

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF HONEY BEE PATHOGENS AND PARASITES IN TEXAS

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GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF AMERICAN FOULBROOD (AFB) IN TEXAS

Department of Entomology, Texas A&M University

PREVENTION

The best way to prevent the spread of AFB to healthy colonies is through good apiary hygienic behavior.

- ✓ Equipment may carry spores of AFB. Infected equipment should not be transferred to healthy colonies. Clean hive tools between colonies by scorching in your smoker.
- ✓ Infected colonies should be isolated to avoid being robbed by bees from healthy colonies.
- ✓ As a last resort, any infected equipment should be burned.

EARLY DETECTION IS THE BEST PROTECTION

To reduce the spread of American foulbrood spores, beekeepers are highly encouraged to regularly inspect their colonies closely to detect early infections. Currently, the best way to monitor for the presence of AFB spores is to pay close attention during hive inspections for signs of the damage caused by the disease.

Visual Detection

- ✓ Infected larvae will change colors from off-white to brown before turning into a black scale.
- ✓ The resulting scale will rest lengthwise on the bottom of the cell.
- ✓ Comb will have an inconsistent appearance with a scattered mix of healthy and infected cells.
- ✓ Infected cells have a sunken, greasy appearance often with several small holes punched in the capping.

Physical Detection

- ✓ The “ropiness test” is used to test for AFB. Insert a toothpick into the larvae and swirl it around. If AFB is present, the resulting remains will have a glue-like appearance that will form a string more than one centimeter long when the toothpick is slowly removed.
- ✓ Hives that are infected with AFB will have a putrid odor that may be detected when the hive is opened.

CONTROL

Prior to exercising any of the registered control measures you are urged to confirm disease identity by contacting the State of Texas Apiary Inspection Service. If AFB is suspected, samples should be sent to the Chief Apiary Inspector for positive identification. Sample brood should be carefully collected with a toothpick and placed onto wax paper. Be sure to include your name and address on the package.

Terramycin

Oxytetracycline hydrochloride (Terramycin) is one of two chemicals that are approved for use against AFB. Terramycin is a soluble powder that, when combined with brood food, prevents the spores from entering the vegetative stage wherein they multiply. While Terramycin will not eliminate the spores, it will allow the larvae to persist to the adult stage. However, Terramycin has no effect on spores that remain on hive equipment. **Continued application of Terramycin is required to best protect a colony against a repeat outbreak.** Terramycin may be applied in a patty, as a dust, or in liquid feed. However, since small hive beetles seem to be attracted to the patties and the liquid solution must be consumed within 10 days to be effective, the dust is the preferred format.

In the Hive use of Terramycin (TM25) as a dust to Control AFB

NOTE: This quantity will yield enough dust to apply to 12 colonies 3 times each.

- ✓ Combine one 6.4 oz packet of Terramycin with 2 lbs. of powdered sugar.
- ✓ Mix thoroughly
- ✓ Apply 1 oz. of the dust in a square along the top of the frames as shown below.
- ✓ 1 oz. of dust should be applied 3 times total at intervals of 4-5 days.

These are guidelines. Label instructions constitute the legal use of Terramycin; follow them carefully.

In October 2005, tylosin tartrate (Tylan) soluble powder was approved by the FDA for use against American foulbrood. Additional information of the approval may be found at http://www.fda.gov/cvm/CVM_Updates/honeybee.htm

Tylan

In the Hive use of Tylan as a Dust to Control AFB

NOTE: This quantity will yield enough dust to apply to 13 colonies 3 times each.

- ✓ Combine one tablespoon of Tylan with 2 lbs. of powdered sugar.
- ✓ Mix thoroughly
- ✓ Apply 1 oz. of the dust in a square along the top of the frames as shown below.
- ✓ 1 oz. of dust should be applied 3 times total at intervals of one week.

These are guidelines. Label instructions constitute the legal use of Tylan; follow them carefully.



Figure 1. The “ropiness test” may be used to test for American Foulbrood. Larvae swirled with a toothpick will string out more than one centimeter long if AFB is present.



Figure 2. Both Terramycin and Tylan may be applied as a dust in the hive. The dust should be spread in a square along the top frames of the hive.

Image Sources

"Gluey Larval Remains of American Foulbrood in Honey Bees." Online image. School of Biosciences. Cardiff University. Nov. 2006. <<http://www.cardiff.ac.uk/biosi/research/micro/staff/bnd.html>>.

