

Honey bee chemoreceptors found for smell and taste

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Honey bees have a much better sense of smell than fruit flies or mosquitoes, but a much worse sense of taste, according to researchers at the University of Illinois at Urbana-Champaign.

"The recently completed honey bee genome reveals a remarkable expansion of the insect odorant receptor family compared with those found in fruit flies or mosquitoes," said Hugh M. Robertson, a professor of entomology and an affiliate of the university's Institute for Genomic Biology. "The bee genome also reveals far fewer gustatory receptors – those used for the sense of taste – than we had anticipated."

In work funded by the National Institutes of Health and reported in the Oct. 26 issue of the journal *Genome Research*, Robertson and postdoctoral research associate Kevin W. Wanner identified the family of honey bee chemoreceptors that deals with smell and taste.

Honey bees (*Apis mellifera*) have 170 odorant receptors, the researchers found, compared with 62 in fruit flies (*Drosophila melanogaster*) and 79 in mosquitoes (*Anopheles gambiae*).

The enhanced number of odorant receptors underlies the honey bee's remarkable olfactory abilities, including perception of pheromones, kin recognition signals, and social communication within the hive.

Honey bees also use odor recognition for finding food. "Foraging worker bees might encounter a bewildering number of flowers to choose from,

but they can discriminate between them using subtle olfactory cues," Robertson said. "A large number of odorant receptors allows the bees to find food and communicate its location to other bees."

In striking contrast, the researchers found only 10 gustatory receptors in *A. millifera*, compared with 68 in *D. melanogaster* and 76 in *A. gambiae*.

The low number of gustatory receptors for the sense of taste was unexpected, Robertson said, but can be explained.

"Honey bees have a beneficial, non-antagonistic relationship with plants, so plants don't have to defend themselves with toxins," Robertson said. "And in the nurturing environment of the hive, bee larvae are provisioned by adults with food that is pretty much free of toxins. Since the bees don't have to detect toxins, they don't need many gustatory receptors."

While honey bees don't need many taste buds, they do require an excellent sense of smell to detect chemical signals, such as pheromones, that control bee behavior inside and outside the hive.

For example, the sole task of male drone bees is to mate with virgin queen bees, and the male's antennae are specifically designed for the detection of queen pheromone.

"We have identified several honey bee odorant receptors that are abundantly expressed in male antennae," Robertson said. "This moves us an important step closer to understanding the molecular details of how bees, and insects in general, smell."

Source: University of Illinois at Urbana-Champaign

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