How to stop pain from serious burns using epigenetics

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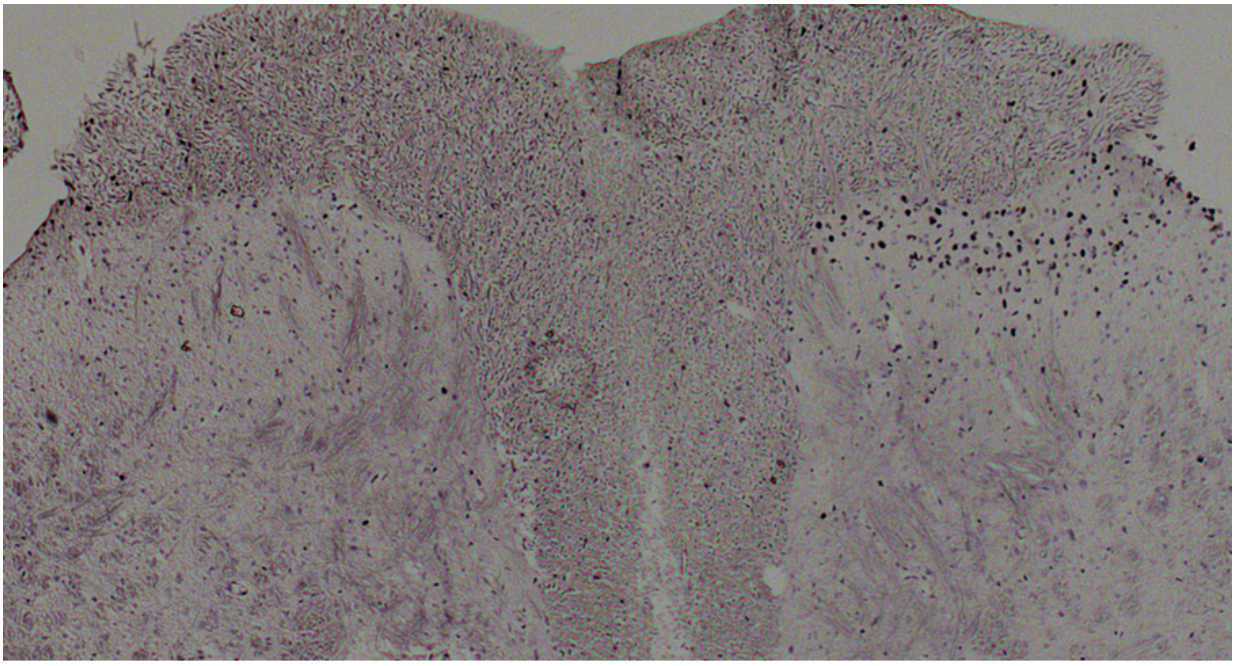

The unpleasant sensation sparked by the nervous system when confronted with a harmful stimulus can be alleviated by blocking a genetic marker that switches off the activity of the neurons involved. Jose Vicente Torres Pérez, a Spanish researcher who works at Imperial College in London, has trialled this innovative pain relief therapy on mice with serious burns. The aim is to use his findings to help burn victims. Credit: Jose Vicente Torres Pérez

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One of the outstanding issues in modern medicine is treating pain effectively. Torres set out to curb the suffering of people with serious burns. He found that blocking a new genetic marker can reduce the neural activation caused by painful stimuli. Torres, the only Spanish researcher participating in the study published today in the journal *Scientific Reports*, says, "The cell activation markers most used today are pERK1/2 and c-Fos, but both have their limitations."

The development and persistence of pain depends on plastic changes to the neurons that process information on harmful stimuli, which are those of the dorsal spinal cord. These plastic changes are largely regulated by epigenetic mechanisms, i.e. chemical changes that alter the expression of the genes, but not their sequence, such as post-translational modifications of histones. "Seeking new pain markers continues to be very important in the field of nociception, which analyses the subjective experience of pain, and a need that has not yet been met," adds Torres Pérez.

New pain relief therapy

Technically, the team has demonstrated in mice that a population of superficial neurons in the spinal cord controls an epigenetic marker known as pS10H3. "We observed the effect after using various animal pain models: inducing burns, applying capsaicin or electrical nerve stimulation," explains Torres Pérez. Therefore, the authors believe that if this activation is blocked, they will achieve a new pain relief therapy.

For the Spanish researcher, "Marker pS10H3 is a new marker of pain

processing in neurons on the spinal cord, and the changes it causes are fundamental to normal pain development, which opens up new therapeutic possibilities."

Application to burn victims

Recent advances have significantly increased the survival rates of burn victims, but little has been achieved to alleviate the pain caused by burn damage. According to the authors, advances that help to decipher the molecular mechanisms produced in neurons that are key to processing pain—such as the discovery of this alteration—will help to find new therapeutic strategies.

"We propose that blocking this epigenetic modification could be a new strategy to try to reduce or completely eliminate the pain after these processes," Torres Pérez concludes.

More information: Jose Vicente Torres-Pérez et al. Phosphorylated Histone 3 at Serine 10 Identifies Activated Spinal Neurons and Contributes to the Development of Tissue Injury-Associated Pain, *Scientific Reports* (2017). DOI: 10.1038/srep41221

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