Recommendations for Management of Honey Bee Diseases and Pests in Alberta 2014-2015

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A Checklist of General Recommendations:

- ✓ *Use Best Management Practices (BMP) and Biosecurity Standard Management Systems to produce quality honey and prevent the occurrence and spread of honeybee pests and diseases in your beekeeping operation.*
- ✓ *Use Integrated Pest Management (IPM) practices to control bee pests and diseases.*
- ✓ *An accurate diagnosis is needed to determine the proper treatment for an infection or infestation. Become aware of the various symptoms that honey bees show so as to best determine and select the appropriate treatment methods.*
- ✓ *When appropriate, apply treatments and use only the medications that have been approved and registered for use in bee colonies.*
- ✓ *The label always takes precedence over the recommendations. The user assumes responsibility for the possible misuse and or mishandling of recommended products.*
- ✓ *Tylosin is not yet a fully registered antibiotic for use by beekeepers. The use of Tylosin in spring will increase the risk of contaminating honey with antibiotic residues. Always follow instructions as outlined on the label. If you have to use Tylosin, it is preferred to use as a fall treatment.*
- ✓ *Do not unnecessarily feed antibiotics to healthy colonies. Routine "prophylactic" use of antibiotics is not an acceptable practice.*
- ✓ *The use of non-registered medications is a violation of the law; any unnatural residues found within honey could affect its marketability.*
- ✓ *Resistance to Apistan and Checkmite is widespread across Alberta. Check for resistance before deciding which miticide to use for varroa control.*
- ✓ *If you applied Apivar and high levels of mites are found after treatment, contact the provincial apiculturist immediately.*
- ✓ *Don't feed your bees diets that might contain unknown ingredients as that can contaminate your honey.*
- ✓ *Don't extract honey from the brood chamber.*
- ✓ *In case of suspected honey bee pesticide kill, you may report an incident directly to Health Canada by calling the Pest Management Information Service at* ***1-800-267-6315 or 780-495-5042****.*
- ✓ *Store antibiotics and pesticides appropriately. Any antibiotics and pesticides must be handled safely when used and disposed of.*
- ✓ *Use records to track treatments and evaluate outcomes.*

"CONTAMINATION OF HONEY IS A SERIOUS PROBLEM FACING THE BEEKEEPING INDUSTRY. IT IS THE RESPONSIBILITY OF THE BEEKEEPER TO ENSURE THAT THEIR HONEY MEETS FOOD SAFETY STANDARDS."

American Foulbrood (AFB)

AFB is a bacterial disease caused by *Paenibacillus larvae larvae.* It is the most widespread and destructive of the honey bee brood diseases. It afflicts queen, drone, and worker larvae alike.

Preventative Measures

To maintain healthy colonies:

- Requeen colonies with new queens preferably from hygienic bred stocks.
- Replace 3-4 combs in the brood chamber every year with new drawn combs from honey supers or use new foundation combs. It is highly recommended to replace old brood combs to reduce re-infection rates with various pathogens and reduce the sub-lethal toxicity of pesticide residues on the developmental stages of bees. Replacing combs will also reduce accumulated chemical residues in combs. Consequently, it will reduce the risk of contaminating extracted honey.
- Disinfect dead outs and empty (no bees) used hive boxes using Electron Beam or Gamma Irradiation. For preparing equipment for irradiation, place each hive box with frames in a plastic bag, then, place in a cardboard box to reduce the risk of getting the irradiation line dirty with spilled honey. For more details, please contact the irradiation facility
  Contact information:

IOTRON TECHNOLOGIES IN.,

1425 Kebet Way
Port Coquitlam, BC, Canada V3C 6L3
Phone: 604-945-8838 Fax: 604-945-8827
e-mail: iotron@iotron.com
For more information, check: http://www.iotron.com

- Decontaminate empty (no bees and no frames) hive boxes, bottom boards and inner cover using one of the following options:
  - Scorching
  - Washing with high pressure water
  - Using Virkon (Disinfectant sold at Veterinarian Drug stores), follow the instructions on the label. Then, rinse with water.

Preventative antibiotic application:

Time of application: Spring and fall

You can use Oxy-Tetracycline. One of the following formulations can be used according to the label:

- 25-S in powdered (icing) sugar mix
- OxySOL-62.5
- Foul Brood Mix

Note: Oxy-Tetracycline sugar syrup mix: This formulation has a very short half-life. Therefore, it does not work effectively in some cases.

