The sweet spot: Scientists discover taste center of human brain

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Researchers long ago mapped sight, hearing and other human sensory systems in the brain. But for taste, which could be considered our most pleasurable sense, precisely where the "gustatory" cortex is and how it works has been a mystery.

Using functional magnetic resonance imaging (fMRI) and a new method of statistical analysis, researchers have discovered the taste center in the human brain by uncovering which parts of the brain distinguish different types of tastes.

"We have known that tastes activate the human brain for some time, but not where primary taste types such as sweet, sour, salty and bitter are distinguished," said Adam Anderson, professor of human development at Cornell University and senior author of the study, published in *Nature Communications*.

"By using some new techniques that analyze fine-grained activity patterns, we found a specific portion of the insular cortex—an older cortex in the brain hidden behind the neocortex—represents distinct tastes," Anderson said.

The insular cortex, which separates the frontal and temporal lobes, has long been thought to be the primary sensory area for taste. It also plays a role in other important functions, including visceral and emotional experience.

"The insular cortex represents experiences from inside our bodies," Anderson said. "So taste is a bit like perceiving our own bodies, which is very different from other external senses such as sight, touch, hearing or smell."

Previous work has shown a nearby insular region processes information originating from inside the body—from the heart and lungs, for example. In this way, distinct tastes and their associated pleasures may reflect the needs of our body. Taste not only reflects what is on our tongue but also our body's need for specific nutrients, Anderson said.

The researchers found evidence that could be considered the "sweet" spot in the insula—a specific area where a large ensemble of neurons respond to sweetness stimulation on the tongue.

"While we identified a potential 'sweet' spot, its precise location differed across people and this same spot responded to other tastes, but with distinct patterns of activity," Anderson said. "To know what people are tasting, we have to take into account not only where in the insula is stimulated, but also how."

Compared with previous animal studies that show distinct activation clusters of basic tastes in the brain, the new study's results reveal a more complex taste map in the human brain, Anderson said, where the same insular region represents

multiple tastes.

More information: Junichi Chikazoe et al, Distinct representations of basic taste qualities in human gustatory cortex, *Nature Communications* (2019). DOI: 10.1038/s41467-019-08857-z