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## Why Sleep Deprivation Eases Depression

*Glial activity reveals how sleep deprivation elevates mood*

By David Levine on May 1, 2013



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Sleep deprivation is a quick and efficient way to treat depression. It works 60 to 70 percent of the time—far better than existing drugs—but the mood boost

usually lasts only until the patient falls asleep. As an ongoing treatment, sleep deprivation is impractical, but researchers have been studying the phenomenon in an effort to uncover the cellular mechanisms behind depression and remission. Now a team at Tufts University has pinpointed glia as the key players.

The researchers previously found that astrocytes, a star-shaped type of glial cell, regulate the brain chemicals involved in sleepiness. During our waking hours, astrocytes continuously release the neurotransmitter adenosine, which builds up in the brain and causes “sleep pressure,” the feeling of sleepiness and its related memory and attention impairments. The neurotransmitter causes this pressure by binding to adenosine receptors on the outside of neurons like a key fitting into a lock. As more adenosine builds up, more receptors are triggered, and the urge to sleep gets stronger.

In the new study, published online January 15 in the journal *Translational Psychiatry*, the scientists investigated whether this process is responsible for the antidepressant effects of sleep deprivation. Mice with depressivelike symptoms were administered three doses of a compound that triggers adenosine receptors, thus mimicking sleep deprivation. Although the mice continued to sleep normally, after 12 hours they showed a rapid improvement in mood and behavior, which lasted for 48 hours.

The results confirm that the adenosine buildup is responsible for the antidepressant effects of a lack of sleep. This finding points to a promising target for new drug development because it suggests that mimicking sleep deprivation chemically may offer the antidepressant benefits without the unwanted side effects of actually skipping sleep. Such an intervention could offer immediate relief from depression, in stark contrast with traditional antidepressants, which take six to eight weeks to kick in.

The study may also have implications beyond depression and sleep regulation,

according to Dustin Hines, lead author and a postdoctoral fellow at Tufts. “For many years neuroscientists focused almost exclusively on neurons, whereas the role of glia was neglected,” Hines says. “We now know that glia play an important role in the control of brain function and have the potential to aid in the development of new treatments for many illnesses, including depression and sleep disorders.”



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