

## Research Published by: [Agricultural Research Service](#)

According to **recently published research**, scientists from the **Agricultural Research Service** and their Chinese counterparts have discovered a particular metabolic pathway that regulates how honey bees allocate their body's resources, such as energy and immune response, in response to stresses like the cold temperatures of winter.

The **study's lead entomologist, Yanping "Judy" Chen**, stated that this cellular pathway has the strongest link yet discovered to the significant overwintering colony losses that have been affecting honey bees and raising a great deal of concern among farmers and beekeepers, particularly those who grow almonds, over the past 15 years. She works with the Beltsville, Maryland-based **ARS Bee Research Laboratory**.

The **SIRT1 protein**, which is part of a family of proteins that assist control of cellular lifespan, metabolism and metabolic health, and stress resistance, is synthesized at different rates depending on the "**signaling**" route.

"In honey bees merely exposed to a cold challenge of 28 degrees C (**82.4 degrees F**) for five days, we saw almost three-fold lower levels of SIRT1 and significantly higher levels of colony mortality compared to bees maintained at 34-35 degrees C (**93.2-95 degrees F**), which is the optimal core temperature of a **honey bee cluster inside a beehive in winter**," Chen explained. Additionally, the scientists discovered that bees under cold stress had a higher chance of contracting illnesses, which raised the possibility of colony losses.

For instance, colonies of honey bees injected with the **internal microsporidia parasite Nosema ceranae** and maintained at 34 degrees Celsius exhibited a 41.18 percent survival rate, compared to a 100% mortality rate in colonies subjected to 5-day cold stress at **28 degrees Celsius**.

"**So that shows it is primarily cold stress that the SIRT1 signaling pathway is responding to rather than pathogens**," Chen explained. "Our study suggests that the increased energy overwintering bees use to maintain hive temperature reduces the energy available for immune functions, which would leave overwintering bees more susceptible to disease infections; all leading to higher winter colony losses."

Chen notes that in addition to mitigating overwintering and yearly colony losses, this research presents a viable avenue for novel treatment approaches. One method might be to treat honey bees with **SRT1720**, a particular SIRT1 gene activator that is being tested as an **anti-inflammatory and anti-cancer medication**, to increase the synthesis of the SIRT1 protein.

The main internal scientific research organization of the **United States Department of Agriculture** is called the Agricultural Research Service. Every day, ARS focuses on finding answers to the nation's agricultural issues. The economic impact of every dollar spent on agricultural research in the United States is \$20.

**Source:** [ars.usda.gov](http://ars.usda.gov)