

# Diseases & Pests



NCBA Bee School 2020

# Overview



## ☞ Brood Diseases

- ☞ American Foulbrood (AFB)

- ☞ European Foulbrood (EFB)

- ☞ Chalkbrood

- ☞ Sacbrood

## ☞ Adult Diseases

- ☞ Nosema

# Overview



## ∞ Parasites

- ∞ Varroa Mites (varroa destructor)

- ∞ Tracheal Mites – no longer an issue

## ∞ Predators

- ∞ Wax Moths

- ∞ Small Hive Beetles

- ∞ Mammals

# Considerations



- ∞ Cause
- ∞ Symptoms
- ∞ Signs
- ∞ Diagnoses
- ∞ Transmission
- ∞ Control/Prevention

# American Foulbrood



- ❧ American foulbrood disease occurs throughout the world where honey bees are kept. About 3 percent of all colonies inspected in the United States are found to be infected.

# American Foulbrood



## ☞ Cause

☞ *Paenibacillus larvae ssp. larvae*, the causative organism of American foulbrood disease, is a spore-forming bacterium which produces over a billion spores in each infected larva. Only spores are capable of inciting the disease. The spores are extremely resistant to heat and chemical agents. Worker, drone, and queen larvae are susceptible to the disease. Under natural conditions, infected queen and drone larvae are rarely seen.

# American Foulbrood



## ☞ Symptoms

- ☞ Spotty brood pattern, perforated sealed brood with coffee brown sunken larvae inside, sunken sealed brood.
- ☞ Moisture on sunken sealed brood, protruding pupa tongue (rare), and rotting smell (compared to rotting meat or sulfurous chicken house).
- ☞ Light to dark brown or black scale that is hard to remove.
- ☞ Often colonies next to infected colonies will show symptoms of the disease.
- ☞ Larvae rope at least 2 cm.

# Healthy Brood



# American Foulbrood



# American Foulbrood



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# American Foulbrood



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# American Foulbrood



## ☞ Diagnosis

- ☞ A good field test is the “ropey” test. Stick a toothpick into a capped cell and draw out the dead larvae/pupae. The “rope” should stretch about 2 cm.
- ☞ American Foulbrood also has a characteristic odor
- ☞ Field Test kits
- ☞ State Bee Inspector
- ☞ Lab testing is necessary for definitive diagnosis

# American Foulbrood



## Transmission

- Introduced to the hive by drifting bees from nearby colonies
- Infected equipment/tools, beekeepers and robbing
- AFB is very contagious and all equipment must be cleaned before using it in healthy hives
- Nucs (nucleus hives)
- Infected Honey - do not feed store bought or honey from other beekeepers to your bees

# American Foulbrood



- ❧ Control/Prevention/Treatment
  - ❧ Good management practices.
  - ❧ Inspection by state bee inspector
    - ❧ You must follow his instructions
  - ❧ Destroy equipment by burning: It is best to burn all colonies infected with AFB.
  - ❧ There is no recommended treatment for AFB

# European Foulbrood



☞ In some areas, European foulbrood is a more serious threat to beekeepers than American foulbrood. This disease is serious because it occurs most frequently at the time that colonies are building their peak populations, often before honey flows.

# European Foulbrood



## ☞ Cause

☞ European Foulbrood (*Melissococcus plutonius*) is transmitted when the bacteria become mixed with the bee bread, nectar or diluted honey, and then fed to young larvae. The bacteria then replicate in the larvae mid-gut, killing the larvae within 4-5 days. This causes the larvae to die before sealed in most cases.