"American Foulbrood (Application of Terramycin®)." Online image. 12 May 2003. Honey Bee Parasites, Pests, Predators & Diseases. Mid-Atlantic Apiculture Research and Extension Consortium. Nov. 2006. <<http://maarec.cas.psu.edu/pest&disease/pppdIndex.html>>.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF EUROPEAN FOULBROOD (EFB) IN TEXAS

Department of Entomology, Texas A&M University

PREVENTION

The best way to prevent the spread of EFB to healthy colonies is through good apiary hygienic behavior.

- ✓ Equipment may carry spores of EFB. Infected equipment should not be transferred to healthy colonies. Clean hive tools between colonies by scorching in your smoker.
- ✓ Infected colonies should be isolated to avoid being robbed by bees from healthy colonies.

EARLY DETECTION IS THE BEST PROTECTION

To reduce the spread of European foulbrood spores, beekeepers are highly encouraged to regularly inspect their colonies closely to detect early infections. Currently, the best way to monitor for the presence of EFB spores is to pay close attention during hive inspections for signs of the damage caused by the disease.

Visual Detection

- ✓ Infected larvae will change colors from off-white to yellow before turning brown.
- ✓ Once larvae are brown, the tracheal system will become visible as thin silver lines throughout the body.
- ✓ Infected larvae will assume contorted, uncommon positions in the cell and will usually die before the cell is capped.
- ✓ Infected cells may have a sunken, greasy appearance often with several small holes punched in the capping.

Physical Detection

- ✓ The “ropiness test” may be used to test for EFB. Insert a toothpick into the larvae and swirl it around. If EFB is present, the resulting remains will NOT have a glue-like appearance (as is the case with American foulbrood) but rather will appear dry. This is a key way to differentiate between AFB and EFB.

How can I the Difference Between AFB and EFB?

- ✓ EFB infected bees die curled in a “C” shape at the bottom of a cell as opposed to becoming a scale along the length of the cell (Fig. 1).
- ✓ AFB infected bees that persist until the pupal stage will have the pupal tongue sticking up in the cell (Fig. 2). EFB infected bees do not do this.

CONTROL

Prior to exercising any of the registered control measures you are urged to confirm disease identity by contacting the State of Texas Apiary Inspection Service. If EFB is suspected, samples should be sent to the Chief Apiary Inspector for positive identification. Sample brood should be carefully collected with a toothpick and placed onto wax paper. Be sure to include your name and address on the package.

Currently, oxytetracycline hydrochloride (Terramycin) is the only chemical that is approved for use against EFB. However, Terramycin has no effect on bacteria that remain on hive equipment. **Continued application of Terramycin is required to best protect a colony against a repeat outbreak.** Terramycin may be applied in a patty, as a dust, or in liquid feed. However, because small hive beetles seem to be attracted to the patties and the liquid solution must be consumed within 10 days to be effective, the dust is the preferred format.

In the Hive use of Terramycin (TM25) as a dust to Control EFB

NOTE: This quantity will yield enough dust to apply to 12 colonies 3 times each.

- ✓ Combine one 6.4 oz packet of Terramycin with 2 lbs. of powdered sugar.
- ✓ Mix thoroughly
- ✓ Apply 1 oz. of the dust in a square along the top of the frames (Fig. 2).
- ✓ 1 oz. of dust should be applied 3 times total at intervals of 4-5 days.

These are guidelines. Label instructions constitute the legal use of Terramycin; follow them carefully.



Figure 1. AFB infected larva (left) will die as a scale along the length of the cell. EFB infected larva (right) will curl up into a “C” shape at the bottom of the cell before dying.

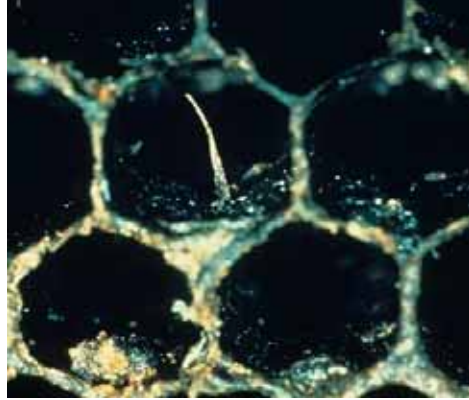


Figure 2. AFB infected bees dying in the pupal stage can be seen with the pupal tongue sticking up in the cell. EFB infected bees do not do this.