Warning: Antibiotics are not allowed for use in bee hives during honey flow. If colonies are treated during honey flow, don't extract any honey from these colonies.

Preparation and use of Oxy Tetracycline -25-S (D.I.N. 02231111) or OxySOL 62.5 (D.I.N.00560189) in icing sugar mix:

- Mix Oxy-Tetracycline-25 S or OxySOL-62.5 with powdered sugar according to the label. Wear gloves and mask during mixing to avoid any exposure to antibiotics.
- Apply the proper dose of the powdered sugar antibiotic mix on the frame rests of the bottom brood chamber.
- Apply 28 grams (approximately two tablespoons) per colony.
- Repeat 3 times at 4-5 day intervals.
- For spring application, stop treating 4 weeks before the main honey flow.
- For fall application, apply the powdered sugar mix after removal of honey supers as described in spring application. Make sure that the recommended dosages of Oxy-Tet are applied 3 times. Resistance can develop faster if the full treatment is not applied.

Preparation and use of Foul Brood Mix (D.I.N. 02231110):

- Apply 18 grams (approximately 1.3 tablespoons) of Foul Brood Mix per colony on the frame rests.
- Repeat 3 times at 4-5 day intervals in spring and fall as described above.

Preparation and use of Tylan Soluble 100 GM (Tylosin Tarterate) (DIN 00103616):
A formal label has not yet been published at the time of writing these recommendations, Please checked attached information. For details, please contact the Provincial Apiculturist.

Note: If you intend to ship honey to Japan, please remember that Tylsoin is not approved for use in Japan. Japan does not have an allowed Maximum Residue Limit (MRL) set for Tylosin in honey.

Note:

At any time when honey bee colonies show symptoms of active AFB (i.e. perforated capped cells, brown scales & sticky to ropy dead larvae or pupae) action should be taken immediately for treatment. Additional steps should be taken after treatment as described above to stop further spread of AFB infection throughout the beekeeping operation. Antibiotics are not allowed for use in bee hives during honey flow. Follow the instructions on the label regarding the withdrawn period of antibiotics before honey flow starts. If colonies are treated with antibiotics during honey flow, don't extract any honey from those treated colonies.

The following actions should be taken based on infection levels:

A: Bee colonies with heavy AFB infection: Inspection of brood combs show that many capped brood cells are perforated, sunken or discolored. Brood combs have cells that contain AFB scales and decaying pupae.

Recommended actions are as follows:

- Burn bees, all frames, and bottom boards of heavily infected hives or irradiate infected hives after burning all bees. Honey should not be extracted from these heavily infected bee hives. Any extraction of these combs will contaminate the extraction line. All combs ran through the infected extraction system will be infected with AFB spores. Thus, more bee colonies in the beekeeping operation will be at high risk of re-infection with AFB.
- Disinfect empty hive boxes, inner covers and lids as described above.

- Send a sample of AFB infected combs to the Provincial Apiculturist office to test for Oxy Tetracycline resistance.
- Use preventative measures as described above to stop re-infection of bee colonies and the spread of AFB throughout your operation.

B. Bee colonies with clinical symptoms of AFB: Inspection of brood combs show that a few capped cells are perforated, sunken or discolored in one or two frames. A few brood cells contain decaying pupae from AFB infection.

Recommended actions are as follows:

Use the shaking method as follows:
- Shake all bees onto frames fitted with strips of wax foundation (1″) in disinfected or new hive boxes.
- Don't feed the bees at this time to allow the bees to digest the honey contaminated with AFB spores in their stomach.
- After 3-4 days, shake the bees again onto frames with full size foundation in a disinfected hive box or new hive box. If the nectar flow is scarce, feed the bees after shaking them onto the frames with foundation.
- Burn all infected combs and decontaminate empty hive boxes, inner covers and lids as described above.
- Melt down combs used in the first shake.

In most cases the above described action will control the AFB in infected colonies.

Use preventative measures:
Use additional preventative measures as described above to stop the spread of AFB and re-infection of bee colonies in your operation.

C. Bee colonies with very light clinical symptoms: Inspection of brood combs show that very few (1-2) capped cells are perforated, sunken or discolored in one or two frames. Very few brood cells contain decaying pupae from AFB infection.

