



Honey Bee Maladies

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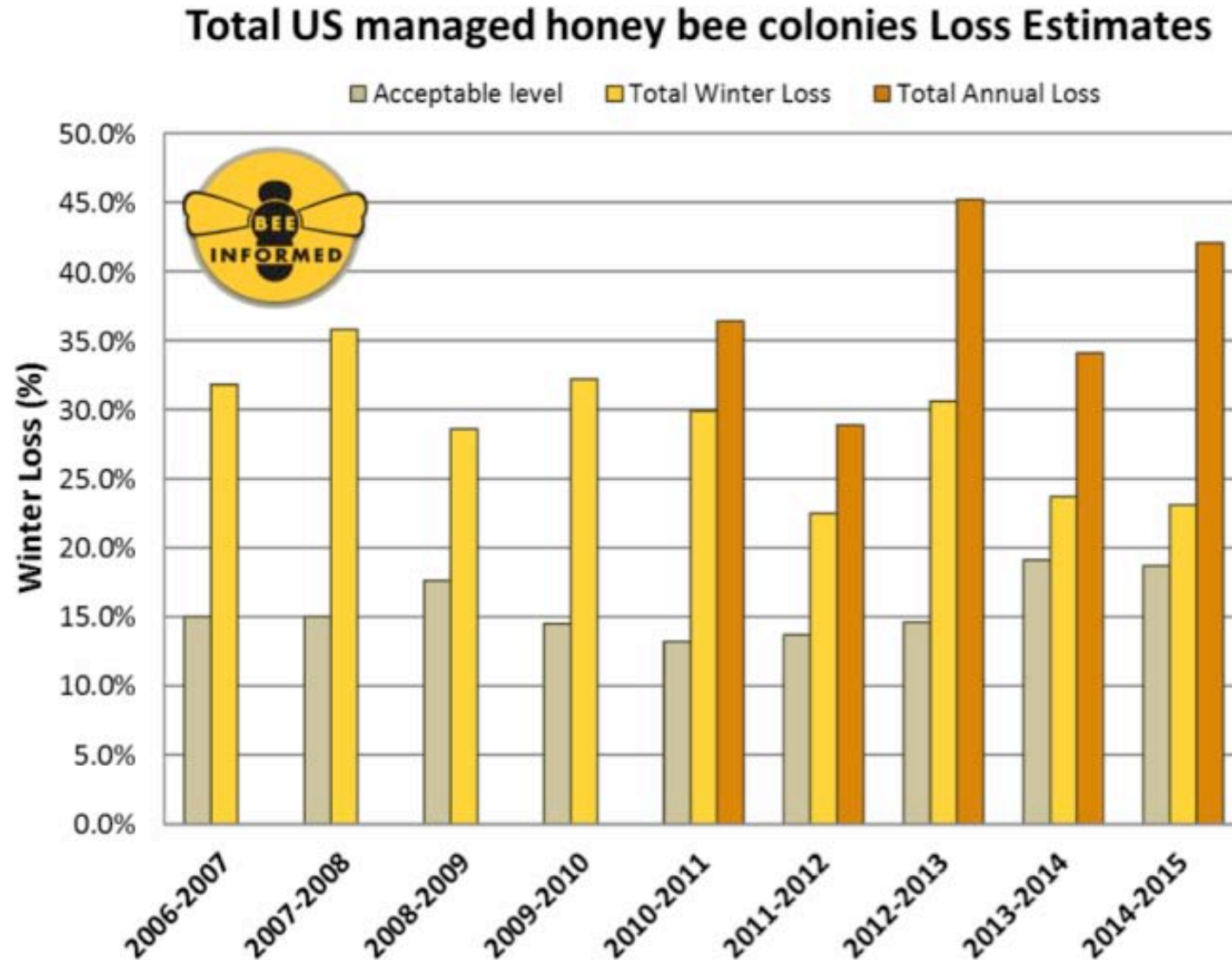
Cooperative Extension



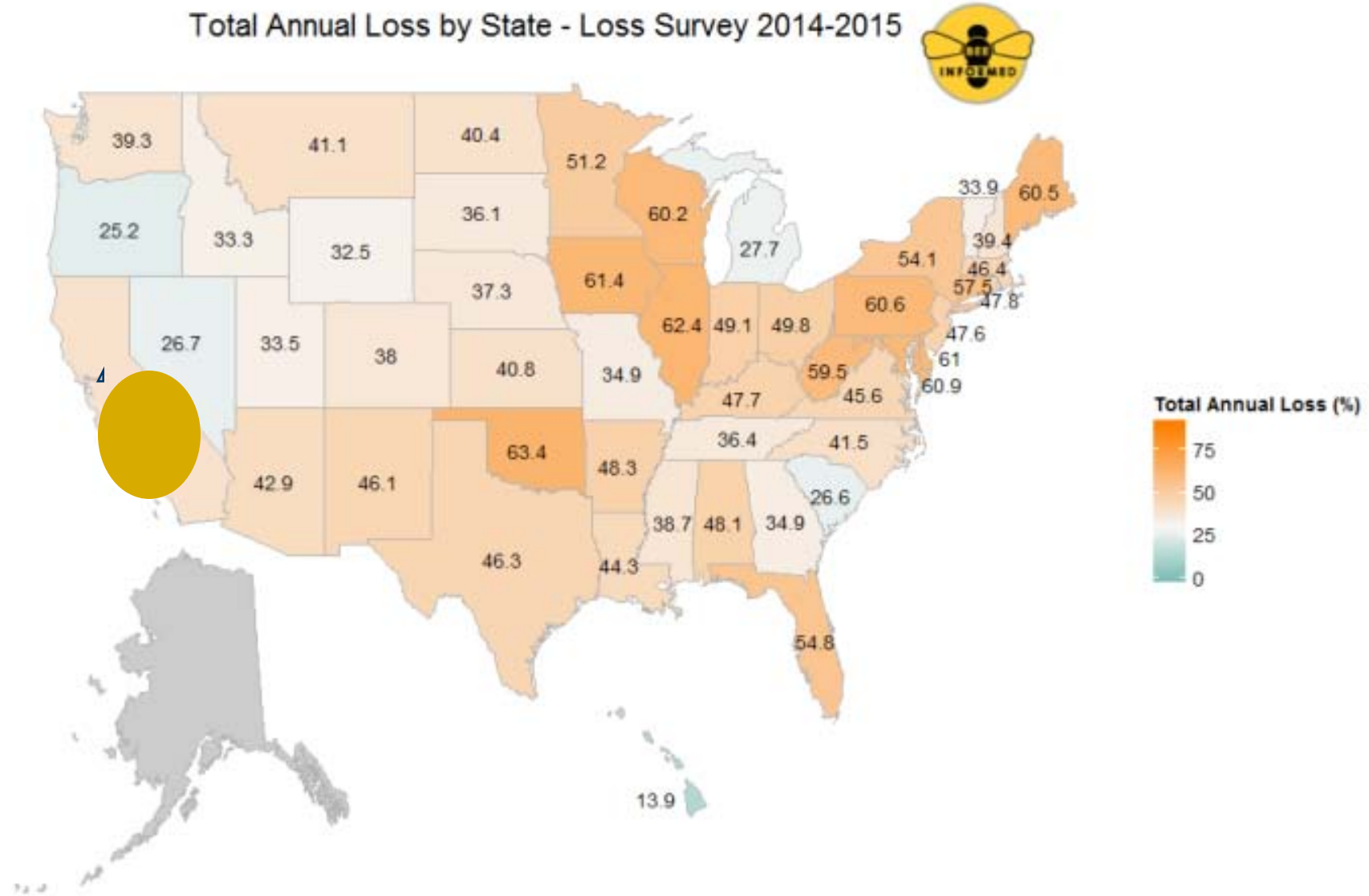
Welcome to the University of California, Davis
Department of

