



The Managed Mentoring Program on getting started in beekeeping.

# Managed Mentoring



# Managed Mentoring

## Introduction to Hive Maladies

Lesson | Hive Maladies



# What is Covered in this Module

---

Individual Honeybee Immunity

---

Colony Level Defenses

---

Disease Variations

---

Syndromes and Phenomena

---

Colony Disorders

---

Foulbrood Primer

---

Disorder Management

---

---



# Intro to Hive Maladies

Viruses, Bacterial Infections, and Syndromes

## *Terminology*

**Hive Maladies:** A malady is generally described as a disease or ailment of the animal body

*For the context of this lesson, we will focus on Viruses, Bacterial Infections, and Syndromes*



# Immune Function and Social Behavior

*Bees are broadly exposed to elements of the outside world and through evolution have developed a layered defense in their individual biology*

## □ Individual Level Defense

- *Despite the onslaught, bees have developed a robust defense system*
  - Some examples: Exterior Cuticle, Grooming, The Stomach Design, Hemolymph Defenses
    - The bees exterior design encompasses several protective elements. Hair that thwarts direct contact of matter. A cuticle that consists of chitins and proteins that affords protection from injury is coupled with wax coating that aids in protections.
    - Bees also practice individual and colony peer grooming (allogrooming) that removes unwanted particles from the exterior.
    - The honey crop and stomach have a high pH balance that makes it inhospitable for bacteria to make it through to vital organs
    - A bees hemolymph (fluid like blood) has inherent immune defense that produce antimicrobial compounds which thwart or inhibit pathogens



# Immune Function and Social Behavior

## □ Colony-Level Defenses

- *It is well established that honeybee colonies have many layers of colony level defense tactics*
  - The superorganism has many tactics that work in harmony to protect the well being of the colony
    - Stinger based defense, Propolis, Altruism behavior and other elements are in play
      - Defense at the exterior prevents the entry of undesirable intruders thwarts unwanted exposures
      - Altruistic bees, when sick or injured, will fly from the hive so they do not deposit problems when they succumb to illness or injury
      - Propolis is employed on the exterior surfaces and throughout the interior as an envelope of antimicrobial / antibacterial protection
    - Removal of deceased bees (undertaker behavior)



# The Defense is not without gaps

## □ Viruses, Bacteria, and Disease Like Syndromes

- *Maladies of bees encompass more than diseases*
- *Bees can be impacted by diseases, pests, disorders, and other maladies, such as environmental impacts or exposure to poisonous plant materials. .*
  - Bacterial Diseases, Fungal Diseases, Protozoan Diseases, Viral Diseases, Ectoparasites (Parasitic Honeybee Mites), Pests of the hive, and Noninfectious Disorders, Environmental

### *Definition*

**Disease:** A disease is a particular abnormal condition, a disorder of a structure or function, that affects part or all of an organism.



# Disease Variations (Bacterial/Fungal)

## □ Bacterial

- *Any variety of illnesses caused by bacteria.*
- *Bacteria produce proteins (exotoxins) that modify, by enzymatic action, or otherwise destroy certain cellular structures*

## □ Fungal

- *Parasitic fungi attack living organisms, penetrate their outer defenses, invade them, and obtain nourishment from living cytoplasm*
- *This results in disease and sometimes death of the host.*



# Disease Variations (Protozoan/Ecto Parasite)

## □ Protozoan

- *Protozoa are microscopic, one-celled organisms that can be free-living or parasitic in nature.*
  - These organisms can multiply in bees, which contributes to their survival.
  - It also permits serious infections to develop from just a single organism.

## □ Ecto Parasite

- *Include organisms such as ticks, fleas, lice, and mites that attach or burrow into an animal or insect.*
  - Become vectors, or transmitters, of many different pathogens that in turn cause tremendous morbidity and mortality from the diseases they cause.



# Disease Variations (Viral)

## □ Viral

- *A viral disease (or viral infection) is a variation from the classical disease disorder in that there is an invasion of the cell and not a disorder.*
  - A viral disease occurs when an organism's body is invaded by pathogenic viruses, and infectious virus particles (virions) attach to and enter susceptible cells

### *Terminology*

**Viral Disease:** A viral disease (or viral infection) occurs when an organism's body is invaded by pathogenic viruses

Electron



## A Quick Aside

- **Pragmatic Coverage of the Topic**
  - To do justice to the breadth and depth of this topic would require an extensive lesson.
  - It is not pragmatic to create a typical instruction lesson in the style of this program and be comprehensive enough to convey the information
  - What follows will be more introductory in explanation.
  - We suggest you use this lesson to 'get acquainted' to the topic and subsequently dedicate additional time to invest in a more in-depth understanding.
    - *We will have recommendations for further study at the end*