Recommended actions are:
- Burn all infected combs, and replace them with foundation. Treat with oxy-tetracycline as described above.
- Use the shaking method to achieve better results in treating infected colonies.
- Use preventative measures as described above to stop the spread and re-infection of bee colonies in your operation.

D. Bee colonies with AFB persistent symptoms: If inspection of brood combs shows persistent symptoms of AFB, preventative and treatment actions did not cure the problem. Take a sample of infected cells and submit it to the Provincial Apiculturist. A test for Oxy-tet resistance will be performed on AFB infected cells. If AFB is resistant to Oxy-Tet, treatment methods recommended for heavy infestation should be immediately employed including using Tylosin. For more information, contact the Provincial Apiculturist office.

European Foulbrood (EFB)

EFB is another bacterial brood disease caused by *Streptococcus pluton*. This disease is considered a stress disease and is most prevalent in spring and early summer. If the infection is very low, the visible disease symptoms might disappear as bee colonies become strong during the season.

Time of Treatment: Spring and fall

Methods of Treatment: Same as described above for AFB. In most cases prevention methods used for AFB are sufficient for EFB treatment.

Chalkbrood

Chalkbrood is a fungal brood disease of honey bees caused by *Ascosphaera apis.* Worker, drone, and queen larvae are mummified and can be found throughout the brood-rearing season. It is more prevalent in cold spring and early summer.

Time of Treatment: Spring and fall

Methods of Treatment: There is no registered chemical treatment.
The following steps are recommended:

- Maintain strong healthy colonies.
- Replace heavily infected combs with new combs.
- Provide good ventilation for bees.
- Requeen with new or ***Hygienic queens***.

Honey Bee Viruses

Adult bee viruses:

Honey bee viruses include Acute Bee Paralysis Virus (ABPV) or (APV), Israel Acute Paralysis Virus (IAPV), Kashmir Bee Virus (KBV), Chronic Bee Paralysis (CBPV), Cloudy Wing Virus (CWV), and Deformed Wing Virus (DWV). Some of these viruses are associated with varroa mites and colony collapse disorder. Honey bees infected with viruses generally fail to fly, appear lethargic and often crawl on the ground. Bees often have bloated abdomens and discolored deformed wings. Infected colonies may suddenly collapse.

Time of Treatment: Spring and fall

Methods of Treatment: There is no registered chemical treatment.

The following steps are recommended:

- Maintain strong healthy colonies.
- Control varroa mites and nosema.
- Disinfect combs of dead-outs.
- Requeen with new or ***Hygienic queens***.

Brood Viruses:

- Sacbrood

Sacbrood is a viral brood disease. It may appear at any time during the brood-rearing season. Scattered brood cells are infected and contain dead brood. Their cappings are dark and may be punctured. The larva-prepupa dies from the virus. When it does, the head end turns up, stays pointed like the end of a canoe. The pearly white color of the prepupa darkens and the skin becomes tough. At this stage, the infected prepuapa resembles a liquid-filled sac. Sacbrood does not usually cause severe losses.

Time of Treatment: Spring and fall

Methods of Treatment: There is no registered chemical treatment.
The following steps are recommended:

- Maintain strong healthy colonies.
- Requeen with new or ***Hygienic queens***.
- Replace heavily infected combs with new combs.

- Black Queen Cell Virus (BQCV)

BQCV is a viral disease. It infects developing queen larvae and causes them to turn black and die. It is thought to be associated with nosema.

Time of Treatment: Spring and fall

Methods of Treatment: There is no registered chemical treatment.

The following steps are recommended:

- Maintain strong healthy colonies.
- Control varroa mites and nosema.
- Disinfect combs of dead-outs and use new disinfected materials for queen rearing.
- Requeen with new or ***Hygienic queens***.
- Disinfect all materials used for queen rearing such as queen cups, grafting tools, and bars.

Acarosis (The Honey Bee Tracheal Mite)

Acarosis is caused by the honey bee tracheal mite, *Acarapis woodi.* It infects worker, drone and queen honey bees, and can be serious if not treated.

Time of Treatment: Spring and early summer

Monitor tracheal mites in bee colonies in early spring and early fall as described in section "Monitoring Honey Bee Pests and Diseases Guidelines". If infestation levels are equal to or greater than 10%, treat your colonies. If you are using formic acid for varroa treatment you will not need further treatment for HBTM.

