

## **Best Management Practices Guide for Illinois Beekeeping**

### **Pest and Diseases**

#### **Symptoms of Disease**

In the spring, summer, and fall, when inspecting a hive, a beekeeper should look for symptoms of disease.

Start outside the hive. Are there dead bees on the ground? How many? Dead bees on the ground may point to problems with mites and viruses, Nosema, robbing, or pesticide concerns. Next, take note when removing the telescoping cover and inner cover. Small hive beetles are often hiding at the top of the hive, chased and guarded by guard bees.

The brood nest itself gives clear indications of problems in the hive. By examining the queen's laying pattern, and how the brood is developing, you may catch in time a brood disease, like European Foulbrood, or a high mite population that is killing larvae as it feeds. A spotty "gunshot" brood pattern gives these symptoms, as well as points out the early stages of queen failure. A poor brood pattern is a good reason to stop, and further investigate the health of the bees.

In adult bees, abnormal behavior such as tumbling, trembling, inability to take flight, spotting in or on the hive, and physical defects of the bees, such as hairlessness, K-wing, and deformed wings are symptoms of disease. In brood, anything other than C-shaped, glistening white larvae at the back of the cell is suspect. Cappings in brood nest should be tannish brown, and convex. Also, a healthy bee hive has a pleasant smell. With the exception of a few nectar and pollen sources, such as fall aster and goldenrod, an unpleasant smell may be indicative of a problem.

#### **Symptoms and Treatments of European Foulbrood**

Recently, more Illinois beekeepers are experiencing European Foulbrood (EFB) infections in their apiaries. Lab tests sent to the Beltsville Bee Research Laboratory are returning positive results, and in some locations the disease is witnessed to be more aggressive than experienced in years prior.

EFB is a bacterial infection, primarily in the gut of honey bee larvae. The bacteria that we credit as the signifier of this disease is *Melissococcus plutonius*, however, EFB can be present in conjunction with several other forms of bacteria. This creates a disease that can have a host of different symptoms. Displaced, discolored larvae, and a "shotgun" brood pattern, or a frame that has all stages of larvae and capped brood, with several empty cells, and no order to the laying pattern, are symptoms of EFB. Other symptoms are twisting, misshapen larvae, dull or discolored larvae, and dried, dead larvae in cells. In some cases, the capped brood can die while pupating. Sometimes a foul smell is associated with EFB. Any beekeeper noticing symptoms like these should call an Illinois Dept. of Agriculture (IDOA) Apiary Inspector to identify the disease and recommend treatment.

There are a few different approaches for treating EFB. A "shook swarm" technique is gaining popularity as an effort to eliminate the disease. The best time for this procedure is during the honey flow, as the colony has the best opportunity to rebuild its hive in time for winter. In the shook swarm process, the old queen is destroyed, and a new queen is in a cage, or a queen cell is placed in clean, sterilized equipment, and sterilized frames and unused foundation. Once the diseased hive has been queenless for 24 hours, the bees may be shaken off of the old frames into the new equipment with the new queen or queen cell. It is a good idea to do this just before dark, so the bees are less likely to abscond. If shaking bees into a hive and adding a queen cell, after shaking, note where inside the new hive the bees are clustered. Put the queen cell in the center of the cluster. Shook swarms will

rarely move their cluster to keep a strange queen warm through the night, Placing the queen cell in cluster gives the growing virgin queen a chance to stay warm and hatch out into the cluster.

When shaking bees, it is extremely helpful to have an empty deep hive body to set on top of the new, clean hive body. The old frame is shaken inside the empty box, jarring the bees loose so that they fall directly onto the tops of the new, clean frames, and crawl into the new hive body, rather than flying off, and possibly absconding. To help bees settle, recover, and rebuild their hive, continuously feed 1:1 sugar syrup, and pollen substitute, especially at times when there is little forage available.

The aggressive nature of recent EFB infections experienced in some parts of Illinois often calls for antibiotic treatment in tandem with the shook swarm technique to rid EFB from the apiary. Several beekeepers have had good results treating infected hives with Oxytetracycline, the antibiotic in the product "Tetra B Mix". Applying Tetra B Mix as a drench has shown great results in stopping the spread of EFB bacteria. Rather than sprinkle the p[powdered sugar/Tetra B mixture around the edge of the brood nest, hoping that the bees properly consume and distribute the medicine, follow the instructions on the label for the dosage amount and mix Tetra B into a 50/50 sugar syrup. This medicine can then be applied by sprinkling or drizzling over the top bars and bees in all of the hive bodies. When administered this way as a drench, rather than a powder, the treatment poses no danger to the brood nest, and it is safe to sprinkle this medicine anywhere in the hive, whereas when the treatment is applied in powdered form, the powder can kill larva, and disrupt the queen's laying pattern.

Antibiotic treatments can only be administered when honey supers have been removed. If the honey flow is approaching, a last antibiotic treatment can be administered no less that 6 weeks before the honey supers are put on the hive.

