Fly causes 'zombie bees,' not CCD

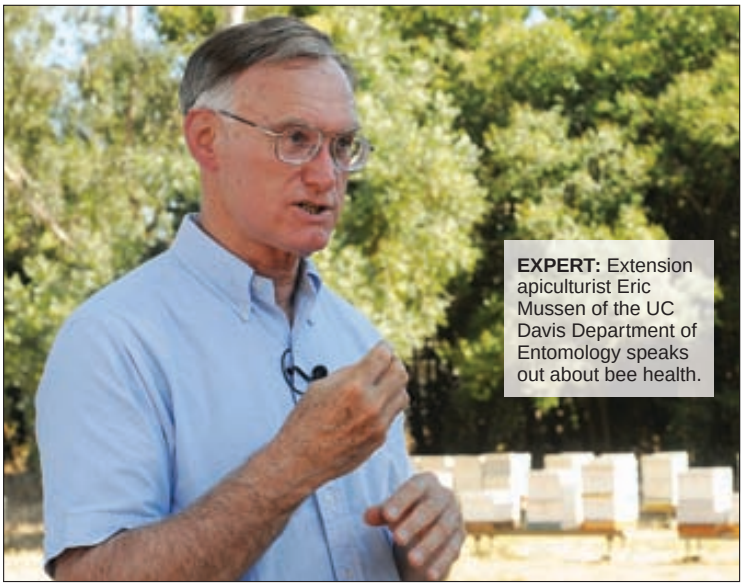
Editor's note: *An* A. borealis *fly lays eggs inside a honeybee it has infected, causing the honeybee to act like a zombie before it is killed by the emerging fly larvae. This report was published in the journal* PLoS ONE *by John Hafernik, a biology professor at San Francisco State University, and it created a news feeding frenzy as a possible cause of colony collapse disorder. Kathy Keatley Garvey UC Davis Entomology communications specialist, sets the record straight.*

By **KATHY KEATLEY GARVEY**

Key Points

- Bee expert Eric Mussen explains a new bee threat: the parasitic phorid fly.
- Mussen does not consider the fly a significant threat to honeybees.
- Fly parasitism is another bee stress, but not the dominant CCD factor.

ZOMBIE FLY: The parasitic phorid fly, *Apocephalus borealis*, lays eggs inside a honeybee it has infected, causing the honeybee to act like a zombie before it is killed by the emerging fly larvae.



EXPERT: Extension apiculturist Eric Mussen of the UC Davis Department of Entomology speaks out about bee health.

PHOTO BY KATHY KEATLEY GARVEY

NOTED honeybee expert Eric Mussen, Extension apiculturist with the University of California, Davis, Department of Entomology, delivered the keynote address Jan. 5 at the 43rd annual American Honey Producers Association Convention in Phoenix. Mussen touched on the newly announced threat to honeybees: the parasitic phorid fly, *Apocephalus borealis*.

San Francisco State University researchers found that the parasitic fly lays its eggs in honeybees; it was previously known to parasitize bumblebees only. The parasitism causes bees to reportedly fly around acting like zombies and unable to return to their hives.

First documentation

This is the first documentation that the phorid fly also infects and eventually kills honeybees and may pose an emerging threat to North American apiculture. Parasitized honeybees show hive abandonment behavior, leaving their hives at night and dying shortly thereafter. On average, seven days later, up to 13 phorid larvae emerge from each dead bee and pupate away from the bee. Using DNA barcoding, it was confirmed that phorids that emerged from honeybees and bumblebees were the same species.

Microarray analyses of honeybees from infected hives revealed that these bees are often infected with deformed wing virus and *Nosema ceranae*. Larvae and adult phorids also tested positive for these pathogens, implicating the fly as a potential vector or reservoir of these honeybee pathogens. Phorid parasitism may affect hive viability since 77% of sites sampled in the San Francisco Bay Area were infected by the fly, and microarray analyses detected phorids in commercial hives in South Dakota and California's Central Valley. Understanding details of phorid infection may shed light on similar hive abandonment behaviors seen in colony collapse disorder, or CCD.