Methods of Treatment:

Spring treatment options:

- **Using 65% Formic acid:**

- Liquid formic acid can be used according to the Formic Acid 65% label. For guidelines, please check the following website:
  http://www.medivetpharmaceuticals.ca/Guidelines/pmra%20final%20english%20label%20june%203.pdf
  For material safety data sheet, please check the following website:
  http://www.medivetpharmaceuticals.ca/MATERIAL%20SAFETY%20DATA%20SHEET%20Formic%20Acid.pdf
- Consult with the Provincial Apiculturist for application details.

- **Mite Away Quick Strip (MAQS):** MAQS is a 7-day, single application mite control product registered for use against varroa and tracheal mites. There are two critical application times: MAQS can be used during the honey flow but since it is best to have healthy colony populations going into the honey flow, spring treatment 4 to 6 weeks before the flow is recommended. For more information, please check the label: http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=41123188

3. Use HBTM Resistant Queens:

- Requeen your colonies with queens from known honey bee tracheal mite resistant stocks once every two years.

Fall treatment options:

a. If you treated with formic acid in the spring, it will not be necessary to treat again in the fall, unless the HBTM infestation level in samples is equal or more than 10%.
b. Fall treatment should start as early as possible to protect winter bees from mites and before temperatures become too low for formic acid to be effective.
c. Treat with ***Formic acid*** as described in spring treatment.

Varroasis (The Varroa Mite)

Varroasis is caused by the Asiatic varroa mite, *Varroa destructor.* Varroa can be seen with the naked eye and appears as a small red or brown spot on the bee's thorax. Varroa reproduce on honey bee pupae and feed on bee hemolymph. Varroa are also known to carry and vector bee viruses that are particularly damaging to the bees. Varroa infestations can cause irreversible damage to honey bees that can lead to honey bee colony losses.

Time of Treatment: Spring and early summer

Varroa populations should be monitored at least 2-3 times in spring and early summer. There are two instances in which treatment is recommended: When a sample of 300 bees taken from brood combs and washed using the Varroa Hand Shaker is equal to or greater than 3% (3 mites/100 bees) or when the average natural mite drop on a sticky board (12x16″), left in the hive for 3 days is equal to or greater than 10 mites/day. For more details, check section "Monitoring Honey Bee Pests and Diseases Guidelines".

Resistance to Apistan and Checkmite+ is quite wide spread throughout Alberta. Therefore, varroa resistance to Apistan® and Checkmite+ should be tested for to determine their efficacy before using them. To test for resistance, Please use the Pettis test as described: **http://www.ars.usda.gov/Services/docs.htm?docid=7474**

Methods of Treatments: To treat varroa use one of the following options:

Chemical Treatment Options:

1. **Apivar:** Apivar is effective against typical varroa mites as well as Apistan and Checkmite+ resistant varroa mites. Follow instructions on the label.

   Directions for Use: To control varroa mites, remove honey supers before application of Apivar®. Use 2 Apivar® strips per brood chamber. Separate the double strip and hang each strip between two comb frames inside the brood area or the bee cluster, with a minimum distance of 2 frames between strips. Suspend Apivar® strips in the brood chamber in such a way that the bees can walk on both sides of the strips. Leave strips inside the hive for 42 days before removing. In case of movement inside the beehive far from the strips, a repositioning of the strips should be done to place them in the bee cluster. After repositioning the strips, leave the strips for 14 more days before removal. Strips must be removed after a maximum of 56 days. DO NOT re-use the strips. Strips should be removed from bee hives 14 days before the honey flow. For more details, **please check the following website:**
   http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=44379799
   Note: Placing strips in the top box where bees are not active or found will not help in the treatment of mites as bees must actively walk on the Apivar strips before acquiring the active ingredient that kills the varroa mites.

2. **65% Formic Acid:** Formic acid is effective against typical varroa mites as well as, Apistan and Checkmite+ resistant varroa mites. There are conditions that must be met to achieve effective treatment.
   a. Read carefully the guidelines published in the following website:
   http://www.medivetpharmaceuticals.ca/Guidelines/pmra%20final%20english%20label%20june%203.pdf
   For material safety data sheet, please check the following website:
   http://www.medivetpharmaceuticals.ca/MATERIAL%20SAFETY%20DATA%20SHEET%20Formic%20Acid.pdf
   b. Consult with the Provincial Apiculturist for application details.