Some beekeepers choose to treat the hives solely with antibiotics, forgoing the shook swarm technique and continue to use the old comb from the EFB infected hive. This management has at times shown less predictable results and requires consistent monitoring of all hives in the apiary. Symptoms of hives treated this way can disappear for a year or two, but after a stressful weather event, the symptoms may return. Some beekeepers have experienced the return of an EFB infection more virulent than the original infection. Some Illinois beekeepers have lost entire apiaries in a month's time to a recurrent infection, and have observed the spread of the disease to feral hives and neighboring apiaries. There are several factors that may contribute to these aggressive re-infections. the use of inappropriate antibiotics, such as generic oxytetracycline, not designed for use on honey bees, has been observed to perpetuate the disease at times, rather than eliminate it. Also, expired or improperly stored antibiotics should not be used to treat EFB for the same reason. It is possible that inappropriate treatment is giving the EFB bacteria a resistance to antibiotic treatment and can cause the beekeeper to receive a financial penalty from the IDOA. Therefore, great care should be taken when confronting this disease in the apiary. Choosing to destroy EFB infected frames and comb entirely is an extreme approach to the problem, however, is an easy approach to eliminating the disease.

An important final consideration in dealing with an EFB is preventing the spread or infection. Hive entrances should be reduced to prevent robbing. Removing EFB dead outs immediately, and either destroying infected comb, or securely storing infected comb will keep healthy colonies from consuming and carrying infected stores back to their hives. Monitor all hives in the EFB infected apiary closely for recurrent infections.

## Symptoms and Treatment of Chalkbrood

Chalkbrood is a fungus that infects pupae, and is usually a problem of too much moisture in the hive. Larvae usually die as they begin pupating, right after their cells have been capped. Bees uncap and work to remove the white, hard pupae, "mummified" in fungus that eventually Chalkbrood darkens with spores. In the cells, Chalkbrood looks similar to pollen, but uniformly white, with a yellow dot or tow, looking like eyes. Bees with hygienic behaviors aptly detect and remove dead brood, leaving a "shotgun" brood pattern, and "mummies" piled up at the entrance or in front of the hive.

Usually, Chalkbrood is easy to reverse. Propping open the inner cover to get more airflow and ventilation will help turn this problem around. Also, make sure the hives are tilting forward slightly so that water can drain out through the entrance. For more severe cases, re-queening has been shown to help. Moving the hive to a sunnier location and replacing badly infected combs and sterilizing the hive might be necessary. If the hive is weak and forage is poor, feed 1P:1 sugar syrup and pollen substitute and reduce the entrance to prevent robbing, but maintain ventilation with a reduced upper entrance.

## Symptoms and Treatments for Nosema

Trouble flying, spotting on, in and around the hive. And a general decline of the colony can be symptoms of Nosema, *Nosema apis* and *Nosema ceranae* are fungal infections in the mid-gut of the bee.

*Nosema apis* is sometimes referred to as "bee dysentery", and can worsen throughout the winter, as bees are forced to cluster in the cold temperatures, without the opportunity to take cleansing flights and leave the hive to eliminate. Signs of *Nosema apis* are dark streaks on the outside of the hive, and dark streaks across the top bars of the frames, the streaks are highly infectious, containing *Nosema* spores. Cleaning the streaked hive components with bleach can help prevent recurrent infection.

*Nosema ceranae* is a newer strain of *Nosema* that can noticeably weaken colonies during the summer. Recognized signs of *Nosema ceranae* are "K wing," or a displaced look to the wings, and dead bees on the ground in front of the hive. To confirm that your bees have *Nosema ceranae*, call your IDOA Apiary inspector to take a sample of bees to send to the Beltsville Bee Lab. A microscopic exam can positively confirm *Nosema*, and a spore count will be conducted.

There is still debate about how helpful and necessary it is to treat an infected hive with Fumagillin, however, studies show that beekeepers who treat at dosages below or above the label instructions can do more damage than good. As with all honey bee treatments, the label instructions must be followed for best results.

## Symptoms and Treatments: Viruses

Viruses are recently a growing concern with bees. There is a strong correlation between presence of viruses and mite loads. Allowing *Varroa* mites to cross a certain population threshold (3 mites per 100 bees) has been linked to high suffering from weakened immune systems and stress from viruses.

Many viruses cannot be identified by inspecting hives; however, some viruses have visible symptoms. Deformed wing virus can be detected visibly by observing withered, disfigured wings on the bodies of young nurse bees. Another visible virus is Parasitic Mite Syndrome (PMS). Symptoms of PMS are shotgun brood pattern and dying larva, much like symptoms of European Foulbrood. If you see these symptoms, call and IDOA Illinois Apiary Inspector to take a sample to help differentiate which disease you are facing.

Chronic or Acute Bee Paralysis virus can also be visible symptoms. Commonly seen with this virus is a number of “greasy hairless bees” sitting idly on the top bars of frames, and at the entrance (they have been chased off of comb by healthier bees.) These bees look scrawny, with tapered abdomens, and have a “greasy” appearance after losing their hair. Advanced stages of this virus will have sickly looking bees seemingly pouring out of the hive entrance, driven away by the healthier bees. At this stage, sick bees tremble as they walk, with the healthier bees gnawing at their wings as they drive them from the hive.

