Erasing unpleasant memories with a genetic switch

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Researchers from KU Leuven (Belgium) and the Leibniz Institute for Neurobiology (Germany) have managed to erase unpleasant memories in mice using a 'genetic switch'. Their findings were published in *Biological Psychiatry*.

Dementia, accidents, or traumatic events can make us lose memories

formed before the injury or the onset of the disease. Researchers from KU Leuven and the Leibniz Institute for Neurobiology have now shown that some memories can also be erased when one particular gene is switched off.

The team trained mice that had been genetically modified in one single gene: neuroplastin. This gene, which is investigated by only a few groups in the world, is very important for brain plasticity. In humans, changes in the regulation of the neuroplastin gene have recently been linked to decreased intellectual abilities and schizophrenia.

In the reported study, the mice were trained to move from one side of a box to the other as soon as a lamp lights up, thus avoiding a foot stimulus. This learning process is called associative learning. Its most famous example is Pavlov's dog: Conditioned to associate the sound of a bell with getting food, the dog salivates whenever it hears a bell.

When the scientists switched off the neuroplastin gene after conditioning, the mice were no longer able to perform the task properly. In other words, they showed learning and memory deficits that were specifically related to associative learning. The control mice with the neuroplastin gene switched on, by contrast, could still do the task perfectly.

Professor Detlef Balschun from the KU Leuven Laboratory for Biological Psychology: "We were amazed to find that deactivating one single gene is enough to erase associative memories formed before or during the learning trials. Switching off the neuroplastin gene has an impact on the behaviour of the mice, because it interferes with the communication between their brain cells."

By measuring the electrical signals in the brain, the KU Leuven team discovered clear deficits in the cellular mechanism used to store

memories. These changes are even visible at the level of individual brain cells, as postdoctoral researcher Victor Sabanov was able to show.

"This is still basic research," Balschun adds. "We still need further research to show whether neuroplastin also plays a role in other forms of learning."

More information: Soumee Bhattacharya et al, Genetically Induced Retrograde Amnesia of Associative Memories After Neuroplastin Ablation, *Biological Psychiatry* (2016). DOI: 10.1016/j.biopsych.2016.03.2107

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