Figure 3. Terramycin dust should be applied in a square on the top bars of the hive.

Image Sources

"American Foulbrood (Application of Terramycin®)." Online image. 12 May 2003. Honey Bee Parasites, Pests, Predators & Diseases. Mid-Atlantic Apiculture Research and Extension Consortium. Nov. 2006. <<http://maarec.cas.psu.edu/pest&disease/pppdIndex.html>>.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF CHALKBROOD IN TEXAS

Department of Entomology, Texas A&M University

PREVENTION

There are several ways to prevent the spread of chalkbrood in the apiary. Because bees will remove infected individuals from the hive, a certain degree of prevention is naturally occurring. The following tips can be combined with the bee activity to achieve the highest level of protection against the disease.

- ✓ Maintain well ventilated colonies to keep the hive dry and free of fungus.
- ✓ Frames that contain high numbers of infected larvae should be destroyed and replaced.
- ✓ Refrain from giving healthy colonies pollen from infested colonies.
- ✓ Re-queen badly infected colonies.

DETECTION

The best way to monitor for the presence of chalkbrood is to pay close attention during hive inspections for signs of the damage caused by the disease.

Visual Detection

- ✓ Infected cells will often have a small hole in the capping. These holes are chewed by adult bees as identification of infected cells.
- ✓ Bees will remove the dead larvae from their cells and discard them either on the bottom board of the hive or in front of the hive entrance.
- ✓ Comb will have a spotted appearance that is easily identified by the presence of the white, chalk-like larvae in uncapped cells.

Physical Detection

- ✓ Since the infected larvae often harden before the bees can remove them from the comb, the comb will rattle when shaken.

CONTROL

Currently there is no registered chemical method of control for chalkbrood. For preventative strategies, see above.

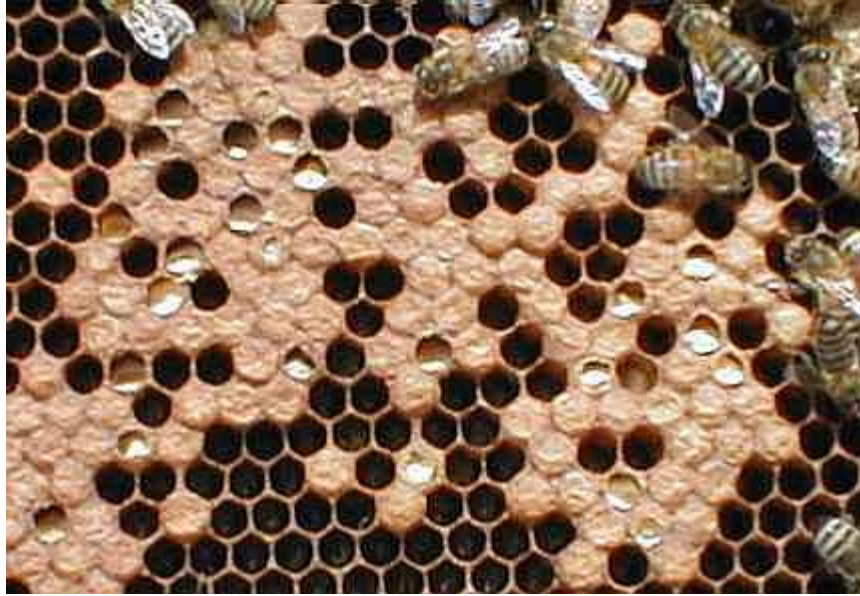


Figure 1. Infected comb will have a spotted appearance. Infected larvae are easily visible in uncapped cells.