Time of Treatment: Late spring and fall

Mite Away Quick Strip (MAQS): MAQS is a 7-day, single application mite control product registered for use against varroa and tracheal mites. There are two critical application times: MAQS can be used during the honey flow but since it is best to have healthy colony populations going into the honey flow, spring treatment 4 to 6weeks before the flow is recommended. For more information, please check the label:
http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=41123188

3. **Oxalic Acid**: Apply dripped or sublimated oxalic acid according to the label. For more information, check the following website:
   http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=41123045
   http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=41121903

4. **Thymovar:** Thymovar is registered for use to control varroa mites. Use according to the label's instructions. For more details, please check:
   http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=41121170

5. **Checkmite+ Strips**: Follow instructions check the following label:
   http://pr-rp.hc-sc.gc.ca/1_1/pr_web.ve1?p_ukid=3874
   Test for resistance before application.

6. **Apistan® Strips:** Follow instructions check the following label:
   http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=41118027
   Test for resistance before application.

Important note: Monitor the varroa mite population before and after treatments to determine if your treatment was successful. Mite levels should be below the economic threshold (less than 3% in a washed sample of 300 bees using the Varroa Hand Shaker or less than 10 mites/day of natural mite drop on a sticky board (12" x 16")) to keep healthy colonies. Please consult with the Provincial Apiculturist if you have a question on control options for varroa or would like an update on registered miticides.

Time of Treatment: Late spring and summer

Alternative Cultural and Genetic Options:

Beekeepers are recommended to use cultural and genetic management practices to suppress the development of varroa populations in bee colonies. The following options are suggested for use when the Integrated Pest Management (IPM) strategy for varroa control is implemented.

1. **Requeen colonies with resistant stock:**
   Requeen your colonies with queens from hygienic genetic stock, Varroa Sensitive Hygiene (VSH), or Russian bees that are known for varroa tolerance.

2. **Trapping varroa in drone brood:**
   Drone brood removal is an effective method to trap adult and immature developing mites in bee colonies. The following instructions describe the process of implementing this method in a beekeeping operation:
   A. Place two empty plastic drone combs or two empty frames with a 1" piece of foundation fixed to the top bar or place two shallow frames in the standard brood box of bee colonies during the drone rearing season in spring and summer.

B. Leave the drone combs in the hive for 3 weeks. Bees will draw drone cells on the drone foundation, on the 1" foundation strip fixed on the top bar, or on the bottom bar of the shallow frame. Using plastic drone foundation will save the bees a lot of time and energy. The plastic foundation can be recycled. The queen will lay eggs and varroa will move into the drone brood, their preferred host, before bees cap the cells.
C. After 3 weeks, remove these drone brood combs. Drone brood cells will be capped containing varroa mites and their developing offspring.
D. Destroy the capped drone brood to kill all of the developing varroa mites. Wax drone combs can be melted. If you want to recycle drone combs, kill capped brood by scratching all capped cells and placing the combs back in the hive. Bees will then clean up all of the damaged brood and varroa offspring. Beekeepers can also freeze capped drone brood combs for one week, when this is complete, place combs back into bee colonies for the bees to clean and reuse.
E. Repeat this method 2-3 times in spring-early summer.

Warning: Don't leave the drone brood for more than 24 days in the hives. Drones will emerge with mites and consequently the mite populations will increase in the colony. Timing of removing capped drone brood is vital for trapping and removing mites from infested colonies.

3. **Screened Bottom Boards:**

Screened bottom boards with 8 mesh screens can be placed onto bottom boards of bee hives. Some research results have shown that this method could reduce mites by 0-30%. In cold climates, the buildup of bee colonies could slow when screen bottom boards are used. However, some models are modified to reduce the drift of cold air into the hives and minimize the negative impact on brood production.

Time of Treatment: Late summer and early fall

Monitor varroa populations as early as mid-August. Monitoring should be done 2-3 times, once every 10-15 days. If varroa infestation levels are equal to or greater than 3 mites/100 bees (3%) after washing 300 housekeeping bees from the brood area using the Varroa Hand Shaker or 10 mites/24 h/sticky board, treatment should be immediately deployed. If varroa levels are EXTREMLY HIGH, remove honey supers immediately for treatment. Waiting until honey harvest is completed will allow varroa population to build up and cause irreversible damage to winter bees. Consequently, high losses of bee colonies will be expected.

Fall treatment options:

1. **Apivar:** Follow instructions on the label. Make sure that strips are placed in the bottom brood box where most of the bees and brood are located at this time of the year.

