Treatment Recommendations

For the Control of Mites and Honey Bee Diseases

This document is intended as a guide for beekeepers in the management of honey bee pests and diseases and includes recommendations for both treatments and monitoring methods. Any recommended product is to be used in accordance with label directions. The users assume responsibility for any risk to persons or property arising from the use of the recommended products.

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General Best Management Practices (BMPs) for the Control of Pests and Diseases

It is recommended that beekeepers implement the following best management practices for the control of pests and diseases in Ontario apiaries:

1. Read product labels before applying disease or mite control products.
2. Follow treatment withdrawal times. Do not use treatments when honey supers are on, unless specified on the product label.
3. Follow safety precautions and use appropriate protective equipment as recommended by the label directions when mixing and applying treatments.
4. The presence of multiple parasites/diseases may require treatment below the recommended treatment threshold(s).
5. Treat all colonies that require treatment in the yard at the same time.
6. Monitor colonies to determine the severity of varroa infestation.
7. Rotate treatments for varroa management to prevent the development of resistant varroa mites. For example, use synthetic mite-strips in spring followed by a formic acid treatment in fall.
8. When managing varroa, oxalic acid should be used as a follow-up treatment in the late fall, after a primary early fall treatment.
9. Use temperature-dependent treatments like formic acid and thymol within recommended temperature thresholds.
10. Treatment timing is important as treatments need to be applied before infestations/infections reach damaging levels.
11. The use of Ontario-bred disease resistant honey bee queens may help colonies naturally resist some diseases and pests. However, treatment will still be required.
12. It is recommended to replace 2 to 3 old frames in the brood chamber (typically the darkest) every year with newly drawn comb or foundation. This practice will help to reduce the level of pathogens and miticide residues in the hive.

Ministry of Agriculture, Food and Rural Affairs

Ontario

Treatment Recommendations

American Foulbrood (*Paenibacillus larvae*)

American foulbrood (AFB) is a readily transmissible disease. There is no cure for AFB. Action should be taken immediately after AFB is found to prevent further spread of the disease. At any time when honey bee colonies show signs of AFB, report the finding immediately to the regional bee inspector, burn all infected equipment and kill the bees.

Monitoring Method(s):

- Examine brood frames as colonies are opened.
- Signs of AFB include a scattered brood pattern and cappings with a punctured, sunken, dark and greasy appearance.
- Infected larvae settle to the bottom of the cell wall in a sunken gooey mass, beige to dark brown in colour.
- Insert a toothpick into the cell and draw out the contents. AFB will draw out 1.25 cm and has the consistency of mucous.
- Check empty cells on brood frames for AFB scales (hardened dark black masses of old dead larvae).

Treatment Method(s):

- All colonies in the yard should be treated at the same time, see table below for specific recommendations.
- Other methods of application such as using pollen substitutes as carriers or using the sugar syrup method are not recommended. These methods can contaminate honey, are less effective and will promote resistant AFB strains.
- **NOTE:** Oxytetracline is the only registered antibiotic that may be used for treatment in spring. Honey from the brood nest areas of the colonies treated with oxytetracycline should not be harvested for human consumption.
- **NOTE:** Tylosin is the only registered antibiotic to be used in fall. Tylosin should not be used in the spring as this product may contaminate honey in spring and summer. Honey from the brood nest areas of colonies treated with Tylosin should not be harvested for human consumption.