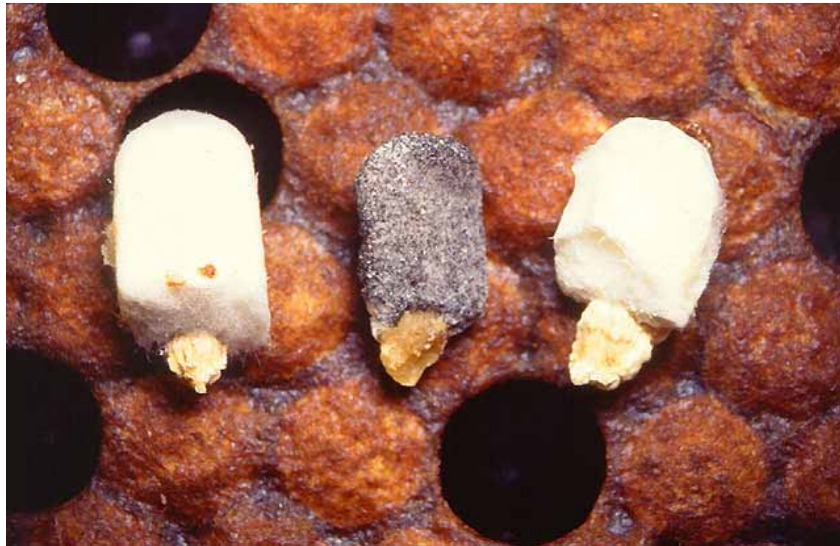


Figure 2. Infected larvae will have a white, chalk-like appearance if infected with only one strain of the disease. Larvae infected with two strains will have a darkened, black appearance.

Image Sources

"Chalkbrood in Cells." Online image. 2 May 2000. A Beekeeper's Diary. Alberta Beekeeping, Pollination, Bees & Honey. Nov. 2006. <<http://www.honeybeeworld.com/diary/2000/diary050100.htm>>.

"Color Variations in Chalkbrood Mummies." Online image. Microbes Help Bees Battle Chalkbrood. USDA. Nov. 2006. <<http://www.ars.usda.gov/is/AR/archive/aug98/bees0898.htm>>.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF NOSEMA DISEASE IN TEXAS

Department of Entomology, Texas A&M University

PREVENTION

There are several ways to combat the spread of nosema in the apiary. Because nosema thrives in cold and damp conditions, a combination of these options is recommended to achieve the highest level of protection against the disease.

- ✓ Careful selection of wintering site.
- ✓ Shelter sites against cold winds.
- ✓ Hive entrances should face south.
- ✓ Keep hives off the ground.
- ✓ Tilt hives forward to avoid water buildup on bottom boards.
- ✓ Insulate hives and give them entrance reducers before winter. *NOTE: Ensure that hives are well ventilated. Without proper air flow, a hive will accumulate excess moisture which could damage the hive.*

Fumidil B is a water-soluble powder that may be fed to both overwintering colonies and package bees. Fumidil B is mixed with sugar and water to formulate a medicated syrup that is fed to colonies. The medicated syrup should not be fed during the honey flow or immediately before the honey flow. Established colonies should be fed medicated syrup in the spring and again in the fall before overwintering. Package bees should be given medicated syrup as a primary food source up to one month prior to being shaken for packaging.

EARLY DETECTION IS THE BEST PROTECTION

To reduce the spread of nosema spores, beekeepers are highly encouraged to regularly inspect their colonies closely to detect early infections. Currently, the best way to monitor for the presence of nosema is to pay close attention during hive inspections for signs of the damage caused by the disease.

Visual Detection

- ✓ Bee feces can be seen on both the outside and inside of the hive.
- ✓ An accumulation of dead bees at the entrance of the hive.
- ✓ Bees may lose the ability to fly and can be seen crawling at the entrance with wings unhooked.

CONTROL

Prior to exercising any of the registered control measures you are urged to confirm disease identity by contacting the State of Texas Apiary Inspection Service. If nosema is suspected, samples should be sent to the Chief Apiary Inspector for positive identification. For information on submitting samples to the Chief Apiary Inspector, refer to the following page.

http://tais.tamu.edu/forms/pdf/bee_id_howto.pdf



Figure 1. Nosema may cause dysentery in bees which results in the deposition of feces on both the outside and inside of a hive.