# European Foulbrood



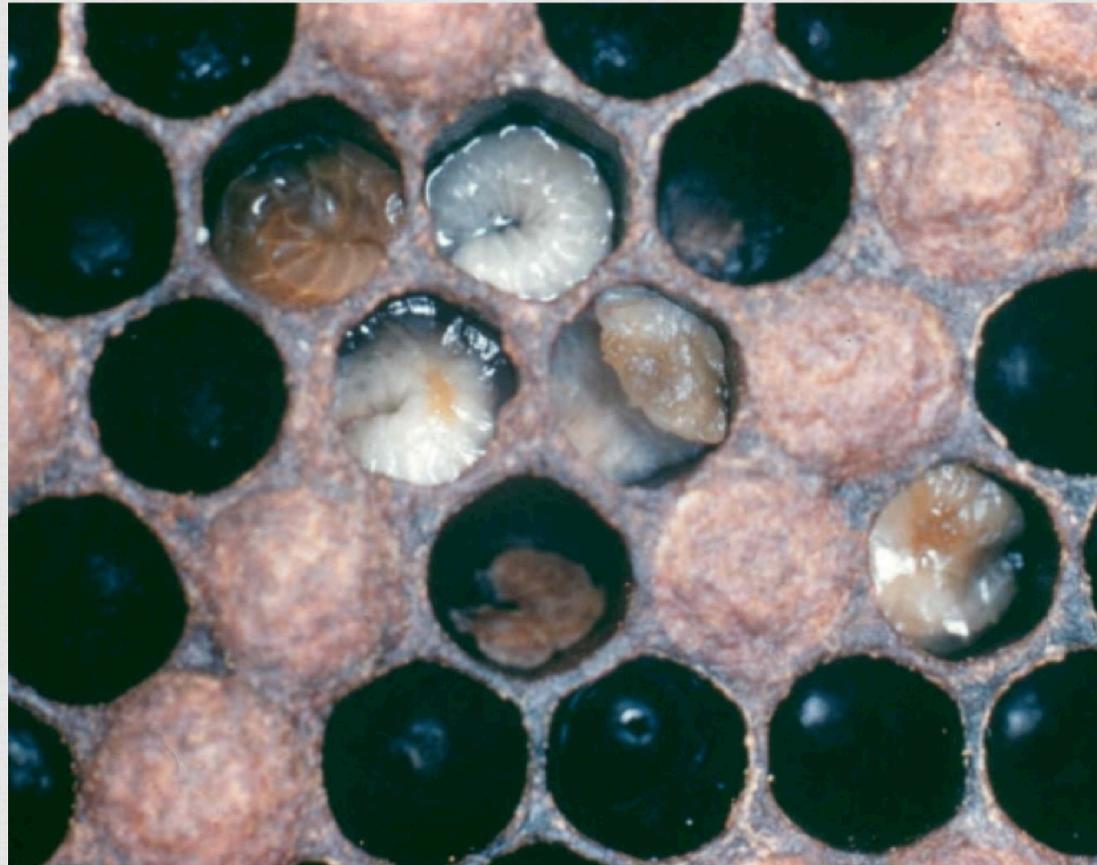
## ☞ Symptoms

- ☞ Spotty brood pattern, whitish-yellow to brown larvae, curled upward or twisted.
- ☞ Deflated larvae in the bottom of the cell with a defined tracheal system.
- ☞ Odors produced can be sour or fish-like, or no odor at all (different odors can come from secondary bacteria.) Scale is usually from brown to black sunken to the bottom of the cell.
- ☞ Outside frames of the brood nest are usually infected first.

