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Making Scents of Sounds: Noises May Alter How We Perceive Odors

The neural basis for "smound" may have been uncovered

By Lynne Peeples | Tuesday, February 23, 2010 | 19 comments

Editor's note: This story, from the April 2010 issue, is being posted early to coincide with a journal publication date.

"SMOUND" PROPOSITION: What you hear may affect what you smell.
Image: Peter Sherrard/Getty Images

Flavor just got some competition. Smell and taste are known to converge to produce the best and worst of culinary experiences, but new research suggests that information received through the nose can also be altered by noise. If confirmed, this newfound union could have potent olfactory and gustatory implications.

The discovery of a possible smell-sound sense, or "smound," came to Daniel Wesson by accident. "I was simply trying to find the way the olfactory tubercle responds to odors," he says, referring to a structure at the base of the brain that was implicated in odor detection only in 2004. But when he set down his coffee mug on a laboratory bench one afternoon, he noticed that the activity in the tubercle of the mice he was studying spiked. He picked his mug back up. Sip. Clunk. Spike.

Wesson and his colleague Donald Wilson, both at the Nathan S. Kline Institute for Psychiatric Research in Orangeburg, N.Y., decided to investigate the smound spikes more rigorously. As they describe in the February 24 *Journal of Neuroscience*, they first verified that the tubercle does indeed respond to smell. They found that 65 percent of tubercle cells from 23 anesthetized mice were activated by at least one of five odors—an important finding in its own, because no one knew if tubercle cells could discriminate odors, a process thought to be exclusive to the part of the brain known as the piriform cortex. Next, Wesson and Wilson repeated the experiment, this time presenting a subset of the cells with only a tone: 19 percent fired.

The next set of recordings "really changes the way we think about smell," Wesson says. He and Wilson repeatedly sent a mix of both odors and tones into tubercle cells and saw that responses from 29 percent became either enhanced or suppressed depending on the presence or absence of the second stimulus. One cell, for example, appeared not to care for either smell or sound but responded robustly to the combination.

Historical hints of perceptual interplay between smells and sounds have been

reported— in the mid-1800s French perfumerist G. W. Septimus Piesse catalogued odors based on analogous auditory pitches. Wesson and Wilson, though, may have found the first neural evidence. But because sensory activity does not always equate with perceived changes, they must devise an experiment to determine what their mice actually smell and hear. The perceptual shift could be significant: changes in sensory activity even smaller than what was seen in these experiments can greatly influence the senses. “In theory, one spike could allow for the discrimination between a tangerine and a mango,” Wesson notes.

Olfactory-auditory integration adds to a growing list of intimate connections between sensory systems. “While we like to think that there are five separate senses, that’s not the way it works,” remarks Donald Katz, a neurobiologist at Brandeis University. “What your brain really does is take objects and process them.”

The existence of a smound sense has broad implications. It may help elucidate the defective processing behind mysterious disorders such as synesthesia, in which patients taste colors and see flavors. And Wesson and Wilson plan to develop technology related to their findings; for instance, they hope to patent a device that emits a tone into the ear of a dog every time it sniffs, enhancing its sensitivity to, say, explosives. The necessary details will come after they identify which frequencies and intensities best amplify and suppress odors.

Of course, diners can experiment on themselves. They could see if food smells—and hence, tastes—differently based on the background sounds. You might find that your saffron risotto pairs better with Beyoncé than with Beethoven.