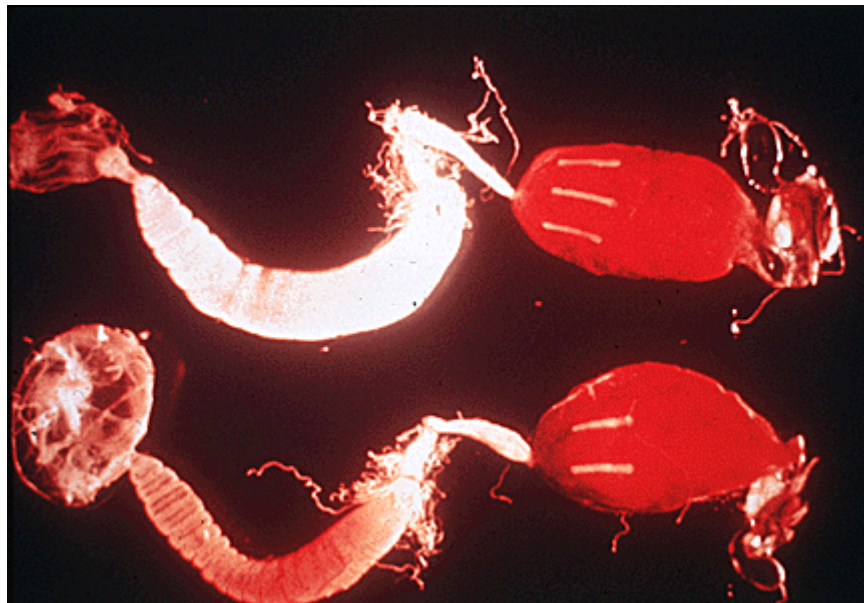


Figure 2. The digestive system and gut of a bee infected with nosema (Top) and of a healthy bee. Diseased bees will appear white in color and no rings on the gut will be visible.



Figure 3. Fumidil B. All label instructions should be followed precisely to ensure legal use of the chemical.

Image Sources

"Nosema." Online image. Dec. 1997. Bee Tidings. University of Nebraska Entomology. Nov. 2006. <<http://entomology.unl.edu/beekpg/tidings/btid1997/btidc97.htm>>.

"Fumidil." Online image. Honey Bee Encyclopedia. BeeCARE. Nov. 2006. <<http://www.beecare.com/indexDynFrames.htm?http://www.beecare.com/Encyclopedia/Encyclopedia%20F.htm&1>>.

"Fumidil 'B' Pack." Online image. 31 Oct. 2002. Nov. 2006. <<http://website.lineone.net/~dave.cushman/fumidilb.html>>.

"Nosema (comparasion of healthy and diseased honey bee gut)." Online image. 12 May 2003. Honey Bee Parasites, Pests, Predators & Diseases. Mid-Atlantic Apiculture Research and Extension Consortium. Nov. 2006. <<http://maarec.cas.psu.edu/pest&disease/slide39.htm>>.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF SACBROOD IN TEXAS

Department of Entomology, Texas A&M University

PREVENTION

Viruses may spread throughout a colony by nurse bees that remove infected larvae from the cells. It is also suspected that *Varroa* mites play a role in the spread of the disease. To prevent sacbrood from spreading to healthy colonies, good apiary hygienic behavior is required.

- ✓ Take preventative measures to minimize the presence of other pests or diseases in the hive.
- ✓ Infected colonies should be isolated to avoid being robbed by bees from healthy colonies.
- ✓ Re-queen infected colonies.

DETECTION

Visual Detection

- ✓ Infected larvae will change colors from off-white to yellow.
- ✓ The head of the dead larvae will darken and be raised up slightly in the cell.
- ✓ Molting fluid will build up beneath the unshed skin of the larvae, causing a sac-like appearance. These sacs are easily removed from the cells.
- ✓ Infected cells will usually be identified by the bees with small holes in the capping before being emptied later by nurse bees.

CONTROL

To date, there is no existing chemical that effectively controls sacbrood. In most observed cases of sacbrood, the bees have successfully overcome the disease on their own and no control has been required. However, if a colony is heavily infected, it is recommended that frames containing the virus be removed and destroyed.



Figure 1. Infected larvae will have a darkened head and a sac-like appearance due to a build up of molting fluid beneath the unshed exoskeleton.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF VARROA MITES (*Varroa destructor*) IN TEXAS

Department of Entomology, Texas A&M University

PREVENTION

Varroa mite numbers may be reduced through the use of the following good beekeeping practices.

- ✓ Purchase bees from reputable bee breeders with a current disease free certificate issued by state authorities.
- ✓ Quarantine swarms and treat for *Varroa* prior to introduction to your mite free apiaries.
- ✓ Large colonies are better able to withstand mite infestations. Eliminate or combine small colonies.

EARLY DETECTION IS THE BEST PROTECTION

Regular examination of all hives is a crucial part of preventing an outbreak of Varroa mites. Because Varroa mites can travel from bee to bee and from colony to colony with ease, **it is important to treat ALL colonies in an apiary where mites are present.** Varroa mites are often hidden from view inside capped brood cells where they reproduce.