ENTOMOLOGY

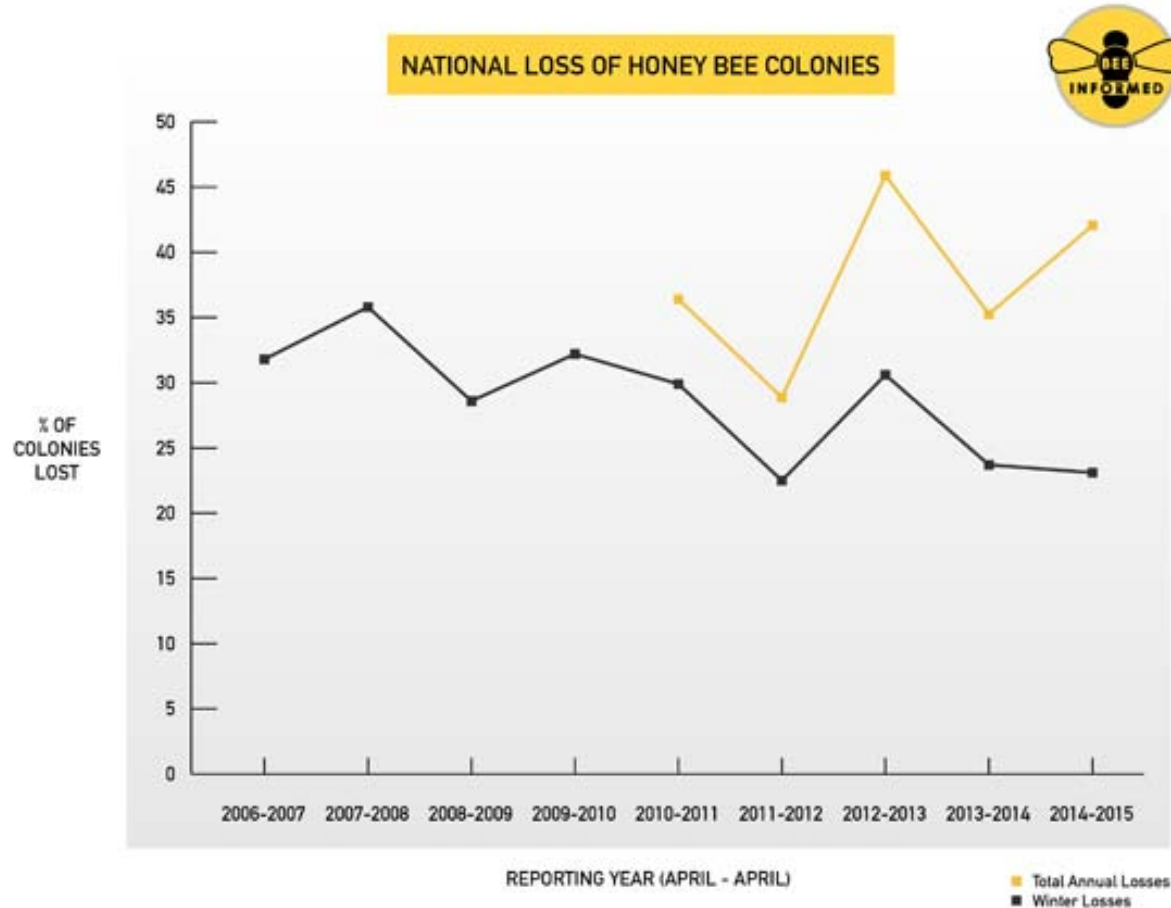
How are honey bees doing these days?



What about California?



2014-2015 preliminary results



Top causes

Backyard beekeepers

Winter

Starvation

Weak colonies

Varroa mites

Sideline and commercial
beekeepers

Varroa mites

Queen failure

Pesticides

But wait! What about CCD?

- A syndrome characterized by a specific set of symptoms *(Cox-Foster et al. 2007)*

- **Rapid loss of adult workers** with disproportionately high brood population and the presence of the queen
- **Lack of dead bees** in and around the hive
- **Delayed invasion** by hive pests and **robbing** by nearby hives

- Reported only by ~ 7% beekeepers in 2013-2014 *(Steinhauer et al. 2015)*

NOT CCD



CCD



What causes CCD?

