Medical Xpress

Moral disgust leaves us with a 'bad taste'

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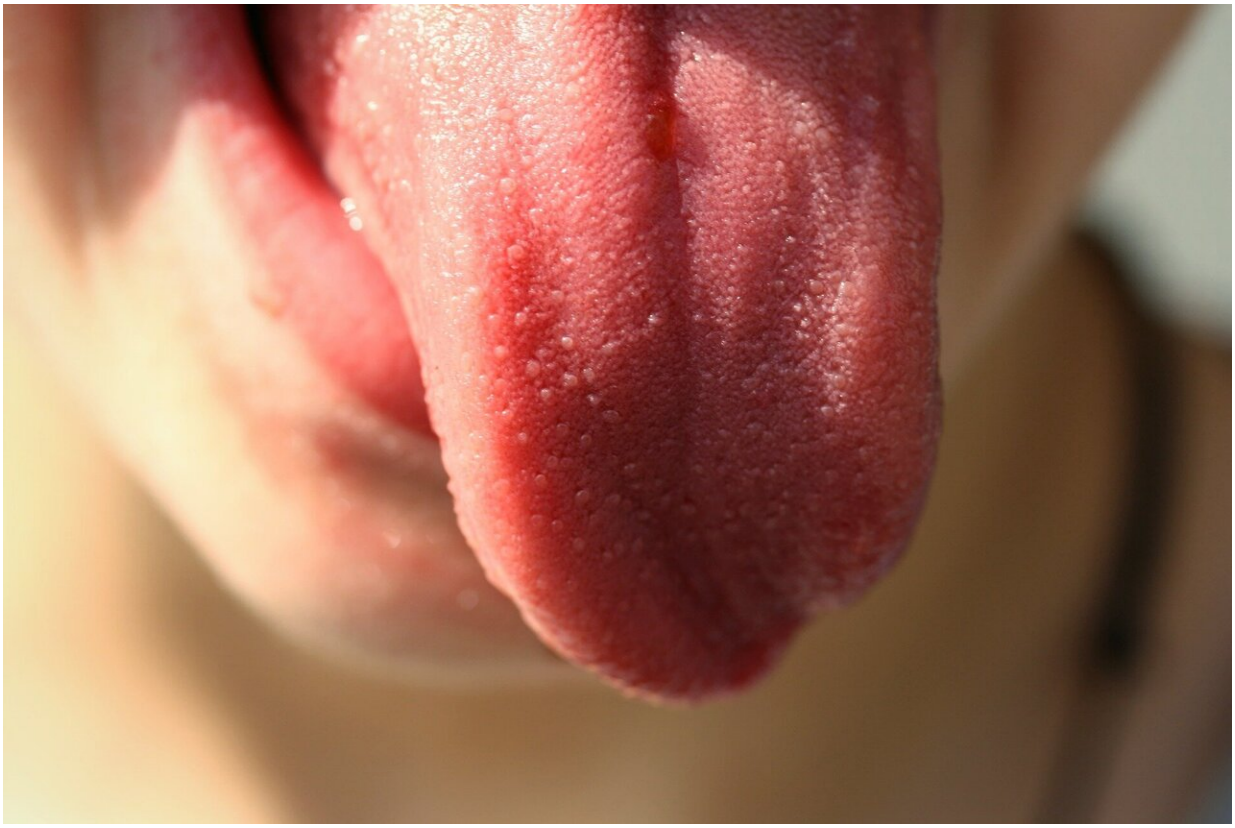

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When we witness behaviors that violate shared moral norms, our brain inhibits the neurons that control our tongue movements—just as it does when something tastes bad. An international research group led by the Universities of Bologna and Messina came to this result in their study published in the journal of *Social, Cognitive and Affective Neuroscience*

and recently awarded the "Best Paper Prize 2021" at the XII International Conference on Neuroethics.

"Our study puts forward the hypothesis of an oral origin of morality; the rejection impulse originally evoked by oral disgust might have been co-opted to promote the withdrawal from moral transgressions," says Alessio Avenanti who is the research coordinator and a neuroscientist at the Department of Psychology of the University of Bologna, Cesena Campus. "Moral disgust, therefore, is not just a consequence of thought processes and mental cognitive abilities but is connected to physiological and emotional responses."

Indeed, 'disgusting' describes not only the taste of rotten or non-edible food but also an action or behavior we perceive as revolting because it violates the moral norms of our culture or system of values. The researchers analyzed the neurons controlling the motor activity of the tongue to discover if and how this relationship between morality and disgust relies on neuro-mechanisms linked to physical responses.

"From a sensory point of view, the tongue-disgust linkage is intuitive, as this oral muscle works as a sensory organ that encodes flavors through the taste receptors located on its surface," says Carmelo Vicario, first author of this study and professor at the University of Messina. "In a previous study, we had already shown that oral-disgust stimuli could inhibit the motor cortex controlling the tongue. This study confirms that a similar process happens when we witness violations of morality."

The researchers came to this conclusion by using Transcranial Magnetic Stimulation (TMS) on a sample of subjects. TMS is a non-invasive form of brain stimulation that allowed the researchers to stimulate the tongue primary motor area thanks to an electromagnetic coil positioned on the subject's head. The subjects of the study were presented with vignettes of moral transgressions. The neuroscientists then recorded the response

of the neurons controlling the tongue movement through some electrodes.

In this way, they showed that the more those moral transgressions filled the subjects with indignation, the more inhibited the motor capacity of their tongue was. This phenomenon was observed only at the level of the tongue and did not seem to involve other parts of the primary motor cortex.

When we taste something unpleasant, we experience inhibition of the movement of our tongue. This reaction might reflect an implicit avoidance-defense mechanism to prevent the ingestion of potentially harmful substances. This study indicates that a similar avoidance-defensive mechanism could have adapted as a response to violations of shared moral norms.

"This study suggests neurophysiological evidence connecting morality to a physiological response that has implications within the philosophical debate between the moral theories of sentimentalists and rationalists. A debate that is increasingly asking for the contribution of philosophers, psychologists and neuroscientists," states Giuseppe Pellegrino, who co-authored the study and is the director of the Centre for studies and research in Cognitive Neuroscience at the University of Bologna.

More information: Carmelo M Vicario et al, Indignation for moral violations suppresses the tongue motor cortex: preliminary TMS evidence, *Social Cognitive and Affective Neuroscience* (2020). DOI: 10.1093/scan/nsaa036

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