# What gives bees their sweet tooth?

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Scientists have discovered bees linger on a flower, emptying it of nectar, because they have sugar-sensing taste neurons which work together to prolong the pleasure of the sweetness.

Newcastle University researchers report that the bees' taste neurons found on their proboscis—their mouthparts—fire intense signals for up to 10 seconds—much longer than the taste neurons found in other

insects.

Bees visit flowers to obtain nectar, a sugary solution, which they eat to feed their colony and to fuel their flight. Bees can taste sugars on their proboscis and when in contact with food, taste neurons on the proboscis are activated signalling the presence of food.

Publishing in *Current Biology*, the researchers report that the neurons that specifically respond to sugar exhibit a very intense activation, which persists up to 10 seconds.

While these neurons exhibit intense activity, the bee will remain feeding at the same sugar source. Only when this activity declines does the bee remove its proboscis to enable it to try a further feeding point.

Author Geraldine Wright, Professor of Insect Neuroethology from the Institute of Neuroscience, explains: "We demonstrate in bees that, like in humans, the first taste of something sweet such as a lollipop is incredibly intense but then becomes less interesting. This is so our sensory neurons don't get overloaded and burn out.

"What we've found in bees is that the initial intense sweetness of sugar can last up to 10 seconds—so they will stay on the same sugar source.

"This makes sense if you think a worker bee is not just collecting for its own use but is storing it for others in the hive. It also means the bee will find a flower and drink all the nectar before other bees can intervene and take it."

## Discovery of two neurons

The team found that the bee has two taste neurons within each 'taste bud' which interact to enable this persistent, intense sugar neuron activity.

Lead author, Newcastle University Ph.D. student Ashwin Miriyala said: "Other insects have one type of taste neuron that is activated by sugars. We have discovered however, that bees have two different types of sugar-activated neurons.

"The first neuron exhibits intense activity when in contact with sugar. The second neuron intermittently inhibits the activity of the first neuron for short durations of time. This inhibition allows the first neuron a sort of 'resting period', so it can recover and maintain its intense activity for longer periods of time.

"Our data show that the interaction between these two sugar neurons is a result of electrical connections between them. This is the first evidence for this kind of connection in any insect taste neuron."

**More information:** Burst firing in bee gustatory neurons prevents adaptation. Ashwin Miriyala, Sébastien Kessler, F. Claire Rind and Geraldine A. Wright. *Current Biology*, 2018.

Provided by Newcastle University