A Metagenomic Survey of Microbes in Honey Bee Colony Iridovirus and Microsporidian Linked to Honey Bee Colony Decline

REVIEW ARTICLE



ulich³,

Synergistic Effect of Multiple Factors

Bulletin of Insectology 65 (1): 99-106, 2012
ISSN 1721-8861

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In situ replication of honey bee colony collapse disorder

Rec Chensheng LU¹, Kenneth M. WARCHOL², Richard A. CALLAHAN³

*Cr ¹Depart Short communication

²Worces

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Nutritional stress due to habitat loss may explain recent honeybee colony collapses

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Abstract Department of Biology, Colorado State University, Fort Collins, CO 80523, USA

The conc
ony colla
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ABSTRACT

In spite of the tremendous public interest in the recent large honeybee losses attributed to colony collapse disorder, there is still no definitive explanation for the phenomenon. With the hypothesis that nutritional stress due to habitat loss has played an important role in honeybee colony collapse, I analyze

What affects honey bees?

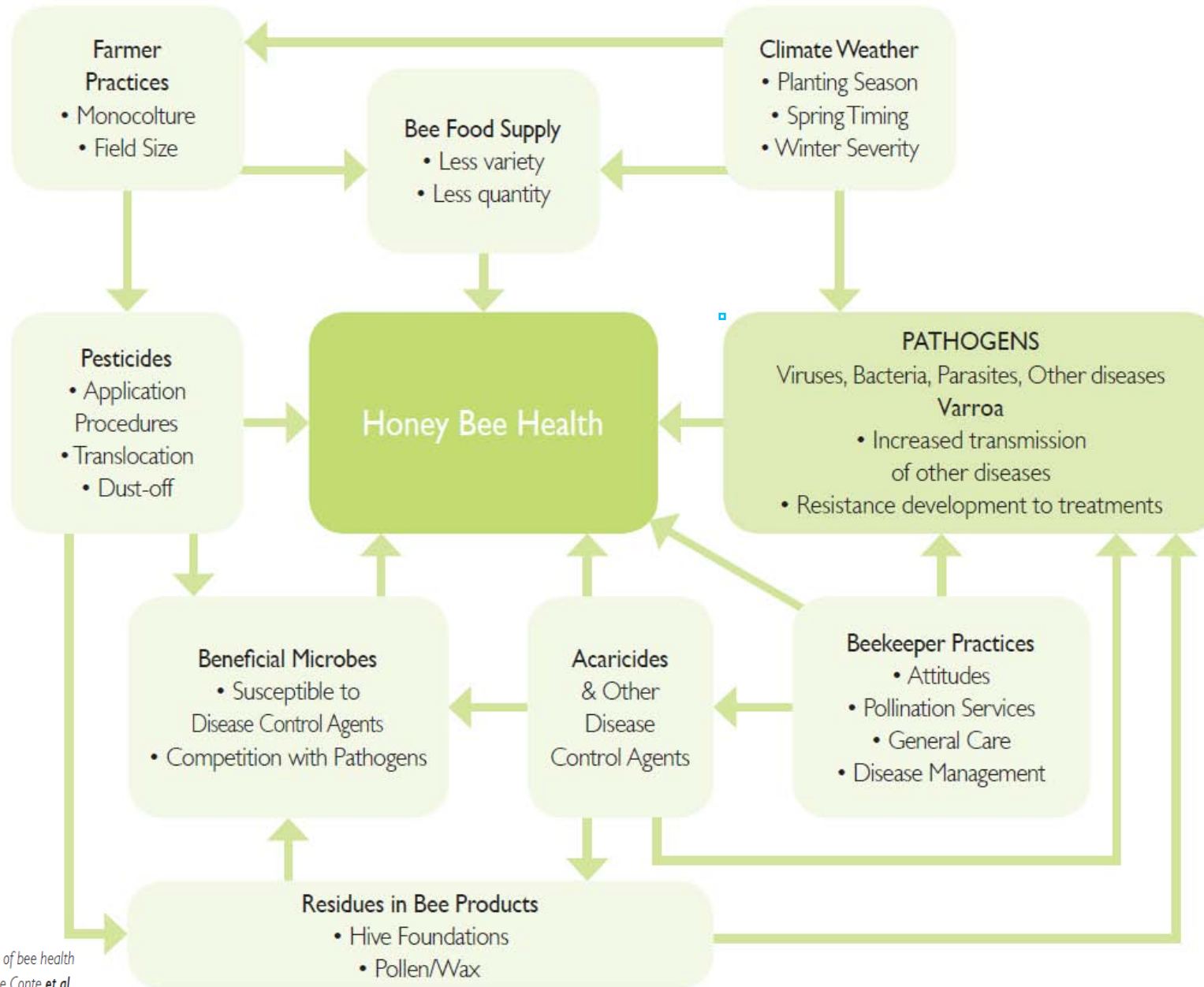


Figure 6. Interrelationship of bee health Stressors Adapted from Le Conte *et al.*, 2010,

Diseases

• Brood

- American Foulbrood
- European Foulbrood
- Chalkbrood
- Various viruses
- Sacbrood*



• Adult

- Nosema
- Various viruses (23 thus far)



Parasites and Pests

• Parasites

- Varroa mites
- Tracheal mites*



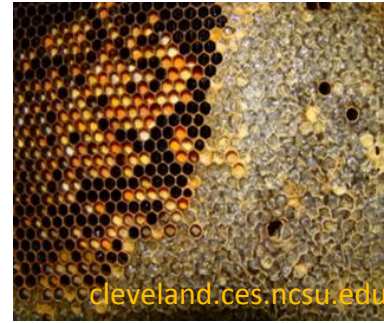
• Pests

- Small Hive Beetle
- Wax moths
- Mice
- Ants



What does a healthy colony look like?