Treatment	Timing	Method
Control Measures		
Burning	Any time when signs of AFB are observed	• Burn all frames, bottom boards and bees from infected hives. Scorch empty bee boxes, inner covers and lids. • Treat all remaining colonies with OXYTET-25-S or OXYSOL-62.5 powdered sugar mix (*see below*).
Gamma Radiation	Any time	• Disinfect contaminated empty hive parts using irradiation at 1.2 m rads. • Supers with frames without bees should be placed in containers that are inaccessible to honey bees (“bee tight”) for irradiation.
Preventative Actions		
OXYTET-25-S or OXYSOL-62.5 powdered sugar mix	Spring and fall	• Follow label directions. • Label must indicate that the mixture can be used for honey bees. • Apply the powdered sugar mix along the margins of the brood chamber, avoid applying powdered mix directly on open brood. • Repeat 3 times at 4-5 day intervals in the spring and in the fall. Stop treating 4 weeks before the main honey flow.
Tylan 100 Soluble (Tylosin)	Fall	• Follow label directions. • Label must indicate that the mixture can be used for honey bees. • Apply the powdered sugar mix along the margins of the brood chamber, avoid applying powdered mix directly on open brood. • Colonies should receive three treatments administered as a dust in confectioners/ powdered sugar. The 200 mg dose is applied over the top bars of the brood chamber weekly for 3 weeks.

Treatment Recommendations

Chalkbrood *(Ascosphaera apis)*

Chalkbrood is a readily transmissible disease. Spores are highly infectious and are carried in contaminated pollen by infected foraging bees. There is no cure for Chalkbrood.

Monitoring Method(s):

- Examine brood frames as colonies are opened.
- Signs of disease include dead and dried larvae covered in a hard white or black fungus with the tip of the larvae protruding from the cell (also known as "chalkbrood mummies").

Treatment Method(s):

- Registered chemical treatments are not available for Chalkbrood.

Treatment	Timing	Method
Control Measures		
New queens	Spring and summer	• Maintain strong, healthy colonies and requeen with queens from hygienic stocks.

European Foulbrood *(Mellisoccus pluton)*

European foulbrood (EFB) can occur when colonies are stressed or have inadequate nutrition. Larvae are most susceptible to infection when they are less than 48 hours old.

Monitoring Method(s):

- Examine brood frames as colonies are opened.
- Signs of disease include dead larvae that appear yellowish or brown in color and are found curled in a C-shape at the bottom of the cell and is often accompanied by a sour odor which is distinct from AFB.

Treatment Method(s):

- Requeen or replace infected combs with new non-infected combs or foundations. It is unnecessary to kill bees.

Treatment	Timing	Method
Control Measures		
Replace infected combs	Any time when signs of EFB are observed	• Burn or irradiate at 1.2 m rads all infected combs. • Treat all remaining colonies with OXYTET-25-S or OXYSOL-62.5 powdered sugar mix (*see below*).
Preventative Actions		
OXYTET-25-S or OXYSOL-62.5 powdered sugar mix	Spring and fall	• Follow label directions. • Label must indicate that the mixture can be used for honey bees. • Apply the powdered sugar mix along the margins of the brood chamber, avoid applying powdered mix directly on open brood. • Repeat 3 times at 4-5 day intervals in the spring and in the fall. Stop treating 4 weeks before the main honey flow.
Pollen supplements	Spring and fall	• Provide supplemental feed after intensive berry pollination.
New queens	Spring and fall	• Requeen colonies with new queens from mite and disease resistant hygienic stocks.

Treatment Recommendations

Nosema *(N. apis* and *N. ceranae)*

Nosema are single-celled parasites of the honey bee that are classified as fungi and infect and damage the mid-gut tissue.

Monitoring Method(s):

- Testing by a qualified laboratory is necessary to diagnose the presence of nosema.
- Collect 50 adult bees from the front entrance of suspected colonies and send to a bee testing laboratory for diagnosis.

Treatment Method(s):

- Requeen colonies with new queens from hygienic stocks. See table below for specific recommendations.
- Other methods of application such as using barrel feeding are not recommended. These methods do not provide a standardized dosage as the Fumagilin-B will settle.

Treatment	Timing	Method
	Preventative Actions	
Fumagilin-B	Spring and fall	• Follow label directions. • Label must indicate that the mixture can be used for honey bees. • Use only if colonies are exhibiting a significant infection (> 1 million spores/bee). • Feed bees a mix of Fumagilin-B with sugar syrup and apply using direct-to-colony feeding techniques such as bag or pail feeding. • Ensure medicated sugar syrup does not come in contact with direct sunlight.
New queens	Spring and summer	• Requeen colonies with new queens from mite and disease resistant hygienic stocks.

