Laboratory Services for Honey Bees, Their Pests and Diseases and Honey Samples in Ontario, Canada
Author: Paul Kozak, Ontario Provincial Apiarist, OMAFRA

While many bee diseases can be visually diagnosed in the colony and pest levels can be measured through established field bioassays, there are other pests and diseases that require laboratory services. In some cases, this work has been done by Apiary Inspectors or trained technicians processing samples in a simplified lab in which to do dissections at a lab bench. In other cases, where large and expensive equipment is required for molecular analysis of honey bee pathogens, a partnership with a separate lab and dedicated and trained staff is an option. Some of these labs are national in scope, some are regional (within state / provincial governments or University partnerships). Pathology labs that are typically set up to service sectors dedicated to vertebrates (whether livestock, companion animals or wildlife) are realizing that there is need for lab services in apiculture and the equipment and processes of these labs can be easily used to address health in these ‘other’ animals such as bees. With established government honey bee diagnostic labs and some newer labs becoming available, there are some additional options and an opportunity for the labs to complement each other (perhaps even collaborate) rather than just compete.

In Ontario, the approach we have taken is to use existing lab services through the University of Guelph – Animal Health Laboratory (AHL) and Agriculture and Food Lab (AFL). Both labs have a close working partnership with our regulatory and surveillance programs through the Ontario Ministry of Agriculture of Food, and Rural Affairs. The Animal Health Laboratory provides diagnostics for animal pathogens in veterinary inspection including livestock, producer and corporate clients, researchers as well monitoring programs including outbreaks and reportable diseases. The Agricultural Food Laboratory can address bee health through screening of a large number of pesticides in various matrices, and honey sampling programs within Ontario routinely screen honey for lead, antibiotics and other compounds in order to ensure safe food produced within Ontario. Other regulatory programs such as meat and dairy inspection also use the services of AFL as well as agricultural clients, researchers and the Ministry of Environment. Both labs accept clients (other Apiary Programs and researchers) outside of Ontario and outside of Canada and have the required permits to import sample materials.

Honey bee and Honey testing at the AHL and AFL

1. Bee testing offered at the AHL
The AHL offers quantitative detection of honey bee (Apis mellifera) pathogens as a routine testing service. The test results can be used to identify the presence of pathogens, many that can lead to disease and negatively affect honey bee health. The quantification of pathogens (levels as opposed to simply presence or absence) testing can also assist in the distinction between low-grade latent infection and high-level infection by pathogens.
The quantitative PCR test methods for honey bee pathogens listed below are now Standards Council of Canada (SCC) accredited under the AHL flexible scope for PCR assays as listed on Lab Services’ SCC scope of accreditation to ISO/IEC 17025. These assays include:

- Acute bee paralysis virus (ABPV)
- Black queen cell virus (BQCV)
- Chronic bee paralysis virus (CBPV)
- Deformed wing virus (DWV)
- Israeli acute paralysis virus (IAPV)
- Kashmir bee virus (KBV)
- Sacbrood virus (SBV)
- *Crithidia mellificae*
- *Spiroplasma apis, Spiroplasma melliferum*
- *Tropilaelaps* spp.

The AHL also offers:

- microscopy examination for tracheal mites (*Acarapis woodi*)
- visual detection and PCR genotyping of Varroa mites (*Varroa destructor*)
- PCR detection and DNA sequencing confirmation for small hive beetles
- PCR detection of *Lotmaria passim, Nosema apis* and *N. ceranae, Apocephalus borealis*.

The bacterial causes of American foulbrood (AFB) (*Paenibacillus larvae*) and European foulbrood (EFB) (*Melissococcus plutonius*) can be culture isolated for detection. *P. larvae* isolates can be tested for antimicrobial resistance.

The AHL can also quantitatively test vitellogenin (a biomarker for honey bee health) mRNA levels for honey bee health monitoring.

**Sample submission (contact for further details):**

- For PCR and tracheal mite testing: 100-150 bees, live or frozen, shipped on dry ice
- For AFB and EFB testing: honey or comb, shipped cool
- For small hive beetles: beetle or larvae, shipped cool

A unique case number is applied to each submission and the samples are divided as needed by each lab section depending on the clinician's requests. Each case is entered into our laboratory information management system (LIMS) and routed to the various labs. Interim and final reports are sent to the clinic by email or fax, according to the submitter's request. As well, samples are forwarded to external labs elsewhere in Canada and the US on behalf of our clients. These external laboratory reports are incorporated into the client's final report.

The AHL is accredited for specific tests listed on our SCC scope of accreditation or "fixed scope". There can be a lag in applying for and adding a test to a "fixed" scope, therefore the AHL has also become accredited for veterinary laboratory testing techniques (flexible scope).
Specialists (virology, bacteriology, etc.) at AHL in each section can work with clients on addressing their specific requirements for sampling, detection and data / reporting.

2. Test provided by the AFL:
   **Pesticides:**
   Analytical support for bee-specific matrices such as honey for approximately 500 pesticides (includes 7 neonicotinoid class pesticides) which can be detected by our GC & LC-MS/MS multi-residue screens, TOPS-142LC/GC. The lab is able to work with clients to test new pesticides.