Not the cause

"This information explains why some infested honeybee adults leave the colony at night and are not likely to come back," Mussen said. "The percent infestation level is not high enough to cause a colony collapse disorder loss by itself. However, anything that further stresses the bee population and increases bee losses can contribute to CCD."

Mussen said the fly "may be contributing to the loss of adult bees from colonies, but that probably is happening also in colonies that are not collapsing. CCD seems to be an additive malady, so losses to fly parasitism can join the other stresses. It does not appear to be a dominant factor."

Mussen said he does not consider the fly a significant threat. "Honeybees have an amazing ability to 'make up for' unanticipated losses — like exposures to bee-toxic agrichemicals in the fields — to the adult population by rearing more brood than would be expected at that time of the year, to return to normal population size." Mussen said that perhaps "all the other stresses that we have been studying have combined to impair the immune system of the bees. Then, whatever mechanism in the bees' bodies that used to prevent successful parasitism by the fly no longer is working as well. Nearly every facet we have studied — microbes, mite feeding, exposure to pesticides, etc. — all have had a suppressing effect on the honeybee immune system."

Among speakers at the convention was bee breeder-geneticist Susan Cobey. Asked about the phorids, Cobey said she learned a year ago of the San Francisco-based study. "I'm still not sure how widespread it is or how much of a problem it may be … another contributing factor in the [bee health] puzzle."

Study questions HFCS body effects

Key Points

- The HFCS survey results and comments were added to the public record.
- Comments refute the claim of no metabolic HFCS-sugar differences.
- CRA shrinks the safety worry by saying consumers will protect themselves.

By **LEN RICHARDSON**

THE Sugar Association, citing recent consumer research and a new study on human metabolism, advised the U.S. Food and Drug Administration to reject a pending request to change the name of high-fructose corn syrup, or HFCS.

In 15 pages of comments submitted to the FDA, the Sugar Association confirmed that the proposed name change would mislead consumers. The comments included findings from a recent in-depth survey by consumer research expert Joel B. Cohen, who previously has been commissioned to conduct consumer research for the Federal Trade Commission and the National Cancer Institute. The HFCS survey results and associated comments were added to the public record in response to the Corn Refiners Association's, or CRA, September 2010 FDA petition seeking to replace the HFCS name.

Name change

Many consumers read food labels to identify and avoid foods that contain HFCS; as a result, sales of the sweetener have fallen. In response, the CRA began a multimillion-dollar campaign to promote HFCS as "corn sugar," which is the name of an entirely different sweetener — dextrose — on its websites and in TV commercials. CRA also petitioned the FDA to remove the "corn sugar" name from the real corn-sugar product and transfer it to HFCS. This would enable food companies to remove the HFCS name from their ingredient labels and refer instead to "corn sugar."

The comments also refute the CRA claim that there are no metabolic differences between HFCS and sugar. They refer to a study jointly conducted by several scientific departments at the University of Florida and the University of Colorado, Denver, and published by the journal *Metabolism*, which shows significant differences in human absorption and metabolism of HFCS compared with sugar.

"The *Metabolism* study confirms that the human body experiences significantly different acute metabolic effects from the consumption of HFCS when compared to sugar," said Andy Briscoe, Sugar Association president and CEO. "This research builds on earlier animal studies suggesting that HFCS and sucrose can have different effects on body weight and obesigenic measures. The FDA should accordingly reject the proposed name change in the best interest of consumers' health and their right to know."

The rules

FDA requires the use of a common and usual name in product ingredient lists, so that consumers know what specific ingredients are in the products they buy. The Cohen survey demonstrated that changing the ingredient's name to "corn sugar" would mislead consumers into believing that their food contained an entirely different sweetener than HFCS.