Sacbrood

Sacbrood is caused by a viral infection. In larvae, the virus can cause mortality when in the brood cell.

Monitoring Method(s):

- Affected larvae can be identified by the presence of a fluid filled sac that can be removed from the brood cell, often intact.
- Testing by a qualified laboratory is necessary to diagnose the presence of Sacbrood.

Treatment Method(s):

- Registered chemical treatments are not available for Sacbrood.

Treatment	Timing	Method
	Preventative Actions	
New queens	Spring and summer	• Maintain strong, healthy colonies and requeen with queens from hygienic stocks.

Small Hive Beetle *(Aethina tumida)*

The Small Hive Beetle (SHB) is an apiary pest damaging stressed colonies by destroying wax comb and honey bee brood in addition to spoiling honey. At any time when SHB is suspected, report the finding immediately to the regional bee inspector.

Monitoring Method(s):

- Examine the top of brood frames for the presence of SHB adults immediately after the lid is removed.
- Adult and larval beetles may also be encountered on the surface of brood frames among the worker bees.
- A variety of mechanical traps, such as chemical–free oil traps, are commercially available to monitor for SHB. Traps will not control SHB populations.

Treatment Method(s):

- The effects of small hive beetle can be mitigated by following best management and biosecurity practices.

Treatment	Timing	Method
Preventative Actions		
Best management and biosecurity practices	Any time	• Do not move SHB-positive bee colonies and equipment to new bee yards. • Maintain strong, healthy and populous colonies. • For more information, please see the *Small Hive Beetle Best Management and Biosecurity Practices* infosheet at www.ontario.ca/beekeeping.

Tracheal Mites *(Acarapis woodi)*

Tracheal mites are internal parasites of honey bees that live and reproduce in the tracheae.

Monitoring Method(s):

- Tracheal mites are very small and can only be observed with a microscope.
- Tracheal mite infestation lack unique physical symptoms and can only be diagnosed by the mites and eggs, and evidence of scarring detected in the dissected trachea.
- Collect 150 adult bees from the suspected bee yard or 50 bees/colony and send to a bee testing laboratory for diagnosis.

Treatment Method(s):

- It is recommended that bees be treated when the tracheal mite infestation is ≥10%.
- If colonies are being treated with formic acid for varroa management, further treatments for tracheal mites are unnecessary.

Treatment	Timing	Method
Control Measures		
65% liquid formic acid (35 ml multiple application)	Spring and fall	• Colonies must have 6 or more frames of brood covered with bees to use this treatment. • Follow label directions, seal all holes in the hive box except for the main entrance and utilize personal protective equipment. • Use a single 35 ml pad per hive and place on the top bars close to the brood area for 3 applications, 4 days apart. • For really small colonies, move the brood to the side of the hive and place absorbent pad in the middle of the tops of the frames in the brood chamber.
Mite Away Quick Strips™ (MAQS™)	Spring and fall	• Colonies must have 6 or more frames of brood covered with bees to use this treatment. • Follow label directions, seal all holes in the hive box except for the main entrance and utilize personal protective equipment. • Treatment period is 7 days in length.
Preventative Actions		
New queens	Spring and summer	• Requeen colonies with new queens from mite and disease resistant hygienic stocks.

Treatment Recommendations

Varroa Mites *(Varroa destructor)*

Varroa mites are external parasite of honey bees and elevated levels of infestation may result in symptoms of stress in the colony during the active season.

Monitoring Method(s):

- Colonies can be monitored for varroa using three methods: sticky board, ether roll or alcohol wash.
- After applying varroa treatment in June, August and early fall, check all bee yards (at least 5 hives in each) using the monitoring method of your choice to determine the efficacy of the treatments.
- For more information, please see the *Varroa Mite Sampling and Monitoring* infosheet at www.ontario.ca/beekeeping.

Treatment Method(s):

- Treat colonies when the varroa mite infestation is ≥ 2% of bees in the spring and ≥ 3% of bees in the late summer/fall.

