

Protein that boosts memory identified

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Increasing the level of a certain DNA-modified enzyme in the brain significantly improves cognitive ability. The discovery was made by the research team led by Prof. Dr. Hilmar Bading at the Interdisciplinary Center for Neurosciences of Heidelberg University. Mouse experiments showed that the Dnmt3a2 protein can boost memory performance in the animals. Because this protein also affects fear memory and the ability to erase bad memories, the researchers hope these findings can be used to develop new treatments for post-traumatic stress disorder and other

forms of anxiety. The results of the research were published in the journal *Molecular Psychiatry*.

In an earlier study, the Heidelberg scientists learned that there are reduced levels of Dnmt3a2 protein in the brains of older mice. When the elderly animals were injected with viruses that produce this protein, their memory capacity improved. "Now we have found that increasing the Dnmt3a2 level in the brains of younger mice also boosts their cognitive ability," explains Prof. Bading. In a number of different long-term memory tests, including classic Pavlovian conditioning, the scientists were able to demonstrate that mice with more Dnmt3a2 on board performed considerably better.

Dnmt3a2 is an epigenetic regulator that chemically modifies the genetic material, the DNA. The result is a change in the production rates of specific proteins. The activation of gene transcription, in which genetic information is transferred to RNA, and the subsequent synthesis of new proteins not only play a critical role in memory consolidation but also in memory erasure. The Heidelberg neuroscientists therefore also carried out "erasure" experiments using similar methods as in confrontational therapy in patients. This therapy is used to treat [post-traumatic stress disorder](#) and aims to interrupt or even completely erase disturbing associations. "We found that mice with a higher Dnmt3a2 level in the brain were able to erase the association between a specific place and a painful stimulus with far greater efficiency," explains Bading.

The findings of the Heidelberg neuroscientists give valuable new impetus to the treatment of cognitive impairment. "They could be used to develop new medications to improve [memory](#) in senile dementia or in patients suffering from neurodegenerative diseases like Alzheimer's," continues Prof. Bading. The researchers also see the potential to develop new treatments for anxiety disorders. New medications that increase the production or activity of the enzyme could be combined with

confrontational therapy. However, Prof. Bading also raised concerns since the new results open the door for possible misuse in healthy individuals to improve their mental processes and intellectual capability.

More information: A M M Oliveira et al. Dnmt3a2: a hub for enhancing cognitive functions, *Molecular Psychiatry* (2015). [DOI: 10.1038/mp.2015.175](https://doi.org/10.1038/mp.2015.175)

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