



The ABCs – Almonds, Bees and CCD

May Berenbaum, University of Illinois





For most of my career as an entomologist, I was blissfully unaware of the remarkable interdependence of honey bees and almonds in the U.S. Here's how I found out...





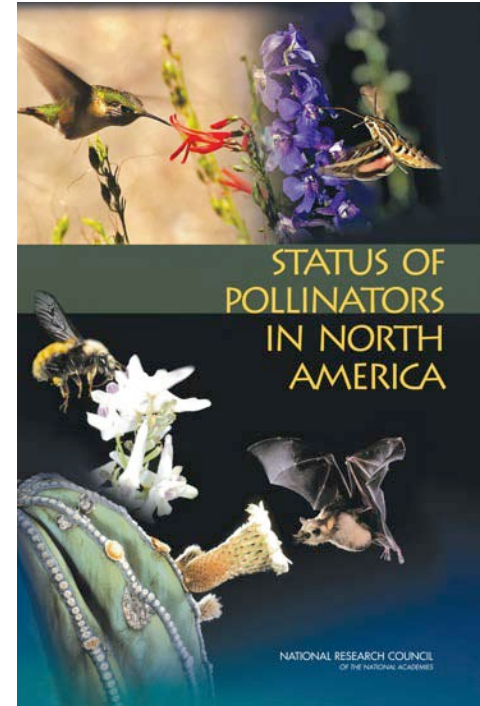
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Status of Pollinators in North America

It all started
with the
National
Academy of
Sciences
study on the
status of
pollinators in
North
America...

Committee Membership

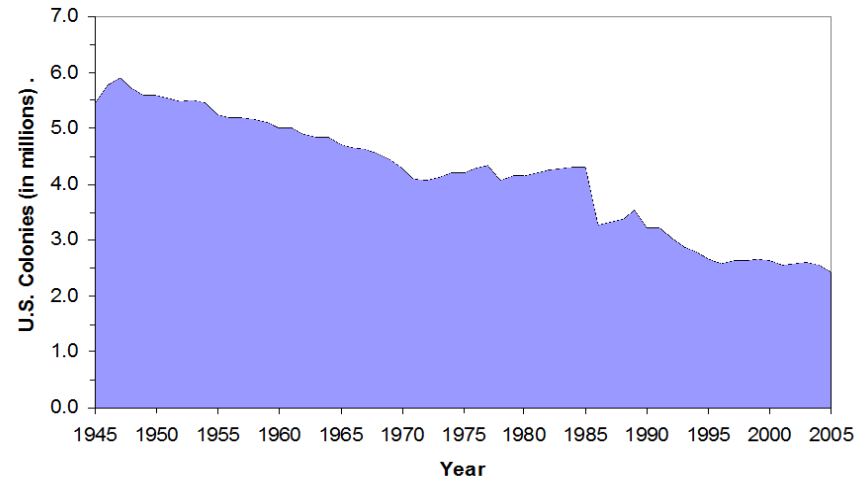
- **May Berenbaum (chair)**
 - Peter Bernhard, St Louis University'
 - Stephen Buchmann, The Bee Works
 - Nicholas Calderone, Cornell University
- Paul Goldstein, Florida Museum of Natural History
 - David Inouye, University of Maryland
 - Peter Kevan, University of Guelph
- Claire Kremen, University of California-Berkeley
 - Rodrigo Medellin, University of Mexico
 - Taylor Ricketts, World Wildlife Fund
- Gene Robinson, University of Illinois Urbana-Champaign
 - Allison Snow, Ohio State University
 - Leonard Thien, Tulane University
 - F. C. Thompson, U.S. National Museum
- Dr. Scott Swinton, Michigan State University



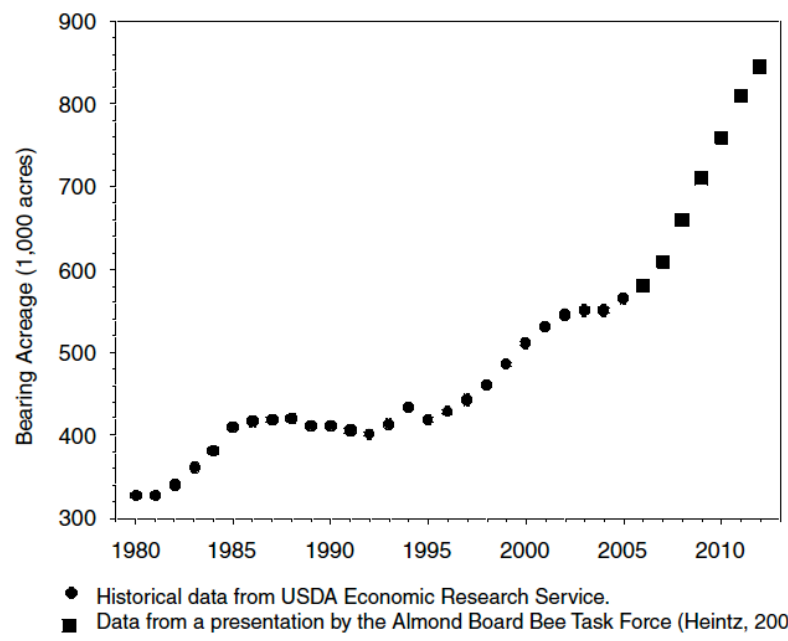
Managed Pollinators

Status

- Long-term population trends for honey bees in the United States are demonstrably downward.

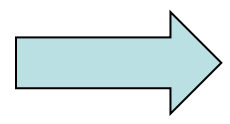


U.S. honey bee colonies, 1945-2005.
Data compiled from USDA-NASS



...The first figure in the report describes the exponential growth in U.S. almond acreage and predicts an increase to 850,000 acres by 2012 (requiring 2.12 million colonies of pollinators)...

FIGURE 1-1 Bearing acreage of U.S. almond trees in 1980–2010. Almost all almonds are grown in California.



These losses occurred as demand for agricultural pollination services was increasing dramatically, particularly for crops that depend completely on pollinators. The almond-growing business presents a compelling example (Figure 1-1). Over the 25 years between 1980 and 2005, U.S. almond acreage increased by nearly 70 percent. Approximately 1.4 million bee colonies are needed to pollinate 550,000 acres of almonds in California, and in 2005 a shortage of colonies led to imports of colonies from Australia (Flottum, 2005). According to forecasts of the California Almond Board (cited in Sumner and Boriss, 2006), almond growing will expand to 850,000 acres by 2012, eventually requiring the services of 2.12 million colonies of pollinators. Other pollinator-dependent crops include squash (Figure 1-2) and muskmelon (cantaloupe) (Figure 1-3); domestic production of these crops has nearly doubled over the past two decades.

Consequences of Decline

Findings: Managed pollinator decline and rising cost of pest control could increase pollinator rental fees.

Among the most conspicuous, demonstrable consequences of changing pollinator status is the rising cost of pest control in bee husbandry that has attended mite infestations of managed populations. Honey bee rental fees rise because of increasing demand attributable to growth in almond production and because of seasonal instability in honey bee populations. Notwithstanding, alternative managed pollinator species are not being widely utilized. And despite evidence of their efficacy as crop pollinators, wild species are not being effectively utilized.

One predicted consequence was an increase in pollinator rental fees (due to increasing demands of almond production)...

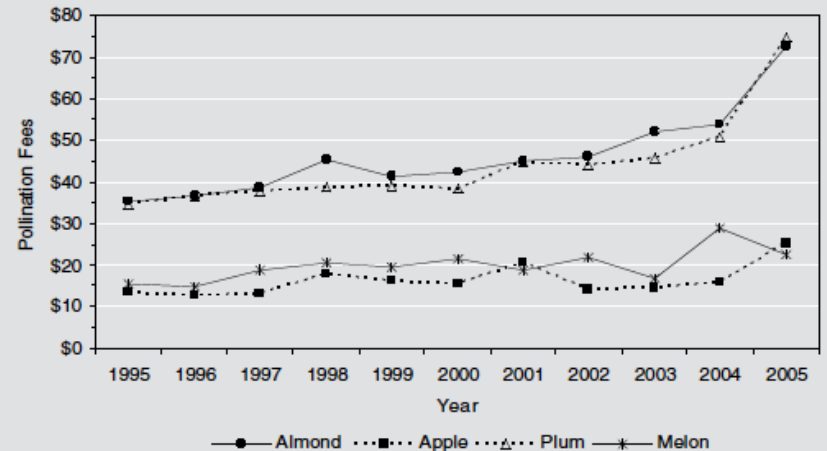
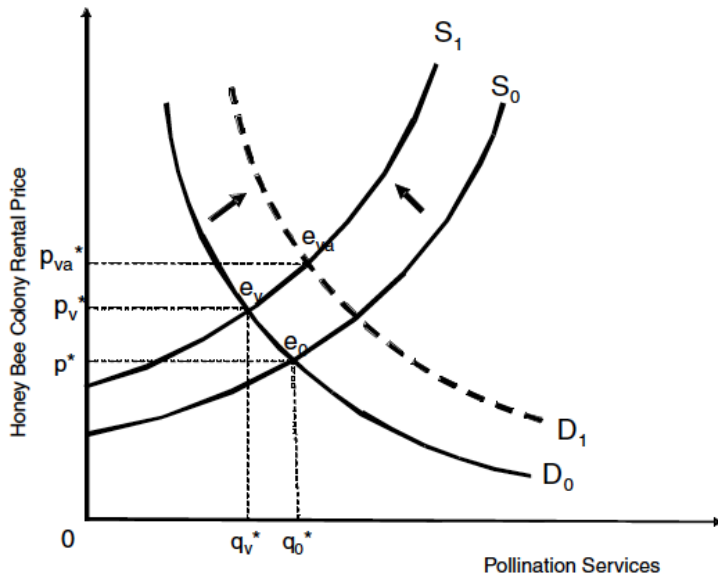
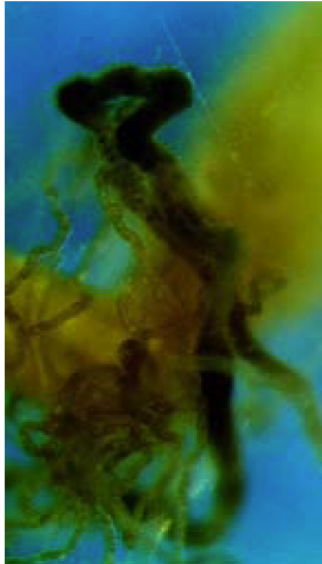


FIGURE 4-2 Honey bee colony rental rates for selected California crops, 1995–2005. SOURCE: Data compiled from *California Bee Times*, various issues, 1996–2006.



**“Fall-Dwindle Disease”:
Investigations into the causes
of sudden and alarming colony
losses experienced by
beekeepers in the fall of 2006.**

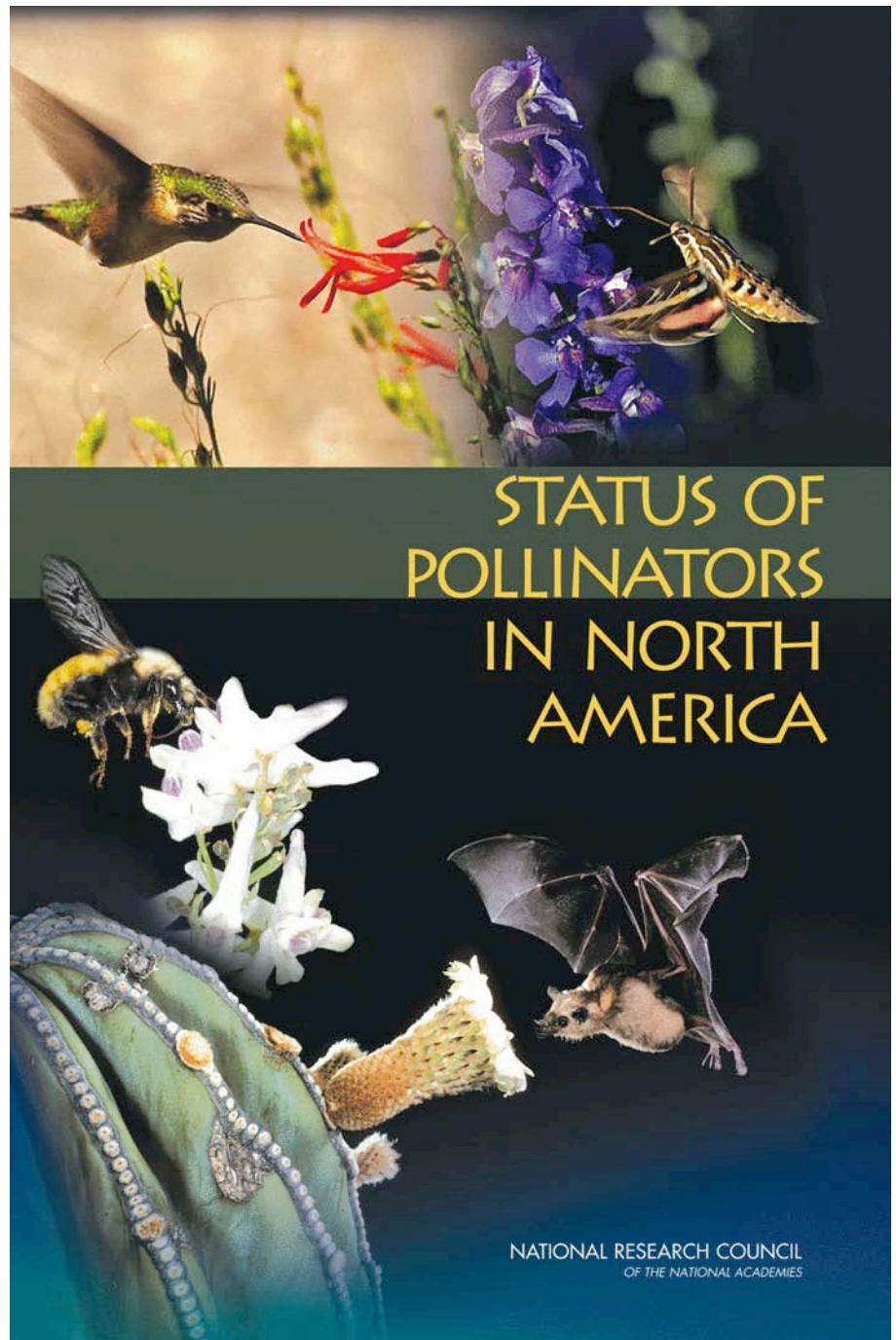
**Preliminary Report:
First Revision**

Dennis vanEngelsdorp¹²,
Diana Cox Foster²,
Maryann Frazier²,
Nancy Ostiguy²,
Jerry Hayes³

December 15, 2006
Revised January 5th, 2006

During the months of October, November, and December 2006, an alarming number of honey bee colonies began to die along the East Coast of the United States. West Coast beekeepers are also beginning to report unprecedented losses. This phenomenon, without a recognizable underlying cause, has been tentatively been termed “Fall Dwindle Disease”, and threatens the pollination industry and production of commercial honey in the United States. This has become a highly significant yet poorly understood problem for beekeepers. States, like Pennsylvania, can ill afford these heavy losses; the number of managed colonies is less than one half of what it was 25 years ago. Many beekeepers are openly wondering if the industry can survive. There are serious concerns that losses are so great that there will not be enough bees to rebuild colony numbers in order service pollination needs and to maintain economic viability in these beekeeping operations.

In October 2006, the release of the report coincided with the first disturbing indications of a new phenomenon...



Colony Collapse Disorder (CCD)



-- November 2006 Dave Hackenberg lost 400 colonies in Florida

-- Other beekeepers experienced similar sudden losses

A new disease?

- Bees die away from the hive
- Queen, grubs, food left behind
- Scavengers slow to move in



Keith Delaplane

February 27, 2007

Honeybees Vanish, Leaving Keepers in Peril

By [ALEXEL BARRIONUEVO](#)

VISALIA, Calif., Feb. 23 — David Bradshaw has endured countless stings during his life as a beekeeper, but he got the shock of his career when he opened his boxes last month and found half of his 100 million bees missing.