Visual Detection

- ✓ Uncap sealed brood and look for small brown spots on pupae.
- ✓ Mites are more difficult to see on darkened adults, but are still visible to the naked eye.
- ✓ Dead mites may be seen in hive debris of infested colonies.
- ✓ Adult bees may have deformed wings, a result of deformed wing virus associated with mite infestation.

CONTROL

There are currently three registered chemicals that may be used to control Varroa mites; Apistan[®] strips (active ingredient fluvalinate), CheckMite+[™] strips (coumaphos), and Hivastan[™] (fenpyroximate). Currently, the use of fenpyroximate is approved ONLY under Section 18 Crisis Exemption in Texas (March 20, 2007). It is important to avoid contaminating honey with chemicals. Supers containing honey should be removed before strips are applied and not replaced until at least 2 weeks after strips are removed.

Apistan[®] (fluvalinate) to Control Varroa Mites

NOTE: Protective gloves should be worn at all times when handling chemical strips.

- ✓ In order to prevent mite resistance, strips must be removed after 8 weeks of application.

- ✓ Proper use/removal of the strips will also prevent contamination of bee products.
- ✓ Mites are resistant to fluvalinate in many regions.

These are guidelines. Label instructions constitute the legal use of Apistan®; follow them carefully.

CheckMite+™ (coumaphos) to Control Varroa Mites

NOTE: Protective gloves should be worn at all times when handling chemical strips.

- ✓ In order to prevent mite resistance, strips must be removed after 8 weeks of application.
- ✓ Proper use/removal of the strips will also prevent contamination of bee products.

These are guidelines. Label instructions constitute the legal use of CheckMite+™; follow them carefully.

Hivastan™ (fenpyroximate) Patties to Control Varroa Mites

NOTE: Protective gloves should be worn at all times when handling chemical products.

- ✓ Place 225g. of fenpyroximate onto wax paper and form into a thin patty.
- ✓ Lay patty on top of the frames closest to the brood cluster. In two-box colonies, patties should be placed between boxes.
- ✓ Patties should never be applied during honey flows.
- ✓ Remove the patty promptly after six weeks of application.
- ✓ Proper use/removal of the product will prevent contamination of bee products.

These are guidelines. Label instructions constitute the legal use of Hivastan™; follow them carefully.



Figure 1. Protective gloves should be worn whenever chemicals are handled.



Figure 2. Strips should hang between frames with the tabs resting on the top bars.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF TRACHEAL MITES (*Acarapis woodi*) IN TEXAS

Department of Entomology, Texas A&M University

Unlike Varroa mites and small hive beetles, tracheal mites are not visible to the naked eye. The microscopic mites are only present inside the respiratory system of the bees. As a result of this, there are limited visual cues that will alert a beekeeper to their presence.

Visual Detection

- ✓ Bees may be seen crawling up the sides of the hive or on blades of grass.
- ✓ Bees may appear unable to fly.

Foraging age bees suspected of hosting *Acarapis* mites should be collected in alcohol and sent to the State of Texas Chief Apiary Inspector for examination. To examine the bees for tracheal mites, sections of the thorax containing the trachea may be sliced, cleared of muscle tissue, stained, and then examined under a microscope for the presence of mites. There is also an ELISA (Enzyme Linked Immuno-Sorbent Assay) test that may be done in a laboratory to indicate the presence of tracheal mites. The sample size for an ELISA test must be large (several hundred bees).

CONTROL

There is currently only one registered chemical that is approved for use against tracheal mites; menthol crystals. These crystals act as a fumigant and become effective as they transform from a solid crystal to a gas. The crystals are temperature sensitive and will be most effective between temperatures of 80-85°F.

In the Hive Use of Menthol Crystals to Control Tracheal Mites

NOTE: Protective gloves should be worn at all times when handling chemicals.

- ✓ Place crystals into a square 7-inch (1.8 oz.) plastic mesh packet. Crystals should not be able to fall through the mesh.
- ✓ When the temperature surrounding the hive is above 60°F, place a packet of the crystals on top of the frames in a hive. When the temperature reaches 80°F or more, the packet should be moved to the bottom board. The reason for this is that menthol, as a gas, is heavier than air. If the packet is left on the top bars of a hive when the temperature is over 80°F, the gas will fall through the hive potentially causing damage to the bees or absconding to occur.
- ✓ It is important to remove the packets at least two weeks prior to the honey flow to ensure that no honey is contaminated.