# Honeybee Diseases

## Brood Diseases

- *American Foulbrood (Bacterial)*
- *European Foulbrood (Bacterial)*
- *Chalkbrood (Fungal)*
- *Stonebrood (Fungal)*
- *Sacbrood (Virus)*

## Adult Bee Diseases

- *Vairimorphia [Nosema] (Microsporidian parasite)*
- *Black Queen Cell Virus (Virus)*
- *Deformed Wing Virus (Virus)*
- *Chronic Paralysis Virus (Virus)*
- *Israeli Acute Paralysis Virus (Virus)*
- *Kashmir Bee Virus (Virus)*



# Honeybee Conditions and Syndromes

## Conditions

- *Chilled Brood (from cold temps)*
- *Dysentery / Spotting on hive*
- *Pesticide Kills*
- *Starvation*
- *Robbing*
- *Laying Workers*

## Syndromes, Phenomenon

- *Parasitic Mite Syndrome*
- *Honeybee Syndrome*
- *Colony Collapse Disorder*
- *Absconding*



# Expanding on the Less Common

## CCD

- *Colony Collapse Disorder*
  - Colony collapse disorder (CCD) is a phenomenon in which worker bees from a beehive abruptly disappear.
  - It was originally discovered in 2006.
  - The exact cause of the condition has never been codified
    - In current times most attention is given to the impacts from Varroa mites and the wide array of problems that create CCD like symptoms in colonies

## Honeybee Syndrome

- *Honeybee Syndrome*
  - Typically this syndrome is attributed to death of honeybees by consuming a specific type of sugar
  - Manna Trees, and other produce, contain mannose which causes death to bees when consumed
    - Honeybees lack proper enzymes to digest this form of sugar
  - This is not a prevalent exposure



# Parasitic Mite Syndrome and Absconding

## □ PMS & Absconding

- *PMS or Parasitic Mite Syndrome is a condition that causes a honeybee colony to deteriorate and eventually dwindle away and die.*
  - There has not yet been a pathogen detected which causes the brood symptoms that appear with this syndrome.
    - Varroa mites are always present with this syndrome, and considered an underlying factor
- *Absconding*
  - The two items (PMS & Absconding) are not related, but they have a common outcome. Bees cannot not functional in the environment and when it comes to absconding, something is not suitable to the colony operation, and they leave.



Further Reading



# Colony Disorders

## □ Dysentery / Prolonged Confinement

- *Uncontrolled Defecation within the interior or on exterior surfaces*
  - In the case of confinement, or some conditional illnesses, the excess storage of solids, followed by water intake exceeds the waste holding capability
    - Honeybees can maintain 30 to 40% of their body weight in fecal material.
- *Un-ripenend, Fermented, High Ash Content Honey/Nectars*
  - These three conditions can cause distress in honey bees as they create conditions where sugars are difficult to digest
    - Some underlying conditions could also be the presence of yeasts and fungi in the food



# American Foulbrood (AFB)

## □ A highly contagious brood disease

- *Caused by the bacterium Paenibacillus larvae*
  - Can only infect brood in development; Adults are not susceptible
- *Background*
  - Caused by a spore that germinates in the gut of the larva and multiplies rapidly.
  - It causes the larva to die soon after it has been sealed in its cell.
    - Death typically occurs after the cell has been capped, during the last two days of the larval stage or the first two days of the pupal stage.
  - Primarily spread by beekeepers exchanging equipment between infected and healthy hives or by bees robbing infected weak/dead colonies



# AFB Symptoms

## □ Capping Appearance - Irregular brood patterns

- *Scattered and irregular pattern of capped and uncapped cells.*
  - Infected cells are discolored, sunken, and often have punctured cappings
  - First the capping of the diseased cell becomes moist and darkens in color
  - The larva shrinks; and the cell capping goes from convex to concave. Impacted cappings can become greasy in appearance.
- *Larval Appearance*
  - At death, the diseased larva changes from a normal pearly white color to a creamy brown
  - Gradually darkens from creamy brown to brown to dark brown as the larva dries up



# AFB Symptoms

## ❑ Capping Appearance - Irregular brood patterns

- *False Tongue*

- The presence of pupal tongue, though not always present, is a characteristic symptom of American foulbrood. If death occurs at the pupal stage, the tongue of the pupa (false tongue) protrudes from the scale across the cell.

- *Odor*

- The odor of dead brood is very characteristic and has been described as resembling a glue pot or glue color.

