Honey Bee Brood Disease, Detection and Management

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Introduction

- Focus my discussion on the major brood diseases
- Diagnosis and treatment options
- Brief discussion of other pests and diseases frequently detected at the lab.
Diagnostic Service

- No charge for this service
- Receives 2,500 plus samples per year
- Samples sent by Beekeepers or apiary inspectors
- 3 – 5 days average turnaround time for sample processing
Diagnostic Service

2702 samples processed in 2016:

- 1001 (37%) brood samples
- 1,688 (62%) bee samples
- 13 (1%) other - pollen, honey, beetles, royal jelly, etc.
Diagnostic Service

Samples from MD in 2016:

- 93 (3.4%) samples processed
- 43 (46%) were comb and smear
  - 10 (23%) diagnosed with AFB
  - 12 (28%) diagnosed with EFB
Brood Diseases

- American foulbrood
- European foulbrood
- Chalkbrood
- Sacbrood (virus)
# Field Diagnosis of Brood Diseases

## Table 1. Comparative symptoms of various brood diseases of honey bees

<table>
<thead>
<tr>
<th>Symptom</th>
<th>American foulbrood</th>
<th>European foulbrood</th>
<th>Sacbrood</th>
<th>Chalkbrood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of dead brood</td>
<td>Usually older sealed larvae or young pupae.*</td>
<td>Usually young unsealed larvae: occasionally older sealed larvae. Typically in coiled stage.</td>
<td>Usually older sealed larvae: occasionally young unsealed larvae. Upright in cells.</td>
<td>Usually older larvae. Upright in cells.</td>
</tr>
<tr>
<td>Color of dead brood</td>
<td>Dull white, becoming light brown, coffee brown to dark brown, or almost black.</td>
<td>Dull white, becoming yellowish white to brown, dark brown, or almost black.</td>
<td>Grayish or straw-colored, becoming brown, grayish black, or black. Head end darker.</td>
<td>Chalk white. Sometimes mottled with black spots.</td>
</tr>
<tr>
<td>Consistency of dead brood</td>
<td>Soft, becoming sticky to ropy.</td>
<td>Watery; rarely sticky or ropy. <strong>Granular.</strong></td>
<td>Watery and granular; tough skin forms a sac.</td>
<td>Watery to pastelike.</td>
</tr>
<tr>
<td>Odor of dead brood</td>
<td>Slight to pronounced odor.</td>
<td>Slightly sour to penetratingly sour.</td>
<td>None to slightly sour.</td>
<td>Slight, non objectionable.</td>
</tr>
</tbody>
</table>

*Bold italics indicate the most useful field characteristics.*
Sampling Diseased Colony

- Probe or comb piece cut out around brood chamber area
- No honey should be present in sample
- Loosely wrapped sample in paper, not plastic or foil wrap
American Foulbrood
Caused by Paenibacillus larvae

- Spore forming bacterium (2.5B/scale)
- Highly contagious
- Usually kills colony
- 123 (12%) samples diagnosed in 2016
American Foulbrood

Brood with comb AFB
European Foulbrood
Caused by Melissococcus plutonius

- Non spore forming bacterium
- Stress Disease
- Normally does not kill colony
- Associative organisms present
- 245 (24%) samples diagnosed in 2016
European Foulbrood

Brood comb with EFB
Examining a comb sample for foulbrood
Diagnosis Foulbrood
Under the Microscope

- Transfer sample to glass cover slip.
Diagnosing Foulbrood Under the Microscope

- Place sample under heat lamp to dry. This fixes the sample to the cover slip.
Diagnosing Foulbrood Under the Microscope

- Stain sample with carbol fuchsin for 30 seconds.
Diagnosing of Foulbrood Under the Microscope

- Gently wash off excess stain with water.
Diagnosing Foulbrood Under the Microscope

- Place wet cover glass with sample side down on slide.
Diagnosing Foulbrood Under the Microscope

- Place slide on microscope and view at 1,000X.
- *P. larvae* spores are uniform in shape, oval and twice as long as wide. Moves with Brownian movement.
- *M. plutonius* cells are lancet shape, and usually found in singles, pairs or chains. Cells clutters and fixes to slide.
Paenibacillus larvae – causative organism for AFB
Melissococcus plutonius – Causative organism of EFB
Diagnosing Foulbrood with Test Kit

ELISA Test kit available for both AFB and EFB
Foulbrood Culturing and Antibiotic Sensitivity Testing

- Conducted only for AFB
- Oxytetracycline (OTC) and Tylan

AFB spore suspensions
Heat shocked AFB suspensions
Foulbrood Culturing and Antibiotic Sensitivity Testing

- Preparing Petri dishes
- Streaking Petri dish with AFB
- Placing antibiotic disk on Petri dish
Foulbrood Culturing and Antibiotic Sensitivity Testing

OTC “Susceptible” AFB

52mm inhibition zone

OTC “Resistant” AFB

18mm inhibition zone

- 13% resistant and 87% susceptible to OTC in 2016
- No sample resistant to Tylan
American Foulbrood

- **Spread**
  - Robbing bees
  - Used beekeeping equipment
  - Transfer of equipment from a diseased colony to a healthy colony
American Foulbrood

- **Control:**
  - Burning
  - Sterilization
  - Drugs?
European Foulbrood

- Controlled by Terramycin
- Follow label directions
  - Treat 3 times at 5 day intervals
  - Do not treat hive 3 weeks before or during honey flow
Chalkbrood

Ascosphaera apis

- Caused by a fungus
- No medication for treatment
- Requeen colony
Sacbrood

Morator aetalulas

- Caused by a virus
- Does not cause severe damage
- Common in spring

Larva with SBV
Other Pests and Disease

Nosema Disease

- A microsporidian (parasitic fungi)
- Infection of digestive tract of adult bees

- Two species:
  - Nosema apis
  - Nosema ceranae
Other Pests and Disease

Varroa Mites
- External parasitic mite
- Present serious threat to colony health
- Activates/transmits viruses

Honey bee tracheal mites
- Internal parasitic mite
- Becoming less of a problem
- Some of the chemical treatments for varroa kill HBTM
BRL Bee Disease Diagnostic Service

We do not conduct...

- Viruses testing
- Pesticide testing (done by USDA-AMS-National Science Lab)
- Race identification (done by USDA Tucson Lab when requested by State or Fed Government)
How to Submit Samples

How to Send Brood Samples

- A comb sample should be at least 2 x 2 inches and contain as much of the dead or discolored brood as possible. NO HONEY SHOULD BE PRESENT IN THE SAMPLE.

- The comb can be sent in a paper bag or loosely wrapped in a paper towel, newspaper, etc. and sent in a heavy cardboard box. AVOID wrappings such as plastic, aluminum foil, waxed paper, tin, glass, etc. because they promote decomposition and the growth of mold.

- If a comb cannot be sent, the probe used to examine a diseased larva in the cell may contain enough material for tests. The probe can be wrapped in paper and sent to the laboratory in an envelope.

Send samples to:

Bee Disease Diagnosis
Bee Research Laboratory
10300 Baltimore Blvd
Bldg. 306, Room 317
BARC – East
Beltsville, MD 20705
Summary

- Foulbrood is a problem in MD
- Nationwide, seeing some resistant to Oxytetracycline
- AFB is the most destructive of all the brood diseases.
Questions?