When it comes to eating, rats follow their noses

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(PhysOrg.com) -- Associate professor Don Katz sits in his modest office while a colleague makes a cappuccino next door. The small machine gurgles and churns and the smell of fresh brewed coffee wafts through the air.

Would it taste the same if you could not smell it? Does a sense of smell require a sense of taste? Katz and colleagues are trying to find answers to such questions by investigating a curious behavior of rats.

“Rats learn what food that they like from smelling the breath of other rats,” says Katz, an associate professor of psychology and neuroscience. “A rat will essentially say, ‘Hey – Fred ate that and lived to tell the tale’ so later, when that rat is offered a choice, he will gravitate toward the food that he smelled on the other rat’s breath.”

This is true even when confronted with very bitter tastes, such as raw cocoa, which rats generally do not care for. “And they will even make rat yummy faces to show that they’re enjoying the experience,” says Katz, who by now can read their facial nuances.

Rats are social animals, says Katz. So, despite the fact that the research was conducted in a laboratory setting, he says that it’s highly likely that this mechanism plays strongly into their food choices in the real world as well.

The research included a training session and a testing session. During the

training session, a rat was placed with another rat that had just finished eating. When the "sniffer" rat was then presented with a choice of foods, it opted for the one it had just smelled. But if the "sniffer" rat was made anosmic, or unable to smell, it no longer displayed a preference.

Once Katz and colleagues proved that smell was the driving force in food choice, they set out to see if the behavior change survived if the rats had no sense of taste. This was analogous to asking, "does your sense of taste still work right when you can't smell?"

Katz says that some of his research, which was published in the journal Nature Neuroscience, can be compared to the effects of the common cold: A stuffy nose throws tastes systems out of whack, leaving food tasting bland. This, says Katz, is because the taste and smell systems work together.

The problem, he says, is that the opposite natural experiment never occurs: "It's never the case were there's a three to four day period when someone's tongue isn't working," says Katz.

Katz and his colleagues temporarily disabled part of the primary taste cortex in the rat's brain while the animal was in the training session. They then found that when the sense of taste was partially disabled, foods no longer smelled the same, showing that the taste system must be intact in order to smell properly.

In addition, they learned that the experiment had a state-dependent effect, meaning that if the taste system was knocked out while the animal was in the midst of smelling the other rat's breath, it would still learn to prefer that taste — but only if the taste cortex was disabled again during the decision process.

"Whatever the rat smells while its sense of taste is disabled will taste

different when the taste system is back online," says Katz. "This is why when you knock out taste for both the training and testing session the rat appears to behave normally — the sense of smell is altered the same way in both sessions."

Temporarily disabling part of the primary taste cortex turned out to have a bigger impact on the sense of smell than the sense of taste, the researchers found. Something that may smell like roses or oranges when the taste cortex is intact can smell like something entirely different when the taste cortex is knocked out, explains Katz.

Katz says the study will help scientists better understand the linkages between the two senses and, even, how the loss of one sense can affect the quality of a person's life.

"We have naively thought that 'taste is just smell' but this project reveals the truth to be much more complex, and offers a beginning to a new conception of flavor," says Katz. "In fact, the senses of taste and smell intertwine in an intricate dance, each one influencing the action of the other."

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