In 24 states throughout the country, beekeepers have gone through similar shocks as their bees have been disappearing inexplicably at an alarming rate, threatening not only their livelihoods but also the production of numerous crops, including California almonds, one of the nation's most profitable.

"I have never seen anything like it," Mr. Bradshaw, 50, said from an almond orchard here beginning to bloom. "Box after box after box are just empty. There's nobody home."

The sudden mysterious losses are highlighting the critical link that honeybees play in the long chain that gets fruit and vegetables to supermarkets and dinner tables across the country.

Beekeepers have fought regional bee crises before, but this is the first national affliction.

Now, in a mystery worthy of Agatha Christie, bees are flying off in search of pollen and nectar and simply never returning to their colonies. And nobody knows why. Researchers say the bees are presumably dying in the fields, perhaps becoming exhausted or simply disoriented and eventually falling victim to the cold.

As researchers scramble to find answers to the syndrome they have decided to call "colony collapse disorder," growers are becoming openly nervous about the capability of the commercial bee industry to meet the growing demand for bees to pollinate dozens of crops, from almonds to avocados to kiwis.

Along with recent stresses on the bees themselves, as well as on an industry increasingly under consolidation, some fear this disorder may force a breaking point for even large beekeepers.

A [Cornell University](#) study has estimated that honeybees annually pollinate more than \$14 billion worth of seeds and crops in the United States, mostly fruits, vegetables and nuts. "Every third bite we consume in our diet is dependent on a honeybee to pollinate that food," said Zac Browning, vice president of the American Beekeeping Federation.

The bee losses are ranging from 30 to 60 percent on the West Coast, with some beekeepers on the East Coast and in Texas reporting losses of more than 70 percent; beekeepers consider a loss of up to 20 percent in the offseason to be normal.



The New York Times picked up the story and made the link to almonds...and it was one of the most frequently downloaded stories in the entire month of February

REVIEW COLONY COLLAPSE DISORDER IN HONEY
BEE COLONIES ACROSS THE UNITED STATES

HEARING
BEFORE THE
SUBCOMMITTEE ON HORTICULTURE
AND ORGANIC AGRICULTURE
OF THE
COMMITTEE ON AGRICULTURE
HOUSE OF REPRESENTATIVES
ONE HUNDRED TENTH CONGRESS
FIRST SESSION
MARCH 29, 2007
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- * Tim Mahoney, FL
- * John Barrow, GA
- * Kirsten E. Gillibrand, NY

Minority

- * Randy Neugebauer, TX
Ranking Minority Member
- * John R. "Randy" Kuhl, NY
- * Virginia Foxx, NC
- * K. Michael Conaway, TX
- * Robert E. Latta, OH

The extensive losses caught the attention of legislators in key states (California, with its \$2.5 billion almond industry, and Florida) and the House Agriculture Committee Subcommittee on Horticulture and Organic Agriculture (which oversees apiculture) held a hearing on Colony Collapse Disorder on March 29, 2007

March 07, 2008 Current Operating Stat.



Albert Einstein Memorial. Copyright © 1978 by Robert Banks

Two sets of witnesses were empanelled—three people to represent the scientific community and four to represent beekeepers and the almond industry



Richard Adee, left and Jim Doan testify before the House Subcommittee on Horticulture and Organic Agriculture.

May 2007

BEE CULTURE



March 07, 2008 Current Operating Stati.

Beekeepers/almond industry

- Mr. Paul Wenger, First Vice President, California Farm Bureau Federation, Modesto, California
 - Mr. David Ellingson, Commercial Bee Keeper, Ortonville, MN
 - Mr. Gene Brandi, Legislative Chairman, California State Beekeepers Association, Los Banos, California
 - Mr. Jim Doan, Commercial Bee Keeper, Hamlin, New York
 - Mr. Richard Adee, Legislative Committee Chairman, American Honey Producers Association, Bruce, South Dakota
- ### Scientists
- May Berenbaum, University of Illinois Urbana-Champaign--
 - Diana Cox-Foster, Pennsylvania State University
 - Carl RexRoad, USDA-ARS, Washington, DC

For Congress

Date: 03/29/2007
 Session: 110th Congress (First Session)
 Witness(es): May R. Berenbaum
 Credentials: Professor and Head, Department of Entomology, University of Illinois Urbana-Champaign and Chair, Committee on the Status of Pollinators in North America, Board on Life Sciences and Board on Agriculture and Natural Resources, Division on Earth and Life Studies, National Research Council, The National Academies
 Chamber: House
 Committee: Horticulture and Organic Agriculture Subcommittee, Committee on Agriculture, U.S. House of Representatives
 Subject: Problems in Domestic Bee Colonies

Colony Collapse Disorder and Pollinator Decline

Statement of

May R. Berenbaum
 Professor and Head, Department of Entomology
 University of Illinois Urbana-Champaign
 and
 Chair, Committee on the Status of Pollinators in North America
 Board on Life Sciences and Board on Agriculture and Natural Resources
 Division on Earth and Life Studies
 National Research Council
 The National Academies

before the

Subcommittee on Horticulture and Organic Agriculture
 Committee on Agriculture
 U.S. House of Representatives

March 29, 2007

Bloomberg.com



Blue Orchard Bees Find Favor in Colony Collapse Disorder Peril

By Alan Bjerga



[More Photos/Details](#)

Oct. 19 (Bloomberg) -- Rosalind James steps into a Styrofoam shelter surrounded by thousands of wild bees. Dozens buzz past the entomologist as she examines blocks that contain 3,540 holes for solitary bees. "Bee condos," she says.

The smattering of stings she's sustained is a small sacrifice for work that may save a \$75 billion-a-year slice of the U.S. economy.

James leads a U.S. Department of Agriculture team in Logan, Utah, that is fighting fallout from Colony Collapse Disorder. The malady has killed at least 2 billion honeybees that pollinate crops from almonds to zucchini. As

entomologists try to solve the mystery, scientists at Logan are teaching anti-social, wild bees to imitate commercially maintained honeybees and pollinate crops.

"If honeybees disappeared tomorrow we'd be in a world of hurt," says Jim Cane, a research colleague of James in Logan. Further colony collapse "would bankrupt a lot of farmers and make a big hole in some state budgets" from revenue lost on California almonds and oranges, Florida citrus and North Carolina apples.


A pollinator shortage may lower profits at companies from Dole Food Co., the world's largest fresh-produce seller, to Hershey Co., maker of Almond Joy candy bars, says Sterling Smith, a commodities broker and vice president at FuturesOne LLC in Chicago.

Prices at Risk

"First, you'd see increased reliance on imports, followed by higher prices," he says. Fruit- and vegetable-buying tends to be price-sensitive, and an almond shortage would make prices for the tree nut rise "astronomically," he says.

CNN, ABC,
CBS, NPR, PBS,
Bloomberg, and
CSPAN all
covered the
hearings and
almonds
continued to
make news...





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genetic engineering

GE and bee Colony Collapse Disorder -- science needed!

Dear Senator Thomas Harkin,

We share similar concerns. The viability of a robust food supply is paramount to the American people.


One out of every three bites of food that we consume is due to the work of honeybees, serving as crucial pollinators in agriculture and farming communities. Yet agriculture and food production may be severely impacted by Colony Collapse Disorder (CCD), a trend documented in honey bee colonies and prominently featured in a New York Times story (1). Beekeepers are reporting estimates as high as 80% loss of their honey bee colonies. Such a huge loss of the services of bees is extremely serious and beekeepers report it's a growing trend.

The cause of CCD is unknown. Although factors being considered include pesticides, mites, microbial disease and habitat decline, there's a possible link that's not being investigated. Highly respected scientists believe that exposure to genetically engineered crops and their plant-produced pesticides merit serious consideration as either the cause or a contributory factor to the development and spread of CCD.(2,3,4,5,6,7,8,9,10) In searching for the cause of massive honey bee losses nationwide, we must leave no stone unturned to find the answer.

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That's about when things started getting weird...

Most sincerely,

Laurel Hopwood, Chair

Sierra Club Genetic Engineering Committee

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“Highly respected scientists believe that exposure to genetically engineered crops... merit serious consideration as either the cause or a contributory factor to the development and spread of CCD”

All citations antedate CCD

GMO Safety

Genetic engineering - Plants - Environment

Effects of Bt maize pollen on the honeybee

(2001 - 2004) Jena University, Institute of Nutrition and Environment

Topic

This project aimed to answer to the following question:

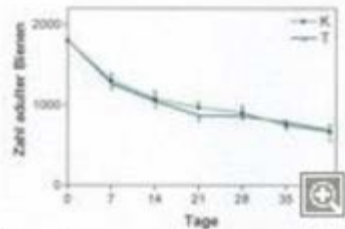


Does large-scale cultivation of Bt maize have an impact on the honeybee?

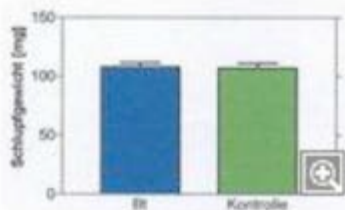
The honeybee is of paramount importance as a pollinator in the natural environment and agriculture. Honeybees pollinate 70 percent of all flowering plants in our part of the world.

As reductions in efficiency of bee colonies have immediate ecological consequences for flora, pesticides have to be tested for incompatibility with honeybees using a standardized process. (OECD Guidelines, 1996). To date there are no regulations or recognized methods for testing the compatibility of genetically modified plants with bees.

The aim of this research project was to develop a simple, reproducible test procedure for the effects of transgenic plants on the honeybee. The resulting procedure could be incorporated into the approval procedure as well as being used during post-market monitoring.



Number of adult bees over a period of 6 weeks,
Number of colonies = 9



Weight of worker bees at pupation. Population at end of experiment: Bt=126,
Control=146

Original project title

Auswirkungen von Bt-Maispollen auf die Honigbiene – Methodenentwicklung zu Wirkungsprüfung und Monitoring

Contact

Prof. Dr. Hans- Hinrich Kaatz
Martin- Luther- Universität
Halle

Institut für Zoologie
Molekulare Ökologie
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...in fact the only “study” was poorly designed, compromised by disease, and never published in a refereed scientific journal



Walter Haefeker, the German beekeeping official, speculates that “besides a number of other factors,” the fact that genetically modified, insect-resistant plants are now used in 40 percent of cornfields in the United States could be playing a role. The figure is much lower in Germany -- only 0.06 percent -- and most of that occurs in the eastern states of Mecklenburg-Western Pomerania and Brandenburg. Haefeker recently sent a researcher at the CCD Working Group some data from a bee study that he has long felt shows a possible connection between genetic engineering and diseases in bees.

NEWSLETTER

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The study in question is a small research project conducted at the University of Jena from 2001 to 2004. The researchers examined the effects of pollen from a genetically modified maize variant called “Bt corn” on bees. A gene from a soil bacterium had been inserted into the corn that enabled the plant to produce an agent that is toxic to insect pests. The study concluded that there was no evidence of a “toxic effect of Bt corn on healthy honeybee populations.” But when, by sheer chance, the bees used in the

experiments were infested with a parasite, something eerie happened. According to the Jena study, a “significantly stronger decline in the number of bees” occurred among the insects that had been fed a highly concentrated Bt poison feed.

According to Hans-Hinrich Kaatz, a professor at the University of Halle in eastern Germany and the director of the study, the bacterial toxin in the genetically modified corn may have “altered the surface of the bee’s intestines, sufficiently weakening the bees to allow the parasites to gain entry -- or perhaps it was the other way around. We don’t know.”

Of course, the concentration of the toxin was ten times higher in the experiments than in normal Bt corn pollen. In addition, the bee feed was administered over a relatively lengthy six-week period.

Kaatz would have preferred to continue studying the phenomenon but lacked the necessary funding. “Those who have the money are not interested in this sort of research,” says the professor, “and those who are interested don’t have the money.”

Glenn Chapman says:
[April 9th, 2007](#)

Ozone depletion...

I heard a scientist studying Colony Collapse Disorder (CCD) state that his studies show that bees are going blind. Strong UV due to Ozone depletion is burning out key areas of their eyes having to do with locating flowers, finding the pollen centers of flowers, and the bee's navigation sensors. As a result, they burn up more energy trying to perform basic tasks, spend more time in search of their colony, collect less pollen because of their inability to locate it, and literally starve. Or they become so weak they succumb to disease. I think that the ramifications of this are only beginning to be realized. The ecological chain is going to be affected in ways we cannot even imagine now and mankind is in for a real threat to his/her survival within a very short time.

Judy Hennessy says:
March 20th, 2007

Chemtrails...

Intuitively, my guess is that the sad state of bees dying all over the world at this time is one of the many deleterious effects which are resulting from **chem trails, or, in other words the U.S. military's secret arial [sic] spraying project (which may be in conjunction with other countries' similar activities, presumably, as a means of offsetting 'global warming.'**)

There is more than one fallacy here, however. Contrary to the much popularized notion that global warming is man-made, this weather phenomenon appears concurrently with an ice age, which the planet has recently entered. At one of the earth's magnetic poles, the ice is rapidly melting; while at its opposite side, it is rapidly forming, possibly tantamount to another polar shift.

As a scientist, myself, I have come to the conclusion that what we need is **a world-wide grassroots movement, in conjunction with some concerned and courageous scientists-forming a world-federation aimed at curtailing the prevailing multi-lateral secrecy which bars us from participating in decisions effecting all of our welfare.**



<http://www.celsias.com/2007/02/27/bees-dying-by-the-millions/>

(1997-USDA-ARS imported Russian queens)

It has long been known that both the United States and the Soviets have conducted decades long research into the use of **mind control technologies**, with the greater aim being towards the control of their own citizens, but also towards its uses in warfare, and which these events appear to be coming in line with past predictions of the unintended consequences should these esoteric be unleashed.

What is occurring in the United States today relating to hundreds of millions of their domestic bees disappearing, and who are descendants of their original Russian Queen ancestors, is that **their Military Leadership has unleashed upon their citizens through their propaganda media organs (television/radio) the 'fearful' 250 Hz signal intended to 'anger' their population in the buildup towards war with Iran.**

But! One of the unintended consequences produced by their provocative actions against their own citizens is that they have likewise 'signaled' the demise of their agricultural industry through the decimation of their domestic bee industry.

Is it indeed possible that the Soviets in the 1980's were foresighted enough to plant this ticking time bomb in the very heart of America should the United States at some future date become intent upon Global domination?



Then—cell phones
were implicated...



Are mobile phones wiping out our bees?

Scientists claim radiation from handsets are to blame for mysterious 'colony collapse' of bees

By Geoffrey Lean and Harriet Shawcross
Sunday, 15 April 2007

It seems like the plot of a particularly far-fetched horror film. But some scientists suggest that our love of the mobile phone could cause massive food shortages, as the world's harvests fail.

They are putting forward the theory that radiation given off by mobile phones and other hi-tech gadgets is a possible answer to one of the more bizarre mysteries ever to happen in the natural world - the abrupt disappearance of the bees that pollinate crops. Late last week, some bee-keepers claimed that the phenomenon - which started in the US, then spread to continental Europe - was beginning to hit Britain as well.

The theory is that radiation from mobile phones interferes with bees' navigation systems, preventing the famously homeloving species from finding their way back to their hives. Improbable as it may seem, there is now evidence to back this up.

Colony Collapse Disorder (CCD) occurs when a hive's inhabitants suddenly disappear, leaving only queens, eggs and a few immature workers, like so many apian Mary Celestes. The vanished bees are never found, but thought to die singly far from home. The parasites, wildlife and other bees that normally raid the honey and pollen left behind when a colony dies, refuse to go anywhere near the abandoned hives.

The alarm was first sounded last autumn, but has now hit half of all American states. The West Coast is thought to have lost 60 per cent of its commercial bee population, with 70 per cent missing on the East Coast.

