Chinese spice helps unravel the mysteries of human touch

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New insight into how human brains detect and perceive different types of touch, such as fluttery vibrations and steady pressures, has been revealed by UCL scientists with the help of the ancient Chinese cooking ingredient, Szechuan pepper.

Humans have many different types of receptor cells in the skin that allow us to perceive different types of touch. For more than a century, scientists have puzzled over whether touch signals from each type of receptor are processed independently by the brain, or whether these different signals interact before reaching conscious perception.

For the study, published in the *Proceedings of the Royal Society B*, UCL researchers took a novel approach to this question by stimulating one type of touch receptor chemically, and another type mechanically. This bypasses the problem of different mechanical touch stimuli potentially interacting within the skin, with unknown effects on the receptors.

Instead, the UCL team used hydroxy-?-sanshool, a bioactive compound of Szechuan pepper responsible for the characteristic tingling quality of Szechuan cuisine, to stimulate the touch receptors responsible for the sensation of fluttery vibration.

In the study, consisting of 42 participants, hydroxy-?-sanshool was applied to a small skin area on the lip. Once participants started to experience a tingling sensation, they were asked to note the strength of the tingling sensation.

Next researchers applied a steady pressure stimulus to different locations on the upper and lower lips. Participants reported their subjective perception of the intensity of the tingling sensation, by rating it relative to the initial sensation before pressure was applied.

Across several tests, the tingling sensation caused by hydroxy-?-sanshool, was dramatically reduced by steady pressure. The intensity of tingling sensation caused by hydroxy-?-sanshool decreased as the steady pressure increased, and also decreased as the site of steady pressure was moved closer to the site where sanshool was applied.

Lead author Professor Patrick Haggard (UCL Institute of Cognitive Neuroscience), said: "Scientists had previously described how 'touch inhibits pain', but our work provides novel evidence that one kind of touch can inhibit another kind of touch.

"Our results suggest that the touch system for steady pressure must inhibit the touch system for fluttery vibration at some level in the nervous system.

"The inhibition between these signals may explain how the brain produces a single perception of touch, despite the wide range of signals transmitted by the different types of sensory receptor in the skin."

More information: Antonio Cataldo et al, Touch inhibits touch: sanshool-induced paradoxical tingling reveals perceptual interaction between somatosensory submodalities, *Proceedings of the Royal Society B: Biological Sciences* (2021). DOI: 10.1098/rspb.2020.2914