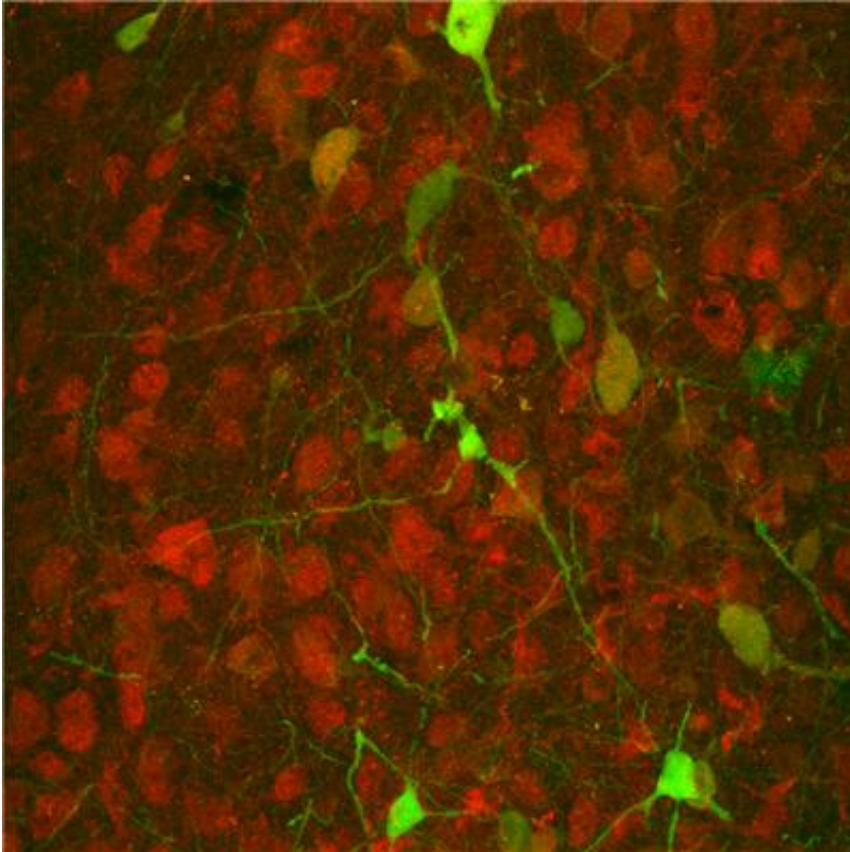


Switching off anxiety with light

April 7 2014



Nerve cells containing the light-activated 5-HT1A receptor (green) and the naturally occurring 5-HT1A receptor (red). © RUB, image: Masseck

Receptors for the messenger molecule serotonin can be modified in such a way that they can be activated by light. Together with colleagues, neuroscientists from the Ruhr-Universität Bochum (RUB) report on this finding in the journal *Neuron*. An imbalance in serotonin levels seems to

cause anxiety and depression. The researchers have provided a new model system for investigating the mechanism underlying these dysfunctions in cell cultures as well as living organisms.

G protein coupled receptors play an important role in medicine and health

One receptor, which is important for the regulation of [serotonin levels](#) in the brain, is the 5-HT1A receptor. It belongs to a protein family called G protein coupled [receptors](#) (GPCRs). These receptors can activate different signalling pathways in cells to support or suppress various signalling events. "About 30 per cent of the current drugs target specifically GPCRs", says Prof Dr Stefan Herlitze from the Department of General Zoology and Neurobiology at the RUB. Due to the lack of tools to control intracellular signalling pathways with high temporal and spatial accuracy, it was so far difficult to analyse these pathways precisely.

Coupling of visual pigments to serotonin receptors

Applying optogenetic methods the scientists in Bochum used cone opsins from the mouse and human eye to control specifically [serotonin](#) signalling pathways either with blue or red light. Prof Dr Stefan Herlitze has been working with optogenetic techniques since 2005 and is one of the pioneers in the field. The light-activated serotonin receptors can be switched on within milliseconds, are extremely light sensitive in comparison to other optogenetic tools and can be repetitively activated. "We hope that with the help of these optogenetic tools, we will be able to gain a better understanding about how [anxiety and depression](#) originate", states RUB neuroscientist Dr Olivia Masseck.

Successful behavioural tests

The scientists also demonstrated that they were able to modulate mouse emotional behaviour using the light-activated receptors. When they switched on the serotonergic signals by light in a certain brain area, the mice became less anxious.

More information: O.A. Masseck, K. Spoida, D. Dalkara, T. Maejima, J.M. Rubelwoski, L. Wallhorn, E.S. Deneris, S. Herlitze (2014): Vertebrate cone opsins enable sustained and highly sensitive rapid control of Gi/o signaling in anxiety circuitry. *Neuron*, [DOI: 10.1016/j.neuron.2014.01.041](https://doi.org/10.1016/j.neuron.2014.01.041)

Provided by Ruhr-Universitaet-Bochum

Citation: Switching off anxiety with light (2014, April 7) retrieved 24 April 2024 from <https://medicalxpress.com/news/2014-04-anxiety.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.