CCD has since spread to Germany, Switzerland, Spain, Portugal, Italy and Greece. And last week John Chapple, one of London's biggest bee-keepers, announced that 23 of his 40 hives have been abruptly abandoned.

Other apiarists have recorded losses in Scotland, Wales and north-west England, but the Department of the Environment, Food and Rural Affairs insisted: "There is absolutely no evidence of CCD in the UK."

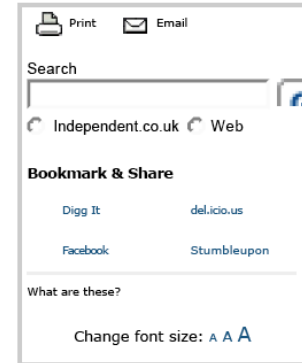
The implications of the spread are alarming. Most of the world's crops depend on pollination by bees. Albert Einstein once said that if the bees disappeared, "man would have only four years of life left".

No one knows why it is happening. Theories involving mites, pesticides, global warming and GM crops have been proposed, but all have drawbacks.

German research has long shown that bees' behaviour changes near power lines.

Now a limited study at Landau University has found that bees refuse to return to their hives when mobile phones are placed nearby. Dr Jochen Kuhn, who carried it out, said this could provide a "hint" to a possible cause.

Dr George Carlo, who headed a massive study by the US government and mobile phone industry of hazards from mobiles in the Nineties, said: "I am convinced the possibility is real."



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...but the purported study, also not published in a refereed scientific journal, examined cordless, not cell, phones...

**Can Electromagnetic Exposure Cause a Change in Behaviour?
Studying Possible Non-Thermal Influences on Honey Bees – An Approach within the
Framework of Educational Informatics**

Wolfgang Harst¹, Jochen Kuhn^{2*} & Hermann Stever¹

¹ Institute of Educational Informatics, University of Koblenz-Landau/Campus Landau, Fortstr. 7, 76829 Landau, Germany.

² Institute of Science and Science Education (ISSE), Department of Physics, University of Koblenz-Landau/Campus Landau, Fortstr. 7, 76829 Landau, Germany.

* Author for correspondence (e-mail: kuhn@uni-landau.de)

Abstract

In recent years the public discussion has been focused increasingly on possible unhealthy effects of high-frequency electromagnetic fields (particularly of mobile-phones) on human beings. Whereas thermal effects of this radiation could be explained very well, non-thermal effects could hardly be clarified. In our last works, we pointed out that – from view of Educational Informatics – honey bees are suitable bioindicators to serve as a model of a living being to study learning processes especially in this aspect.

In this paper, we describe a first pilot study, which explores the non-thermal influence of high-frequency electromagnetic fields. Therefore we observe the behaviour of honey bees (*apis mellifera carnica*) by exposing them to the radiation of DECT-phones. In this study four respectively eight bee-colonies were used as experimental group and were irradiated, whereas the same numbers of comparable bee-colonies was field-free. The observed parameters were the building behaviour of the bees within the beehive, its weight and especially the bees' returning behaviour.

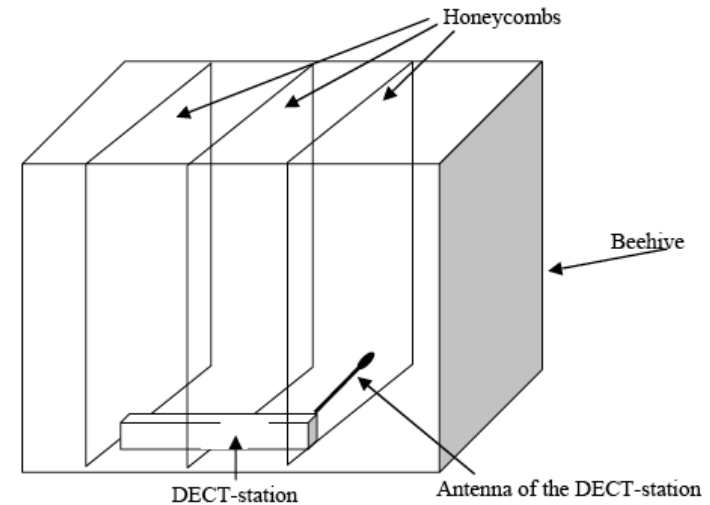


Fig. 1: Position of the DECT-station within a beehive.

DECT: Digital Enhanced Cordless Technology

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Ecological Apocalypse: Why Are All The Bees Dying?

GM, toxic chemicals, chemtrails destroying eco-system, threatening very survival of humanity

Paul Joseph Watson



The alarming decline in bee populations across the United States and Europe represents a potential ecological apocalypse, an environmental catastrophe that could collapse the food chain and wipe out humanity. Who and what is behind this flagrant abuse of the eco-system?

Many people don't realize the vital role bees play in maintaining a balanced eco-system. According to experts, if bees were to become extinct then humanity would perish after just four years.

"If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more

animals, no more man," said Albert Einstein.

Panic increased...



So, on April 23-24, the USDA convened a workshop with about fifty bee researchers and other interested parties at USDA BARC to prioritize Colony Collapse Disorder research objectives...

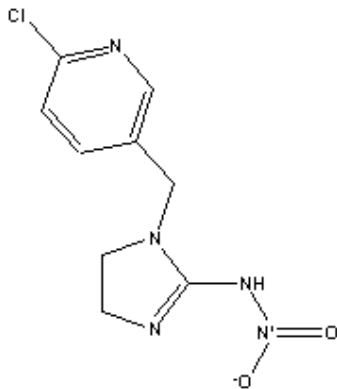
Hypotheses to account for colony collapse disorder

Most likely

- Neonicotinoid insecticides
- Novel pathogen or parasite
- Immune suppression relating to management practices
- Declines in nutritional adequacy of diet

Less likely

- GM corn pollen
- Cell phones
- Elevated UVB light
- Jet chemical contrails
- Wi-Fi
- Elevated carbon dioxide
- Osama Bin Laden
- Automobile grilles
- Solar maxima
- Alien abduction
- Bee “rapture”



Imidacloprid



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Genetic Engineering

More Experts Tie Bee Collapse to GMOs and Pesticides

Lost colonies: Where have bees gone?

By Dan Wilson

Appleton Post-Crescent, 5/18/2007

[Straight to the Source](#)

Mike Rueden of rural Seymour keeps bees to sell the honey.

When he went to check on his 80 hives this spring he found only 15 colonies had survived. The bees apparently had succumbed to the mystery disease that is affecting bees nationwide.

It's not just Rueden's bees. Another beekeeper, Bob Bennett of Greenville said he was wiped out, too.

"I had 45 colonies last year and had only two left this spring," said Bennett. "Then the queens in those died and I bought more queens and they died in just the past two weeks."

Now a nationwide investigation, congressional panels and a recent U.S. Department of Agriculture scientific workshop are swarming around the newly named "colony collapse disorder." Says the USDA's Kevin Hackett, "With more dead and weakened colonies, the odds are building up for real problems."

"We lost 75 percent of our bees," said Rueden who now is carefully nursing 14 hives in the hopes that he can salvage enough honey to get through the season.

Beekeepers report losses of 30 to 90 percent of their honeybee hives, according to a Congressional Research Service study in March. Some report total losses.

Rueden is making plans to try to prevent the severe losses of last winter.

"We are going to try some new things and do some divides and try to winter smaller numbers of bees in smaller hives," he said.

The meeting had no impact whatsoever on public speculation about the causes of colony collapse disorder

To: maybe@uiuc.edu
From: Andree Duggan <andree@betterdaysalliance.org>
Subject: bee clue
Date: Sun, 24 Jun 2007 12:06:35 -0400
Dear May

Being an avid organic gardner who hasn't seen any wild honey bees in her gardens this spring (CT), I have been following the critically important issue of colony collapse. All of my gardening friends in CT have also noticed the absence of honeybees in their gardens. It's freaking us out.

I also have been watching HAARP for several years, the high powered energy emitting device in Alaska that tampers with the magnetic ionosphere by boiling it and bending it 80 miles out into space (that's how powerful it is). It has been steadily powering up, and 2006 it was fully operational creating energy beams 4x's as powerful as before. **It's[sic]** effects now reach all of the US and half way around the globe. I strongly encourage the national working group not to underestimate or play down the role HAARP may be playing in this unfolding drama.

I believe we should simply shut it off for a year to see if this has any effect on the bees. At the very least, a scientific study should correlate HAARP transmissions and activities to bee disappearances. HAARP is believed by many to be a largely top secret military project, so you may not get cooperation. For all of our sakes, I hope you do.

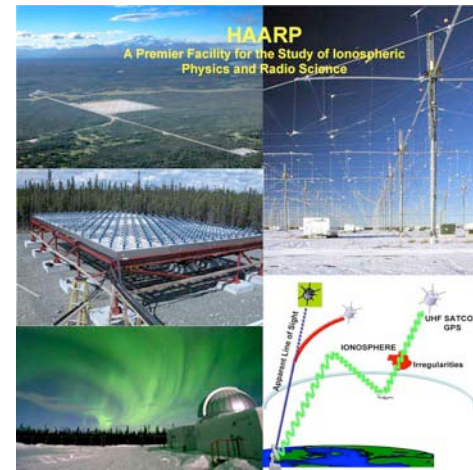
This is an excellent article that will provide you with some clues and leads. I am most appreciative of the work you and the others are doing.

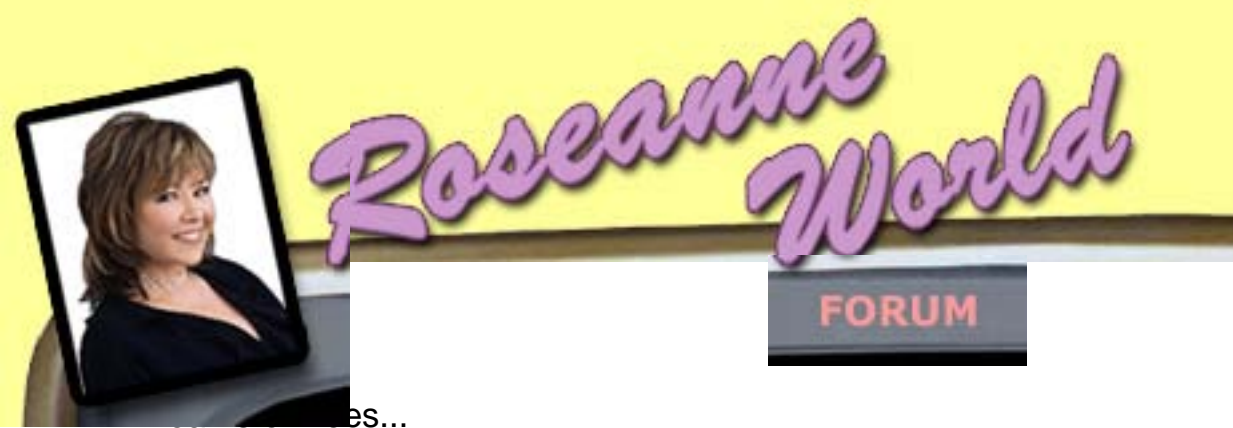
<http://www.hyperstealth.com/haarp/index.htm>

Sincerely,
Andree Duggan (860) 395-7283
<http://www.andreeduggan.com>

and rampant speculation continued...

High Frequency Active Auroral Research Program





...Chernobyl...

As a young girl, I used to read about bees as an obsession. I thought they, along with ants, were the smartest and most highly evolved of all life forms. I loved the fact that there were colonies ruled by queens, served by males who competed with each other to keep her fed and in control. I have dreamed that dream of bees my whole life, and truly wish I had been born orange and black.

Today's show is about the possible voluntary extinction of those very highly intelligent life forms. People have thought I was crazy for the last 16 years to talk about the effect Chernobyl's accidents would quickly have upon the food chain, but now, the monthly extinction of different life forms seems to be inescapable fact...read about chernobyl and the poisoning of water, air earth and food chain. The bees are more evidence I think.

Posted at 1:04 PM - Permalink

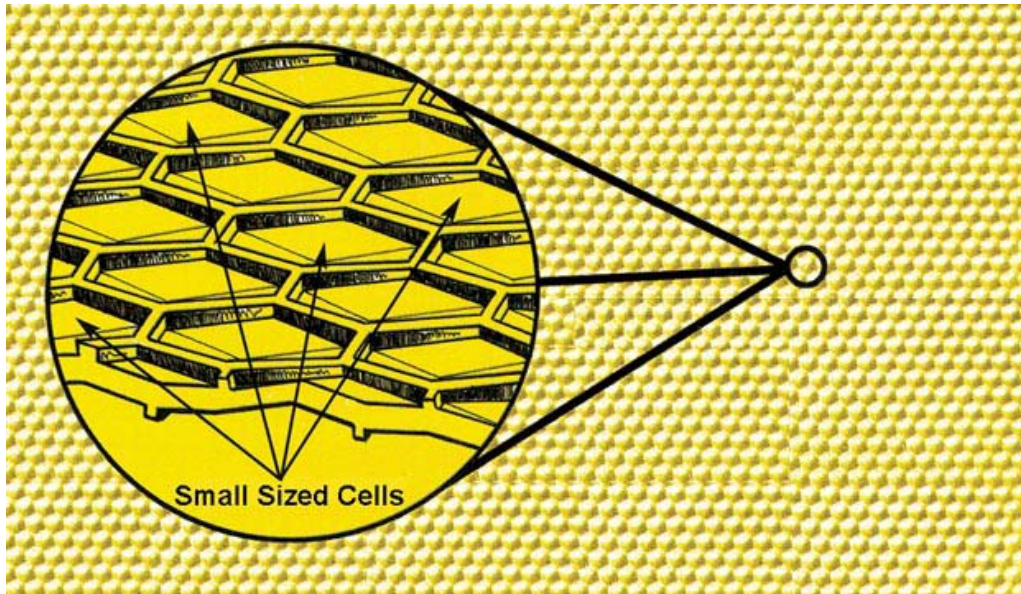
Today's Radio Show - Wed. May 16th.....

today's show: is about honeybees with Professor May Berenbaum. Read her article Losing Their Buzz in the New York Times.

Call (909) 888 - 5222 between 5 - 6 pacific time

Click here for more information about the show

<http://www.roseanneworld.com/blog/index.php26>



Dee Lusby's POV on
Beesource Natural
Cell Size

ED & DEE LUSBY

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The news you're not supposed to know..

Article posted May 10 2007, 1:18 PM

No Organic Bee Losses



Small-cell comb does not control *Varroa* mites in colonies of honeybees of European origin

Thomas D. SEELEY, Sean R. GRIFFIN

Department of Neurobiology and Behavior, Cornell University, Ithaca, NY 14853, USA

Received 9 July 2010 – Revised 26 September 2010 – Accepted 4 October 2010

Abstract – We tested the idea that *Varroa* destructor can be controlled in colonies of the European subspecies of *Apis mellifera* by providing them with combs built of small cells, in which immature mites might have difficulty developing for lack of space. We established seven pairs of equal-size colonies that started out equally infested with mites. In each pair, one hive contained only standard-cell (5.4 mm) comb, and the other contained only small-cell (4.8 mm) comb. We measured the colonies' mite loads at monthly intervals across a summer. No differences arose between the two treatment groups in their mean mite loads (mites per 100 worker bees or mite drop per 48 h). We suggest that providing small-cell combs did not inhibit mite reproduction because the fill factor (thorax width/cell width) was only slightly higher in the small cells than in the standard cells (79% and 73%, respectively).



In early 2007, USDA bee researchers collected samples of afflicted bees in Pennsylvania, California, and Florida in order to figure out what was causing the problems...