- Queen present
- Many adult worker bees
- Good brood pattern
- Lots of pollen and honey



Healthy Eggs

- One per cell
- Attached to the bottom of the cell
- Look like a small grain of rice



Healthy Brood

- White grubs
 - Lots of food in the bottom of the cell
- “C” shaped
- Plump
- Pearly white with a glistening appearance
- Will fill the cell as they continue to grow



Healthy Capped Brood

- Brood pattern is mostly solid
- Cappings are medium brown
 - Convex and without punctures



Healthy Developing Pupae

- Remain white, plump & glistening during initial development
- As they change to adult they change the coloring
 - Eyes are the first to change color



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BROOD DISEASES

Chalkbrood



- Fungal disease
- Workers, drones, queens susceptible
- Larvae ingest spores
- Die at 6-7 days of age
- Dead brood “mummies”
- Only disease you can diagnose from outside of the colony
- Trt: strong colonies, good management, re-queening with hygienic queens

Foulbrood Diseases

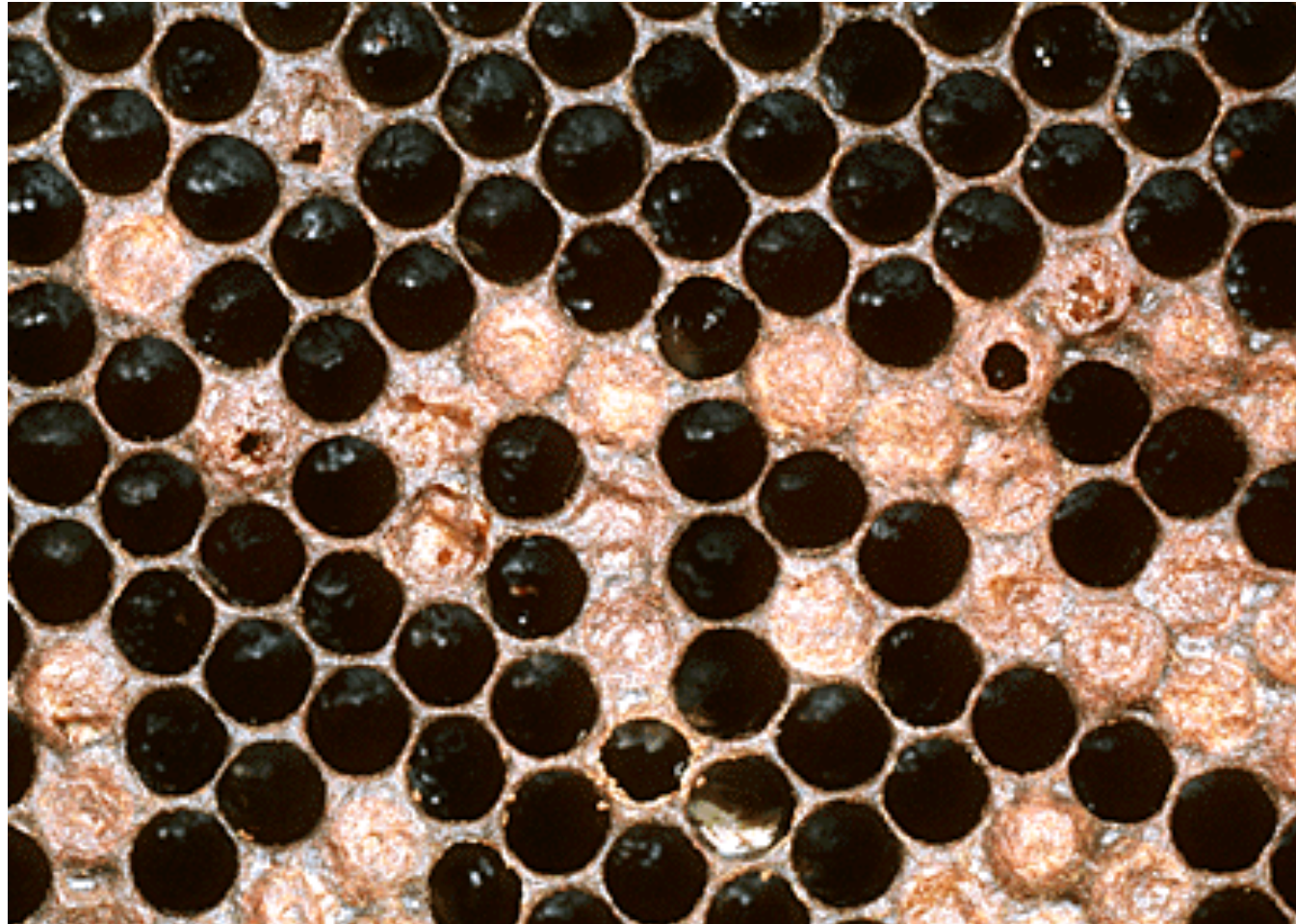
- American foulbrood
 - European foulbrood
- Both are bacterial diseases
 - Antibiotics can be used to treat both, but may not be desirable

American Foulbrood (AFB)

