whether they go into REM sleep soon after falling asleep. Another test that can be used to test for narcolepsy is the hypocretin test. This test measures the levels of hypocretin in the fluid that surrounds the spinal cord. To get a sample of

the fluid, a spinal tap is done in which a needle is inserted into the lower back area. (US Dept of Health and Human Services, & National Institute of Health, 2010)

## **Treatment**

Narcolepsy has no cure, although medicines, lifestyle changes, and other therapies can relieve many of its symptoms. Treatment for the disorder is based on the type of symptoms the patient has and how severe they are. Medicines used to treat narcolepsy symptoms include: stimulants to ease daytime sleepiness and raise alertness, a medicine that helps make up for low levels of hypocretin, sleep medicine, and anti-depressants. The hypocretin medicine helps stay awake during the day and sleep at night. Anti-depressants can also help prevent cataplexy, hallucinations, and sleep paralysis, which are all caused by narcolepsy (US Dept of Health and Human Services, & National Institute of Health, 2010). Lifestyle changes may also help relieve some symptoms of narcolepsy. Following a regular sleep schedule—going to bed and waking up at the same time every day—is suggested. Some people also do something right before bedtime to help them fall asleep faster. Also, people with narcolepsy should exercise regularly and avoid large meals and beverages just before bedtime.

## **Recent Advancements**

In 1999, a research team working with canines identified hypocretin receptor 2 as the gene that causes narcolepsy. It codes for a protein that allows brain cells to receive instructions from other cells. Defective versions of the gene encode proteins that cannot recognize these messages, and may be cutting the cells off from messages that promote wakefulness (Sutton, 2005). Also in the same year, after successful clinical trial results, the Food & Drug

Administration approved a drug called Modafinil for the treatment of EDS. Two types of antidepressants have also been effective in controlling cataplexy in many patients, which are tricyclics (including imipramine, desipramine, clomipramine, and protriptyline) and some serotonin reuptake inhibitors (including fluoxetine and sertraline). There has recently been a new medication approved for those who suffer from narcolepsy with cataplexy (in July 2002) and EDS (in November 2005). This medication, called Xyrem (sodium oxybate or gamma hydroxybutyrate, also known as GHB), helps people with narcolepsy get a better night's sleep, allowing them to be less sleepy during the day. But, due to safety concerns associated with the use of this drug, the distribution of Xyrem is greatly restricted. (NINDS, 2010)



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