A Metagenomic Survey of Microbes in Honey Bee Colony Collapse Disorder

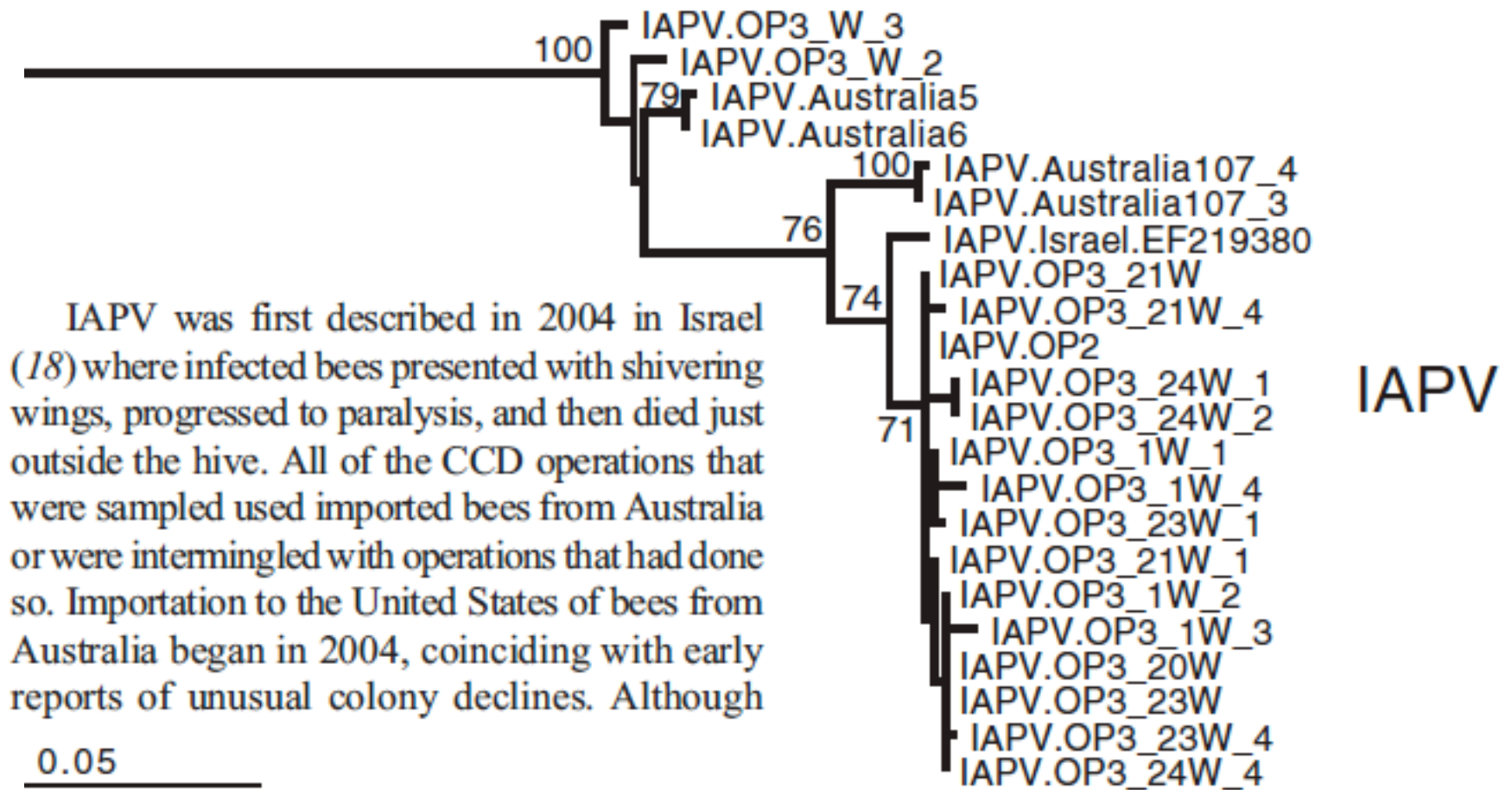
Diana L. Cox-Foster,¹ Sean Conlan,² Edward C. Holmes,^{3,4} Gustavo Palacios,² Jay D. Evans,⁵ Nancy A. Moran,⁶ Phenix-Lan Quan,² Thomas Briese,² Mady Hornig,² David M. Geiser,⁷ Vince Martinson,⁸ Dennis vanEngelsdorp,^{1,9} Abby L. Kalkstein,¹ Andrew Drysdale,² Jeffrey Hui,² Junhui Zhai,² Liwang Cui,¹ Stephen K. Hutchison,¹⁰ Jan Fredrik Simons,¹⁰ Michael Egholm,¹⁰ Jeffery S. Pettis,⁵ W. Ian Lipkin^{2*}

September, 2007

In colony collapse disorder (CCD), honey bee colonies inexplicably lose their workers. CCD has resulted in a loss of 50 to 90% of colonies in beekeeping operations across the United States. The observation that irradiated combs from affected colonies can be repopulated with naive bees suggests that infection may contribute to CCD. We used an unbiased metagenomic approach to survey microflora in CCD hives, normal hives, and imported royal jelly. Candidate pathogens were screened for significance of association with CCD by examination of samples collected from several sites over a period of 3 years. One organism, Israeli acute paralysis virus of bees (IAPV), was strongly correlated with CCD.

Agent	Number of positive samples n (% positive of samples tested)			Positive Predictive Value (%)	Sensitivity (%)	Specificity (%)
	CCD (n = 30)	non-CCD (n = 21)	Total (n = 51)			
IAPV	25 (83.3%)	1 (4.8%)	26 (51.0%)	96.1	83.3	95.2
KBV	30 (100%)	16 (76.2%)	46 (90.2%)	65.2	100	23.8
<i>N. apis</i>	27 (90%)	10 (47.6%)	37 (72.5%)	73.0	90.0	52.4
<i>N. ceranae</i>	30 (100%)	17 (80.9%)	47 (92.1%)	63.8	100	19.0
All 4 agents	23 (76.7%)	0 (0%)	23 (45.0%)	100	76.7	100

Using a viral metagenomics approach, Cox-Foster et al. demonstrated that Israeli Acute Paralysis Virus is associated with colony collapse...



Almonds weren't mentioned specifically but the fact that honey bees were imported in 2004 from Australia and subsequently [for almond pollination] was mentioned...

US authorities suspect Aust bees carrying virus

Simon Lauder

Updated September 07, 2007 19:24:00

The US Agriculture Department has pointed the finger at Australian bees as possible carriers of a virus that they say is causing the collapse of the honey bee industry in the United States and Europe.

The claims are likely to harm the Australian industry and could lead to a ban on the import of Australian bees.

The failure to find what has caused the honey bee crisis is an ongoing headache for the industry, which in the US is worth about \$17 billion.

The name for the mysterious problem, Colony Collapse Disorder, sums up its devastating effects for beekeepers.



PHOTO: Australian honey bee exports to the US may be in danger thanks to colony collapse disorder suspicions.

MAP: Australia

Warren Taylor ships tens of thousands of Australian bees to Canada each year and he questions the conclusion that Australian bees may be the source of CCD.

"We've been shipping bees to Canada for 15 years," he said.

"There's been no colony collapse in Australian bees."

Mr Taylor, managing director of Australian Queen Bee Exporters, says he has very suspicious about the claims from the US.

"I'm curious as to whether there's some hidden agenda with the local bee producers," he said.

...which really irritated Australian beekeepers...

HISTORICAL PRESENCE OF ISRAELI ACUTE PARALYSIS VIRUS IN THE UNITED STATES

by YANPING CHEN and JAY D. EVANS*
USDA-ARS, Bee Research Laboratory, Beltsville, MD 20705

High bee colony losses in the United States this past year can be attributed in part to an unresolved syndrome termed Colony Collapse Disorder (CCD). An extensive genetic survey found one virus, Israeli Acute Paralysis Virus (IAPV), to be strongly associated with CCD. Using DNA sequencing and phylogenetic analyses, we provide evidence that IAPV was present in U.S. bees collected several years prior to CCD, and prior to the recent importation into the U.S. of honey bees from Australia and New Zealand. While downplaying the importance of bee importation for the appearance of CCD, these results indicate an urgent need to test specific strains of IAPV for their disease impacts.

Honey bees are of great agricultural importance in the U.S. and worldwide (Morse and Calderone, 2000), and are continually threatened by parasites and pathogens. During the winter of 2006-2007, a rare and extreme syndrome of honey bee losses was observed. This syndrome, labeled Colony Collapse Disorder (CCD), is defined by a rapid depopulation of adult bees in colonies, often leaving a substantial standing brood of healthy larvae (<http://www.ento.psu.edu/MAAREC/ColonyCollapseDisorder.html>). Survey evidence suggests that roughly 25% of beekeepers have suffered the effects of CCD, as defined by characteristic traits and colony losses of >50% (Van Engelsdorp *et al.*, 2007). Many beekeepers lost substantially more than 50% of their operations. While events similar to CCD have occurred in past decades (Wilson and Menapace, 1979), the severity of this event has caused appropriate concern nationally and internationally.

Recently, an unprecedented 'metagenomic' approach was used to detect parasites and pathogens in bees associated with CCD and controls (Cox-Foster *et al.*, 2007). This study described numerous microbes from bees, some known as

pathogens and others that had not been seen prior in honey bees. One striking result was the tight correlation between Israeli Acute Paralysis Virus (IAPV), an unclassified Dicistroviridae virus, and CCD. IAPV was detected in 25 of 30 (83%) CCD-affected honey bee colonies, but only once in 21 healthy colonies (Cox-Foster *et al.*, 2007). This virus was also found in package bees imported from Australia and isolates of royal jelly imported from China. The identification of IAPV as a newly described virus for the U.S., its association with an important disease, and implications for both bee management and trade issues, have all led to intensive efforts to study this virus. These efforts are focused on past and present worldwide distributions of IAPV, on determining mechanisms by which this and related viruses can cause disease, and on determining whether IAPV strains differ substantially in their

impacts on bees.

To help address these questions, we screened honey bee samples collected in California, Maryland and Pennsylvania from 2002 to 2007 for the presence of IAPV. The genetic relationships of different IAPV strains were studied by sequencing one section (the 5'UTR) from the IAPV genome for isolates collected from 33 U.S. honey bees (out of several hundred screened bees). The results from this survey indicate that IAPV has been circulating in U.S. bee populations since at least 2002, and forms a worldwide species that is greatly diverged from the related Kashmir Bee Virus (Figure 1). Specifically, IAPV isolates from this study can be split into four distinct clusters supported with bootstrap statistical values >55%. These clusters reflect collections from California, Maryland, Pennsylvania, and Israel. CA, and PA isolates each



Some of the research colonies used in the study



Gathering field samples for analysis

-- it turned out that healthy colonies in the U.S. collected in 2001 and kept in a freezer were positive for IAPV when tested in 2007, vindicating Australian bees and beekeepers...

Chen and Evans. 2007. American Bee Journal.

*Corresponding author:

Jay D. Evans, Bee Research Laboratory,
USDA-ARS, Bldg. 476, BARC-East,
Beltsville, MD 20705 USA, Phone 301-
504-8749, Fax 301-504-8736, e-mail:
jay.evans@ars.usda.gov

sunday, 16 september 2007

ISRAELI GERM WARFARE VIRUS BLAMED FOR HONEY BEE DECLINE

?????!!!

SHODDY CONTAINMENT AT NES TZIYONA BIOLOGICAL INSTITUTE ALLEGEDLY ALLOWED WEAPON TO ESCAPE HUMAN FOOD SUPPLY ENDANGERED WORLDWIDE FROM LACK OF POLLINATION AS BILLIONS OF BEES DIE WORLDWIDE!!

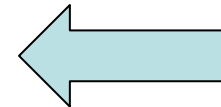
By: Hal Turner

Pentagon Reveals Dark Side of the mystery

Sources in the U.S. Defense Department have told The Hal Turner Show they know exactly where the virus originated: The Nes Tziyona Biological Institute, the main research facility for Israel's clandestine arsenal of chemical and biological weapons.

S O S

The virus is a military bio-weapon developed by the Israeli Defense Force in the year 2000 to use against countries hostile to Israel.



A well-placed Pentagon source with access to classified bio-weapons research tells the Hal Turner Show "The Israeli Military has a well-deserved inferiority complex. They have visions of world domination, but have a lazy and poorly disciplined military that has never successfully defended the country without massive help from the U.S."

The source went on to say "What the military lacks in fighting ability they make up for in weapons of mass destruction. Since the world will not tolerate an overt release of nuclear, chemical or biological weapons by Israel, they had to come up with something cunning. Sinister. Quiet. The IAPV met all those criteria."

By wiping out much of an enemy's food supply at the level of pollination an enemy cannot feed its troops - or its population. The Israelis decided such a problem would hasten the end hostilities by any superior aggressor.

RELEASE INTENTIONAL?

No one knows how the bio-weapon got out and some worry the release was intentional.

...In-hive pesticides gained attention...



...as did agricultural pesticides (particularly neonicotinoids, synthetic neurotoxic analogues of nicotine)





Gaucho Pesticide with Bayer's imidacloprid is the culprit!!!!!!

My first OP on this:

<http://www.democraticunderground.com/discuss/duboard.ph...>

The bee drop off is now termed Colony Collapse Disorder (CCD).

Because of the newness of CCDs, there is not the years of science behind this phenomenon as there are with the connections between some pesticides and cancer.

What is known is that the numbers of bees that have disappeared are placing our food supply in jeopardy. Billions of bees have mysteriously vanished since late last year in the U.S. Is it all that unrealistic to assume pesticides may have a role in the bees' disappearance?

the sake of example, one possibility that comes to mind are insecticides, including Imidacloprid.

According to the Pesticide Action Network, in 1994 in California alone, 5,178 pounds of Imidacloprid were used to treat more than 20,000 acres. It might seem that this is a huge amount, but not when you consider what they used 11 years later.

In 2005, California's use of Imidacloprid jumped to 163,618 pounds, spread 54,961 times treating 787,444 acres. That included 106,591 acres of wine grapes.

Virginia keeps no records of how much pesticide is used. There currently is no process in place.

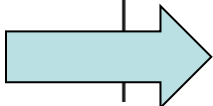
Some experts believe Imidacloprid confuses bees, so they cannot find their way home to the hive.

Neonicotinoids had been blamed for bee disappearances years earlier in France...

PLEASE RECOMMEND TO HELP SAVE THE HONEYBEES AND YOURSELF!