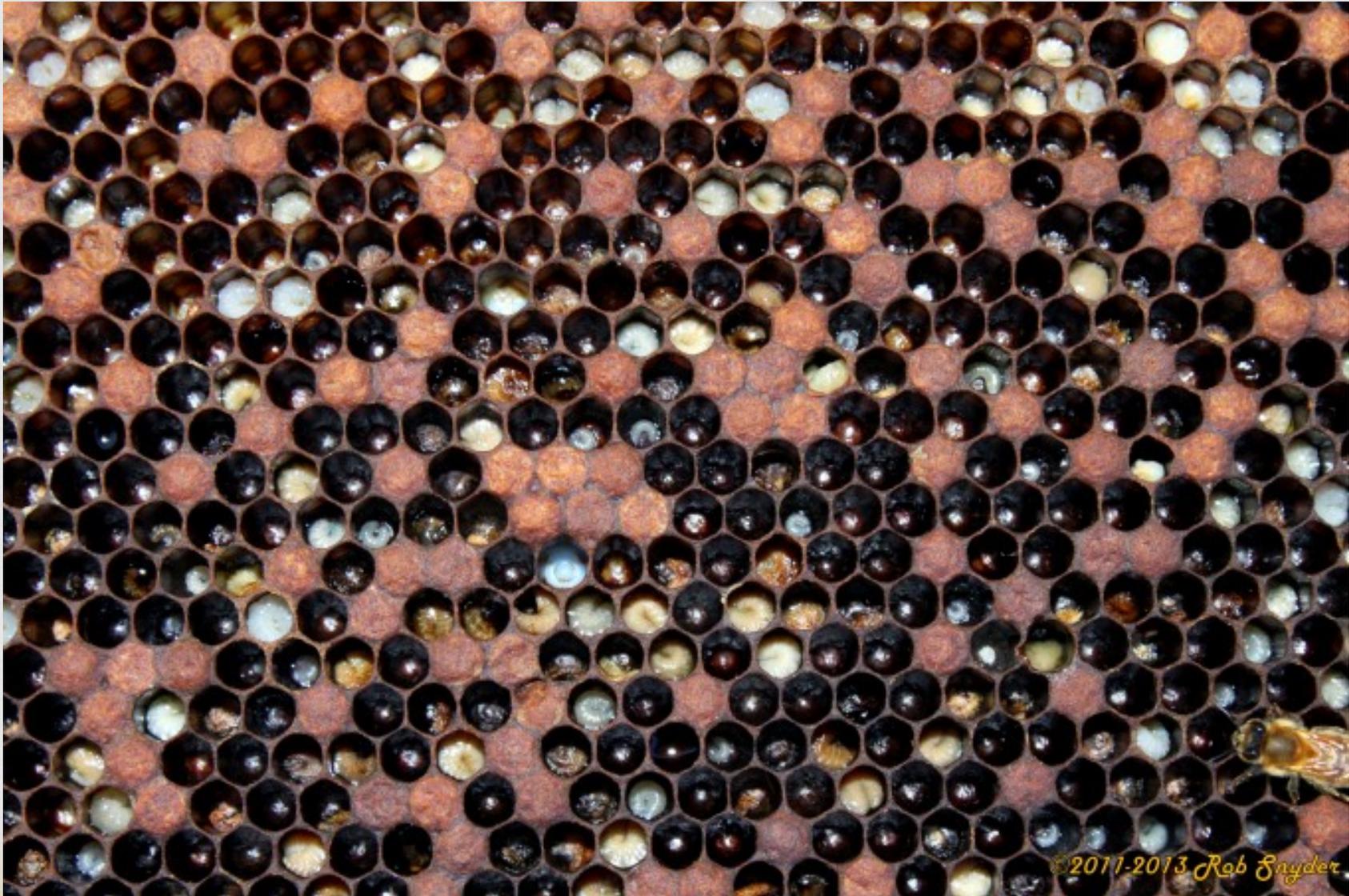
# European Foulbrood



# European Foulbrood



# European Foulbrood



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# European Foulbrood



## Transmission

- Infected equipment/tools, beekeepers and robbing
- EFB is very contagious and all equipment must be cleaned before using it in healthy hives
- Nucs (nucleus hives)
- Infected Honey – do not feed store bought or honey from other beekeepers to your bees

# European Foulbrood



- ❧ Control/Prevention/Treatment
  - ❧ Good management practices.
  - ❧ Inspection by state bee inspector
    - ❧ You must follow his instructions
  - ❧ The recommended treatment for EFB is Terramycin
  - ❧ Vet must assist diagnosis and prescribe the treatment for EFB
    - ❧ Follow the label - IT IS THE LAW

# Chalkbrood



# Healthy Brood



# Infected Brood



# Chalkbrood



## ☞ Cause

- ☞ (Ascosphaera Apis)

- ☞ Fungus (spores viability: 15 years)

## ☞ Symptoms/ Diagnosis

- ☞ Spotty brood pattern.

- ☞ Chalk-like mummies at the colony entrance, chalk-like mummies in open brood.

- ☞ Early stages of chalkbrood look very similar to SBV but the head is less defined and more round with a sunken appearance.

# Chalkbrood



## ☞ Treatment

- ☞ Apiguard or thymol based products are active against Chalkbrood
- ☞ Increase ventilation
- ☞ Re-queening

# Sacbrood Virus



# Sacbrood Virus



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# Sacbrood Virus



## ☞ Cause

☞ Sacbrood Virus (*Morator aetatulas*) often appears during spring or colony buildup and causes larval death.

## ☞ Symptoms/ Diagnosis

☞ Perforated sealed brood, pupae present with undeveloped head.

☞ Color ranges from pearly white to pale yellow to brown and eventually to black, when it is in scale form it is brittle and easily removed.

# Sacbrood Virus



## Transmission

Worker bees spread virus by:

- Feeding young uninfected larvae
- Exchanging food with other adult bees
- Contaminating food stores

## Treatment

The only known treatment is to re-queen.

# Nosema



- ❧ Nosema is a genus of microsporidian parasites that infect the digestive tract of the honeybee.
- ❧ Nosema disease in U.S. honey bees is caused by one of two (or both) fungi named *Nosema apis* and *Nosema ceranae*
- ❧ Nosema disease is difficult to diagnose without using laboratory equipment.

