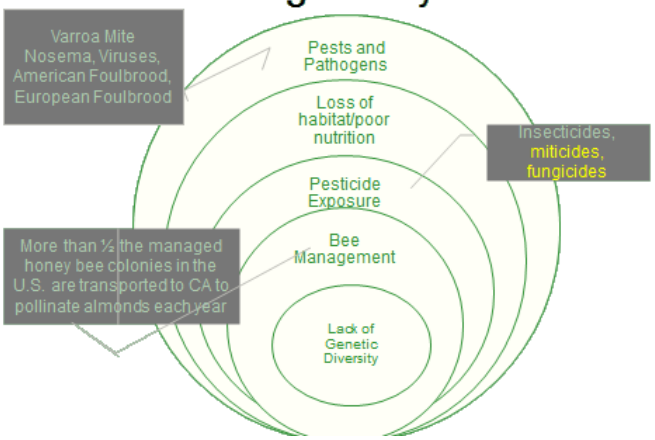
Colorado Department of Agriculture

2016 National Honey Bee Health Survey

Factors Affecting Honey Bee Health



Target pests

Common Name	Scientific Name
• Honey Bee Mite	*Acarapis woodi*
• Acute Bee Paralysis	Acute Bee Paralysis Virus
• Bee Slow Paralysis	Bee Slow Paralysis Virus (SPB)
• Black Queen Cell	Black Queen Cell Virus (BQCV)
• Chronic Bee Paralysis	Chronic Bee Paralysis Virus
• Deformed Wing	*Iflavirus* Deformed Wing Virus (DWV)
• Israeli Acute Bee Paralysis	*Israeli* Acute Paralysis Virus (IAPV)
• Nosema Disease	*Nosema apis*
• Nosema Disease	*Nosema ceranae*
• Parasitic mite	*Tropilaelaps sp./spp.*
• Varroa Mite	*Varroa destructor*

The issues are complex

Survey purpose:

To document which bee diseases/parasites/pests of honey bees are present in Colorado and the U.S. and, to provide information on the causes of honey bee decline.

The survey will also evaluate pollen from sampled hives for the presence or exposure to pesticides. This will contribute to ongoing research on potential synergisms between pesticides and bee diseases.

No Cost: The survey is completely voluntary and free.

Requirements: participating apiaries must have 4 or more hives.

CDA will sample from 24 apiaries statewide. Past focus has been on apiaries with 8 or more hives. This year we have approval to include apiaries with as little as 4 hives. We want to get a more representative picture of honey bee health in the state.

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Results of past surveys (2011 – 2013):

What did we find?

- Samples collected from 25 apiaries in 2011-12
- Samples collected from 24 apiaries in 2012-13
- Pollen sampled from 10 hives for each survey period (total 20 samples) – for pesticide detection

Results – Bee Health

2011/2012

- Varroa mite (20 of 25)
- Deformed Wing Virus (23 of 25)
- Black Queen Cell Virus (15 of 25)
- Israeli Acute Paralysis Virus (1 of 25)** new report in CO
- Nosema found in 10 of 25

2012/2013

- Varroa Mite (17 of 19)
- Viruses found in 15 of 19 samples analyzed
- Three viruses previously unreported in CO
  - Kashmir Bee Virus
  - Chronic Bee Virus
  - Acute Bee paralysis Virus
- Nosema found in 12 of 19

