Bitter Taste Sensitivity May Predict Surgical Outcome in Certain Chronic Rhinosinusitis Patients

PHILADELPHIA (November 12, 2015) – New research from the Monell Center and the Perelman School of Medicine at the University of Pennsylvania suggests that physicians may someday be able to use a simple taste test to predict which surgical intervention is best suited to help a subset of chronic rhinosinusitis patients.

The current findings draw upon the team’s earlier research showing that a receptor that detects bitter taste in the mouth also is found in the upper airways, where it functions to defend against bacterial infection.

“There are many medical and surgical options for patients with chronic rhinosinusitis,” said study author Noam Cohen, MD, PhD, Adjunct Associate Member at Monell, and Associate Professor of Otorhinolaryngology: Head and Neck Surgery at Penn’s Perelman School of Medicine. “For those patients who elect surgery, we may be able to use information from the taste system to set realistic expectations as to which type of surgery might result in the most improvement.”

Chronic rhinosinusitis, or CRS, affects more than 35 million Americans and accounts for one in five adult antibiotic prescriptions annually. Each year, over half a million CRS sufferers do not respond to antibiotics or other medications and choose to undergo sinus surgery.

The current study, published online ahead of print in The International Forum of Allergy & Rhinology, followed 123 CRS patients who had not responded to conventional medical treatment and had elected to undergo functional endoscopic sinus surgery. Each was classified as to the presence (82 patients) or absence (41) of nasal polyps, benign growths in the nose that contribute to the symptoms of CRS.

Genetic analysis and behavioral tests also provided information about a bitter taste receptor known as T2R38 and its underlying gene, called TAS2R38.

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Small variations in the \textit{TAS2R38} gene are related to differential taste sensitivity to a compound called phenylthiocarbamide, or PTC. One gene variant, known as PAV, generates a receptor that is highly sensitive to PTC; people having this variant find PTC solutions highly bitter and unpleasant. In contrast, people with the insensitive AVI variant often cannot distinguish PTC from water.

Study researchers began investigating the relationship between bitter taste and CRS surgical outcomes after they found that the T2R38 bitter taste receptor is also present in human upper airways, where it plays a role in the airway’s innate defense system against bacteria.

The researchers have demonstrated that the same variations in the \textit{TAS2R38} gene that underlie taste sensitivity also are linked to the ability of upper respiratory cells to fight off certain upper respiratory infections. Specifically, people having the taste sensitive PAV variant are better able to combat airway bacteria and are less likely to develop severe CRS that necessitates medical intervention.

Knowing that \textit{TAS2R38} genetic variations correlate to differences in immune response, the current study asked whether those same variations relate to surgical outcomes in CRS patients.

The researchers assessed patient improvement one, three, and six months after surgery using the Sino-Nasal Outcomes Test, a scale commonly used to measure nasal and general health symptoms and related quality of life.

In patients without polyps, a person’s \textit{TAS2R38} variant, as reflected by both genotype analysis and bitter taste sensitivity to PTC, was associated with their degree of postsurgical improvement.

“Although all patient groups improved after surgery, those having the sensitive PAV variant had a greater improvement,” said Cohen. “It’s possible that the remaining patients might obtain better symptomatic benefit from more aggressive surgical approaches.”

These findings suggest that for CRS patients without nasal polyps, knowledge of their T2R38 genotype, or the more easily determined PTC taste sensitivity, may help --more--
physicians predict which patients would respond best to standard functional endoscopic sinus surgery.

“The same bitter receptor that responds to a bitter taste compound in the mouth also responds to chemicals secreted by bacteria in the airways. This immune boost may help the more bitter-sensitive people to recover and feel better post-surgery,” said study author Danielle Reed, PhD, a behavioral geneticist at Monell.

“While these data are still preliminary, it’s exciting that a simple taste test may aid in counseling patients and setting realistic expectations for improvement following this type of surgery,” said Cohen. “We look forward to expanding this study to include more patients, and tracking their post-surgical progress longer.”

Also contributing to the research were Beverly Cowart, Anna Lysenko, and Corrine Mansfield of Monell, and lead author Nithin Adappa, Douglas Farquhar, James Palmer, David W. Kennedy, David Owens, and Robert Lee of the University of Pennsylvania’s Department of Otorhinolaryngology. This research was supported by grants R01DC013588, P30DC011735, and R01DC004698 from the National Institute on Deafness and Other Communication Disorders of the National Institutes of Health and by a grant from a philanthropic contribution from the RLG Foundation, Inc.. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or other funders.

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