

An end to sleep problems? Researchers discover enzyme behind effects of sleep deprivation

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There is hope for those who miss one night too many or whose children keep them up at night. The unwelcome effects of a bad night's sleep - forgetfulness, impaired mental performance - can be dealt with by reducing the concentration of an enzyme in the brain.

These are the conclusions of research published by Dutch researcher Robbert Havekes and colleagues in the 22 October issue of *Nature*.

Millions of people are regularly plagued by [sleep deprivation](#). This can lead to both short-term and long-term problems with memory and learning capacity. How sleep deprivation causes these kinds of problems was largely unknown up to now. Havekes and his colleagues discovered that sleep deprivation in [mice](#) undermines the function of a specific molecular mechanism in the hippocampus, the area of the brain responsible for consolidating new memories.

Enzyme inhibition

The researchers kept mice awake for five hours. They found increased levels and activity of the enzyme PDE4 and lower levels of the molecule cAMP in these mice. cAMP plays a crucial role in the formation of new connections between brain cells in the hippocampus and the strengthening of old ones. And without these processes we cannot learn.

The researchers inhibited the activity of the PDE4 enzyme and discovered that this counteracts the effects of sleep deprivation. Lack of sleep leads to an increased PDE4 activity which then blocks the action of cAMP. Consequently fewer connections being formed or strengthened in the hippocampus. This is the first report of researchers 'saving' synaptic plasticity (the ability to develop and strengthen new connections) from the effects of sleep deprivation.

The discovery not only shows how a lack of sleep leads to problems, but also how these problems can be solved. Drugs that stimulate the action of cAMP may make it possible to counteract the effects of sleep deprivation.

Neurobiologist Robbert Havekes received a grant from NWO's Rubicon programme in 2007. Havekes is currently working with Ted Abel's group at the University of Pennsylvania.

More information: The article Sleep deprivation impairs cAMP signalling in the [hippocampus](#) by Christopher G. Vecsey, George S. Baillie, Devan Jaganath, Robbert Havekes, Andrew Daniels, Mathieu Wimmer, Ted Huang, Kim M. Brown, Xiang-Yao Li, Giannina Descalzi, Susan S. Kim, Tao Chen, Yu-Ze Shang, Min Zhuo, Miles D. Houslay & Ted Abel appeared in the 22 October issue of *Nature*.

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