And drop Bayer a line:

Bayer Agricultural Products
P. O. Box 4913
Kansas City, MO 64120

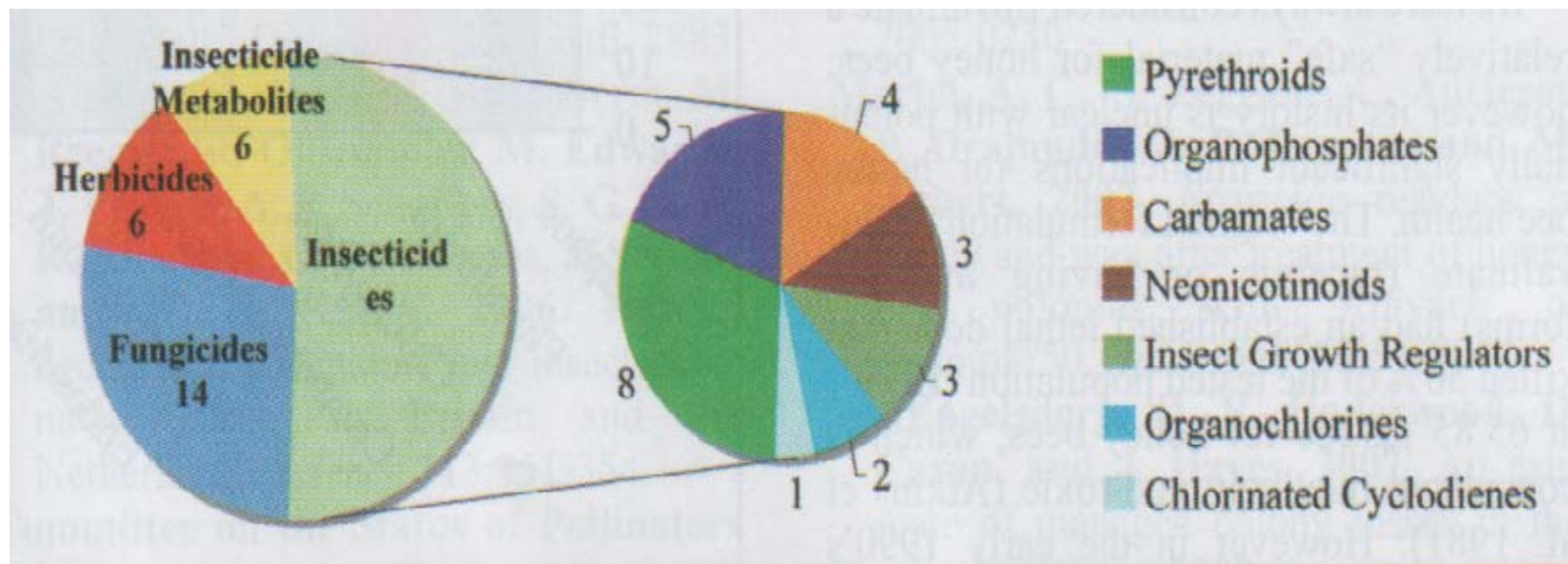


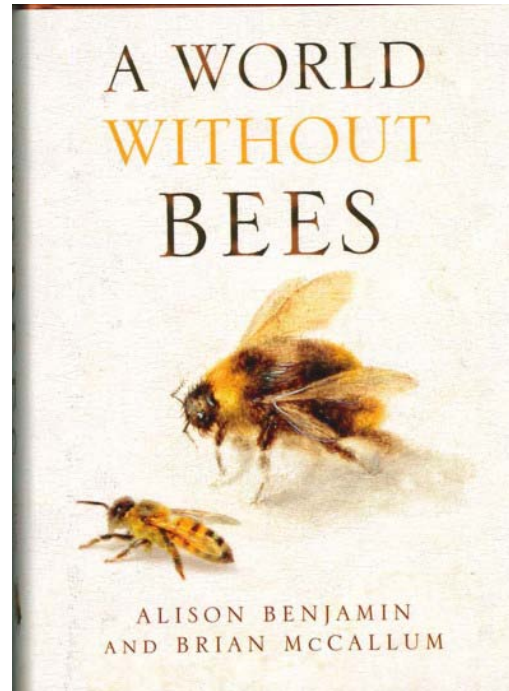
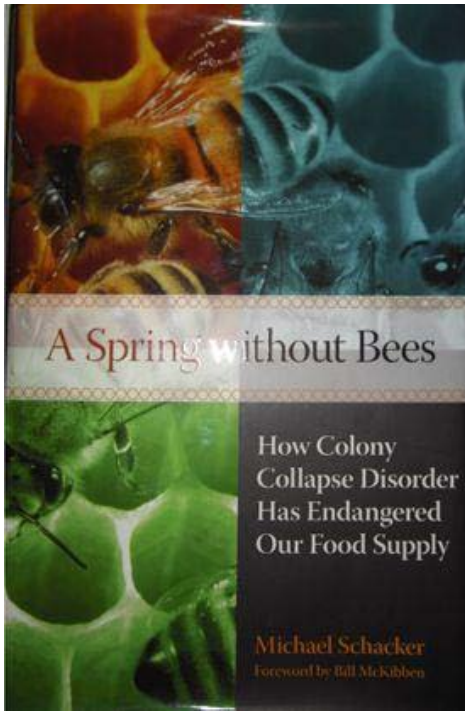
But . . .

-- France STILL has problems after banning imidacloprid

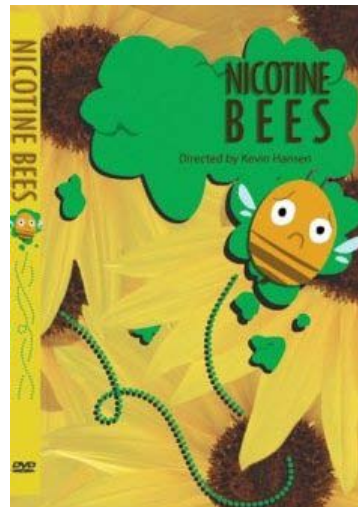
-- Imidacloprid has been used in the U.S. since 1996

-- Only 3 out of 108 pollen samples taken from CCD colonies contained imidacloprid





Such findings did not deter authors of popular books and documentaries, who continued to blame neonicotinoids ...



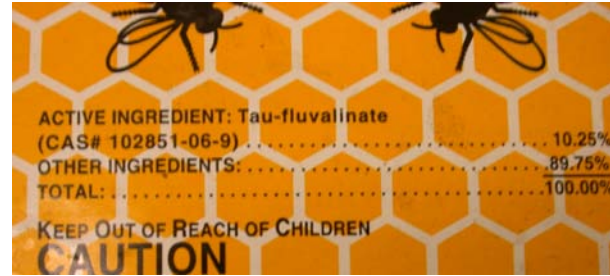
A meta-analysis of experiments testing the effects of a neonicotinoid insecticide (imidacloprid) on honey bees

James E. Cresswell

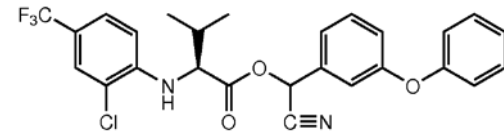
In 2010, a meta-analysis of 14 different studies of the neonicotinoids and bees revealed no overall detectable lethal effects at field levels

Abstract Honey bees provide important pollination services to crops and wild plants. The agricultural use of systemic insecticides, such as neonicotinoids, may harm bees through their presence in pollen and nectar, which bees consume. Many studies have tested the effects on honey bees of imidacloprid, a neonicotinoid, but a clear picture of the risk it poses to bees has not previously emerged, because investigations are methodologically varied and inconsistent in outcome. In a meta-analysis of fourteen published studies of the effects of imidacloprid on honey bees under laboratory and semi-field conditions that comprised measurements on 7073 adult individuals and 36 colonies, fitted dose–response relationships estimate that trace dietary imidacloprid at field-realistic levels in nectar will have no lethal effects, but will reduce expected performance in honey bees by between 6 and 20%. Statistical power analysis showed that published field trials that have reported no effects on honey bees from neonicotinoids were incapable of detecting these predicted sublethal effects with conventionally accepted levels of certainty.

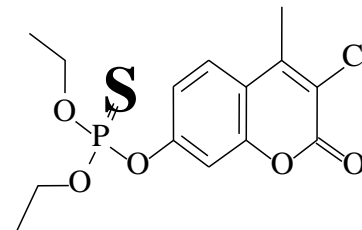
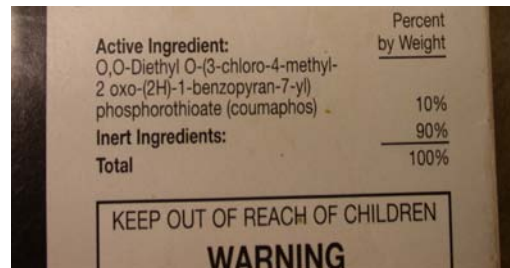
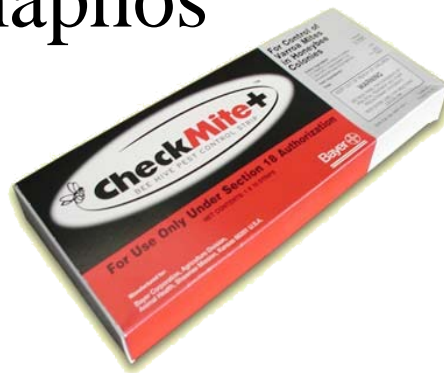
Tau-fluvalinate



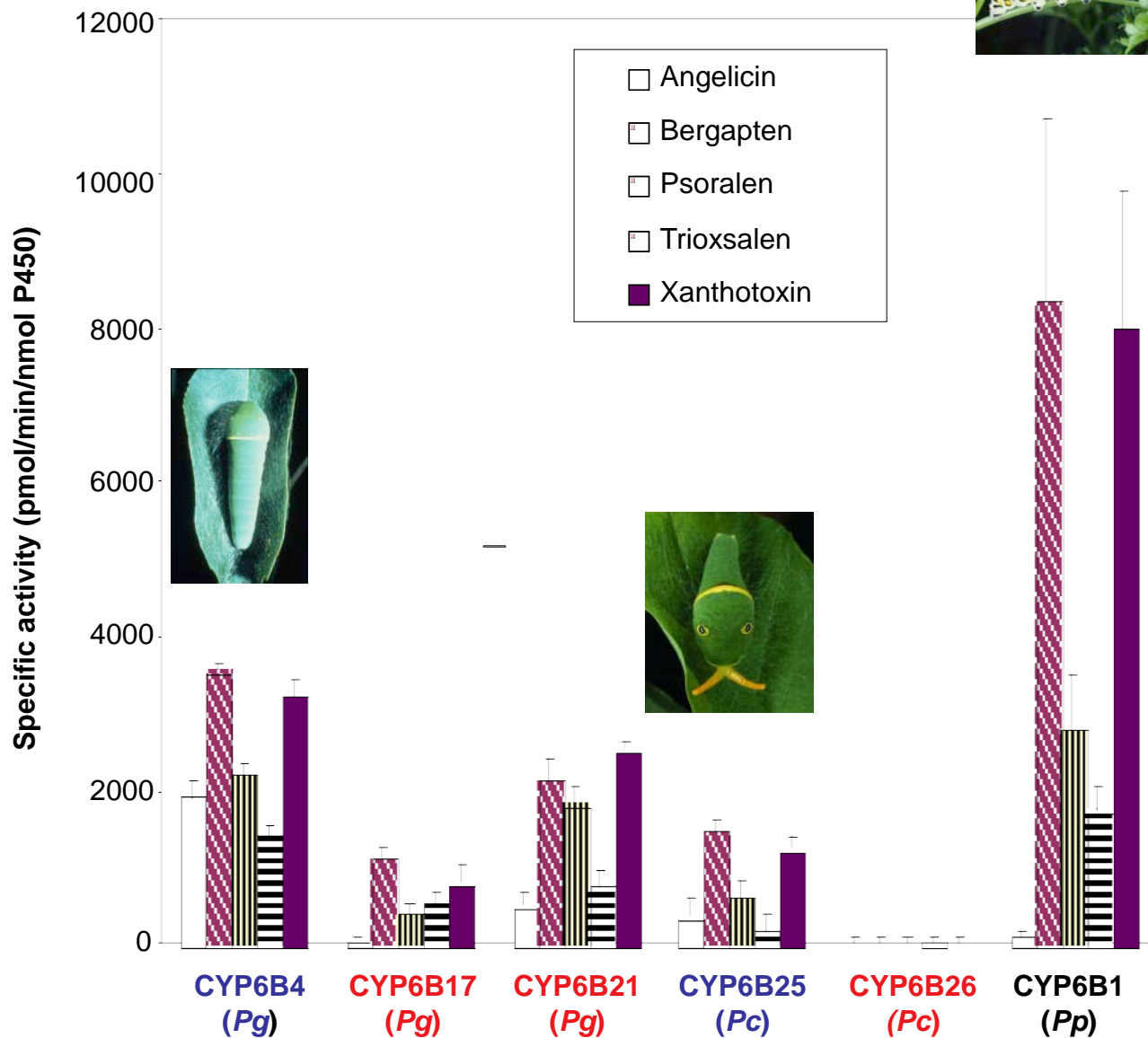
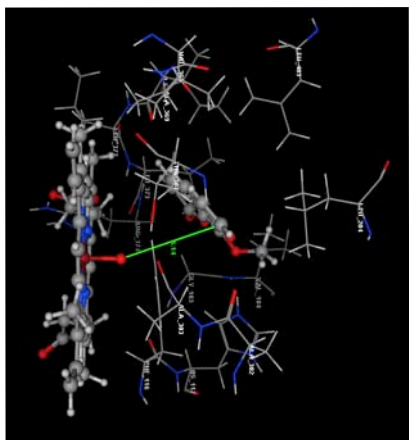
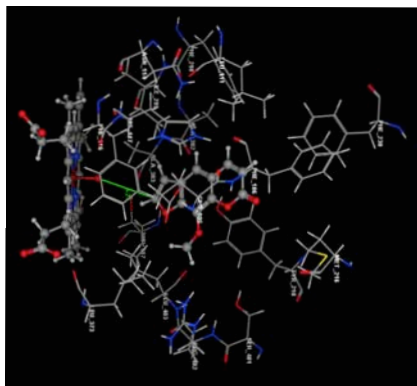
...what about the in-hive acaricides?



Coumaphos



I was recruited to investigate honey bee toxicology...





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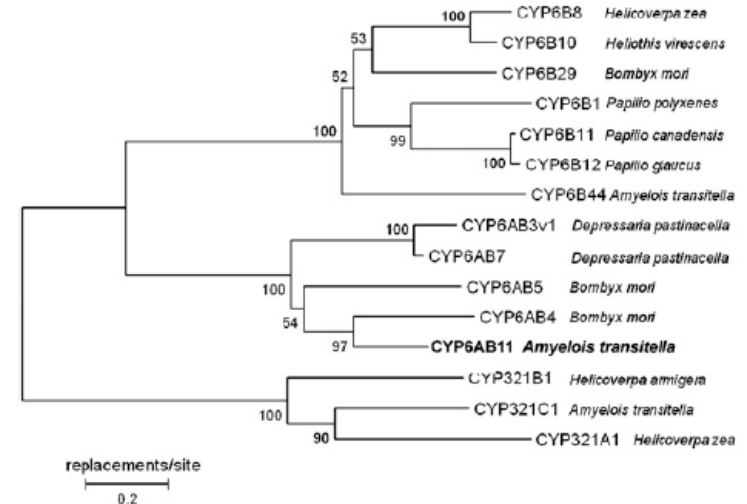
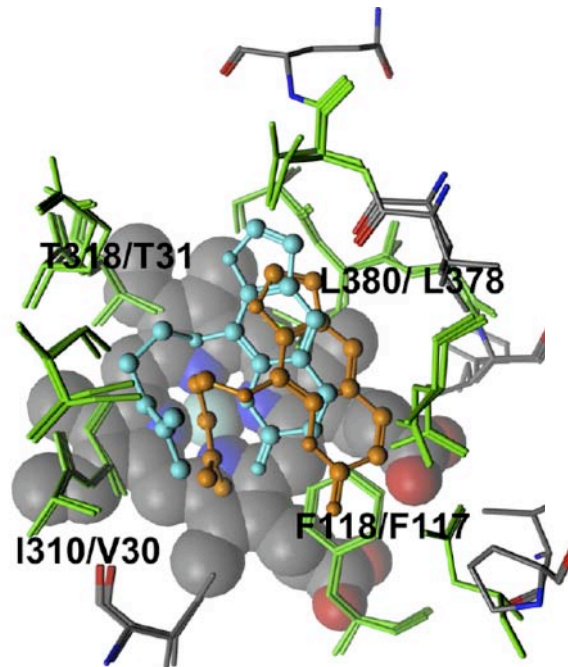
Insect Biochemistry and Molecular Biology

journal homepage: www.elsevier.com/locate/ibmb



A substrate-specific cytochrome P450 monooxygenase, CYP6AB11, from the polyphagous navel orangeworm (*Amyelois transitella*)

Guodong Niu^a, Sanjeewa G. Rupasinghe^b, Arthur R. Zangerl^a, Joel P. Siegel^c,
Mary A. Schuler^b, May R. Berenbaum^{a,*}



Work I still do, thanks to the Almond Board!