2. **65% Formic Acid treatment options:** Use as described above.

3. **Thymovar:** Use as described above

4. **Oxalic Acid:** Apply dripped or sublimated oxalic acid according to the label. Oxalic acid sublimation can be the last resort when other treatments fail. The best time for treatment is when temperatures are below 10 ºC and there is no brood present. The efficacy of oxalic acid sublimation can be up to 95% when brood is not present in bee colonies and the treatment is done properly.

5. **Checkmite+ Strips:** Follow instructions on the label. Test for resistance before application.

6. **Apistan® Strips:** Follow instructions on the label. Test for resistance before application.

Important note: Monitor the varroa mite populations before and after treatment to determine if your treatment was successful. Mite levels should be below 3% in a washed sample of 300 bees or less than 10 mites/day of natural mite drop on a sticky board (12" x 16") in wintering bees.

Nosemosis (Nosema Disease)

Nosema is caused by *Nosema apis* and *Nosema ceranae*. It is a microsporidian fungal disease that infects the intestinal tract of adult bees. Nosema can cause detrimental effects on honey bees, colony development, queen performance, and honey production.

Time of Treatment: Spring

Nosema infection levels should be monitored in the spring. The total number of spores in a sample of 30-50 old foraging bees from honey combs or inner cover can be used to determine the average number of spores per bee per colony. If the average number of spores exceeds 1 million/bee, bee colonies should be treated with Fumagillin.

Methods of Treatment:

Fumagillin-B (D.I.N 02231180) can be used for Nosema treatment. Follow the label for instructions.

The following treatment options are:

Spring Treatment using Fumagillin in 50% sugar syrup:

a. If bees continue to have more than 1 million spores per bee in the spring, feed one gallon of Fumagillin medicated sugar syrup to each colony.
b. When you prepare the mix, make sure you use the concentration of Fumagillin that is recommended on the label.
c. Protect your Fumagillin medicated sugar syrup from direct sunlight when feeding bees. Fumagillin decays within hours when exposed to light.

Treatment of heavily infected colonies that will not take in syrup:

a. Prepare 50% sugar syrup and mix 2 g of fumagillin per one liter of syrup.
b. Spray directly onto the bees (200-400 ml/hive) based on population size.
c. Medicated syrup can be applied 4 times per hive at 10 day intervals.

Note: Feeding Fumagillin to bees in powdered sugar mix or pollen patties is not as effective as feeding Fumagillin in sugar syrup.

Time of Treatment: Late spring and summer

- Requeen colonies when queens are available.

Disinfect dead outs and hive boxes with frames using one of the following options:

a. Using Electron beam or Gamma irradiation:

Disinfect dead outs and contaminated combs and empty hives (no bees) using irradiation. For more information check the AFB section.

b. Disinfect dead out bee hives using acetic acid:

Use acetic acid to fumigate dead outs to kill Nosema spores before reusing boxes in the field. For more information check:
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex11780

Time of Treatment: Fall

Fall Treatment using Fumagillin in (2 sugar: 1 water) sugar syrup:

a. Feed bees 2 gallons of Fumagillin medicated sugar syrup/colony according to the label's instructions.
b. Follow the same steps in preparing and feeding the Fumagillin medicated sugar syrup as described in spring treatment.

Monitoring Honey Bee Pests and Diseases Guidelines

1. **Honey Bee Tracheal mites (HBTM):**

   Samples should be collected in the early spring or early fall so that tracheal mites can be monitored, this willdetermine the efficacy of your treatment. For example, if you treat in the spring, samples should be collected in the fall and vice versa.

   There are two sampling methods:

   A. **Individual bee colony samples:** Collect 50-75 bees per hive from honey combs or the inner cover. Place collected bees in a jar containing 70% alcohol. From each apiary, collect samples from 6 hives. In each operation collect samples from 5-10 apiaries. Then, dissect 30 to 50 bees per colony. Check the infestation levels to determine the average mite prevalence. If the average tracheal mite infestation level is 10% or more, treatment should be applied as previously described.

   B. **Composite bee sample representing an apiary:** Collect 5 -10 bees from honey combs or the inner cover from each hive in an apiary of 25 - 40 colonies. Place collected bees in a jar containing 70% alcohol. Collect composite samples from 5 -10 apiaries. Dissect only 150 bees / apiary and examine the tracheae for the presence of tracheal mites. If the average tracheal mite infestation level is 10% or more per apiary, treatment should be applied as previously described.