# Nosema



## ☞ Nosema Apis

- ☞ Most problematic in the winter and spring
- ☞ Bees will begin to expel waste in the hive and on the outside (dysentery)
- ☞ Brown spotting on the outside of the hive will appear
- ☞ Affects mostly worker bees
- ☞ Bees may be unable to fly (crawling around) due to disjointed wings
- ☞ Lack of progression in hive build up
- ☞ May requeen themselves (supersedure)

# Nosema



## ☞ Nosema ceranae

- ☞ Can affect a hive at any time of the year
- ☞ Can cause rapid colony decline
- ☞ No symptoms will be present
- ☞ Lack of progression in hive build up
- ☞ May requeen themselves (supersedure)

# Nosema



## Control

- Good management practices
- Maintain healthy hives
- Good supply of protein pollen in the fall
- Replace old frames
- Clean equipment
- Honey-B Healthy, Pro-health,  
Lemongrass/Spearmint oils added to sugar syrup

# Nosema



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



# Varroa Mites



- ❧ *Varroa destructor* is an external parasitic mite that attacks the honey bees *Apis cerana* and *Apis mellifera*.
- ❧ The disease caused by the mites is called *varroosis*.
- ❧ *Varroa destructor* can only reproduce in a honey bee colony. It attaches to the body of the bee and weakens the bee by sucking fat bodies.
- ❧ In this process, RNA viruses such as the deformed wing virus (DWV) is spread to bees.

# Varroa Mites



- ❧ A significant mite infestation will lead to the death of a honey bee colony, usually in the late autumn through early spring.
- ❧ The *Varroa* mite is the parasite with the most pronounced economic impact on the beekeeping industry.
- ❧ It may be a contributing factor to colony collapse disorder, as research shows it is the main factor for collapsed colonies in Ontario, Canada and Hawaii, USA.

# Varroa Mites



- ❧ Mites reproduce on a 10-day cycle.
- ❧ The female mite enters a honey bee brood cell. As soon as the cell is capped, the *Varroa* mite lays eggs on the larva.
- ❧ The young mites, typically several females and one male, hatch in about the same time as the young bee develops and leave the cell with the host. When the young bee emerges from the cell after pupation, the *Varroa* mites also leave and spread to other bees and larvae. The mite preferentially infests drone cells.

# Varroa Mites



- ❧ Why are the mites killing our bees?
  - ❧ Bring in opportunistic bacterial and viral infection
  - ❧ Weaken bees' immune system thus allowing other diseases to kill the colony
  - ❧ Directly damage workers

# Bacteria, Fungus, & Viruses



## ❧ Bacterial

- ❧ American foulbrood
- ❧ European foulbrood

## ❧ Fungal diseases

- ❧ Chalkbrood

## ❧ Viral diseases

- ❧ Chronic paralysis virus
- ❧ Acute bee paralysis virus

❧ Israeli acute paralysis virus

❧ Kashmir bee virus

❧ Black queen cell virus

❧ Cloudy wing virus

❧ Sacbrood virus

❧ Deformed wing virus

# Deformed Wing Virus



# CPV



# K-Wing Virus



# Treatment for Varroa Mites?



**YES**

# How, when and what?



☞ Mite Counting is your first step!

☞ Sticky boards

☞ Drone brood sampling

☞ Sugar roll – less effective

☞ Alcohol roll – more effective

☞ When to count?

☞ Packages – Starting in June

☞ Nucs – Starting in June

☞ Every 3 week or so

☞ Before AND after treatments

# Small Hive Beetle



# Small Hive Beetle



- ❧ It is called: Aethina tumida
- ❧ June 1998, discovered in U.S (Florida)
- ❧ Transported via packages to other states, included Massachusetts
- ❧ Destructive to colonies
- ❧ Prefers sandy soil
- ❧ Heavy infestation may cause hive abandonment

# Small Hive Beetle



- ❧ Infects stored frames and honey in the comb awaiting extraction
- ❧ Discoloration and fermentation of honey
- ❧ Damage caused by feeding activity of the larvae
- ❧ Rapid collapse of otherwise strong colonies
- ❧ The small beetle is black and can be found moving rapidly inside the hive when exposed to sun light.

# Small Hive Beetle



# Small Hive Beetle



## ☞ Treatment

- ☞ Healthy Strong hives
- ☞ Good hive management
- ☞ Small Hive Beetle Traps



# Wax Moth Larvae

- ❧ Complete metamorphosis:  
egg, larva, pupa, adult
- ❧ Larvae tunnels into wax
- ❧ Debris in comb



# Wax Moth



- ❧ *Galleria mellonella*
- ❧ Large loss of stored comb
- ❧ Prefers warm, year-round temps
- ❧ Does not kill colony but can be early warning signal
- ❧ Weak colonies susceptible
- ❧ Treatment/prevention
  - ❧ Cold
  - ❧ Heat