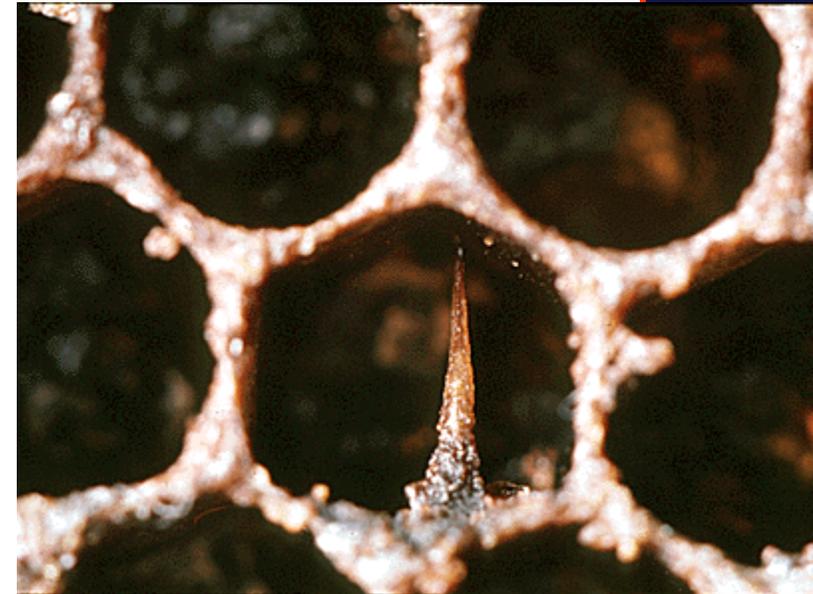
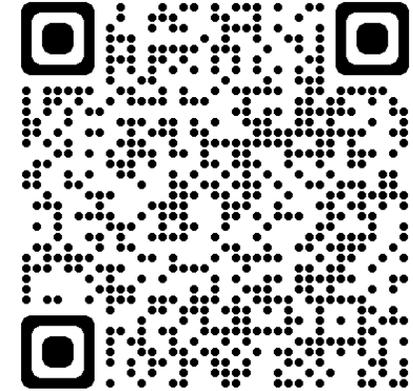


Image credit: AFB Pupal Tongue – Texas Apiary Inspectors Service



# AFB Testing



## □ Rope Test / Milk Test

- *Performing a Rope Test is a common field option*
  - Test by choosing a larva that is discolored and exhibits a melted appearance.
  - Insert a match, twig, or toothpick into the cell, stir the remains of the dead larva, and then slowly withdraw the test stick.
    - If a portion of the decaying larva clings to the twig and can be drawn out about an inch or more while adhering to the dead mass, its death was probably due to AFB.
- *Milk Test*
  - You can procure a specialized test and keep it in your kit if you ever encounter the condition



# Prevalence of Disease and Ailments

## □ Commonality

- *While there is a long list of ailments....*
  - The truth is the common beekeeper should not be concerned or fret at the risk of the long list of possible problems.
  - Even the most experienced beekeepers with a large contingent of hives will not experience some of these problems in many seasons of keeping bees.
- *Prevalence*
  - The most common diseases found in the United States include:
    - European Foulbrood, Chalk brood, American Foulbrood, and Sacbrood
      - Additionally, Nosema variations are quite prevalent, and a concern



# Learn what good looks like

## □ Take the time to visualize

- *Spend time during each inspection – throughout the year*
  - Observe what a good brood pattern looks like when your hive is healthy
  - Pay attention to how it changes throughout the year
  - Look at all aspects – the eggs, the larva + royal jelly, the appearance of the cappings
- *When you get used to what 'good looks like'*
  - It makes it easy to pick up when something looks off



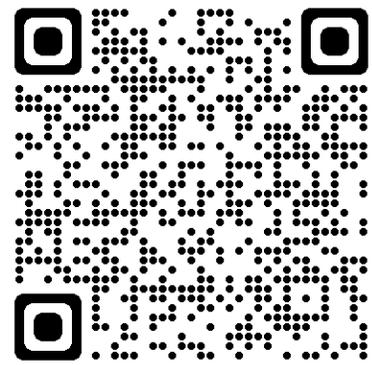
# General Guide of Brood Disease Problems

## ❑ Good Brood has specific characteristics

- *When the brood does not match good characteristics, it is a possible indicator of brood disease*
  - It is imperative to use brood inspection as a first defense to detecting brood maladies
- *Characteristics of good brood (and what bad looks like)*
  - Capped brood with a uniform appearance of contiguous cell is desired.
    - ❑ Shotgun and non-uniform patterns could be a sign of disease or poor queen.
  - Convex, uniformed color cell cappings are expected.
    - ❑ Concave Cappings, and cappings with perforations, and cappings with greasy appearance could be from a compromise larva in development and should be opened - examined for color, and where applicable tested for roping.
  - Eggs in royal jelly, or Pearl white larva are signs of healthy brood.
    - ❑ Any discoloration of yellow ochre, off white, and brown/black larva likely a problem.