Treatment	Timing	Method
Preventative Actions		
New queens	Late spring and summer	• Requeen colonies with new queens from mite and disease resistant hygienic stocks.
Control Measures		
65% liquid formic acid *Single application*: • 250 ml pad in pin-prick perforated bag *Multiple applications*: • 30 - 40 ml pad for two-story colony • 15 - 20 ml pad for one-story colony	Spring and fall	• Colonies must have 6 or more frames of brood covered with bees to use this treatment. • Follow label directions, seal all holes in the hive box except for the main entrance and utilize personal protective equipment. • Apply pad and place on the top bars close to the brood area. Treatment may be repeated up to 6 applications at 3 to 5 day intervals. Leave treatment in for 21 to 30 days. • Only use this product when the air temperature is between 10 to 26 °C. Remove pads from the hives if the daily temperature highs exceed 30°C. • For really small colonies, move the brood to the side of the hive and place absorbent pad in the middle of the tops of the frames in the brood chamber.
Mite Away Quick Strips™ (MAQS™)	Any time	• Colonies must have 6 or more frames of brood covered with bees to use this treatment. • Follow label directions, seal all holes in the hive box except for the main entrance and utilize personal protective equipment. • Treatment period is 7 days. Allow for a minimum of 1 month between applications. • Only use this product when the air temperature is between 10 to 26 °C. Pre-harvest interval honey should not be extracted sooner than 2 weeks following the treatment. • May be used during the honey flow or at any time during the active beekeeping season.
Synthetic mite strips Apivar®, Apistan® or Bayvarol®	Spring and fall	• Follow label directions, label must indicate that the mixture can be used for honey bees. • Apivar® and Apistan®: use 1 strip for every 5 frames of bees. Bayvarol®: use 4 strips per brood chamber. • If treating when air temperatures are low, ensure the strips are positioned in the colony in contact with the cluster. • Remove strips at the conclusion of the treatment period and do not reuse strips.
Thymovar	Spring and fall	• Follow label directions, label must indicate that the mixture can be used for honey bees. • Two consecutive applications are required for full treatment. • Only use this product when the air temperature is between 13 to 30 °C.
Drone trapping	Late spring and summer	• Insert 1-2 frames with drone foundation or empty drone comb into the brood chamber. • Do not leave drone combs to hatch inside colonies. Remove combs containing drone cells from the brood chambers after the cells are capped and before adult drones emerge (approximately 21 days). • Repeat until the drones are evicted from the colony in early fall.

Varroa Mites *(Varroa destructor)* *continued*

Treatment	Timing	Method
	Control Measures	
Screened bottom board	Spring and fall	• Incorporate 8 mesh screens into bottom boards (8 squares per 2.54 cm). • 2.54 x 1.27 cm spacing is needed between the screen and bottom board separate varroa from the bees. • This method may enhance varroa control but will not substantially reduce mite infestations without additional treatment methods.
Oxalic acid (trickle method)	Late fall	• Apply when varroa monitoring indicates treatment is necessary. • Use in conjunction with an early fall treatment and only when little or no brood is present. Do not use when honey supers are in place. • Follow label directions and utilize personal protective equipment. • Dissolve 35 g of oxalic acid dihydrate in 1 L of warmed premixed syrup made from a 1:1 solution of sugar to water (weight:volume) and agitate thoroughly. Smoke bees down from the top bars. Trickle 5 ml of oxalic acid solution directly onto the bees between the frames using a syringe. • Apply on a cool day when the bees are clustered in the hive. • The maximum dose is 50 ml per colony (same dose for nucs, single or multiple brood chambers). • Oxalic acid may stress the colony or cause mortality when colonies are weak or are experiencing unfavorable overwintering conditions.

Additional Resources

- For more information about pest and disease management and to find out where to source queens from mite and disease resistant hygienic stock, please visit the Ontario Beekeepers' Association Technology Transfer Program's website at http://www.ontariobee.com/outreach/ttp
- For more information about chemical products and to search product labels, please visit Health Canada's website at http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php

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