

# Study finds higher pathogen loads in collapsed honeybee colonies

August 13 2009

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Honeybees in colonies affected by colony collapse disorder (CCD) have higher levels of pathogens and are co-infected with a greater number of pathogens than their non-CCD counterparts, but no individual pathogen can be singled out as the cause of CCD, according to a study by an international team of researchers.

The researchers, who represented Penn State's College of Agricultural Sciences, University of Liege, Gembloux Agricultural University, North Carolina State University and the U.S. Department of Agriculture's Agricultural Research Service (ARS), collected samples of adult bees, wax comb, pollen and brood - developing larvae - from 91 colonies in 13 apiaries in Florida and California and quantified more than 200

variables, including the presence of parasites such as varroa and tracheal mites; infection by bacteria, viruses and fungi; pesticide levels; nutritional factors; and bee physiology. No single factor was found consistently only in those colonies suffering from CCD.

The study's findings, which were published in the online journal [PLoS ONE](#), illustrate the complexity of solving the CCD problem, according to lead author and Penn State entomologist Dennis vanEngelsdorp. "Our results suggest that this condition may be contagious or the result of exposure to a common risk factor that impairs the bees' immune systems, making them more susceptible to [pathogens](#)," said vanEngelsdorp, who also is acting state apiarist for the Pennsylvania Department of Agriculture.

VanEngelsdorp noted that higher pathogen loads are likely to have caused CCD symptoms, but what causes the bees to become infected with so many pathogens is still not known. "Although pathogens seem likely to play a critical role in CCD, that role may be secondary, much like AIDS patients die from secondary diseases," he added.

No one of the screened pathogens had a higher prevalence in colonies that had CCD. There also was no significant difference in the prevalence nor in the total load of varroa or tracheal mites and Nosema, a protozoan that causes disease in [bees](#).

But overall, CCD colonies were co-infected with a greater number of pathogens -- viruses, bacteria and microparasites such as Nosema. For instance, 55 percent of CCD colonies were infected with three or more viruses compared to 28 percent of non-CCD colonies.

The researchers also found detectable levels of residues from 50 different pesticides in all of the sampled colonies, but there was no association between increased pesticide levels and CCD.

In fact, the pyrethroid insecticide Esfenvalerate -- used for a wide variety of pests such as moths, flies, beetles and other insects on vegetable, fruit and nut crops -- was more prevalent in the wax in non-CCD colonies, being found in 32 percent of non-CCD colonies compared to 5 percent of the CCD colonies.

Coumaphos, which is used to treat varroa mites in honeybees, also was found in higher levels in non-CCD colonies.

Entomologist Jeff Pettis with the ARS Bee Research Laboratory in Beltsville, Md., said the study suggests that future research should focus on monitoring parasite, pathogen and pesticide loads, as well as potential interactions among pesticide and pathogen loads. "While the study's results don't indicate a specific cause of CCD, the results do help scientists narrow the direction of future CCD research by showing that some possible causes are less likely," said Pettis.

Source: Pennsylvania State University ([news](#) : [web](#))

Citation: Study finds higher pathogen loads in collapsed honeybee colonies (2009, August 13) retrieved 20 April 2024 from

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