

Carnivores pick meats over sweets

Meat-eating animals lack genes involved in detecting sweet flavours

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12 March 2012

Many meat-eating animals have lost their ability to taste sugars over the course of evolution.

Sea mammals, spotted hyenas and other carnivores have all shed a working copy of a gene that encodes a 'taste receptor' that senses sugars, finds a study published this week in the *Proceedings of the National Academy of Sciences*¹.

An animal with a diet devoid of vegetables may have little need to detect sugars, says Gary Beauchamp, director of the Monell Chemical Senses Center in Philadelphia, Pennsylvania, and the lead author of the study. He sees parallels with cave-dwelling fish that have lost their sense of sight.

Most mammals, including humans, are equipped with taste receptors that detect salty, sour, sweet, bitter and savoury foods. But past studies suggest that some animals lack certain taste receptors. Felines such as house cats, tigers and cheetahs do not favour sugar water over plain water, for example, and they all possess an identical mutation in a gene called *Tas1r2* that renders the sweet-taste receptor inactive².

To see whether other carnivores also lack sweet receptors, Beauchamp and his team collected DNA from 12 members of the order Carnivora, including spotted hyenas, a cat-like creature from Madagascar called a fossa, a civet called a banded linsang and several species of sea mammal.

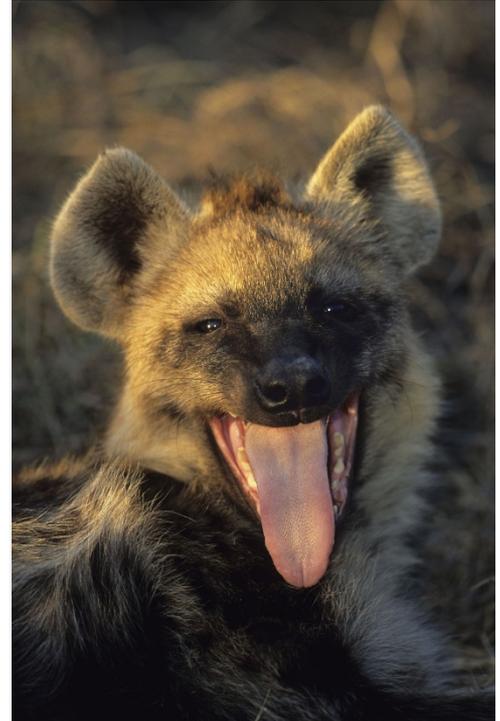
Seven of the species contained a broken copy of the gene encoding the sugar taste receptor, but the exact mutations often differed among them. For instance, fur seals and sea lions share many mutations in *Tas1r2*, but the more distantly related Pacific harbour seal lost its sense of sweetness through different mutations in that gene. The species of land mammals that the researchers examined each contained unique *Tas1r2* mutations.

That the mutations are not identical across species suggests that carnivores have independently lost their ability to detect sugars, an example of convergent evolution. Plants are the major source of dietary sugars, so it makes sense that animals that consume mainly meat or fish could live without a working sugar taste receptor. There is no evidence, however, that carnivores benefit from losing the ability to sense sugars, and some animals such as the insect-eating aardwolf, which is closely related to hyenas, and the omnivorous spectacled bear have working copies of the genes that encode the sweet taste receptors.

Gourmand or glutton?

Sweetness isn't the only taste that meat-eaters do not experience. Beauchamp and his team found that some of the carnivores they studied have also lost their ability to taste other flavours. Bottlenose dolphins and sea lions lack working copies of the gene encoding receptors for tasting savoury flavours (also called umami, produced by amino acids), and dolphins seem also to have shed a receptor that senses bitter compounds. Beauchamp suggests that taste may not have a very important role in what these creatures eat — sea lions and dolphins have few taste buds and tend to swallow things whole.

Peng Shi, a geneticist at the Kunming Institute of Zoology in China, was surprised to see that so many mammals have jettisoned their sweet receptors. Scientists have found little diversity in sweet receptor genes, among animals with working copies, underscoring their importance.



Mauntius Irrages GrbH / Alamy

The spotted hyena is one of many carnivores that lack the receptor required to taste sugars.

Dennis Drayna, a geneticist at the US National Institute on Deafness and Other Communication Disorders in Bethesda, Maryland, who edited the paper, says that the study shows that feeding ecology is the major force shaping the evolution of taste. “It’s remarkable you could see this much evolutionary divergence in something as conserved as eating,” he says.

But just because many carnivores do not sense sugars does not mean they do not eat them. Zebras, a common prey for lions, build up long-chain sugars in their muscles, conferring sweetness to their meat, Drayna notes.

Beauchamp says that when he and his team published a paper² showing that domestic house cats and other felines lack sweet taste receptors in 2005, he was flooded with anecdotes from cat-owners eager to report that their pets enjoy ice cream, grass and other sugar-containing foods. “We got tens, hundreds of calls saying my cat eats X or my cat eats Y,” he says. “Frankly, I have no idea why.”

Nature | doi:10.1038/nature.2012.10207

References

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