These are guidelines. Label instructions constitute the legal use of menthol crystals; follow them carefully.

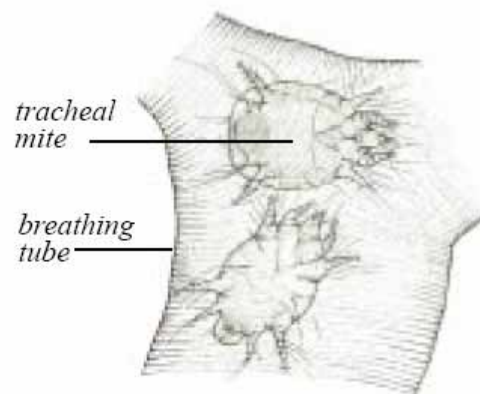


Figure 1. Tracheal mites are microscopic and not visible to the naked eye. With the use of a microscope, these mites may be observed residing in the airways of a honey bee.



Figure 2. Menthol crystals may be used in the hive to control tracheal mites. Check the label for instructions on the legal use of the product.

Image Sources

"Menthol Single 50 gram Package." Online image. 3 Sept. 2003. Dadant & Sons Beekeeping Catalog. Dadant & Sons, Inc. Nov. 2006.
<https://www.dadant.com/catalog/product_info.php?cPath=26_52&products_id=708>.

"Tracheal Mites Infesting Breathing Tube of a Honey Bee." Online image. Feb. 2000. Mid-Atlantic Apiculture Research and Extension Consortium. Nov. 2006.
<<http://maarec.cas.psu.edu/PDFs/Tracheal.pdf>>.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF WAX MOTHS IN TEXAS

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PREVENTION

There are several ways to prevent heavy infestations of wax moth in an apiary. A strong colony of bees will keep wax moth damage to a minimum. Therefore, the best preventative measures are conservation measures which aid the bees in maintaining a strong, healthy colony.

- ✓ Periodically clear the bottom board of any loose materials.
- ✓ Regularly examine colonies for the presence of other diseases or pests. If anything is found, take action to control the problem immediately.
- ✓ Follow good apiary management practices to ensure healthy colonies.

DETECTION

Wax moths can be considered one of the easiest honey bee pests to identify due to their large size. They also are the only pests of honey bee colonies to produce silk strands throughout the hive. For specific examples of wax moth indicators, see images below.

Visual Detection

- ✓ Comb will be either destroyed from tunneling or covered in silk strands left behind by the moth.
- ✓ Cocoons may appear on the wooden parts of frames.
- ✓ Small, dark moth droppings may appear throughout the hive.
- ✓ Bottom board may be covered with pieces/remains of comb.

CONTROL

Currently there is no registered chemical method of control for chalkbrood. For preventative strategies, see above.

- ✓ Hives containing wax moths may be frozen overnight to kill any moths that are present on hive equipment.
- ✓ Extreme heat may also be used to kill existing moths however, overexposure to heat sources may cause irreparable damage to the comb.



Figure 1. Wax moth droppings may appear throughout the hive as small, dark pellets.



Figure 2. Moths will build silk cocoons on the wooden structures of the hive to pupate in.



Figure 3. Perhaps the most characteristic way to identify wax moth presence is the presence of silk threads occurring throughout the hive. These threads often exhibit a “cottony” appearance.



Figure 4. In severe cases, the majority of the comb may be destroyed by the tunneling of the moth.

GUIDELINES FOR PREVENTION, DETECTION AND CONTROL OF THE SMALL HIVE BEETLE IN TEXAS.

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PREVENTION

Prevention through sanitation in the honey extraction plant and the apiary is the first line of defense against small hive beetle infestations.

In the Honey Extracting Plant

- ✓ Beekeeper hygienic behavior is the best prevention. The honey house and extracting equipment must be kept clean.
- ✓ Honey supers should be promptly extracted after they have been pulled from hives and put back onto hives as soon as possible.
- ✓ Honey and slum gum should be stored in tightly sealed drums. Wax cappings should be stored in sealed drums or quickly processed into cakes of wax.
- ✓ Store combs as you would for wax moth control and examine at least once every three weeks for the presence of larvae.
- ✓ Freezing the equipment at -12°C (10°F) for 24 hours is reported to kill all life stages of the beetle. If it's practical for your operation, rotating combs through a chest freezer then tight storage may be worth it.
- ✓ In the honey house beetle larvae can be trapped using florescent lights overnight and then swept or vacuumed up and destroyed.