CYP9Q-mediated detoxification of acaricides in the honey bee (*Apis mellifera*)

Wenfu Mao^a, Mary A. Schuler^b, and May R. Berenbaum^{a,1}

Bees are short on detoxification enzymes--the same enzyme metabolizes both acaricides (Mao et al. 2011) and they synergize each other (Johnson et al. 2006)

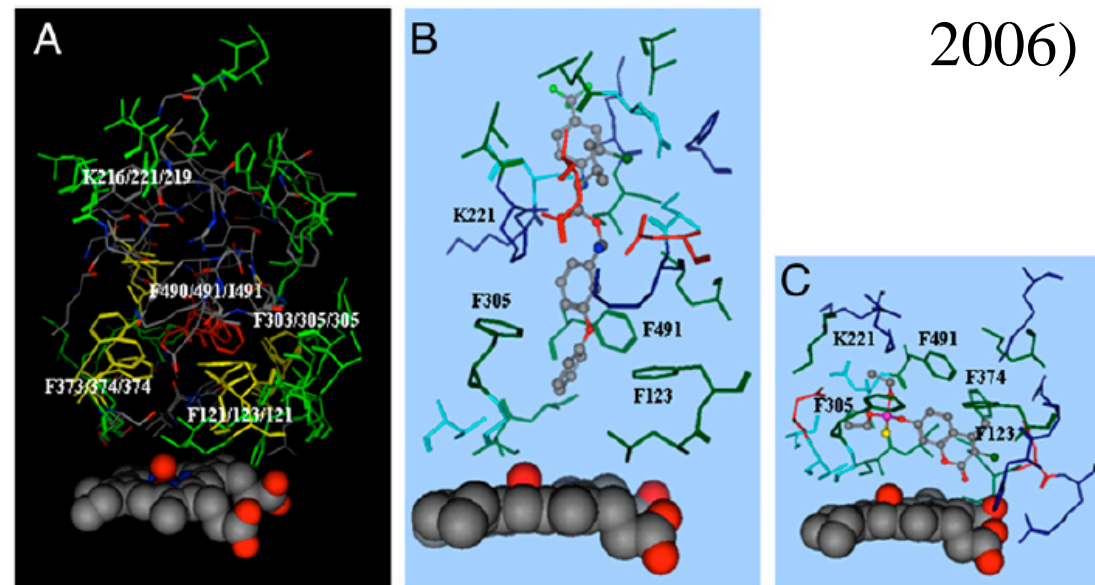


Fig. 2. Docking of tau-fluvalinate in the CYP9Q2 catalytic site. (A) The docking mode for tau-fluvalinate (elemental colors in stick format) in the predicted CYP9Q2 catalytic site is shown with substrate contacts within 4.5 Å of this substrate. Overlaid with this are the predicted CYP9Q1 and CYP9Q3 catalytic sites with Phe123, Phe305, Phe374, Phe491, and Lys221 conserved in two or three CYP9Q proteins, shown in yellow, and other side chains conserved in all three CYP9Q proteins, shown in green. The heme and its bound oxygen are shown in space-filling format. (B and C) The predicted docking modes for tau-fluvalinate (B) and coumaphos (C) in CYP9Q2 are shown in elemental colors, with amino acid side chains within 4.5 Å of this substrate shown in red for acidic residues, blue for basic residues, green for hydrophobic residues, and cyan for hydrophilic residues.

Pesticides might be particularly deadly in combination...

High Levels of Miticides and Agrochemicals in North American Apiaries: Implications for Honey Bee Health

Christopher A. Mullin^{1*}, Maryann Frazier¹, James L. Frazier¹, Sara Ashcraft¹, Roger Simonds², Dennis vanEngelsdorp³, Jeffery S. Pettis⁴

Background: Recent declines in honey bees for crop pollination threaten fruit, nut, vegetable and seed production in the United States. A broad survey of pesticide residues was conducted on samples from migratory and other beekeepers across 23 states, one Canadian province and several agricultural cropping systems during the 2007–08 growing seasons.

Methodology/Principal Findings: We have used LC/MS-MS and GC/MS to analyze bees and hive matrices for pesticide residues utilizing a modified QuEChERS method. We have found 121 different pesticides and metabolites within 887 wax, pollen, bee and associated hive samples. Almost 60% of the 259 wax and 350 pollen samples contained at least one systemic pesticide, and over 47% had both in-hive acaricides fluvalinate and coumaphos, and chlorothalonil, a widely-used fungicide. In bee pollen were found chlorothalonil at levels up to 99 ppm and the insecticides aldicarb, carbaryl, chlorpyrifos and imidacloprid, fungicides boscalid, captan and myclobutanil, and herbicide pendimethalin at 1 ppm levels. Almost all comb and foundation wax samples (98%) were contaminated with up to 204 and 94 ppm, respectively, of fluvalinate and coumaphos, and lower amounts of amitraz degradates and chlorothalonil, with an average of 6 pesticide detections per sample and a high of 39. There were fewer pesticides found in adults and brood except for those linked with bee kills by permethrin (20 ppm) and fipronil (3.1 ppm).

Conclusions/Significance: The 98 pesticides and metabolites detected in mixtures up to 214 ppm in bee pollen alone represents a remarkably high level for toxicants in the brood and adult food of this primary pollinator. This represents over half of the maximum individual pesticide incidences ever reported for apiaries. While exposure to many of these neurotoxicants elicits acute and sublethal reductions in honey bee fitness, the effects of these materials in combinations and their direct association with CCD or declining bee health remains to be determined.

35. Everich R, Schiller C, Whitehead J, Beavers M, Barrett K (2009) Effects of captan on *Apis mellifera* brood development under field conditions in California almond orchards. *J Econ Entomol* 102: 20–29.

Table 2. Summary of pesticide detections in pollen samples from

Pollen Pesticide*	Class#	Detects	Samples	%	Detectio High
Fluvalinate	PYR	309	350	88.3	2670.0
Coumaphos	OP	263	350	75.1	5828.0
Chlorpyrifos	OP	153	350	43.7	830.0
Chlorothalonil	FUNG	148	280	52.9	98900.0
Pendimethalin	HERB	113	247	45.7	1730.0
Endosulfan I	CYC	98	350	28.0	76.7
Endosulfan sulfate	CYC	92	350	26.3	35.0
DMPF (amitraz)	FORM	77	247	31.2	1117.0
Atrazine	S HERB	71	350	20.3	49.0
Endosulfan II	CYC	70	350	20.0	67.7
Fenpropathrin	PYR	63	350	18.0	170.0
Azoxystrobin	S FUNG	53	350	15.1	107.0
Metolachlor	PS HERB	52	350	14.9	103.0
Captan	FUNG	45	350	12.9	10000.0
Esfenvalerate	PYR	41	350	11.7	59.6
Carbaryl	PS CARB	38	350	10.9	1010.0
Cyhalothrin	PYR	38	350	10.9	28.0
THPI (captan)	PS FUNG	35	247	14.2	363.0
Methoxyfenozide	IGR	29	350	8.3	128.0
Dicofol	OC	28	350	8.0	143.0

Over 125 different pesticides and metabolites were found in wax, beebread, adult bees and grubs. Average number per sample was 6 and the high was 39...

Sub-Lethal Effects of Pesticide Residues in Brood Comb on Worker Honey Bee (*Apis mellifera*) Development and Longevity

Judy Y. Wu, Carol M. Anelli, Walter S. Sheppard*



Background: Numerous surveys reveal high levels of pesticide residue contamination in honey bee comb. We conducted studies to examine possible direct and indirect effects of pesticide exposure from contaminated brood comb on developing worker bees and adult worker lifespan.

Methodology/Principal Findings: Worker bees were reared in brood comb containing high levels of known pesticide residues (treatment) or in relatively uncontaminated brood comb (control). Delayed development was observed in bees reared in treatment combs containing high levels of pesticides particularly in the early stages (day 4 and 8) of worker bee development. Adult longevity was reduced by 4 days in bees exposed to pesticide residues in contaminated brood comb during development. Pesticide residue migration from comb containing high pesticide residues caused contamination of control comb after multiple brood cycles and provided insight on how quickly residues move through wax. Higher brood mortality and delayed adult emergence occurred after multiple brood cycles in contaminated control combs. In contrast, survivability increased in bees reared in treatment comb after multiple brood cycles when pesticide residues had been reduced in treatment combs due to residue migration into uncontaminated control combs, supporting comb replacement efforts. Chemical analysis after the experiment confirmed the migration of pesticide residues from treatment combs into previously uncontaminated control comb.

Conclusions/Significance: This study is the first to demonstrate sub-lethal effects on worker honey bees from pesticide residue exposure from contaminated brood comb. Sub-lethal effects, including delayed larval development and adult emergence or shortened adult longevity, can have indirect effects on the colony such as premature shifts in hive roles and foraging activity. In addition, longer development time for bees may provide a reproductive advantage for parasitic *Varroa destructor* mites. The impact of delayed development in bees on *Varroa* mite fecundity should be examined further.

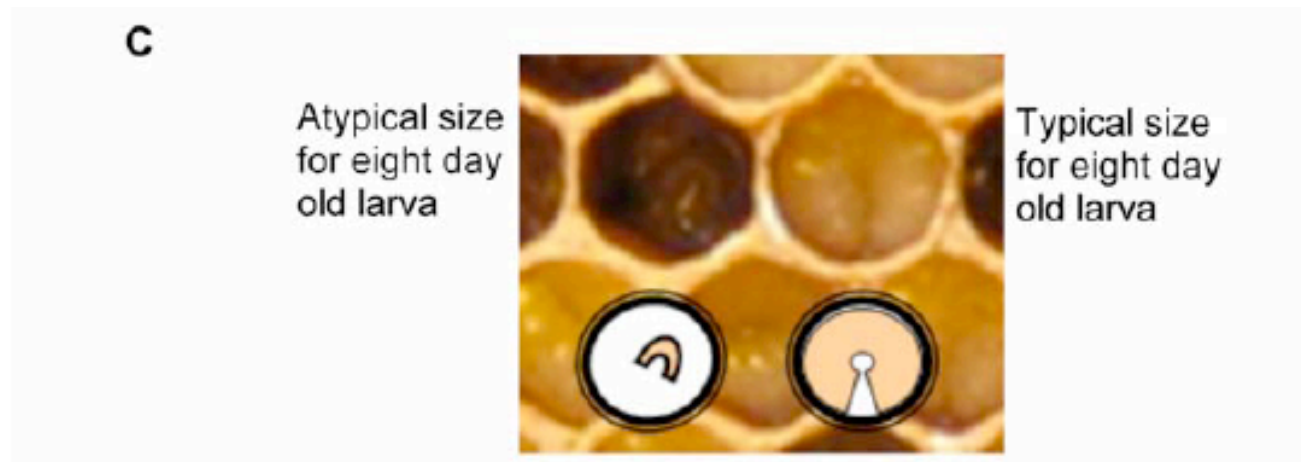
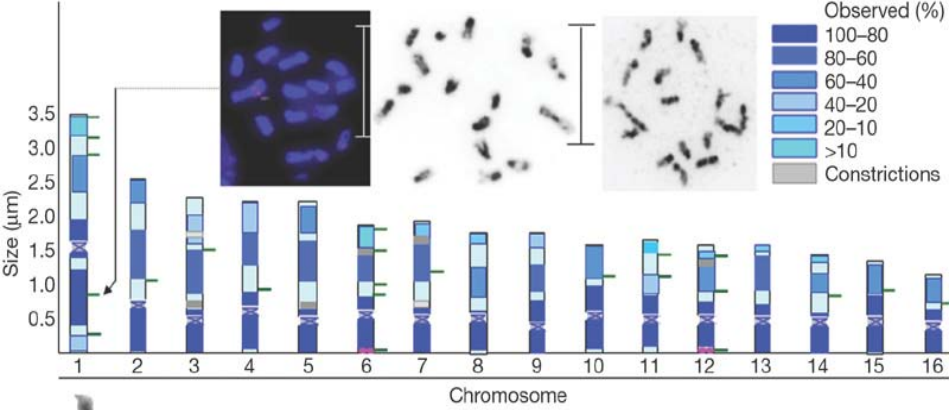


Figure 2. Larval development of worker bees from day 1 (egg stage) through day 19 (late pupal stage). (A) Normal larval development of bees reared in relatively uncontaminated control brood comb. (B) Larval development of bees reared in brood comb containing 17 different pesticides, expressing delayed development at day 4 and day 8. (C) Worker brood reared in brood comb containing 17 different pesticides at day 8 of development. Left: delayed growth. Right: normal development.

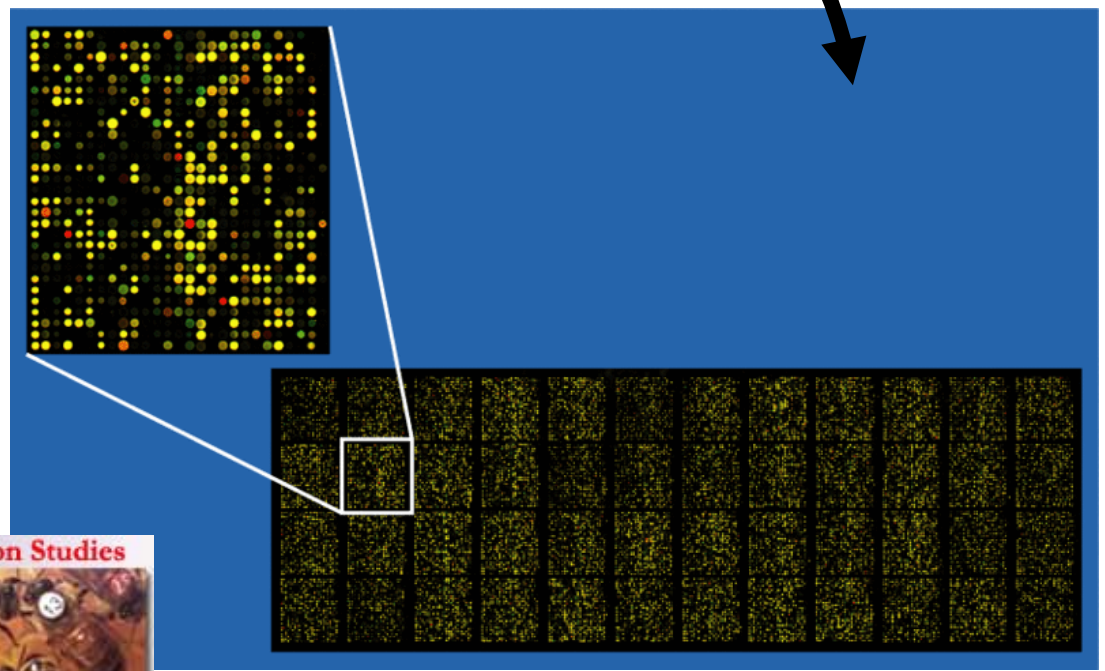
doi:10.1371/journal.pone.0014720.g002

Slower development may favor varroa survival



10,157 genes

Honey bee whole genome microarray (UIUC)



Changes in transcript abundance relating to colony collapse disorder in honey bees (*Apis mellifera*)

Reed M. Johnson^{a,1}, Jay D. Evans^b, Gene E. Robinson^a, and May R. Berenbaum^{a,2}

^aDepartment of Entomology, University of Illinois at Urbana-Champaign, Urbana, IL 61801; and ^bBee Research Laboratory, Agricultural Research Service, United States Department of Agriculture, Beltsville, MD 20705

Contributed by May R. Berenbaum, July 14, 2009 (sent for review February 18, 2009)

Colony collapse disorder (CCD) is a mysterious disappearance of honey bees that has beset beekeepers in the United States since late 2006. Pathogens and other environmental stresses, including pesticides, have been linked to CCD, but a causal relationship has not yet been demonstrated. Because the gut acts as a primary interface between the honey bee and its environment as a site of entry for pathogens and toxins, we used whole-genome microarrays to compare gene expression between guts of bees from CCD colonies originating on both the east and west coasts of the United States and guts of bees from healthy colonies sampled before the emergence of CCD. Considerable variation in gene expression was associated with the geographical origin of bees, but a consensus list of 65 transcripts was identified as potential markers for CCD status. Overall, elevated expression of pesticide response genes was not observed. Genes involved in immune response showed no clear trend in expression pattern despite the increased prevalence of viruses and other pathogens in CCD colonies. Microarray analysis revealed unusual ribosomal RNA fragments that were conspicuously more abundant in the guts of CCD bees. The presence of these fragments may be a possible consequence of picorna-like viral infection, including deformed wing virus and Israeli acute paralysis virus, and may be related to arrested translation. Ribosomal fragment abundance and presence of multiple viruses may prove to be useful diagnostic markers for colonies afflicted with CCD.

