

Opioids erase memory traces of pain

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A team of researchers at the MedUni Vienna's Department of Neurophysiology (Centre for Brain Research) has discovered a previously unknown effect of opioids: the study, which has now been published in *Science* and was led by Ruth Drdla-Schutting and Jürgen Sandkühler, shows that opioids not only temporarily relieve pain, but at the right dose can also erase memory traces of pain in the spinal cord and therefore eliminate a key cause of chronic pain.

The scientists recreated a surgical procedure in vivo in which [pain](#) fibres were stimulated under controlled conditions. Says Sandkühler: "Although deep anaesthesia prevents any sensations of pain, we were able to reserve long-term synaptic potentiation in the spinal cord. Despite anaesthesia, there appears to be a [memory trace](#) for pain and a pain amplifier has engaged." High doses of intravenous opioids over the course of an hour – normally opioids are delivered at moderate doses over a longer period – were able to completely resolve the potentiation. Says Sandkühler: "The memory trace for pain was therefore deleted again and the pain amplifier switched off."

The memory trace, as it is termed, is triggered by a variety of mechanisms, including the potentiation of signal transmission at the contact points (synapses) between the nerve cells. This is known as long-term synaptic potentiation. This pain memory can result in the sensation of amplified pain lasting much longer than the actual cause of the pain, even leading to a condition known as [chronic pain](#) syndrome.

A paradigm shift in pain therapy?

The project, which is sponsored by the Vienna Fund for Science, Research and Technology (WWTF), is currently investigating how this discovery can be put to use in clinical settings. To this end, test subjects or patients with pain syndrome are being given a high dose of an opioid over a period of 60 minutes.

“If our approach turns out to be effective under clinical conditions, this would herald a paradigm shift in pain therapy. It would mean moving away from the temporary, purely symptom-based pain therapy to a long-term removal of the cause of pain based on pain mechanisms using opioids.”

The effect of opioids (morphine or morphine-like substances) is based on their ability to bind to specific binding sites, known as μ -opiate receptors (MOR) which are found on nerve cells and which process pain-related information. Until now, it has been assumed that opioids are only able to alleviate pain while they are bound to the MOR and therefore suppress stimulation in the pain-processing system. Says Drdla-Schutting: “As soon as the medication is stopped, the pain-relieving effect disappears too.” In clinical practice, opioids are therefore given continuously in moderate doses in order to achieve permanent binding to the MOR. This may relieve pain very effectively, but its cause cannot be eliminated. The new, high-dose, short-term therapy with opioids, on the other hand, causes a reversal of cellular changes that play an important role in pain memories, therefore possibly eliminating one of the causes of chronic pain.

More information: “Erasure of a Spinal Memory Trace of Pain by a Brief, High-Dose Opioid Administration.” Ruth Drdla-Schutting, Justus Benrath, Gabriele Wunderbaldinger, Jürgen Sandkühler. *Science*, 335, 13. Jan 2012.

Provided by Medical University of Vienna

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