

# Researchers spread the buzz about bee viruses linked to colony collapse disorder

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Michelle Flenniken studies honey bee pathogens under a microscope in her lab in the Department of Plant Sciences and Plant Pathology. MSU photo by Kelly Gorham

Researchers at Montana State University have published an

informational paper in a scholarly journal summarizing what's known about the role that viruses play in honey bee health.

Co-authored by Michelle Flenniken, assistant professor in the Department of Plant Sciences and Plant Pathology in MSU's College of Agriculture, and two MSU graduate students, the article, "The buzz about [honey bee viruses](#)," was published Aug. 18 in the journal *PLoS Pathogens*, which publishes "outstanding original research and commentary that significantly advances the understanding of pathogens and how they interact with their host organisms," according to the journal website.

The article's release came two days ahead of National Honey Bee Day, which was declared in 2010 by U.S. Secretary of Agriculture Tom Vilsack to further awareness of the important role that honey bees play in the food system and the threats the pollinators face, including from pathogens such as the viruses studied by the Flenniken lab.

"This is an exciting time in honey bee virology," the authors write in the paper, adding that the study of bee viruses is "a rapidly growing field currently in its infancy."

More than a dozen viruses circulate within and between [honey bee colonies](#). Several viruses can be transmitted among multiple bee species, including bumble bees, and some viruses are carried by parasitic mites, for example, *Varroa destructor*.

Honey bee colony losses have averaged 33 percent annually since 2006, increased from a historic average of approximately 12 percent. There are multiple factors, including chemical exposure, lack of quality forage and pathogen prevalence and abundance that impact bee honey bee colony losses. Flenniken said colonies afflicted with colony collapse disorder, which accounts for approximately five percent of annual losses but is

poorly understood, have a higher prevalence of certain viruses.

"We know that certain viruses correlate with poor colony health and colony losses, but the specific viruses differ depending on location and other variables," said Flenniken. "There's not one virus that's always the culprit."

According to co-author Alex McMEnamin, a doctoral student in MSU's Department of Microbiology and Immunology in the College of Agriculture and College of Letters and Science and a member of the Flenniken lab, new technologies are opening frontiers for bee pathogen research.

Until very recently, researchers have only been able to study the impact of viruses on bees at the macroscopic level, McMEnamin said.

"Now, we can study individual viruses and their interactions with individual honey bee cells," he said.

"We can look at all the genes that are expressed or 'turned on' when a bee is infected with a virus," Flenniken added.

Eventually, pinpointing the molecular behavior of bee viruses and the bees' immune response could help researchers understand the specific role those pathogens play in the complex equation of colony deaths, as well as develop management strategies to boost colony health.

Flenniken and the other co-authors, which includes Department of Microbiology and Immunology doctoral student Laura Brutscher, were invited to write the review paper as part of a special series that the PLoS Pathogens website calls a "living collection of short, educational, and highly useful articles."

John Sherwood, head of MSU's Department of Plant Sciences and Plant Pathology, said Flenniken and her collaborators are at the forefront of research into honey bee viruses.

"There is a lot of concern about honey bee colony collapse, but it's been a very difficult puzzle to solve," Sherwood said. "What's unique about Michelle's work is that until recently there has been relatively little research on the viruses [that may be key pieces of the puzzle]."

Publishing an article about bees in a journal that covers immunology, virology and microbiology is another illustration of how the study of pollinators is branching out beyond the fields of entomology and ecology, Flenniken said.

"Researchers from multiple disciplines are talking to each other about pollinator health," she said, "and are pressing forward to address some of the important questions in bee biology."

**More information:** Laura M. Brutscher et al. The Buzz about Honey Bee Viruses, *PLOS Pathogens* (2016). [DOI: 10.1371/journal.ppat.1005757](https://doi.org/10.1371/journal.ppat.1005757)

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