Study finds that Bisphenol A increases the pain sensation of mice

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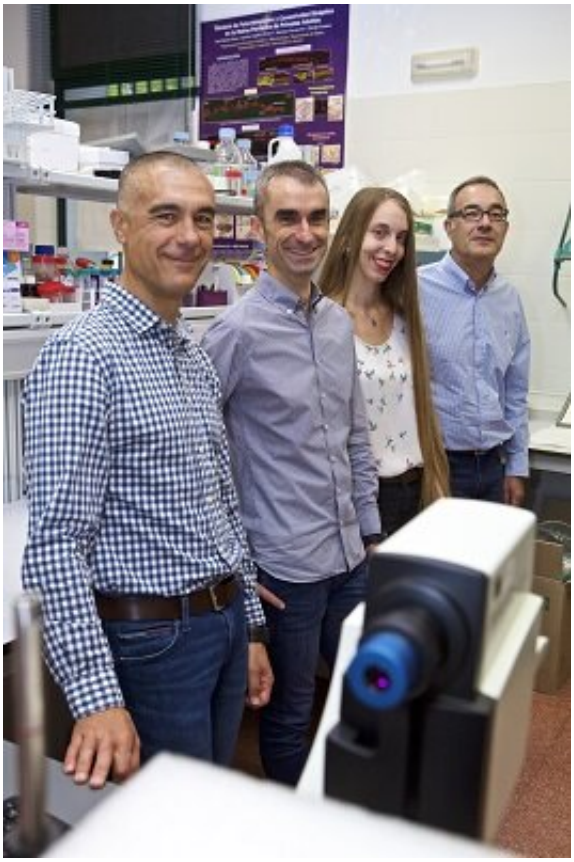

Credit: Asociacion RUVID

University of Alicante (UA) and Miguel Hernández University (UMH) researchers have found out the mechanism of action of bisphenol A (BPA) in nociceptor neurons that transmit the sense of pain. BPA is a chemical substance used to make plastic containers, thermal paper and

coating resins for the inside of food or soft drinks cans.

This is the first study to describe in an animal model how BPA can increase the feeling of pain by modifying the behaviour of certain neurons. The finding has appeared in *Scientific Reports*.

Study method

The researchers treated mice in vivo with small amounts of BPA, like the ones normally found in human blood, proving that the nociceptor neurons that transmit painful sensations are overexcited and remain more active when in direct contact with BPA.

Following an eight-day treatment with bisphenol A, the mice underwent a temperature test and exhibited greater thermal pain sensitivity than the mice not treated with BPA. Once this effect was confirmed, the neurons that transmit painful thermal stimuli were extracted in vivo from the animals to determine the mechanism whereby BPA activated the painful sensation.

"If pain-transmitting neurons are sensitive to bisphenol A, humans may be more prone to certain neurological diseases, in this case thermal pain sensitivity," UA researcher Sergi Soriano says. Soriano highlights the possible relationship between BPA and the effects that appear in erythromelalgia, a genetic mutation characterised by high pain sensitivity in the hands (which become swollen and red) that affects people working in direct contact with the thermal paper used in purchase receipts.

The study not only describes the effect of BPA on nociceptor neurons but also reveals the mechanism of action through estrogen receptor alpha and its interaction with the ion channels responsible for the excitability of sensory neurons. "If we know the mechanism of action of BPA we can predict what other substances with a similar structure may produce

this effect, as well as identify new endocrine disrupters and design molecules that reduce the action of bisphenol A," Soriano explains.

As noted by the UA and UMH researchers in the article published in *Scientific Reports*, exposure to BPA has been associated with several hormone-related diseases, including obesity and diabetes, female and male reproductive alterations, hormone-sensitive cancers, thyroid hormone imbalances and changes in the nervous system, in this case nociceptor neurons.

Recommendations

Until a ban on this substance is approved, as has already happened in other countries, the UA and UMH researchers advise caution: using ceramic or glass containers rather than plastic ones. "It is important to avoid containers marked with the numbers three and seven inside a triangle, as those are the ones containing the most BPA," they add. They also warn that the problem is worsened by exposure to heat, since the substance migrates to food, so they emphasise that food in plastic or Tupperware containers must not be heated.

More information: Sergi Soriano et al. Bisphenol A Regulates Sodium Ramp Currents in Mouse Dorsal Root Ganglion Neurons and Increases Nociception, *Scientific Reports* (2019). DOI: 10.1038/s41598-019-46769-6

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