

Plant compound may protect bees from deadly virus that makes them lose their way home

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Around the world, honeybees are dying in large numbers. This die-off is in part because of a deadly virus that can kill bees or impair their ability

to return to the hives after foraging. But in a study published September 28 in the journal *iScience*, researchers show that a cheap and naturally occurring chemical compound could prevent or reverse the effects of the virus in bees. Bees that were fed the compound before becoming infected were nine times more likely to survive the virus after five days; by monitoring hives in real time, the researchers also showed that bees that were fed the compound were more likely to return to the hive at the end of a foraging day.

The deformed wing virus, transmitted by a parasite called a varroa mite, can infect [bees](#) throughout their lifecycle. Severely [infected bees](#) will die within days or have poorly developed wings that impair their ability to fly and forage. Previous research also shows that the virus can impair a bee's learning and memory, which could affect their ability to find home after hunting for food. Lost bees are likely to die, and their colony may eventually collapse because of a lack of food.

"Pathogens are definitely a stressor for bees," says first author Cheng-Kang Tang at National Taiwan University. "But the beekeepers don't want to use pesticides because of food safety concerns. So, we set out to find some compounds that can increase the strength of bees."

Their study revealed that the virus suppressed the expression of genes associated with nerve signal transmission and several other biological processes related to learning and memory functions in bees. The team identified sodium butyrate (NaB), a [chemical compound](#) found in many plants and known to increase the expression of a variety of genes in animals, including those involved in immune responses and learning, as a potential candidate to protect them from it.

To investigate NaB's effects on honeybees, lead author Yueh-Lung Wu at National Taiwan University and his team fed bees with NaB-laced sugar water for a week before infecting them with the deformed wing

virus. More than 90% of these bees remained alive after five days, while 90% of the infected bees that didn't get NaB died over the same period.

"Our findings show that feeding the insects with NaB before [virus](#) exposure can counteract the negative impacts of the pathogen," Wu says. "We also found previously that NaB can upregulate some [immune response](#) genes in bees, and this can help suppress [viral replication](#) and improve bees' chances at survival."

Wu's team also conducted an experiment on a bee farm. They put monitors at the entrance of several different beehives—each have tens of thousands of foraging bees—for about a month to calculate how many bees leave and return home during the day. The researchers found that, on average, only half of the infected foraging bees managed to return to the hive. But of the bees that were fed with NaB [sugar water](#) before becoming infected, more than 80% found their way home by the end of the day, a level that's comparable to uninfected bees.

"It is a really interesting study because we tested the effect of NaB on bees across different scales, from the genetic level, to behaviors in the lab, then in the field under a natural scenario," Wu says. Next, they would like to observe whether bees respond to the NaB supplement differently across seasons, because the insects are known to change their behavior throughout the year.

"Sodium butyrate is really cheap. So, if we can prove its benefits, it would be an easy and affordable approach for beekeepers to keep their bees alive." Wu says. "Honeybees are important pollinators of myriad fruits and vegetables with economic importance worldwide and therefore are crucial for maintaining the balance of the ecosystem"

More information: *iScience*, Tang et al.: "Real-time monitoring of deformed wing virus-infected bee foraging behavior following histone

deacetylase inhibitor treatment" [www.cell.com/iscience/fulltext ...](http://www.cell.com/iscience/fulltext/2589-0042(21)01024-5)
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