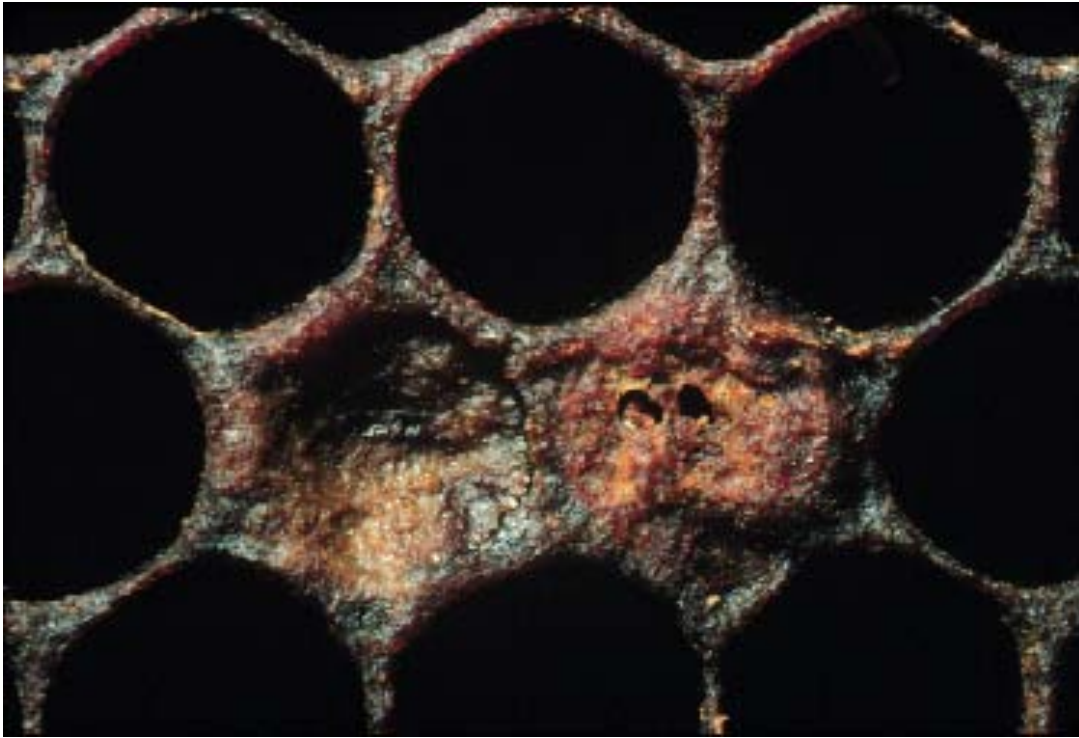
- Causative Agent:
Paenibacillus larvae
- Most deadly brood disease
- Highly contagious
- All involved should be able to recognize and take action!



Irregular Brood Pattern



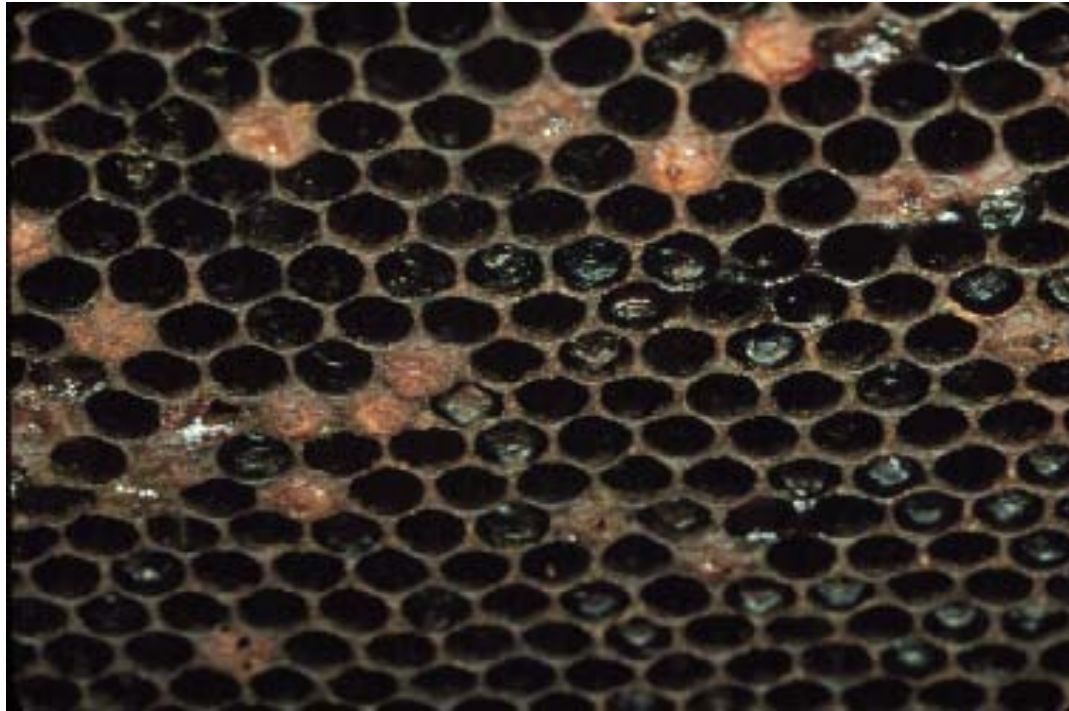
AFB - Symptoms



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- Larvae become infected when > 2 days old
- Die typically just after cell is capped
- Brood pattern is scattered
- Cappings are sunken and punctured

American Foulbrood (AFB)



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Highly contagious

- Spore forming bacterium
- Larva becomes dry to a hard scale that adheres tightly to the cell
- Each scale - 100 million spores

AFB - Symptoms

- Larvae “melt down”
- Light brown turning to dark brown then becoming a black scale
- Larvae ‘rope’ out an inch or more



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AFB - Symptoms



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- Pupal Tongue
 - When brood dies in the pupal stage
- Diagnostic of AFB

American Foulbrood CONTROL

- Be able to recognize this disease
 - Diligently look for disease year-round
- Have a foulbrood action plan
 - Take action immediately