Pesticides also have been suspected to play a role in CCD. Sublethal exposures leading to behavioral disruptions consistent with the failure of foragers to return to their hives have been associated with the neonicotinoid pesticides (7). The long-term use of combinations of in-hive pesticides for control of honey bee parasites also may have contributed to otherwise unexplained bee mortality (8).

To differentiate among possible explanations for CCD, we used whole-genome microarray analysis, comparing gut gene expression in adult worker bees from healthy and CCD colonies. We assayed the gut because it is the principal site of pesticide detoxification and an integral component in the immune defense against pathogens in *A. mellifera*. Samples from colonies varying in CCD severity were collected on the U.S. east and west coasts in the winter of 2006–2007 and compared with healthy (“historical”) controls collected in 2004 and 2005.

Results

Gene Expression Differences. The microarray contained oligonucleotide probes representing 9,867 different genes (with duplicate spots), based on gene predictions and annotation from the honey bee genome sequencing project; in addition, 2,729 probes specific for ESTs matching no existing annotation were represented on the array (9–11), including 21 probes derived from expressed sequence tags (ESTs) specific for rRNA [[supporting information \(SI\) Table S11](#)].

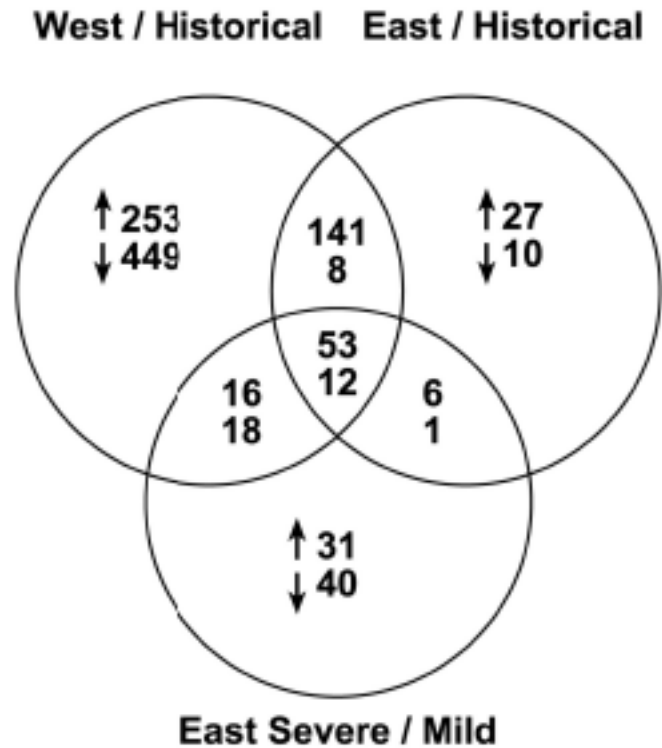


Fig. 3. Venn diagram showing the number of transcripts up-regulated and down-regulated in 3 comparisons: west coast (California) CCD versus historical, east coast (Florida and Pennsylvania) CCD versus historical, and east coast severe CCD versus mild CCD.

Of the 65 genes most consistently upregulated in CCD bees, most represented fragments of ribosomal RNA. Ribosomes are the protein factories of the cell—CCD appeared to be associated with the breakdown of ribosomes. What can break down ribosomes?

Year	Status	State	Colonies	ABPV	KBV	IAPV	DWV	SBV	Number of viruses
2006	Healthy	MA/PA	14	0%	14%	7%	64%	36%	1.21 ± 0.80
	CCD	FL	24	38%	38%	25%	46%	8%	1.54 ± 1.67
	CCD	CA	57	51%	21%	21%	58%	30%	1.81 ± 1.41
2007	Healthy	CA	14	86%	7%	14%	29%	7%	1.43 ± 1.02
	CCD	CA	16	69%	44%	25%	44%	6%	1.88 ± 0.72

„,picorna-like viruses, which hijack the ribosomes and reprogram them to make viral proteins. CCD bees were infected with a larger number of these viruses...

Colony Collapse Disorder: A Descriptive Study

Dennis vanEngelsdorp^{1,2}, Jay D. Evans⁵, Claude Saegerman³, Chris Mullin², Eric Haubruge⁴, Bach Kim Nguyen⁴, Maryann Frazier², Jim Frazier², Diana Cox-Foster², Yanping Chen⁵, Robyn Underwood², David R. Tarpy⁶, Jeffery S. Pettis^{5*}

¹ Pennsylvania Department of Agriculture, Harrisburg, Pennsylvania, United States of America, ² Department of Entomology, The Pennsylvania State University, University Park, Pennsylvania, United States of America, ³ Department of Infectious and Parasitic Diseases, Epidemiology and Risk analysis applied to the Veterinary Sciences, University of Liege, Liege, Belgium, ⁴ Department of Functional and Evolutionary Entomology, Gembloux Agricultural University, Gembloux, Belgium, ⁵ United States Department of Agriculture (USDA) – Agricultural Research Service (ARS) Bee Research Laboratory, Beltsville, Maryland, United States of America, ⁶ Department of Entomology, North Carolina State University, Raleigh, North Carolina, United States of America

Abstract

Background: Over the last two winters, there have been large-scale, unexplained losses of managed honey bee (*Apis mellifera* L.) colonies in the United States. In the absence of a known cause, this syndrome was named Colony Collapse Disorder (CCD) because the main trait was a rapid loss of adult worker bees. We initiated a descriptive epizootiological study in order to better characterize CCD and compare risk factor exposure between populations afflicted by and not afflicted by CCD.

Methods and Principal Findings: Of 61 quantified variables (including adult bee physiology, pathogen loads, and pesticide levels), no single measure emerged as a most-likely cause of CCD. Bees in CCD colonies had higher pathogen loads and were co-infected with a greater number of pathogens than control populations, suggesting either an increased exposure to pathogens or a reduced resistance of bees toward pathogens. Levels of the synthetic acaricide coumaphos (used by beekeepers to control the parasitic mite *Varroa destructor*) were higher in control colonies than CCD-affected colonies.

Conclusions/Significance: This is the first comprehensive survey of CCD-affected bee populations that suggests CCD involves an interaction between pathogens and other stress factors. We present evidence that this condition is contagious or the result of exposure to a common risk factor. Potentially important areas for future hypothesis-driven research, including the possible legacy effect of mite parasitism and the role of honey bee resistance to pesticides, are highlighted.

Citation: vanEngelsdorp D, Evans JD, Saegerman C, Mullin C, Haubruge E, et al. (2009) Colony Collapse Disorder: A Descriptive Study. PLoS ONE 4(8): e6481. doi:10.1371/journal.pone.0006481

Van Engelsdorp et al. (PLoS One, 2009) also found consistently higher pathogen loads in CCD bees...

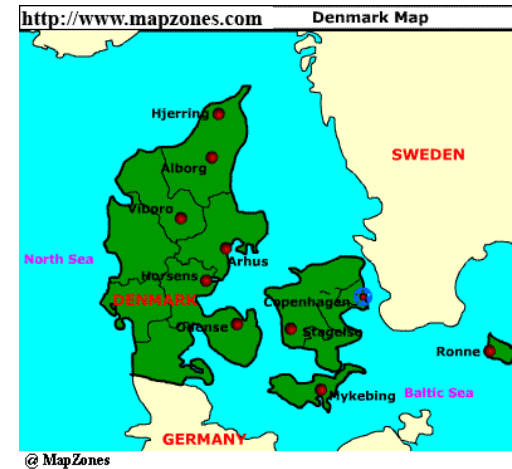
Incidence of acute bee paralysis virus, black queen cell virus, chronic bee paralysis virus, deformed wing virus, Kashmir bee virus and sacbrood virus in honey bees (*Apis mellifera*) in Denmark

Steen Lykke Nielsen, Mogens Nicolaisen and Per Kryger

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Received 31 July 2007 - Revised 13 December 2007 - Accepted 13 December 2007 - Published online 10 April 2008

Abstract - Samples of adult honey bees from apiaries with unusually high winter mortality and brood from hives with symptoms of disease were tested for presence of acute bee paralysis virus (ABPV), black queen cell virus (BQCV), chronic bee paralysis virus (CBPV), deformed wing virus (DWV), Kashmir bee virus (KBV) and sacbrood virus (SBV) by RT-PCR. All six viruses were detected, but the frequencies varied significantly: SBV was detected in 78 apiaries, DWV in 55, ABPV in 11, CBPV in 4, BQCV in 1 and KBV in 1. This is the first record of KBV in Denmark. A large majority of the bee samples were infected with one or more viruses. Single, dual and triple infections were observed. Nucleotide sequences of the PCR products from each virus were determined and found to be 98-99% identical to GenBank accessions except CBPV, which was only 88-90% identical to known CBPV sequences.



@ MapZones

Multiple viral infections are increasingly common all over the world...

...probably as a
result of
globalization of
trade...

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Journal of Invertebrate Pathology 98 (2008) 235–238

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Short Communication

Prevalence of pathogenic bee viruses in Hungarian apiaries: Situation before joining the European Union

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Received 9 August 2007; accepted 12 November 2007

Available online 19 November 2007

Abstract

A survey on the occurrence of six honeybee-pathogenic viruses was carried out using one-step RT-PCR assays. Samples were collected between 1999 and 2004 in 52 Hungarian apiaries located in different regions of the country. The results of the assays on samples of adult honeybees and *Varroa destructor* mites were compared to similar surveys from France and Austria. The study demonstrates geographical differences in the prevalence of honeybee viruses between Hungary and the older EU member states. The results could serve as a basis for monitoring further changes in the distribution of honeybee viruses in Europe.

Are Cell Phone Towers Honey Bees' Next Big Threat? New Study Says Yes.

by Jaymi Heimbuch, San Francisco, California on 08.31.09



Photo via [autan](#)

As if honey bees don't have enough to worry about right now, it seems that cell phone towers may be problematic for the insects. According to a new study, a rapid drop in the bee population in Kerala, India is the result of recently installed cell phone towers, and could cause a complete collapse of bee populations within 10 years.

Reported on [PhysOrg](#), an experiment conducted in Kerala showed that as mobile phone companies installed towers to expand their network, the bee population shrank. Dr. Sainuddin Pattazhy conducted the study and concluded that the electromagnetic waves from the towers shorted out the navigational abilities of worker bees so that they couldn't find their way home after going out to collect pollen.

The report states, "If towers and mobile phones further increase, honey bees might be wiped out in 10 years, Pattazhy said."

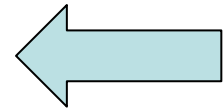
It seems like a highly dramatic conclusion - and one to be skeptical about since the [same issues came up a couple years ago](#). We're still digging for details on the "experiment" - so far it sounds like it's one isolated finding that when a cell phone tower was put up next to a bee hive, the hive collapsed within 10 days. What all factors were involved, we aren't 100% sure yet. But with [honey bees suffering from all sorts of maladies](#), and with their health a [vital component to food systems](#), it is a potential problem that shouldn't be ignored.

August 22nd was [National Honey Bee Awareness Day](#). With this new study, it seems there's a whole lot to stay aware of when it comes to these important insects.

UPDATE: Image is updated to show an actual honey bee and not a quicker-than-the-eye-oh-so-confusing-bee-imitating hover fly.

But bizarre notions persist...The same month that our PNAS paper came out, an unrefereed, apparently unpublished study in Kerala, India, attracted media attention...

August 31, 2009



June 1, 2010

Are cell phones killing off bees?

by [Chris Matyszczyk](#)

301 retweet Share 393 3 digg

When it comes to destruction, humans rarely need help. You just have to look at the pleasure 4-year-old boys enjoy while tearing some toy, worm, or silence to shreds to know that the human species, especially the male kind, loves to annihilate.

However, researchers in India believe that cell phones are assisting in the gradual annihilation of something that so many find especially endearing: the honeybee.

[According to the Telegraph](#), researchers at the Punjab University in Chandigarh decided to investigate whether the arrival of the cell phone might have had something to do with the departure of the honey maker.



Many countries are seeing significant declines in their bee populations. Naturally, climate change, pesticides, and viruses are just three of the commonly proposed possible culprits. However, the Indian researchers thought there might be something else involved, so they decided to perform a controlled experiment. They placed a couple of cell phones around a hive, with a couple of fake ones around another hive; a third hive had no cell phones at all.

The real phones were GSM 900MHz and "the exposure given was 15 minutes twice a day during peak bee activity."

To their controlled surprise, three months of observation led them to conclude that the hive with the real cell phones experienced a significant reduction in its population. The queen bee laid fewer than half the number of eggs that the one in the fake cell phone hive did, and neither honey nor pollen was anywhere to be found.

[In their report](#), the researchers, Ved Parkash Sharma and Neelima Kumar, explained that they decided to perform the experiment because there was increasing evidence that electromagnetic fields are responsible for the decline in bee populations. They also noted that similar results have been obtained by those who studied bee populations "under the influence of high-tension lines."

They suggest that all of our chattering radiation may well be messing with the bees' ability to navigate their way back home.

One can only hope that the researchers can reach some definitive conclusions soon, so that they can conduct a new experiment--one that examines whether there is any significant difference in the radiation emitted by various cell phone carriers.

Changes in honeybee behaviour and biology under the influence of cellphone radiations

Ved Parkash Sharma¹ and Neelima R. Kumar^{2,*}

¹Department of Environment and Vocational Studies, and

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Increase in the usage of electronic gadgets has led to electropollution of the environment. Honeybee behaviour and biology has been affected by electrosmog since these insects have magnetite in their bodies which helps them in navigation. There are reports of sudden disappearance of bee populations from honeybee colonies. The reason is still not clear. We have compared the performance of honeybees in cellphone radiation exposed and unexposed colonies. A significant ($p < 0.05$) decline in colony strength and in the egg laying rate of the queen was observed. The behaviour of exposed foragers was negatively influenced by the exposure, there was neither honey nor pollen in the colony at the end of the experiment.

Keywords: Colony strength, electromagnetic field, foraging behaviour, honeybees.

RECENTLY a new phenomenon of sudden disappearance of bees with little sign of disease or infection has been reported from the world over. Bees simply leave the hives and fail to return^{1,2}. Colony collapse disorder (CCD) is the name given to this problem. Bee colony collapse was previously attributed to viruses, parasitic mites, pesticides, genetically modified crop use and climate change. On the basis of widely reported influences on honeybee behaviour and physiology, electromagnetic field is emerging as a potent culprit³.

The decimation of bees is seen as a grave risk to the delicate equilibrium of the ecosystem. There is an urgent need to understand the complicity of interaction involved in the influence of electromagnetic radiations particularly due to cellphones on honeybee biology and to work out a strategy of development with minimal environmental implications.

Four colonies of honeybees, *Apis mellifera* L, were selected in the apiary of the Zoology Department, Panjab University, Chandigarh. Two colonies T₁ and T₂ were marked as test colonies. These were provided with two functional cellphones of GSM 900 MHz frequency. The average radiofrequency (RF) power density was 8.549 $\mu\text{W}/\text{cm}^2$ (56.8 V/m, electric field). The cellphones were placed on the two side walls of the bee hive in call mode. Electromotive field (EMF) power density was measured with the help of RF power density meter (Figure 1).

Blank colony (B) was equipped with dummy cellphones, while the control colony (C) had no cellphones.

The exposure given was 15 min, twice a day during the period of peak bee activity (1100 and 1500 h). The experiment was performed twice a week extending over February to April and covering two brood cycles.

The following biological aspects were recorded during observations.

Brood area: The total area under brood comprising eggs, larvae and sealed brood was measured in all the experimental colonies with the help of a 1 sq. cm grid mounted on a comb frame⁴.

