The secret to sniffing out a safe supper

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When mice smell the scent of food on the breath of their fellow mice, they use that experience to decide what's safe to eat in the future. Key in that learning process is the pairing of a particular odor with a chemical ingredient found in mouse breath, scientists knew. What they didn't know was how mice manage to sniff that connection out. According to a report published online on July 15th in *Current Biology*, now they do.

"It's as if the mouse were thinking something like, 'My buddy ate food that smelled just like what I have in front of me. He isn't dead. Therefore, this food must be safe to eat,'" explained Steven Munger of the University of Maryland School of Medicine in Baltimore.

"We found that a small subdivision of the olfactory system—one that differs from the rest of the olfactory system in the expression of key proteins used to translate a chemical stimulus into neural signals and in the way it connects to the brain—is specialized for detecting this social stimulus," Munger said. "When function of this olfactory subsystem is disrupted, mice can no longer make sense of this social signal, and thus they fail to make a positive judgment about the food. We now have an answer to the question of how mice can communicate complex information just by breathing on each other."

The discovery about this portion of the olfactory system, known to experts as the GC-D necklace subsystem, adds to growing evidence that the sense of smell is in fact made up of many parts, each with a very specialized purpose.

In fact, the researchers had been studying this particular olfactory subsystem for over a decade, Munger said, but they didn't know what information it might convey to the animals about their environment. The breakthrough came after the researchers decided, based on a few hints, to test its response to carbon disulfide, a chemical ingredient in rodent breath previously linked to social learning about food.

The researchers' studies showed that the GC-D necklace subsystem responds to carbon disulfide and that mice unable to detect that component of rodent breath failed to adjust their food selections after interacting with a "demonstrator" mouse that had just eaten chow seasoned with either cinnamon or cocoa.

Munger said that humans probably don't rely on the same system to make judgments about food, given that a key gene in GC-D neurons doesn't function in most primates. Still, people may use a similar strategy to learn from others what's good to eat. "If someone makes a grimace after taking a bite of something, you probably are not going to want to eat that food," he said.

More information: Zufall et al.: “Report: An Olfactory Subsystem that Detects Carbon Disulfide and Mediates Food-Related Social Learning.” Publishing in Current Biology 20, 1-7, August 24, 2010. DOI 10.1016/j.cub.2010.06.021

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