Why you smell better with your nose than with your mouth

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The marked difference in how much better you recognize odors you breathe in than those that are released when you chew something can be explained by the workings of the epithelium cells that line the nasal

cavity. This was established when researchers had ten study participants stick probes into their noses, and then made electro-physical recordings of how the epithelium cells reacted to different odors presented to them. The study was led by Thomas Hummel of the Technische Universität Dresden in Germany, and is published in Springer's journal *Chemosensory Perception*.

Olfaction refers to the action or capacity of smelling. People are able to smell thanks to their noses (an ability referred to as their orthonasal sense of smell) and through their mouths (their retronasal smelling sense) when odorous molecules are released into the nasal cavity during the process of chewing and swallowing.

According to Hummel, retronasal olfaction, although not as sensitive, represents a peculiar aspect of the olfactory system in that it allows for smells to be evaluated within the interior of the body rather than from the external world. Retronasal olfaction adds to people's experience of eating or drinking, as it evokes different sensations compared to orthonasal smelling. It also helps to keep people out of harm's way when they put potentially harmful substances into their mouths.

Hummel's team used electro-olfactogram (EOG) recordings to evaluate how the epithelium lining in the nasal cavity reacts to stimuli that are either breathed in or are released thanks to the workings of the mouth. This electrographic technique is similar to electrocardiograms that provide neuronal information about the changing bioelectrical potential of the heart.

The experiment was performed on six men and four women, who had to insert a tubular electrode about seven centimeters deep into their nasal cavity. The reaction of the participants' epithelial lining to three odorants (phenylethyl alcohol, hydrogen sulfide and carbon dioxide) were then recorded.

The epithelial lining responded more to orthonasal stimuli than to retronasal ones. This indicates that orthonasal stimuli are perceived with a higher intensity than retronasal ones.

The findings are in line with the thought that the odors of food and liquids, most often experienced through chewing and swallowing, are typically encountered at higher concentrations than orthonasal perceived ones, to allow them to be picked up adequately.

"Compared to the smell of a given food, such as cheese, odor release from that same food is higher intraorally due to salivation, warming, and chewing," explains Hummel. "Because of these conditions, retronasal perception of odors, compared with orthonasal olfaction, may be adjusted to a higher range of odor concentrations."

"This indicates that differences between ortho- and retronasal olfaction may start as early as on the mucosal level," adds Hummel, who says the current findings lend support to previous research showing that the intensity of physically identical stimuli is slightly lower after retronasal stimulation.

More information: Thomas Hummel et al, Electro-Olfactograms in Humans in Response to Ortho- and Retronasal Chemosensory Stimulation, *Chemosensory Perception* (2016). DOI: 10.1007/s12078-016-9217-z

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