   **Sample submission:** please provide a minimum of 5 g for each sample type. Freeze samples soon after collection. Ship samples frozen in a cooler with ice packs for next-day delivery. Please do not ship on Fridays since we are closed on weekends. The standard TAT is 15 business days.

   **Honey:**
   The AFL can test honey for impurities such as lead, other metals, antibiotics and can work with clients on the required limit of detection.

   **Sample submission:** contact lab for further information.

   **Contact the AHL:**
   Email: [ahlinfo@uoguelph.ca](mailto:ahlinfo@uoguelph.ca)
   Tel: 519-824-4120 ext 54530 AHL Specimen Reception

   **AHL Webpage:** [https://www.uoguelph.ca/ahl/](https://www.uoguelph.ca/ahl/)

   **AHL Webpage for Honey Bee Testing:** [https://www.uoguelph.ca/ahl/tests?title=honey%20bee&tid_1=24](https://www.uoguelph.ca/ahl/tests?title=honey%20bee&tid_1=24)

   **Contact the AFL:**
   Email: [aflinfo@uoguelph.ca](mailto:aflinfo@uoguelph.ca)
   519-767-6299 AFL Client Services

   **AFL Webpage:** [https://afl.uoguelph.ca/](https://afl.uoguelph.ca/)
In 2018, the Utah Department of Agriculture and Food’s (UDAF) Entomology Lab proudly began offering Utah beekeepers in-house diagnostic testing for two honey bee diseases, American foulbrood (*Paenibacillus larvae*) and European foulbrood (*Melissococcus plutonius*). In 2020, this service became available to other state regulatory agencies and out-of-state beekeepers.

The UDAF Entomology Lab utilizes real-time quantitative polymerase chain reaction (qPCR) for testing, which is widely regarded as the “gold standard” of diagnostic methods. This service has proven to be more accurate and faster than previously utilized brood diseases diagnostics. In Utah it has been vital for both beekeepers and veterinarians who need accurate diagnostic results to quickly manage outbreaks of foulbrood diseases.

Real-time qPCR is a molecular biology technique that like conventional PCR makes billions of copies of a small segment of a target organism’s DNA or RNA. Unlike traditional PCR, qPCR allows for the real-time monitoring of the copies being made and also allows for the quantification of the starting amount of target DNA in an unknown sample. This is achieved using chemical compounds called “fluorophores” that fluoresce under specific wavelengths of light when new copies of target DNA are made.

For out-of-state samples, the UDAF Entomology lab charges $40 per submission. The sample is tested for both American and European foulbrood, making the service more cost-competitive with VITA “instant” test kits, which retail for about $15 a piece ($30 total to test for both pathogens). An advantage of qPCR testing compared to a VITA kit is that there no ambiguity with the results (you won't lose sleep over faint lines on the instant kits that might indicate a positive result).

We guarantee results within five business days, but results are often turned around faster than that. If the sample is urgent, please call ahead. Also, it is our policy to report test results to the state regulatory authority, regardless of who submits them. Contact the lab if you have any questions.

To submit a sample for testing please complete a submission form, which can be found on our webpage https://ag.utah.gov/farmers/plants-industry/apiary-inspection-and-beekeeping/ under the heading “Submit a Sample for Lab Testing” and mail to our lab. Be sure to follow the sampling guidelines outlined on the form, to ensure accurate results.

**Utah Department of Agriculture**

**Attention: Entomology Lab**

350 N Redwood Rd

Salt Lake City, Utah 84114-6500

801-982-2313
Informational Websites

- **USDA Pollinators Website** - [https://www.usda.gov/pollinators](https://www.usda.gov/pollinators)
  The USDA has developed a new website that contains information on honey bees and other pollinators, as well as the different USDA offices that cater to pollinators and what their initiatives are. It’s an excellent centralized clearing house for information on bee diagnostic services, agricultural crops, establishing pollinator habitats, and so much more. This website is relatively new and early on in its development, so it is not fully flushed out with information. Check back in through the coming months as more information is added.

- **The BeeMD** - [http://www.thebeemd.com/](http://www.thebeemd.com/)
  This website is an online diagnostic tool aimed at quickly identifying honey bee health problems in the field. It was developed in collaboration from government agencies, non-profits, and university researchers. Through a series of questions, this diagnostic tool helps narrow down the likelihood of different health issues depending on where the issue is being seen and what other behaviors or symptoms are apparent. The website not only provides diagnoses for pests and diseases, but also helps beekeepers identify normal behaviors of a colony (i.e. workers standing with their abdomens in the air and fanning their wings).

