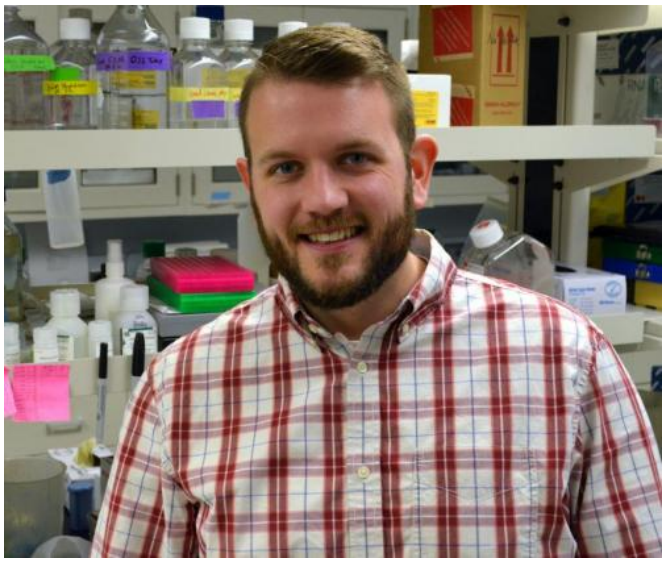
Stress hormone receptors localized in sweet taste cells

3 June 2014



Parker studies interactions between the endocrine and taste systems on molecular and behavioral levels. Credit: Monell Center

According to new research from the Monell Center, receptors for stress-activated hormones have been localized in oral taste cells responsible for detection of sweet, umami, and bitter. The findings suggest that these hormones, known as glucocorticoids, may act directly on taste receptor cells under conditions of stress to affect how these cells respond to sugars and certain other taste stimuli.

"Sweet taste may be particularly affected by stress," said lead author M. Rockwell Parker, PhD, a chemical ecologist at Monell. "Our results may provide a molecular mechanism to help explain why some people eat more sugary foods when they are experiencing intense stress."

Glucocorticoid (GC) hormones affect the body by activating specialized GC receptors located inside of cells. Knowing that stress can have major effects on metabolism and food choice, the researchers used a mouse model to ask whether taste receptor cells contain these GC receptors.

The findings, published online ahead of print in the journal *Neuroscience Letters*, revealed that GC receptors are present on the tongue, where they are specifically localized to the cells that contain receptors for sweet, umami and bitter taste. The highest concentrations of GC receptors were found in Tas1r3 taste cells, which are sensitive to sweet and umami taste.

GC hormones act on cells via a multi-step process. After GCs bind to their receptors within target cells, the activated receptor complex moves, or translocates, to the cell nucleus, where it then influences gene expression and protein assembly.

To explore whether GC receptors in taste tissue are activated by stress, the researchers compared the proportion of taste cells with translocated receptors in stressed and non-stressed mice. Compared to controls, the stressed mice had a 77 percent increase of GC receptors within taste cell nuclei.

Together, the results suggest that sweet taste perception and intake, which are known to be altered by stress, may be specifically affected via secretion of GCs and subsequent activation of GC receptors in taste cells.

"Taste provides one of our initial evaluations of potential foods. If this sense can be directly affected by stress-related hormonal changes, our food interaction will likewise be altered," said Parker.

Parker noted that although stress is known to affect intake of salty foods, GC receptors were not found in cells thought to be responsible for detecting sally and sour taste. One explanation, he said, is that stress may influence salt taste processing in the brain.

Implications of the findings extend beyond the oral taste system. Noting that taste receptors are found throughout the body, senior author and Monell molecular neurobiologist Robert Margolskee, MD, PhD, said, "Taste receptors in the gut and pancreas might also be influenced by stress, potentially impacting metabolism of sugars and other nutrients and affecting appetite."

Future studies will continue to explore how stress hormones act to affect the taste system.

Provided by Monell Chemical Senses Center

APA citation: Stress hormone receptors localized in sweet taste cells (2014, June 3) retrieved 11 October 2022 from https://medicalxpress.com/news/2014-06-stress-hormone-receptors-localized-sweet.html

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