Medical Xpress

Sour research, sweet results: How people perceive sour flavors

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This Thanksgiving, when you bite into the cranberry sauce and the tartness smacks your tongue as hard as that snide comment from your sister, consider the power of sour. Neurobiology researchers at the University of Southern California have made a surprising discovery about how some cells respond to sour tastes.

Of the five taste sensations — sweet, bitter, sour, salty and umami — sour is arguably the strongest yet the least understood. Sour is the sensation evoked by substances that are acidic, such as lemons and pickles. The more acidic the substance, the more sour the taste.

Acids release protons. How protons activate the taste system had not been understood. The USC team expected to find protons from acids binding to the outside of the cell and opening a pore in the membrane that would allow sodium to enter the cell. Sodium's entry would send an electrical response to the brain, announcing the sensation that we perceive as sour.

Instead, the researchers found that the protons were entering the cell and causing the electrical response directly.

The finding is to be published this week in the *Proceedings of the National Academy of Sciences* (*PNAS*) journal.

"In order to understand how sour works, we need to understand how the cells that are responsive to sour detect the protons," said senior author

Emily Liman, associate professor of neurobiology in the USC College of Letters, Arts and Sciences.

"In the past, it's been difficult to address this question because the taste buds on the tongue are heterogeneous. Among the 50 or so cells in each taste bud there are cells responding to each of the five tastes. But if we want to know how sour works, we need to measure activity specifically in the sour sensitive taste cells and determine what is special about them that allows them to respond to protons."

Liman and her team bred genetically modified mice and marked their sour cells with a yellow florescent protein. Then they recorded the electrical responses from just those cells to protons.

The ability to sense protons with a mechanism that does not rely on sodium has important implications for how different tastes interact, Liman speculates.

"This mechanism is very appropriate for the taste system because we can eat something that has a lot of protons and not much sodium or other ions, and the taste system will still be able to detect sour," she said. "It makes sense that nature would have built a taste cell like this, so as not to confuse salty with sour."

In the future, the research may have practical applications for cooks and the food industry.

"We're at the early stages of identifying the molecules that contribute to sour taste," Liman said. "Once we've understood the nature of the molecules that sense sour, we can start thinking about how they might be modified and how that might change the way things taste. We may also find that the number or function of these molecules changes during the course of development or during aging."

Provided by University of Southern California