- **Bee Health Collective** - [https://beehealthcollective.org/](https://beehealthcollective.org/)
  The Bee Health Collective is a repository of information about bee health in the USA. The mission of this project is to gather and provide a ‘one stop shop’ resource of accessible, credible information about honey bee health, honey bee research, the beekeeping industry, and how these relate to important area such as agriculture, resource management and food. This collaborative effort was founded by Project Apis m. and the National Honey Board and is supported by the USDA, the Bee Informed Partnership and the Almond Board of California.
Upcoming Conferences

- **Honey Bee Veterinary Consortium Virtual Conference**
  - Dates: September 21-22, 2020 and September 28-29, 2020
  - You can register for individual days or multiple days. The cost will vary depending on how many webinars you register for:
    - 1 webinar is $35.00
    - 2 webinars are $65.00
    - 4 webinars are $100

- **COLOSS 2020 Conference**
  - The Prevention of Honey Bee COlony LOSSes Association (COLOSS) will be hosting their 16th annual conference virtually this year on October 12-13, 2020. In order to register for the conference you must be a member of the organization. The conference registration is $30 and the registration deadline is Friday, September 18, 2020. For more information about the conference, please visit the COLOSS website (https://coloss.org/events/16th-coloss-conference-2020/)

- **American Honey Producers Association 2020 Convention and Trade Show**
  - The American Honey Producers Association has decided to cancel their 2020 Convention and Trade Show in Baton Rouge, Louisiana due to concerns about the spread of COVID-19. They are working on hosting a virtual event instead and will release information about this event later. In the meantime, they have rescheduled their next convention for November 30 - December 5, 2021 which will take place in the same Baton Rouge location as was planned for the 2020 convention.

- **American Beekeeping Federation 2021 Conference and Tradeshow**
  - The American Beekeeping Federation has announced that the 2021 Conference and Tradeshow will be postponed due to concerns about the status of the COVID-19 situation. They are planning on holding a virtual event at some point during the same week as the originally scheduled conference (January 6-9, 2021). Information about this event and the 2022 conference will be announced later in the year.

- **American Bee Research Conference (ABRC)**
  - The 2020 ABRC meeting has been canceled, however a virtual meeting is being planned for January 7-8, 2021 (tentative dates). Registration for the virtual conference is $40 for members. The cost for membership is also $40. For more information and updates about the conference scheduling, please visit the American Association of Professional Apiculturists website (https://aapa.cyberbee.net/abrc-2021/)

- **Apiary Inspectors of America 2021 Annual Meeting**
  - The Apiary Inspectors of America has decided to cancel their 2021 annual in-person meeting that was originally scheduled for January 12-14 in Salt Lake City, Utah. Instead the organization is planning to hold a virtual meeting during that same time frame. More information about scheduling will be announced at a later date.
  - In the meantime, please submit suggestions for speakers you would like to hear from, or topics you would like to learn more about to Natasha Garcia Andersen (natasha.garcia-andersen@dc.gov).
Announcements

- **At Home Beekeeping Series** provided by the Alabama Cooperative Extension Service will hold a different virtual presentation on the last Tuesday of every month, starting July 28th. These presentations can be viewed via Zoom (https://auburn.zoom.us/j/904522838) or on the Lawrence County Alabama Extension Office Facebook page (https://www.facebook.com/LawrenceCountyextension/). There is no need to register in advance for these sessions. Recordings of these presentations will be available on the Lawrence County Extension Facebook page for 2 weeks after each presentation.
  - August 25th: Taking action against Varroa - Jennifer Berry (Georgia)
  - September 29th: Winter bee biology & management - Jack Rowe (Alabama Extension)
  - October 27th: Creating & maintaining a wildflower meadow - Anthony Abbate (Auburn)
  - November 24th: Getting started and staying in beekeeping - Jeff Harris (Mississippi State)
  - December 29th: Beekeeping boxing day sales - vendors & Geoff Williams (Auburn) & Anne Marie Fauval (Bee Informed Partnership)

- **American Beekeeping Federation Quarterly Newsletter**
The American Beekeeping Federation is working with AIA to feature the different regional inspection agencies in their quarterly newsletter. The upcoming newsletter will feature the agencies located in the North region (IA, IL, IN, KS, KY, MI, MN, MO, ND, NE, OH, SD, and WI). You can submit information about your agency using the following survey: https://agrilife.az1.qualtrics.com/jfe/form/SV_7Qh1B9T7q4xdvGl. **The deadline for the next entry is September 1st!**

- **Bee Culture Apiary Inspection Feature**
  Bee Culture Magazine would like to feature an individual apiary inspection agency in every issue. This is a great opportunity to highlight your program and provide readers insight into how you serve the beekeeping community. You can submit information about your own program using the following survey: https://agrilife.az1.qualtrics.com/jfe/form/SV_8JIAtjBaO4j55UV.

- **AIA Membership Dues** - If you need to renew your AIA member dues, please reach out to our Treasurer, Keith Tignor, as soon as possible (keith.tignor@vdacs.virginia.gov)!

---

**The Apiary Inspectors of America 2021 Annual Meeting will be held virtually this year!**

More information about the meeting dates and schedule will be released later, but in the meantime, if you have any suggestions for speakers or topics you would like to hear from/about, please contact the AIA Vice-President, Natasha Garcia Andersen (natasha.garcia-andersen@dc.gov).