Honey bee gene targeting offers system to understand food-related behavior

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On July 25th *JoVE, the Journal of Visualized Experiments* will publish a new technique that will help scientists better understand the genes that govern food-related behavior in honey bees. The impact of this study could take scientists one-step closer toward understanding—and perhaps changing—undesirable food-related behavior in humans via gene control.

"Our technique has already helped to unravel [the] complex gene networks behind biological processes and behavior, such as gustatory perception," said Dr. Ying Wang of Arizona State University. She and a team of scientists are behind the experiment, titled RNAi-mediated Double Gene Knockdown and Gustatory Perception Measurement in Honey Bees. "Honey bees are much less complex than mammals and humans, but [we] share many major genes," said Wang, "therefore, honey bees have become an emerging system for us to understand food related behavior in humans."

In Wang's previous study, she found that carbohydrate metabolism and insulin pathway genes were involved in honey bee gustatory perception. Her new article introduces two strategies for targeting and simultaneously down-regulating multiple genes in honey bees via RNA interference. This allows for further research in examining the role of insulin metabolism in gustatory perception. The team believes it will be important to understanding how insulin pathways play a role in food-related behavior.

Wang's multiple gene knockdown method is a first in entomology, and it overcomes the many shortfalls associated with typical single-gene targeting methods. A common problem associated with single gene suppression is that it is not sufficient to show the interrelationship of a gene network.

In the article published today, Wang's team has also provided a technique to measure the resulting changes in honey bee behavior, and this has led them to interesting observations. "Gustatory perception is a behavioral predictor for honey bee social behavior," said Wang. A honey bee's sensitivity to sugar predicts the food-choices and timing of foraging.

Wang's experiment opens the door for researchers to build upon her lab's techniques. "We believe our double knockdown approach will be more recognized and shared in the field when it is published in the video journal *JoVE*," said Wang.

With any luck, the impact will result in more than just high-tech pest control. It could instead provide insight into human insulin pathways, potentially giving us an opportunity to learn how to control human dietary behavior.

Provided by JoVE