What's happening to our bees?
By Alicia Moulton
USU Extension Ag/4-H

Honeybees are on the decline throughout the world. Here's why.

Honeybee Colony Collapse Disorder is a complex matter with many factors that have compounded over time. The good news is that there are things all of us can do to help.

Factor 1 As we grow in population, we see a decrease in green, open space and an increase of buildings, roads, and other structures. This means there are fewer plants for bees to forage on. Bees do best when there is a variety of pollen and nectar sources with flowers staggered all season long. Farms often grow one crop type each year. This means fewer plant species and shorter periods of time when plants are in bloom.

To help bees, be sure to plant a garden with a variety of flowers, fruits, and vegetables which bloom throughout the growing season. It is also a good idea to leave unmown, herbicide-free strips of land for bees to hide in if you do have to spray.

To help bees you can also teach your children the value of bees. Teach them the difference between bees and wasps. Bees have fuzzy bodies and do not actively seek to sting people. Wasps have smooth bodies and are often found scavenging at summer barbecues and picnics. Remember that while wasps are annoying if they nest in your home, they are beneficial because they kill harmful agricultural pests.

Factor 2 In the past 50 years, we have seen an increase in crop and urban pesticide use. Bees are particularly sensitive to pesticides.

To help bees, minimize pesticide use. Be sure to read pesticide labels! There may be several pesticides used for the same pest. Choose the ones least harmful to bees. Also, avoid pesticide use while plants are flowering because this is when bees are visiting them.

Factor 3 Beekeepers are seeing a depressed honey market. To make money, they ship bees all over the country to fill pollination contracts for almonds, blueberries, cranberries, etc. These crops require honey bees for pollination.

Number of acres of these crops in increasing faster than number of bees used to pollinate them. Increased movement for pollination leads to disease transfer. "Shipping bees for pollination is like sending your kids to school," said one beekeeper, "They come back with all the sicknesses around."

To help bees, buy local honey. The honey is fresh, delicious, and it gives a warm feeling to know that you are helping local folks and getting a good product. Also, you can ask the beekeeper directly how honey is handled and if chemicals were used in production.

Factor 4 Pathogens and diseases, which have been here a while, are playing on bees' weakened state.

Varroa mites (*Varroa destructor)* attach to bee larvae and parasitize bees, living on the outside of the bee's body. They are relatively large compared to the bee, about $1/6^{th}$ of the bee's body weight. To eliminate varroa mite infestations, beekeepers sometimes put pesticides in the beehive with the bees. Pesticides weaken bees to attack by other diseases and varroa mites are becoming resistant to these pesticides.

Acute Paralysis Virus and Israeli Acute Paralysis Virus both contribute to Colony Collapse Disorder of varroa mite-infested colonies. The varroa mite is a possible vector for these viruses and it also weakens bees and makes them more susceptible to it (Bakonyi et al., 2002).

Nosema apis and *Nosema ceranae* are internal parasites that cause nosemosis, or acute diarrhea in bees. Honeybees are generally very clean insects and defecate outside the hive. Nosemosis causes them to be so sick they cannot make it outside. Thus, spores are able to infect other bees in the hive. Nosema is what causes complete disappearance of bees in the hive.

Foulbrood and chalk brood are spore-forming bacterial diseases which infect honeybee brood (Hansen and Brosgaard, 2003). Foul brood can weaken or kill a colony in one season.

Spores of Nosema species, foul brood and chalk brood can be stored in old wax combs for years. Therefore it is important for beekeepers to remove old wax combs from hives. These can contain disease spores and pesticide residue.

Beekeepers are fighting these diseases using innovative strategies and by developing resistant lines of bees. For example, some bees exhibit "hygienic behavior," in which worker bees detect and remove 95% of diseased brood from the comb before hatching. Bees which exhibit hygienic behavior detect and remove varroa mite, *Nosema* and Foulbrood-infected larva. Queens can pass hygienic behavior is to their offspring. This means beekeepers can select for this trait and make their hives more resistant!

Testing for hygienic behavior

This method is taken from "A sustainable approach to controlling honey bee diseases and varroa mites" Available http://www.sare.org/publications/factsheet/0305.htm May 20, 2008.

Materials

3 in. cylinder (PVC pipe)
10-15 oz liquid nitrogen (easily obtained from welding supplier)
Liquid nitrogen tank
Frame with more than 3 inches diameter sealed brood
(Fewer than 30 unsealed brood in the circle)
Empty super
Thumbtack

Instructions

Lay frame across empty super. Twist cylinder into sealed brood until it reaches midrib. Record the number of unsealed cells inside the cylinder. Pour 1.5 to 2.0 oz of the liquid nitrogen into the cylinder and wait for it to freeze the edges or evaporate. Then pour the remainder of the liquid nitrogen into the cylinder. Wait to remove the cylinder until it thaws (3-5 minutes). Put a thumbtack on the top of the frame to mark the frame and the location of the test on the frame. Some hygienic colonies clean and repair the comb so quickly that it is hard to locate the test when you return. Place the frame back in its box.

Remove the frame containing the frozen brood 48 hours later and record the number of sealed cells remaining within the circle.

Bees are considered "hygienic" if they remove >95% of the brood on two consecutive tests. This trait is highly heritable and will help hives become resistant to diseases and mites.

For more information see www.extension.umn.edu/honeybees.

For more information see
http://www.sare.org/publications/factsheet/0305.htm.

Appl Environ Microbiol. 2002 December; 68(12): 6446–6450. PMCID: PMC134446
doi: 10.1128/AEM.68.12.6446-6450.2002.

Phylogenetic Analysis of Acute Bee Paralysis Virus Strains
Tamás Bakonyi,[1†] Elvira Grabensteiner,[2,3] Jolanta Kolodziejek,[2] Miklós Rusvai,[1] Gražyna Topolska,[4] Wolfgang Ritter,[5] and Norbert Nowotny[2,6,7*]
http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=134446

Hansen, H. and C.J. Brosgaard. 2003. Control of American foulbrood by the shaking method. APIACTA 38:140-145.
http://www.apimondia.org/apiacta/articles/2003/hansen_1.pdf