2. **Varroa mites:**

   Monitor for mites in 6 colonies per apiary, in 4 -10 apiaries per operation, at least 2-3 times in spring and in fall. If you would like to improve accuracy, increase the sample size of monitored colonies and apiaries.

   It is crucial to monitor varroa infestation levels so as to make treatment decisions at the appropriate time and ensure the protection of bees from the irreversible damage caused by varroa mites. It is also important to monitor before and after treatments to determine the efficacy of applied treatments. If the infestation level using the washing method is less than 3% or the average natural mite fall is less than 10 mites/ day, you have good control. If the average mite infestation is higher than 3% in washed bee samples or 10 mites/ day as natural drop on sticky boards, action must be taken before colonies collapse.

Methods for varroa monitoring:

A. **Using the Varroa Hand Shaker:** This is a simple fast reliable method to monitor varroa mite populations in the field. Follow these steps:
   1) Collect approximately 300 worker bees (1/3 cup) from brood frames into a sample jar that contains (up to half of the jar) winter windshield washing fluid, or 70% alcohol. 300 dead bees will fill about 1 inch (25 mm) in the bottom of the jar.
   2) Screw the sample jar onto the hand shaker and then shake the varroa hand shaker vigorously up, down and sideways for 40-60 sec.
   3) Turn the jar with the bees upside down to keep the bees on the top of the screen allowing the mites in the liquid to pass through into the bottom jar.
   4) Check and count the number of mites collected in the fluid in the bottom jar.
   5) To determine the percent infestation, use the following equation: multiply the number of counted mites by 1.3.This will give you the corrected number of mites. Then divide the corrected number of mites by 3. For example,

assuming that you collected 300 bees, and counted 7 mites in the bottom jar, the total number of mites is equal to 7 x 1.3 = 9. The percentage infestation is equal to 9 divide by 3 = 3%.

Note: At the beginning of testing it is recommended to count the number of bees in 5 samples to standardize the method. 300 bees are required to results that accurately determine the prevalence of mites in bee colonies.

B. Natural mite drop on a sticky trap: This is also a reliable method to monitor varroa mite populations.

1) Make sticky traps (12x16") using sticky materials (e.g. Tanglefoot) or a mixture of 50% Vaseline and 50% Crisco shortening.
2) Cover the sticky trap with 8x8-mesh screen and place the sticky trap with screen on the bottom board of the bee hive, or place the sticky trap without a screen in the drawer of the screen bottom board fitted under a bee hive.
3) Leave the sticky trap for 3 days to collect naturally dropped mites from the bee cluster.
4) Remove the sticky trap and examine the trap for natural mite drop. Count the mites and calculate how many mites dropped per day.

Note: Leaving the sticky trap for 3 days (72 hours) gives more accurate results. Sticky traps left for more than 3 days in the hives will collect more debris and will make it harder to find and count dead mites.

3. Nosema:

There are two species of Nosema in Alberta, *Nosema apis* and *Nosema ceranae*. It is hard to distinguish between the spores of each species using microscopic examination. A specific genomic test is required for verifying what species of Nosema is in your operation. It is not necessary to distinguish between nosema species to make treatment decisions. Fumagillin is effective on both species of nosema.

Monitoring Nosema Spores:

To monitor *N. apis*, follow this procedure:

- Collect 30 - 50 bees / hive in the spring and fall from honey combs or bees on the inner cover.
- Homogenize the abdomens of 30 bees in 15 ml of water.
- Examine microscopically and count Nosema spores in 5 squares using a hemocytometer (Read Hemocytometer instructions before use).
- Calculate number of spores per bee by multiplying the total number of counted spores in the 5 squares by 25,000.
- If the number of spores calculated exceeds 1 million / bee, colonies should be treated with fumagillin.

The Small Hive Beetle Alert

The SHB is native to sub-Saharan Africa. It has been established in the United States of America, Egypt and Australia. It was introduced to Canada in 2002 and 2006 but it was not established. It was found in Quebec in 2008 and Ontario 2010. It has not been yet determined if it is established.