-***Varroa destructor*:** Varroa mites attack honey bee colonies as external parasites of adult and developing bees, by feeding on hemolymph. One of the primary causes of honey bee decline, Varroa mites also thought to vector viruses, which affect the bee immune system.
-***Deformed wing virus (DWV)*:** Vectored by Varroa. Implicated in overwintering honeybee colony losses, irrespective of Varroa infestation.
-***Chronic Bee Paralysis Virus (CBPV):*** Thought to be vectored by Varroa. Causes dysentery, trembling, bees unable to fly.
-***Acute Bee Paralysis Virus (ABPV)*:** Thought to be vectored by Varroa. Similar symptoms to CPBV. More rapid development. Part of the Acute Bee Paralysis complex.
-***Israeli Acute Paraylsis Virus (IAPV):*** Thought to be vectored by Varroa. Part of the Acute Bee Paralysis complex.
-***Kashmir bee virus(KBV):*** thought to be vectored by Varroa. Part of the Acute Bee Paralysis complex.
-***Black Queen Cell Virus (BQCV)*:** Vectored by *Nosema apis*. Associated with K-wing symptom.
- ***Nosema Disease***: Caused by a microsporidia (fungus). *N. apis* and *N. ceranae*. *N. ceranae* is more prevalent and more virulent in CO. Causes bee dysentery.

"Most pathogens invade the digestive system through oral ingestion of inoculated food. These pathogens infect the mid gut epithelial cells, which are constantly being replaced and are protected by membranes and filters which confine the pathogen to gut tissue. Parasites that infect the gut like *Nosema apis* and *Nosema cerana* can create lesions in the epithelium that allow a virus like BQCV to pass into the hemolymph and infect other cells in the body. In contrast the external parasite Varroa destructor feeds directly on bee hemolymph providing an opening in the cuticle for viruses to enter. Most virus infections rarely cause infection when ingested orally, but only a few particles are necessary to cause infection when injected directly into the hemolymph. Many viruses can be directly transmitted by Varroa mites, such as: DWV, those in the acute bee paralysis virus complex, and slow bee paralysis virus. Other viruses, like sacbrood, have been detected in Varroa mites but Varroa has not been shown to directly transmit the virus. Some viruses, like DMV have been shown to directly multiply in Varroa mites, however in most cases we don't know the exact relationship of Varroa mites to viruses or enough about how transmission occurs from mites to bees. Knowledge about the presence, role and transmitting routes of these viruses in native bees, and other potential non-Varroa transmission routes is also lacking in detail, complicating recommendations for control. Research does show viruses clearly affect honey bee health and warrant attention from the beekeeper and researcher alike." From: Honey Bee Viruses, the Deadly Varroa Mite Associates. August 19, 2015. Philip A Moore, Michael E. Wilson, and John A Skinner, Department of Entomology and Plant Pathology, the University of Tennessee, Knoxville TN. http://articles.extension.org/pages/71172/honey-bee-viruses-the-deadly-varroa-mite-associates

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Results – Pesticides in Pollen

CO (2011 – 2013)

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- 2,4 Dimethylphenyl formamide (DMPF) - Miticide
- Carbendazim (MBC) - Fungicide
- Chlorfenvinphos - Miticide
- Coumaphos - Miticide
- Cyhalothrin total - Miticide
- Fenpyroximate - Miticide
- *Fluvalinate - Miticide*
- Metribuzin - Herbicide
- Prallethrin - Mosquito insecticide
- Thymol - biocide derived from Thyme (fungus control)
- Trifluralin - herbicide

Results – Pesticide in pollen nationally

- 174 pesticides screened, 80 found nationally.
- Neonicotinoids were found nationally, but not in Colorado under the parameters of this study

Honey bees gather pollen from many floral sources. Some of these sources may be contaminated from direct pesticide application or from systemic insecticides within treated plants. Pollen taken back to the hive is stored and used as food for developing brood. Damage to an individual bee may vary greatly compared to the eventual damage to the hive. This damage is related to the toxicity of a pesticide and the application method. For example, a pesticide sprayed directly on a honey bee may kill her quickly and thus she will not take any of the chemical back to the hive. However, a low level systemic insecticide prevalent in a local pollen source that does not kill immediately will result in that pollen being stored in the hive and used for feeding the brood. It is unknown at this time whether these consistent, low level pesticides affect brood development, brood mortality, queen reproduction and/or queen mortality. It is known; however, that multiple low level pesticides have a synergistic effect making them more lethal in combination with each other than they are when found separately.

From USDA National Honey Bee Survey