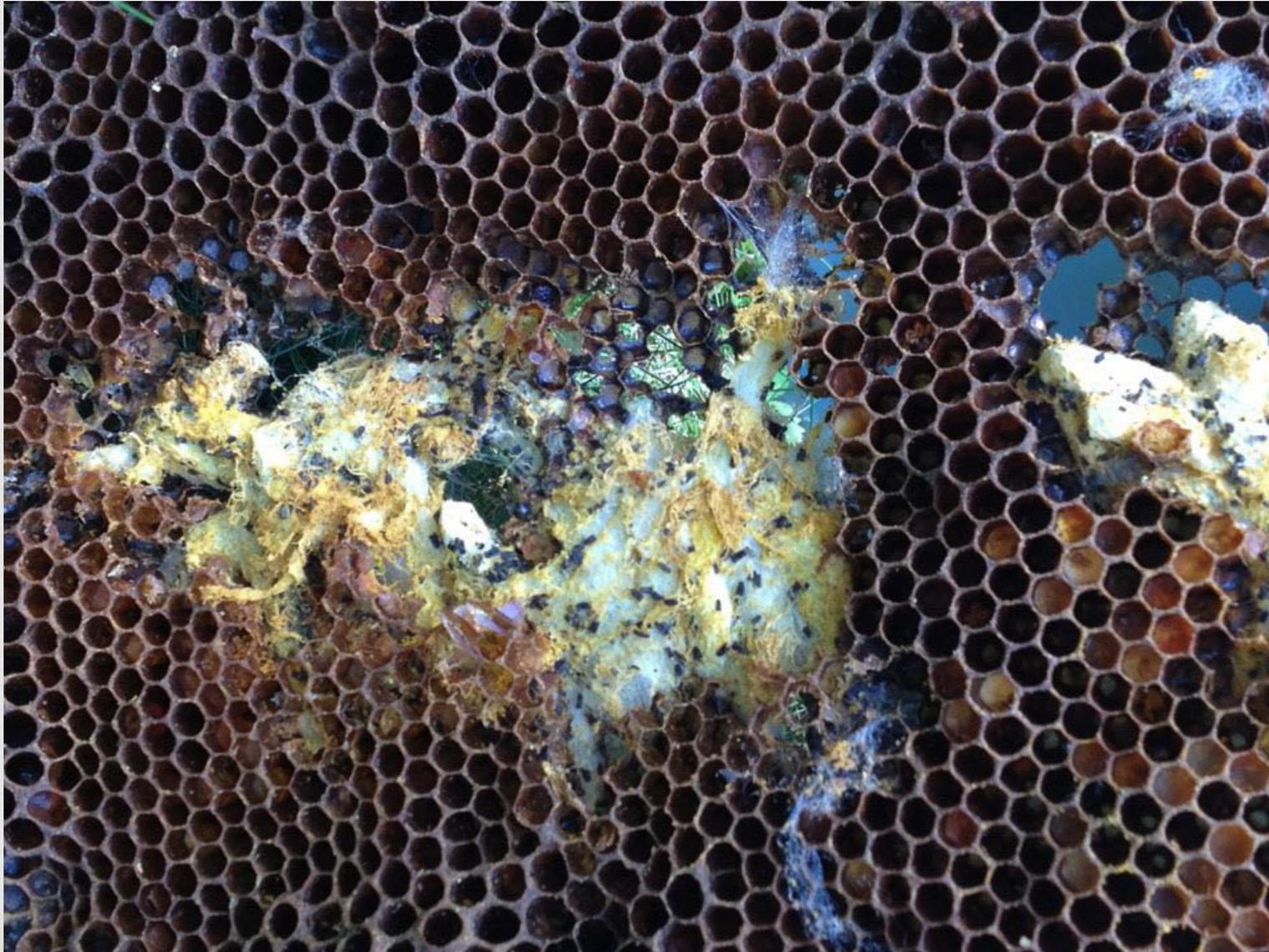
# Wax Moth Larvae on Frames



# Wax Moth Infestation



# Wax Moth Infestation



# Wax Moth Infestation



# Wax Moth Treatment



## ❧ Cold

❧ 4.5 hours @ 20° f / -7° c

❧ 4.3 hours @ 10° f / -12.2° c

❧ 4.2 hours @ 5° f / -15° c

## ❧ Hot

❧ 80 minutes @ 115° f / 46° c

❧ 40 minutes @ 120° f / 49° c

# Integrated Pest Management



- ∞ Threshold
  - ∞ Acceptable level of infestation
  - ∞ Treatment
- ∞ Mechanical vs. Chemical
- ∞ Organic vs. Synthetic
- ∞ Read the label....It's the law!