The best way to counteract viruses is to knock down the mite loads. Treat by your preferred method to control and reduce the Varroa mite population. Then supplement the weakened hive with a frame or two of brood from a healthy hive to boost the population. Re-queen with healthy young queen.

### **Management of Small Hive Beetles**

Small Hive Beetles (SHB) are present in nearly every county in Illinois. Recently, several beekeepers report that strong, healthy hives are falling prey to SHB. However, with good management, SHB can definitely be avoided.

There seem to be some commonalities of strong hives that fall prey to SHB. One common problem is that SHB take advantage of spotty brood patterns. If a hive has a weakening queen, if a hive is hygienically removing brood because of Varroa mite, or if a hive has European Foulbrood, the small hive beetle can take advantage of the empty cells. SHB have the ability to puncture into a cell wall and lay several eggs in a cell where a honeybee is pupating. The eggs hatch quickly, producing rapidly growing larva which eat wax, pollen and brood, leaving a slime on the frames in ruining the comb. It has been observed that when the population of beetles reaches a certain threshold, other SHB will come from other hives, and suddenly, thousands of beetles are present, collectively destroying a hive in just a few days.

Management for SHB begins with keeping colonies strong. Do not allow a weaker colony to have more comb than they can successfully guard. Keeping hives in a sunny location and away from wooded areas can help colonies manage their SHB populations. Applying a ground treatment such as Gardstar, using bottom board traps that hold oil, rock salt, or diatomaceous earth, and using oil traps that fit in between the frames are excellent approaches. Manually smashing visible beetles with a hive tool is also helpful.

### **Management of Wax Moths**

Wax moth primarily invades weak hives and comb that has not been stored properly. Keeping hives strong and not giving the bees too much comb to guard is usually enough management to keep wax moth from damaging hives

When boxes of drawn comb are removed for storage, measure 1 cup to 2/3 cup of Moth Ice Crystals (paradichlorobenzene, not moth balls, which contain Naphthalene, an unsafe chemical for honey bees) onto a paper plate or use Paramoth, according to label instructions. Store boxes with the moth crystals in the stack and secure by sealing entrances and cracks. For comb in their early stages of wax moth infestation, freeze the comb for two days to kill the moths and eggs that are present, then store properly.

## **Signs and Management of Predators of Honey Bees**

Animal footprints and scratch marks on the hive and ground can indicate skunks, or possums, and raccoons. Unexplained sudden defensiveness is another sign of harassment from mammal predators, birds, or insects (Hornets, Yellowjackets, bumblebees, etc.) Elevate hives by at least 12 inches so mammal predators must stand on their rear feet and expose their undersides to get at the entrance, and keep the entrance at a guardable size. Installing carpeting tack strips is effective in discouraging mammals from pawing at hive entrances.

Beekeepers may witness spiders, predatory beetles, and dragonflies; however, these predators have little influence on hive populations or behavior.

Ants are more of an inconvenience than a threat to strong colonies. Shake them off the inner or outer covers, away from the hive and killed the queen ant if seen.

## **Symptoms and Abatement of American Foulbrood**

American Foulbrood is a spore forming bacteria in the gut of honey bee larva and pupae. Larva infected with American Foulbrood typically die just after their cell is capped, and disintegrate into a thick scale, which contains millions of infected American Foulbrood spores. These spores remain viable for 40 to 50 years. For this reason, and because American Foulbrood is easily spread, the Illinois Bees and Apiary's Act mandates that hives infected with American Foulbrood must be abated per instructions of the Illinois Department of Agriculture

American Foulbrood begins to show symptoms with the shotgun brood pattern and thin, broken capping. Further inspection of an infected frame can be conducted with a "rope test." A toothpick is inserted into a sunken or broken capping, and when withdrawn, is connected to the cell contents by a sticky brown rope. This is a fairly reliable indicator of American Foulbrood, however, as with all symptoms of honey bee diseases, and IDOA Apiary Inspector should be notified of the problem, so that the disease sample can be obtained for testing at the Bee Research Lab in Beltsville, MD. Samples that return positive results from Beltsville will indicate that the beekeeper will be required to abate the infected beehive, according to the guidelines set forth by the Illinois Bees and Apiary Act.

## **Recognition and Abatement of Africanized Honey Bees**

According to the Illinois Bees and Apiary Act, Africanized honey bees are recognized as an "exotic strain of bees". Overly aggressive honey bees can pose a threat to people and pets, and be a dangerous nuisance to a neighborhood. Honey bees that are too aggressive to manage should be brought to the attention of an IDOA Apiary Inspector. A sample of bees will be collected, and sent to the Carl Hayden Research Lab in Tucson, AZ. If more morphometric measurements demonstrate that the honey bee sample fits the dimensions of an Africanized honey bees, the IDOA will require the beekeeper to abate the live bees. However, with any hive that is recognized as dangerous, it is strongly suggested that the beekeeper depopulate the aggressive hive.