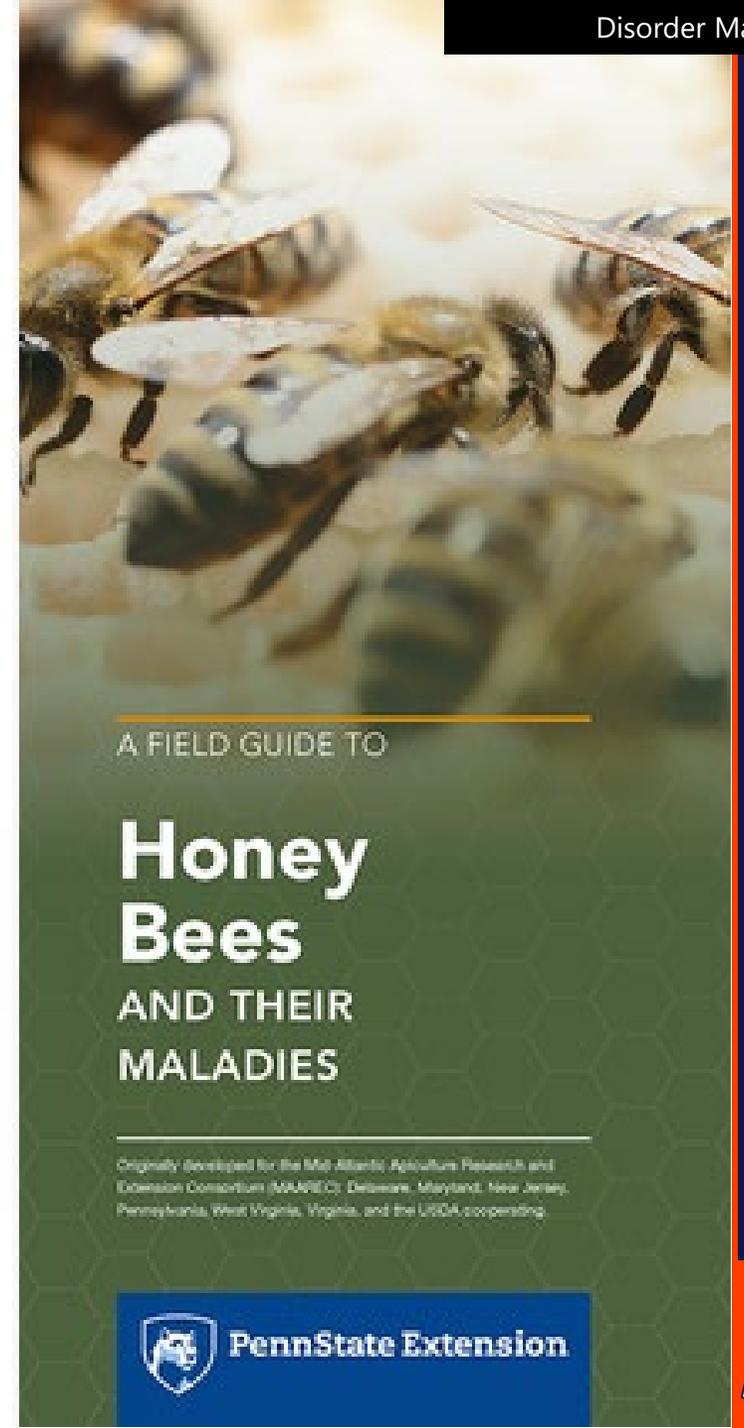
# Penn State Maladies Guide



## □ Field Guide Recommendation

- *Paper based field guide (4" x 8" spiral Bound)*
  - This guide is something that we keep in our kit
  - It is available from Penn State (\$12)
  - It has a summarized coverage of the content within this presentation – along with photos for you to use when you have a finding
  - Compare the finding to the reference in the guide for identification. It also has guidance on remediation

<https://extension.psu.edu/a-field-guide-to-honey-bees-and-their-maladies>



A FIELD GUIDE TO

## Honey Bees AND THEIR MALADIES

Originally developed for the Mid-Atlantic Agriculture Research and Extension Consortium (MAAREC): Delaware, Maryland, New Jersey, Pennsylvania, West Virginia, Virginia, and the USDA cooperating.



PennState Extension



# Closing Comments

- **Customary Close**
  - Where we stand, where we are going...
    - *This lesson was an introduction to hive maladies*
    - *Our next set of topics focus on Swarm Management*
      - Introduction to swarm basics
      - Swarm Triggers
      - Swarm Indicators
      - And Swarm Prevention



# Q&A

- **What Questions did we not anticipate?**
  - If you have feedback, you can leave a constructive comment; but be nice.
  - You could also send an email to [comments@managedmentoring.com](mailto:comments@managedmentoring.com)
    - *Please refer to this video in the subject so we know what the reference is.*

