How do you stop tasting?

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New findings may lend insight into why some people are especially sensitive to bitter tastes. Scientists from the Monell Center and Givaudan Flavors have identified a protein inside of taste cells that acts to shorten bitter taste signals. They further report that mice lacking the gene for this taste terminator protein are more sensitive to bitter taste and also find it more aversive, possibly because they experience the taste for a longer period of time.

"Individual differences in the genes that are responsible for taste termination may explain why some people are supersensitive to certain tastes," said Liquan Huang, Ph.D., a molecular biologist at Monell. "Our findings also suggest that medicines that cause patients to report unpleasant taste distortions or phantom tastes may be interfering with taste termination proteins. If so, it may be possible to develop ways to minimize these unpleasant side effects that are significant barriers to patient compliance."

When you drink tonic water, quinine molecules activate or 'turn on' your taste receptor cells. The activated cells then send messages to tell your brain that the tonic is bitter. The mechanisms that 'turn on' taste cells are fairly well understood, at least for sweet, umami and bitter tastes. The researchers wanted to know: what turns the taste cells off?

When a sweet, bitter or umami molecule interacts with a receptor on the surface of a taste cell, it initiates a cascade of molecular events within the cell. One of these events involves an increase in the amount of calcium inside the cell. This ultimately causes the taste cell to send a

message to the brain, to say for example, "I taste bitter."

However, little was known about what causes the taste cell to stop sending that message. In the study, published online in the open access journal PLoS ONE, the researchers used multiple approaches to identify a protein called Serca3 and demonstrate that it plays an important role in turning off the bitter taste signal.

"This new knowledge helps us more fully understand how taste sensations are controlled," said Huang. "Both the initiation and termination steps contribute to how we sense and perceive tastes."

To demonstrate how Serca3 influences taste, the researchers went on to show that mice bred to lack the Serca3 gene were more sensitive to bitter taste and also found it more unpleasant. This response was primarily related to bitter taste. However, mice without Serca3 also responded to sweet and umami tastes as being slightly more intense as compared to the responses of normal mice. There were no changes for salty and sour tastes.

The Serca3 protein functions as a calcium pump. It helps to terminate bitter taste signals by removing calcium from the cell, which then causes the cell to stop signaling. Huang and his collaborators suspect that another member of the Serca family may work in a similar way to terminate taste sensations in sweet and umami cells. Future studies will investigate the contribution of this component, Serca2, in regulating sweet and umami taste perception.

Provided by Monell Chemical Senses Center

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