Queen prolificacy: This was measured in terms of egg laying rate of the queen. In order to determine the number of eggs laid by the queen per day, the total brood area measured was multiplied by a factor of 4 to calculate the total number of cells containing the brood (there are 4 cells per sq. cm of comb). This number was divided by 21 (as the average time taken for an egg to change into an adult worker is 21 days) to get the egg laying rate of the queen⁵.

The queen prolificacy was calculated as:

$$QP = \frac{\text{Total brood area (cm}^2) \times 4}{21}$$

The following behavioural aspects were observed.

Foraging: (i) Flight activity measured as number of worker bees leaving the hive entrance per minute: before exposure and during exposure. (ii) Pollen foraging efficiency measured as number of worker bees returning with pollen loads per minute: before exposure and during exposure. (iii) Returning ability determined by counting the



Figure 1. Experimental colony showing placement of mobile phones and power density meter.

Four colonies of honeybees, *Apis mellifera* L, were selected in the apiary of the Zoology Department, Panjab University, Chandigarh. Two colonies T₁ and T₂ were marked as test colonies. These were provided with two functional cellphones of GSM 900 MHz frequency. The average radiofrequency (RF) power density was 8.549 $\mu\text{W}/\text{cm}^2$ (56.8 V/m, electric field). The cellphones were placed on the two side walls of the bee hive in call mode. Electromotive field (EMF) power density was measured with the help of RF power density meter (Figure 1).

This study was published with no statistics, on only two test colonies and two experimental colonies...

*For correspondence. (e-mail: neelimark@yahoo.co.in)

How Your Cell Phone Is Killing Bees And Starving The Planet

Steve Kovach | May 12, 2011, 3:32 PM | 1,584 | 9

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Believe it or not, bees are pretty important. They pollinate the food we eat. And their declining population is a major concern for some scientists.

Now a new study says cell phones are to blame.

A Swiss scientist named [Daniel Favre conducted the study](#), and concluded cell phone signals can cause bees to make extra noise, which is a signal to leave the hive. When cell phones are placed near a hive, it acts as a barrier, keeping bees from returning.

When worker bees abandon the hive, the hive as a whole suffers. Thus, the decline in bee population, and a major scare for food scientists.



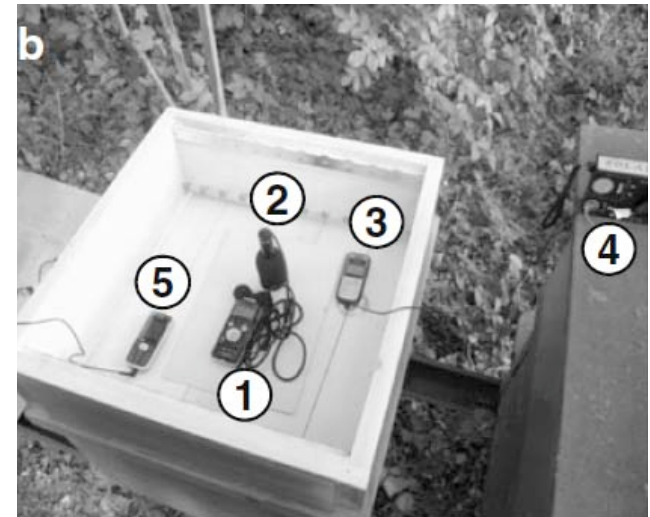
Image: [Max Westby](#)

Mobile phone-induced honeybee worker piping

Daniel FAVRE^{1,2}

Abstract – The worldwide maintenance of the honeybee has major ecological, economic, and political implications. In the present study, electromagnetic waves originating from mobile phones were tested for potential effects on honeybee behavior. Mobile phone handsets were placed in the close vicinity of honeybees. The sound made by the bees was recorded and analyzed. The audiograms and spectrograms revealed that active mobile phone handsets have a dramatic impact on the behavior of the bees, namely by inducing the worker piping signal. In natural conditions, worker piping either announces the swarming process of the bee colony or is a signal of a disturbed bee colony.

This refereed scientific paper actually had nothing to do with colony collapse disorder...



The results of the present pilot study clearly show that the presence of actively communicating mobile phone handsets in the close vicinity of honeybees had a dramatic effect, namely the induction of worker piping which was regularly observed about 25 to 40 min after the onset of the mobile phone communication. This obser-

Radio broadcasts (specifically, a “French info program”) transmitted by a cell phone inside a hive cause honey bees to start making a sound called “piping”...

* constantly playing the France info program (output of the small radio loudspeaker, -18 ± 2 dB at 1 cm). This enables a permanent signal to be sent from this first to a second telephone, otherwise without this signal the communication is automatically interrupted after a

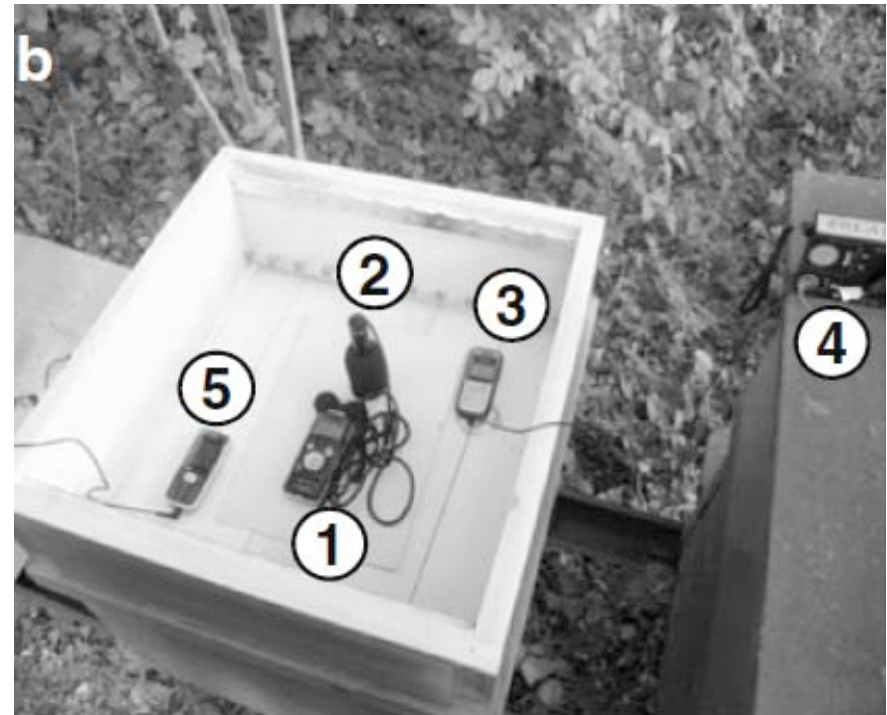


Figure 1. Apparatus positioning in the different hives. **a** Schematic drawing. Sound recorder 1 was connected to a microphone 2, the latter was placed in the close vicinity of the bees in the hive. The first (emitting) mobile phone 3 was connected with hands-free kit, the latter having its small microphone maintained on the loudspeaker of a radio apparatus 4. A second (receiving) mobile phone 5, also having a hands-free kit, was also kept inside the hive. The use of the radio apparatus is intended to allow a permanent communication between the two mobile phone handsets, in order to avoid unwanted disconnec-

Ways cell phones can kill bees:

- if you hit a bee with a cell phone and squash it
- if a beekeeper spends too much time on his/her cell phone and neglects the beeyard
- not using it to call your local legislators and explain to them why bees are important



ORIGINAL RESEARCH ARTICLE



A survey of managed honey bee colony losses in the USA, fall 2009 to winter 2010

Dennis vanEngelsdorp^{1*}, Jerry Hayes Jr.², Robyn M Underwood^{1, 3}, Dewey Caron⁴, and Jeffery Pettis⁴

This study records the fourth consecutive year of high winter losses in managed honey bee (*Apis mellifera*) colonies in the USA. Over the winter of 2009-2010, US beekeepers responding to this survey lost an average of 42.2% of their colonies, for a total loss of 34.4%. Commercial beekeepers (those operating more than 500 colonies) experienced lower total losses as compared to sideline and backyard beekeepers. Similarly, operations that maintained colonies in more than one state and operations that pollinated almond orchards over the survey period had lower total losses than operations either managing colonies in one state exclusively or those not pollinating almonds. On average beekeepers consider acceptable losses to be 14.5%, and 65% of all responding beekeepers suffered losses in excess of what they considered acceptable. The proportion of operations that experienced losses and reported having no dead bees in their colonies or apiaries was comparable to that reported in the winter of 2008-2009. Manageable conditions, such as starvation and a weak condition in the fall were the leading self-identified causes of mortality as reported by all beekeepers. Commercial beekeepers were, however, less likely to list such manageable causes, instead listing poor queens, mites, and pesticides most frequently as the self-identified causes of mortality in their operations.

So how are the bees doing?



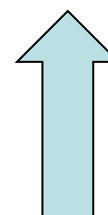
Fig. 2. Total colony losses by state. Operations who reported managing colonies in more than one state had their losses included in all of the states in which they reported managing colonies (see Table 1). States which had fewer than six responders (n.a.) are not included.

Table 2. Average and total losses suffered by beekeepers grouped by the size of their operation. * indicates a significance difference between groups. Different letters in different rows indicate differences between groups in pair-wise chi-square comparisons (P < 0.0001).

Operation Type	Respondents	Average Loss Mean (95 % CI)	Total colonies	Total Losses* Mean (95 % CI)
Backyard	3,944	42.5 (41.3 – 43.6)	25,954	42.9 (41.9 – 43.8) ^a
Sideline	174	42.5 (38.5 - 46.4)	28,217	44.5 (40.6 – 48.4) ^b
Commercial	107	36.0 (31.7 – 40.4)	518,518	33.5 (29.7 - 37.4) ^c

Table 3. Comparison of average and total losses in operations that moved or did not move colonies into almonds for pollination. *indicates significant difference between groups.

	Respondents	Average Loss Mean (95 % CI)	Total colonies	Total Loss Mean (95 % CI)*
Moved into Almonds?				
No	4,063	42.5 (41.4 - 43.6)	112,082	44.6 (43.8 -45.3)
Yes	103	35.5 (30.2 - 40.0)	460,607	32.0 (28.2 – 35.9)



How Colony Collapse Disorder Works

by Jessika Toothman

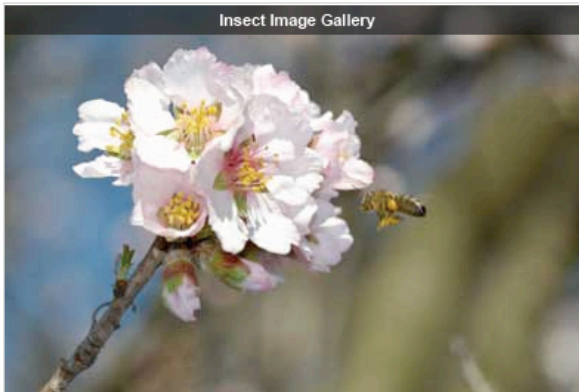
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Inside this Article

1. Introduction to How Colony Collapse Disorder Works
2. Vanishing Bees
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4. Colony Collapse Disorder Research
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“How Things Work”



The next time you enjoy some delicious almonds, take a minute to consider the hard-working bees that pollinate almond tree blossoms. See more [insect pictures](#).
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BUSY AS A BEE

- [Discovery News: Bees on the Brink](#)
- [How Bees Work](#)
- [How do honeybees make honey?](#)
- [What's the difference between bees and wasps?](#)
- [Insect Quiz](#)

But something dramatic is happening in the beekeeping world. Beehives have always been tricky to keep healthy and active because of issues maintaining proper nutrition and health. But now, the issue of healthy beehives has now reached new heights as Colony Collapse Disorder (CCD) affects an increasing number of hives.

So now, in popular culture, almonds and bees are inextricably linked...

Stuff You Should Know



Josh & Chuck explore zombies, mirror neurons and more »

There are many products in modern life that can be difficult to trace back to their roots. Take the [food](#) you ate for supper last night. Have you ever considered the long journey your food made to get to your kitchen table?

Depending on exactly what you ate, it's likely that a fair portion of your food relied on [bees](#) -- specifically commercial honeybees -- at the critical early stages of its development. The little busybodies have been made even busier the past several decades as farming has evolved from small family businesses to large, concentrated single-crop farming operations that require [pollination management](#). When there aren't enough existing bees in the area to handle the job (often because of habitat loss and pesticides), beekeepers are paid to bring their bees to help pollinate a crop.

Beekeeping is big business -- take the almond pollination season for example. Migrating beekeepers descend on the vast [California](#) almond orchards every February, bringing with them more than 1 million [hives](#) (also called colonies) packed with about 40 billion honeybees. During the next few weeks, the bees pollinate 80 percent of the world's almond crop, worth about \$1 billion in exports [source: [Agnew](#)]. Many other crops, like [avocados](#), apples, cherries and melons, depend on the work of bees too. In the U.S., an estimated \$15 billion worth of crops are pollinated by commercial honeybees each year [source: [USDA](#)].

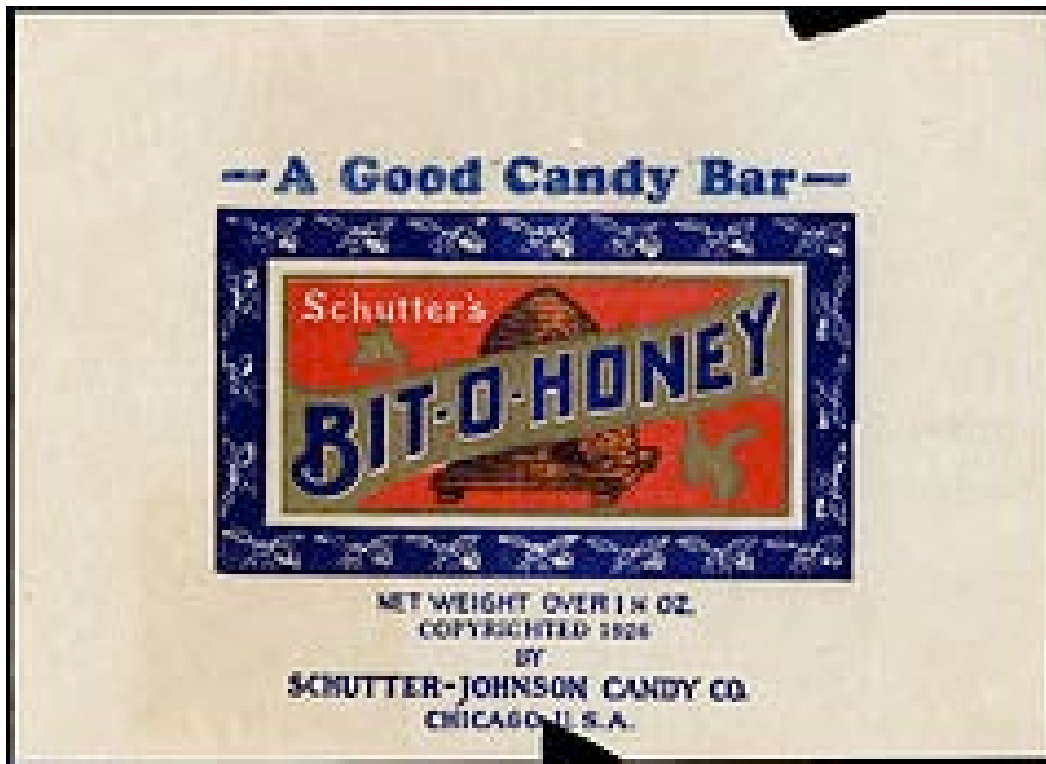
And the bees' impact on your diet isn't limited to the actual food you eat, like those delicious almonds for example. Almond hulls are sold as cattle feed and the crushed shells as bedding for livestock, while the almond dust is collected as an additive to topsoil. So, even if you ate a hamburger for dinner last night and skimped on the fruits and [veggies](#), your meal still might have had the help of a few bees.

Insect Image Gallery



The next time you enjoy some delicious almonds, take a minute to consider the hard-working bees that pollinate almond tree blossoms. See more [insect pictures](#).

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And every bit of honey should make people think of almonds...





Thanks