AFB - Control

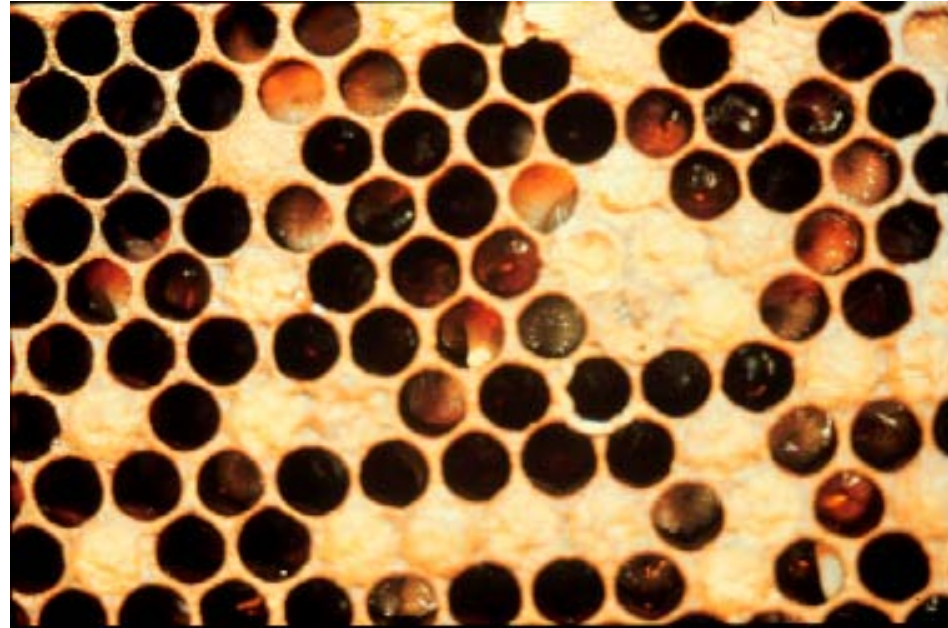
- Treating AFB
 - Antibiotics
 - Tylosin
 - Doesn't treat spores
 - Burning
 - Burying in Hazmat field
 - Gamma radiation



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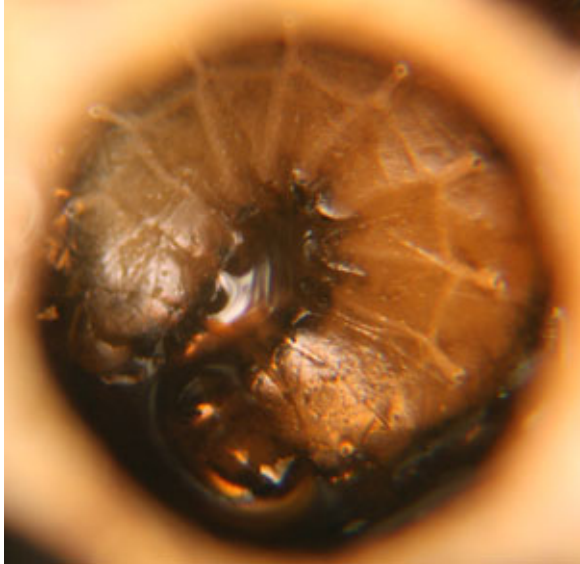
European Foulbrood (EFB)

- Causative Agent:
Melissococcus pluton
- Is also highly contagious
 - Does not form spores
 - Scales loose, easily removed
- Considered a stress disease
 - Usually clears up with a honey flow



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EFB - Symptoms





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- Larva die before the cell is capped, still in 'c' shape
- Infected larvae are blotchy and twisted up in the cells
- Trachea more defined
- Remains do not 'rope out' for more than about 1.5 cm

EFB - Control

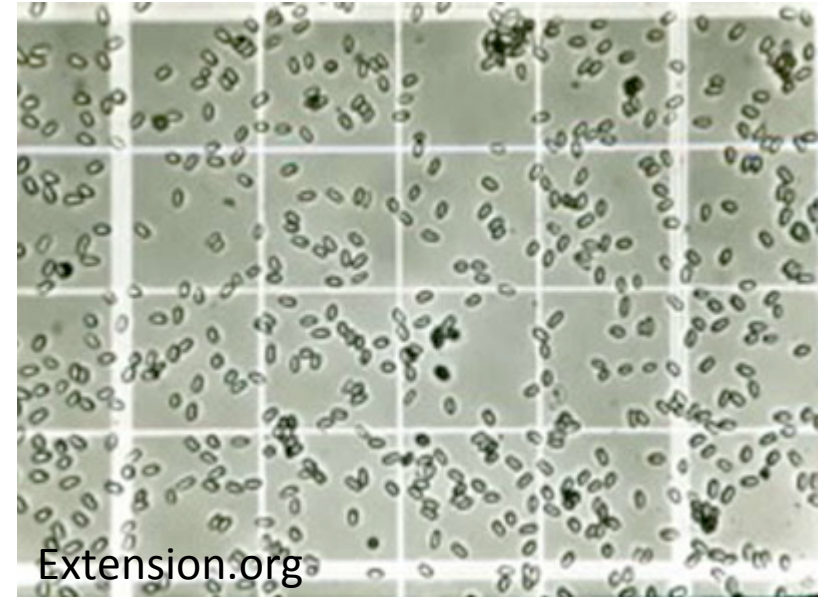
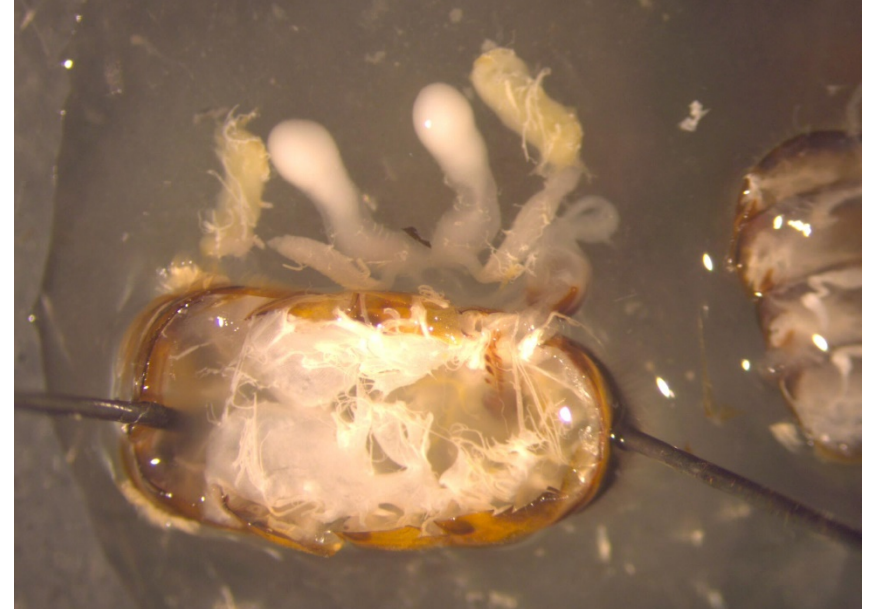
- Treating EFB
 - Re-queening with hygienic queen
 - Antibiotic (Tylosin)

