Immunity-Related Genes in Leafcutting Bee Uncovered

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ARS and cooperators have conducted the first analysis of immunity-related genes in a solitary bee.

(PhysOrg.com) -- The first analysis of immunity-related genes in a solitary bee has been conducted by Agricultural Research Service (ARS) scientists and cooperators.

Honey bees and bumble bees are called “social bees” because they live in colonies and form societies containing a queen and her workers. Bees that do not live in colonies are called “solitary bees” because each female bee is her own queen and she lays eggs in her own nest without workers to help her.

Some scientists believe social insects are more vulnerable to disease because of the crowded conditions in which they live. They make up for

this vulnerability with social behaviors such as grooming, collecting antibiotic plant compounds and removing diseased individuals from the nest.

Honey bees have a reduced immune system when compared to some other insects; this may be because honey bees are social insects with these special behaviors. However, this theory is difficult to prove because little is known about the immune response of solitary bees, and because solitary bees exhibit some of these same behaviors.

ARS entomologist Rosalind James and colleague Junhuan Xu, formerly with Utah State University, identified 116 immunity-related genes from both healthy and infected larvae of the alfalfa leafcutting bee (Megachile rotundata), a solitary bee that is a major pollinator of alfalfa used to feed livestock. They then compared the genes to those found in honey bees and other insects with similar gene sequences, such as the fruit fly and the mosquito.

The immunity-related genes found in the alfalfa leafcutting bee are involved in a variety of functions including cell rescue and cell defense. Similar to the honey bee, the scientists found the alfalfa leafcutting bee to have fewer immune response pathways than have previously been found in other insects.

According to James, who is also research leader of the ARS Pollinating Insects Research Unit in Logan, Utah, these findings provide a foundation to better understand how bees defend themselves against disease.

The research was published in the journal Insect Molecular Biology.

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