

Taste bud biomarker forecasts better post-surgery results for some sinusitis patients

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A simple taste test can identify patients who will have highly successful sinus surgery, researchers from Penn Medicine and the Monell Chemical Senses Center report in this week's *International Forum of Allergy & Rhinology*. For the first time, the team identified a genetic biomarker—a bitter taste receptor—that forecasted better post-surgery results for patients who underwent surgery for chronic sinusitis, which affects nearly 35 million Americans.

People who were most sensitive to a certain bitter compound reported breathing more easily through their nose, having fewer subsequent infections, and sleeping more soundly six months after surgery than those who are less sensitive, the team reported.

"Sinus surgery is a very commonly performed surgery [roughly 550,000 procedures/year] because it helps the vast majority of sinusitis sufferers, but we still don't understand why some people get modest improvement, while other get exceptional improvement in their symptoms," said the study's lead author, Nithin D. Adappa, MD, an assistant professor of Otorhinolaryngology: Head and Neck Surgery at the Perelman School of Medicine at the University of Pennsylvania. "If we could predict the level of improvement for each individual, based on an inborn genetic difference, it would contribute to setting realistic expectations for our patients, which is an important factor in counseling them about surgery."

The biomarker is the bitter taste receptor T2R38. Bitter taste receptors are proteins that are found in taste cells of the tongue, where they protect

against the ingestion of toxic plant and bacterial products. Groups of 50-150 taste cells form a single taste bud. The collaborative Penn Medicine/Monell research team had previously demonstrated that T2R38 is also found in cells lining the passages of the nose and sinuses and contributes to the natural defenses against certain bacteria. Presence of the biomarker was determined genetically through standard DNA sequencing performed in 207 patients who were to have sinus surgery for chronic rhinosinusitis.

The patients were also asked to taste a specific bitter—but safe—chemical and report their sensations. Patients who had the biomarker were more sensitive to the bitter chemical than those who did not have the biomarker.

"This study arises from our earlier work that suggested that people with certain inborn differences in their genetic code for T2R38 might be better at fighting off certain types of respiratory infections," said the study's senior author, Noam A. Cohen, MD, PhD, director of Rhinology research in the department of Otorhinolaryngology at Penn. "Therefore we wondered if this specific genetic difference, in being able to combat infection, correlated with the degree of improvement following surgery. In fact, this is precisely what we found."

Cumulatively, the two studies suggest that people who are genetically more sensitive to certain bitter tastes fight off upper respiratory infections better, and if they do get sick enough to require surgery, they improve more than people with less sensitive systems.

"We continue to learn that taste receptors serve diverse functions throughout the body. In this case, the same bitter receptor that responds to a bitter taste compound in the mouth also responds to chemicals secreted by bacteria in the airways," said study author, Danielle R. Reed, PhD, a behavioral geneticist at Monell.

Chronic rhinosinusitis interferes with nasal drainage and causes mucus to build up. Symptoms include difficulty breathing through the nose, swelling in the face and around the eyes, headache, and facial pain.

Patients requiring sinus [surgery](#) for chronic rhinosinusitis have worse scores for physical pain and social functioning than those suffering from chronic obstructive pulmonary disease, congestive heart failure, or angina. With annual direct costs in excess of \$8 billion in the United States, chronic rhinosinusitis accounts for one in five antibiotic prescriptions in adults.

Patients are typically treated with four to six weeks of medical therapy that consists of topical and/or systemic steroids, sinonasal irrigation, and antibiotics. In cases that continue to resist treatment or medication, endoscopic [sinus surgery](#) may be an option. For this procedure, surgeons use an endoscope, a thin optical tube with an attached light, to explore the patient's sinus passages. Then, depending on the source of obstruction, the surgeon uses various instruments to remove tissue that's causing sinus blockage and enlarge the sinus openings to promote drainage and ventilation.

"The next step is to ask other otolaryngologists to correlate surgical outcomes to DNA sequencing of T2R38 and/or [bitter taste](#) tests to confirm our findings and determine if this effect occurs in people in various geographic regions, as well as patients of other racial and ethnic groups, since our patients were mostly Americans of European descent," said Adappa.

Provided by University of Pennsylvania School of Medicine

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