The adult beetle is about (~5 mm length and ~3 mm width). Females are slightly longer than males, with a dark brown to black colour (lighter shortly after eclosion). It has relatively large clubate antennae. Adult beetles like to live in the dark. When they are exposed to the sunlight they run and try to hide. Eggs are white and bean-shaped (~2/3 of the size of a honey bee egg) and eggs are laid in clutches (up to 210) in cracks, on the bottom board, on the combs and underneath the capping of sealed brood. Larvae are whitish, often covered with a slimy sticky coating. The larva looks like the wax moth larva, but the beetle larva has only three pairs of larger pronounced thoracic legs. The SHB larva does not produce silk like the wax moth larva. Mature larva (wandering phase) is up to 1.2 cm long. The SHB larvae can be found mining in combs or in the debris. Wandering SHB larvae often leave smear trails inside and outside the colony. Such wandering larvae leave a bee hive to pupate 1–20 cm deep in the soil usually in close proximity to colonies (<180 cm). Sometimes SHB pupate inside the hive in the debris on the bottom boards, too.

The small hive beetles attack and feed on the developing stages of bees, honey and pollen. They also spoil honey and convert honey into a slimy stinky runny material. The SHB infestations are typically associated with a rotten smell (e.g. rotting orange). The beetles can kill a weak honey bee colony in a relatively short time.
The small hive beetle can be found in swarms of bees, bee packages, queen battery boxes, queen cages and in previously used honey drums. It is highly recommended to re-cage imported queens before use in your operation. Currently a program is being developed to manage this pest. Each time you examine your colonies, inspect your hives for the presence of the small hive beetle developmental stages (eggs, larvae and adults). You need to examine the inner cover as soon as you remove it from the hive. Remove the hive boxes fast to get to the bottom board. Then, inspect the bottom board for running beetles. Inspect brood combs for developmental stages of the small hive beetles.

Note: If you suspect the presence of this pest in your hives, collect some beetles and mail them to the Provincial Apiculturist for identification. The small hive beetle is an immediately notifiable pest in the federal Animal Health Act and Alberta bee regulations.

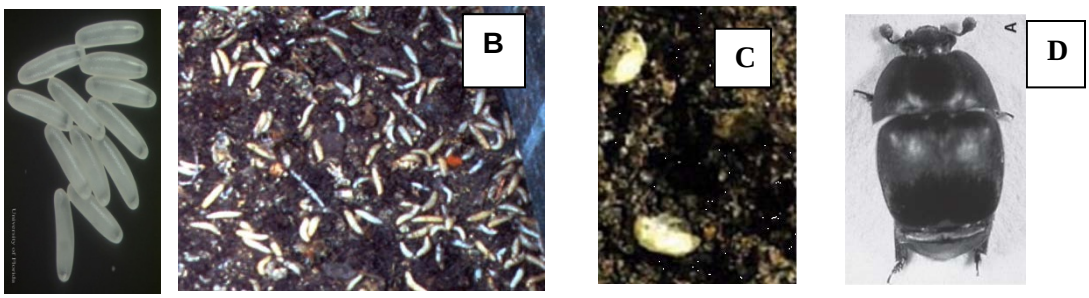

Figure (A) Small hive beetle eggs, (B) larvae in hive debris, (C) Small hive beetle pupae in soil, and (D) Small hive beetle adult (5 mm wide and 5-7 mm long)

"Contact The Provincial Apiculturist office if you suspect any finding of the small hive beetles in your operation"

Disclaimer

1. The Recommendations for Management of Honey Bee Diseases and Parasites in 2014 are provided only as a guide for educational purposes. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used.

2. The label always takes precedence over the recommendations found in this publication.

3. The information given in the recommendations is supplied with the understanding that no discrimination is intended and no endorsement or exclusion of any registered products by the Apiculture Program, Alberta Agriculture and Rural development are implied.

4. The chemical recommendations are consistent with current federal and provincial pesticide regulations and labeling as of the date of publication. Use of common, trade or brand names in this publication is for clarity and information; it does not imply, nor does it guarantee or warrant the standard of the product or effectiveness of the product. Revisions in labels can occur at any time.

5. Due to constantly changing labels and product registration, some of the recommendations given in this writing may no longer be legal by the time you read them. If any information in these recommendations disagrees with the label, the recommendation must be disregarded.

6. To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Always read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide.

7. The Pest Management Regulatory Agency (PMRA) is the federal agency that is responsible for the regulation of pest control products in Canada. As the federal authority under the *Pest Control Products Act* (PCPA), the PMRA enforces compliance with the PCPA.

If you have any questions, Please Contact the Provincial Apiculturist.