In the Apiary

- ✓ Weak colonies should be either combined with other colonies, re-queened, strengthened, or the comb surface reduced in order to maintain enough bees to adequately protect the comb.

EARLY DETECTION IS THE BEST PROTECTION

To reduce the spread and damage caused by the small hive beetle, beekeepers are encouraged to regularly inspect their colonies to detect early infestations. Currently, the best way to monitor for the presence of small hive beetle is to pay close attention during hive inspections for signs of beetles or the damage they cause.

Visual Detection

- ✓ When opening a hive containing beetles, they can be seen running across the combs.
- ✓ Often found on bottom boards attempting to hide in dark corners.
- ✓ Masses of adults and larvae may be seen on the combs and bottom board if the infestation is heavy.
- ✓ Adult beetles can also be detected at night by shining an amber light, which causes them to move on the frames.

Trapping Detection

- ✓ Corrugated cardboard with the paper removed from one side, placed on the bottom board at the rear of the hive, has been successfully used in detecting adult beetles (see below). The beetles are likely seeking a dark and concealing place to hide.

Damage Symptoms

- ✓ Damaged combs. Larvae tunnel through comb with stored honey or pollen, damaging or destroying cappings and comb.
- ✓ Discolored honey. Larvae defecate in honey and the honey becomes discolored from the feces.
- ✓ The honey develops a characteristic odor of decaying oranges.

- ✓ Activity of the larvae causes fermentation and frothiness in the honey.
- ✓ The characteristic odor of fermenting honey is sometimes associated with the presence of the small hive beetle.
- ✓ Damage and fermentation cause honey to run out of combs, creating a mess in hives or extracting rooms.
- ✓ Heavy infestations may cause some colonies to abscond.

CONTROL

CheckMite+™ plus GuardStar® 40% EC use at the same time is strongly recommended.

Prior to exercising any of the registered control measures you are urged to confirm beetle identity by contacting the State of Texas Apiary Inspection Service. Always follow label instructions carefully.

In The Hive use CheckMite+™ to Control Adults

- ✓ Do not use on hives kept for comb honey production.
- ✓ Remove honey supers before application of CheckMite+ Strips and do not replace until 14 days after the strips are removed.
- ✓ Prepare a piece of corrugated cardboard approximately 4x4 inches by removing one side to expose the corrugation.
- ✓ Cut one CheckMite+ strip in half crossways and staple the two pieces to the corrugated side of the cardboard. Tape over the smooth side of the cardboard (the side opposite the strips) with duct tape, shipping tape or similar tape to prevent the bees from chewing and removing the cardboard. Or use one-sided plastic corrugated sheets commercially available in 5X5 inch format from major beekeeper suppliers.
- ✓ Place cardboard as near to the center of the bottom board as possible with the strips down. Make sure the bottom board is clean and the strips lay flat on the bottom board.
- ✓ Leave strips in no less than 3 days and no more than 45 days.
- ✓ For maximum efficacy leave the strips in the hive for at least 42 days (six weeks). Do not leave strips in hive for more than 45 days.
- ✓ Treat no more than four times per year for the small hive beetle.
- ✓ Honey supers may be replaced 14 days after strips are removed.

Wear chemical-resistant gloves or at least rubber dishwashing gloves when handling CheckMite+™. Dispose of used strips according to label instructions.

These are guidelines. The label instructions constitute the legal use of CheckMite+™; follow them carefully.

In the Apiary use GuardStar® 40% EC to Control Pupae

- ✓ GuardStar® should be used as soon as beetles or larvae are detected in or around hives.
- ✓ Mix a solution of 5 ml (1 teaspoon) of GuardStar® 40% EC to 1 gallon of water.
- ✓ Apply the solution using a sprinkler can.
- ✓ Thoroughly wet the ground in an 18 to 24 inch area in front of each hive. One gallon of this mixture treats about 6 hives.
- ✓ Apply in the late evening after bees are inactive.
- ✓ Do not apply GuardStar® 40% EC to colony entrances, it is toxic to honey bees.

These are guidelines. Label instructions constitute the legal use of GuardStar® 40% EC; follow them carefully.