

Cancer survivors' tongues less sensitive to tastes than those of healthy peers

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Head and neck cancer survivors' tongues are less sensitive at the tip, and problems with taste dysfunction may persist for years after patients complete oncology treatments, a team led by food science and human nutrition professor M. Yanina Pepino found in a study. Credit: Luka Gruev

Most survivors of squamous cell head and neck cancers report that their

sense of taste is dulled, changed or lost during radiation treatment, causing them to lose interest in eating and diminishing their quality of life.

In a study of taste and smell dysfunction with 40 cancer survivors, scientists at the University of Illinois Urbana-Champaign found that the tips of these individuals' tongues were significantly less sensitive to bitter, salty or sweet tastes than peers in the control group who had never been diagnosed with cancer.

In a paper published in the journal *Chemical Senses*, the U. of I. team said this diminished taste sensitivity suggested that the taste buds on the front two-thirds of the cancer survivors' tongues or a branch of the chorda tympani [facial nerve](#), which carries signals from the tip of the [tongue](#) to the brain, may have been damaged during radiation therapy.

"While most studies suggest that patients' ability to taste recovers within a few months of treatment, patients report that they continue to experience taste dysfunction for years after treatment ends," said M. Yanina Pepino, a professor of food science and [human nutrition](#) at the U. of I. "Our primary goal in this study was to test the hypothesis that radiation therapy is associated with long-term alterations in patients' senses of smell and taste."

While undergoing radiation and/or chemotherapy, head and neck cancer patients may lose taste buds, triggering a transient reduction in their ability to taste—a condition called hypogeusia—or their perception of tastes may be altered, a condition called dysgeusia that can also occur when nerves are damaged during cancer surgery, she said.

"Taste buds' average lifespan of about 10 days enables rapid recovery from injury if the stem cells are preserved, yet it also makes the short-lived and long-lived cells within taste buds particularly vulnerable to the

direct cytotoxic and anti-proliferative effects of chemotherapy and radiotherapy," Pepino said.

Prior studies that explored taste loss and perception in these patients showed mixed results. Many of these studies involved "whole mouth" experiments that may not have detected regional damage to the [taste buds](#) at the front of the tongue or to the chorda tympani section of the facial nerve, said graduate student Raul Alfaro, the lead author of the study.

The U. of I. team assessed participants' smell and taste functions separately and explored whether sensory interactions between taste and retronasal odors—aromas from food and beverages that are perceived in the oral cavity while eating or drinking—differed for the cancer survivors and the people in the control group.

The team assessed participants' ability to taste regionally by applying cotton swabs soaked in flavored solutions to the tips of their tongues.

They also evaluated participants' whole-mouth taste function by having them swish solutions around in their mouths for five seconds and spit them out. For this test, the participants were presented with nine cups of liquids that contained both taste and smell sensory components. The cups contained two concentrations of strawberry extract in a sucrose solution, lemon extract in citric acid, salt in a vegetable broth and caffeinated instant coffee. They also received one cup of deionized water.

After sipping each sample, participants were asked to identify its taste quality—sweet, salty, bitter, umami (savory) or no sensation—and to rate the smell and taste intensity of the sample on a scale that ranged from "no sensation" to "strongest of any kind."

Participants tasted the samples twice—once wearing a nose clip and once

without—to determine whether their taste perception differed when the nose clip blocked their retronasal olfactory cues.

When participants' sense of taste was assessed using the whole-mouth test with or without the nose clip, they similarly rated the taste and smell of nearly all of the samples.

However, when participants' [sense of taste](#) was assessed regionally at the tip of the tongue, the cancer survivors were more likely to respond they did not perceive a taste or to misidentify the taste quality—such as bitter, salty or sweet—of multiple samples.

"Although the results from the whole-mouth taste test suggested that head and neck cancer survivors' taste function was normal and well preserved, results from the regional tests indicated that they had some deficits," Pepino said. "Subtle taste dysfunction in the tip of the tongue persisted for several months after they completed their oncology treatments.

"Taste dysfunction at the tip of the tongue might sound unimportant; however, there is an elegant cross-talk between the nerves that conveys signals from the tip and the back of the tongue, such that taste signals in the tip of the tongue inhibit signaling from the back. This system allows taste intensity to remain constant in the whole mouth, even when taste signaling coming from the tip of the tongue is reduced. However, reduced signal input can also lead to phantom tastes, metallic [taste](#) and other oral symptoms."

More information: Raul Alfaro et al, Taste and Smell Function in Head and Neck Cancer Survivors, *Chemical Senses* (2021). [DOI: 10.1093/chemse/bjab026](https://doi.org/10.1093/chemse/bjab026)

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