European foulbrood	American foulbrood
	
<ul style="list-style-type: none"> • Can be slightly ropey with threads less than 1.5cm, but usually not ropey. • Odor: sour or none • Scale: brown to black, rubbery • Stage of Brood: before capped • Appearance: twisted, dull to yellow to dark brown, tracheal tubes often visible 	<ul style="list-style-type: none"> • Coffee color, ropey with a fine thread about 2.5cm • Odor: sulfurous, “chicken house” • Scale: brown to black, brittle • Stage of Brood: after capped • Appearance: chocolate brown to black, perforated cappings
<p><i>Fig.3: Table from Shimanuki and Knox (2000) and Delaplane (1998), Ropey length from Shimanuki (1997), American foulbrood photo by Williams, USDA.</i></p>	

ADULT DISEASES

Nosema

- Spore-forming microsporidian
 - (*Nosema apis*)
 - (*Nosema ceranae*)
- Invades the digestive track of workers, queens, drones
- Spores shed in the feces of bees
- Dysentery (condition) can be a symptom of the disease (but not *N. ceranae*)



Nosema -- Treatment

- Fumagilin-B
 - In sugar syrup
 - Established colonies
 - Fall treatment
 - Packages
 - Spring treatment



Viruses



- Over 20 assoc. with bees
- Deformed wing virus
 - Associated with varroa mites
- Paralysis viruses
 - Acute bee paralysis virus (APV)
 - Chronic bee paralysis virus (CPV)
 - Israeli acute paralysis virus (IAPV)





PARASITES AND PESTS

Varroa Mites



Varroa destructor

- First discovered in the US in 1987
- Native to Asia
- Original host are the Asian honey bee *Apis ceranae*
- Preferentially reproduce on drone brood, but in *A. mellifera* will reproduce in worker brood as well

Varroa Mites

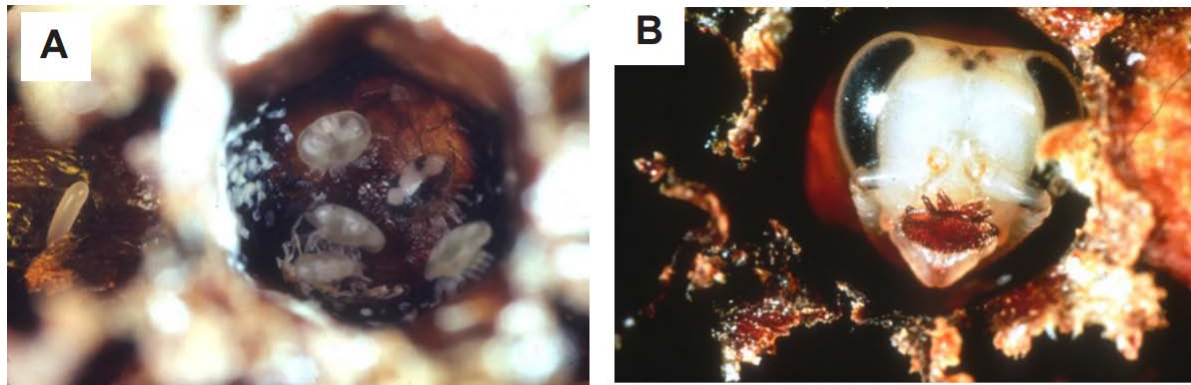


Figure 1. Varroa mites in the brood cells of the bees. A) The cell was uncapped and the honey bee pupa was removed so that you can see immature mites in the brood cell on the right, and a honey bee egg in the cell on the left. The mites must mature before the bee emerges. B) Another cell was opened to expose a mature mite on a honey bee pupa. The pupa has dark eyes and would emerge as an adult in several days. (Photo credit: Hairy Laidlaw)

Purdue extension

- #1 issue
 - Highly associated with colony loss
- Feed on hemolymph of adults and brood
- Reproduce in brood cells
- Vector virus diseases
- Suppress immune response

Monitoring Mite Levels

- Uncapping fork
- Sticky boards
- Alcohol wash
- Sugar Roll



**Several treatments available,
some more effective than others**

Small Hive Beetle - *Aethina tumida*

- Native to Africa, found in the US in 1990s
- Adults are good flyers
 - Attracted to hives (weak hives)
 - May also have aggregation pheromone
- Lay eggs in colonies (in mass)
- Larvae feed on pollen, eggs and brood
- Leave colonies to pupate in the soil and emerge as adults



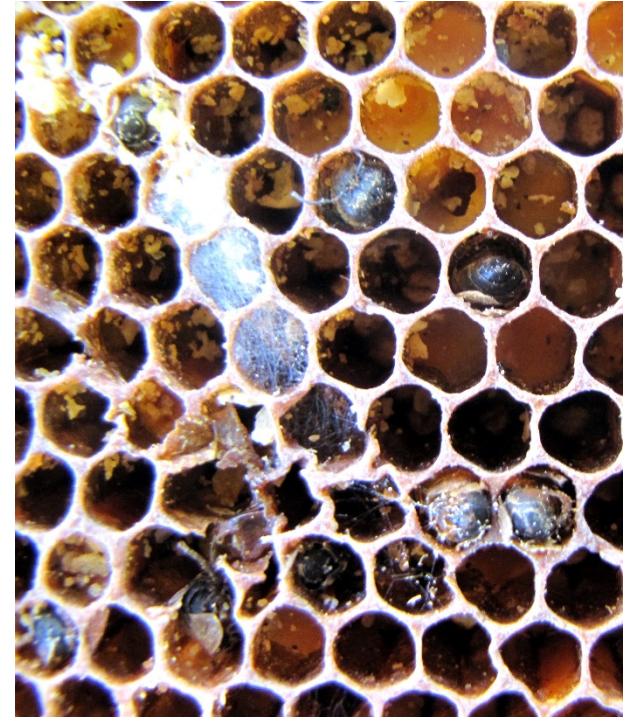
Small Hive Beetle Management

- Prevention
 - Keep hives strong
 - Keep yards and honey kitchens clean
 - Don't leave pollen patties lying around
- Mechanical Control
 - Numerous traps
- Chemical
 - Checkmite+ (AI - Coumaphos)



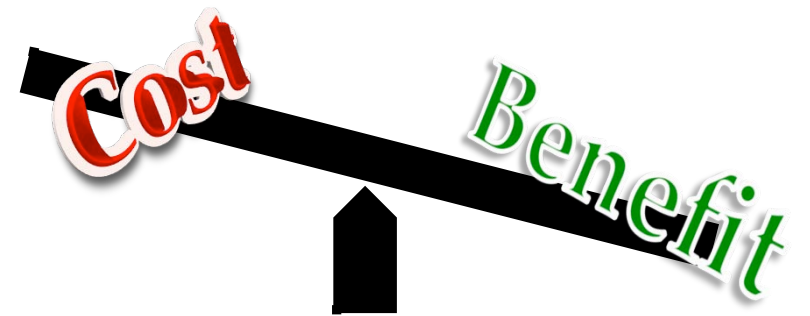
OTHERS

- Mice
- Wax moths
- Ants

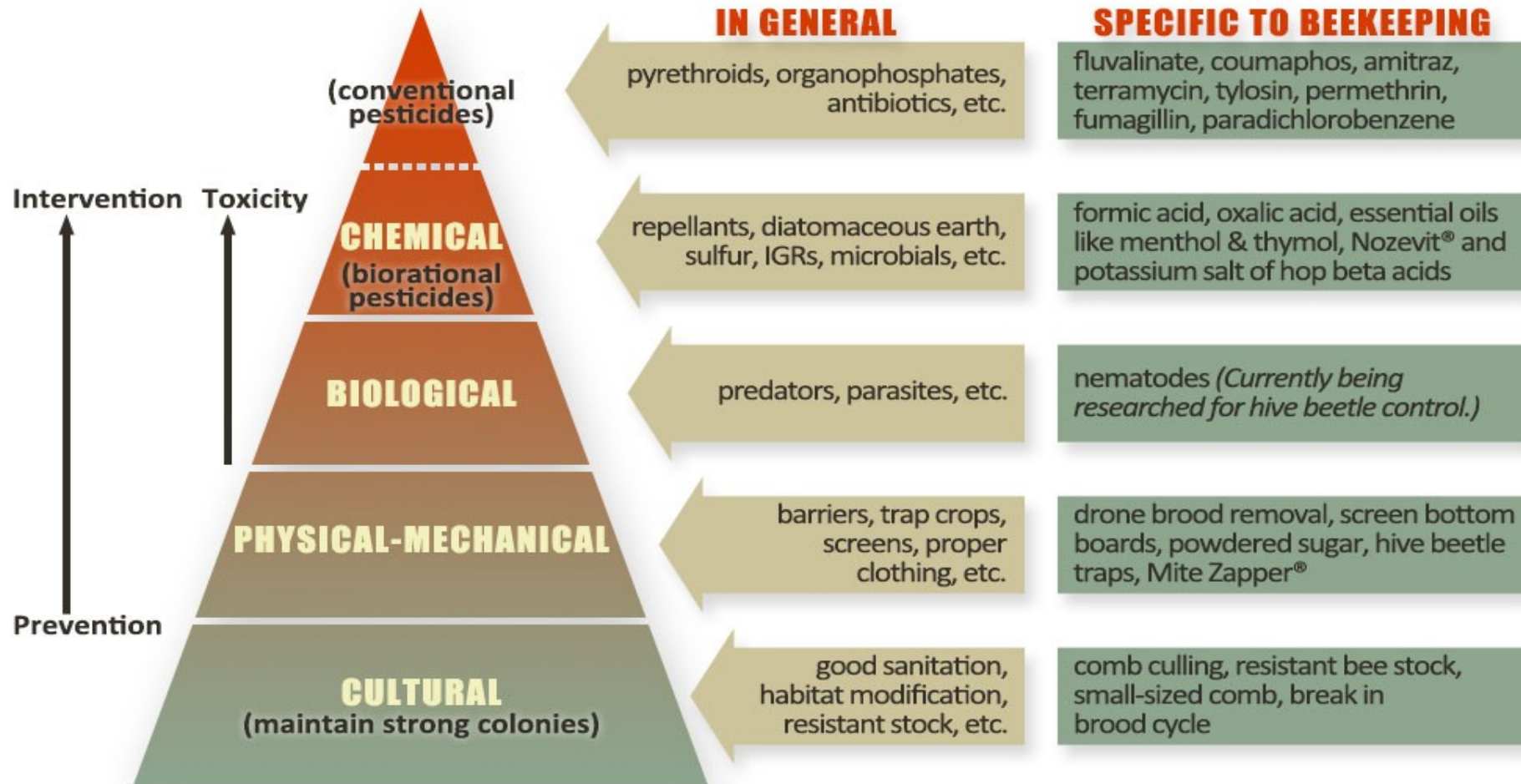


What's a beekeeper to do?

- Utilize an **Integrated Pest Management** approach
 - Decision-making process based on understanding the host and pest biology and host-pest interactions
 - Action based on thresholds
 - Uses multiple tactics
 - Safe, profitable and environmentally friendly



Pyramid of IPM tactics



Pyramid of IPM Tactics

Knowledge is power!

- Know what is going on in your hives
 - Keeping in mind **cost-benefit**
- Know host and pest/pathogen biology
- Know symptoms of specific stressors
 - **Monitor** for certain stressors (e.g., *Varroa*)
- Prevention rather than intervention
 - **Have a plan** for prevention and treatment if necessary



Questions???

