

# Honeybees and American Foulbrood



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# Importance of Honeybees to Agriculture

- Approximately one third of our diet is derived directly or indirectly from insect-pollinated plants.
- USDA estimates that 80% of insect crop pollination is done by honeybees.
- Honeybee pollination has an annual direct value to U.S. agriculture of \$15-20 billion.

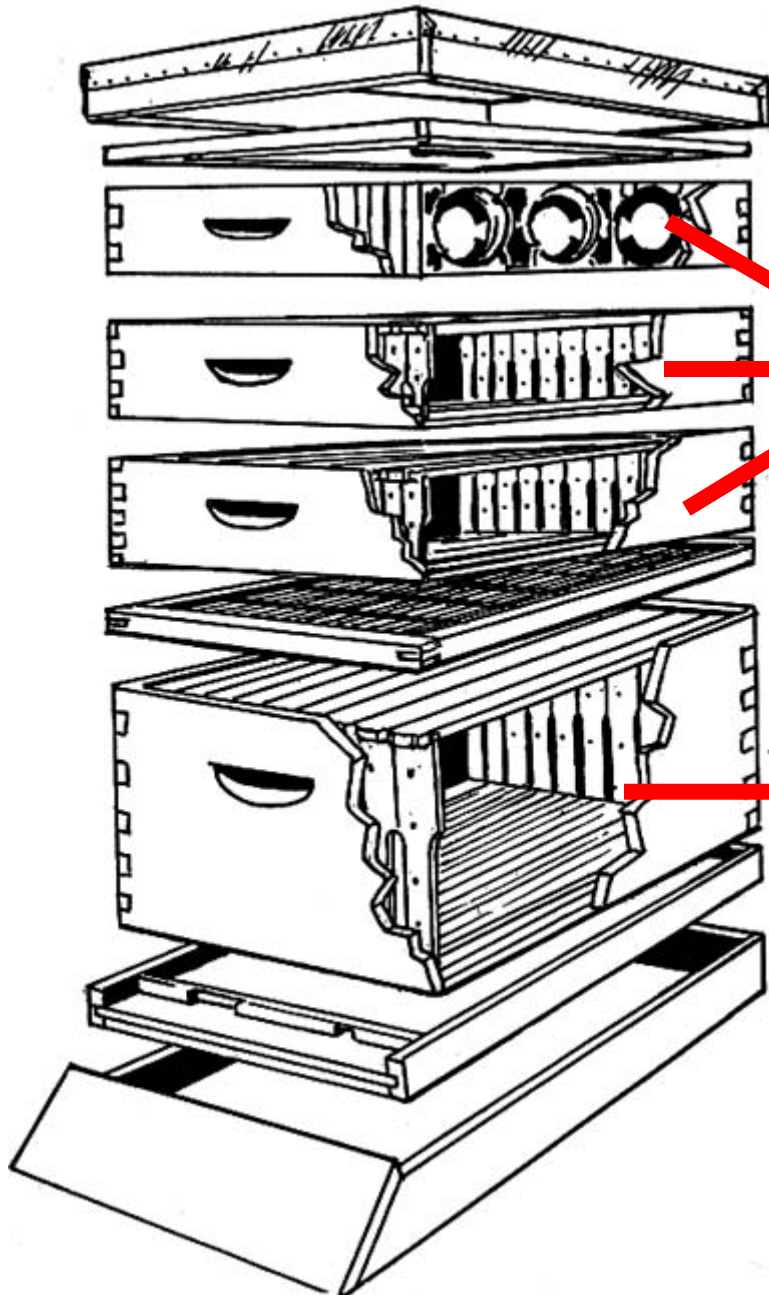


Honeybees form an important cornerstone in the foundation of modern agricultural production.





# Langstroth Beehive



Honey Supers

Brood Chamber (2)

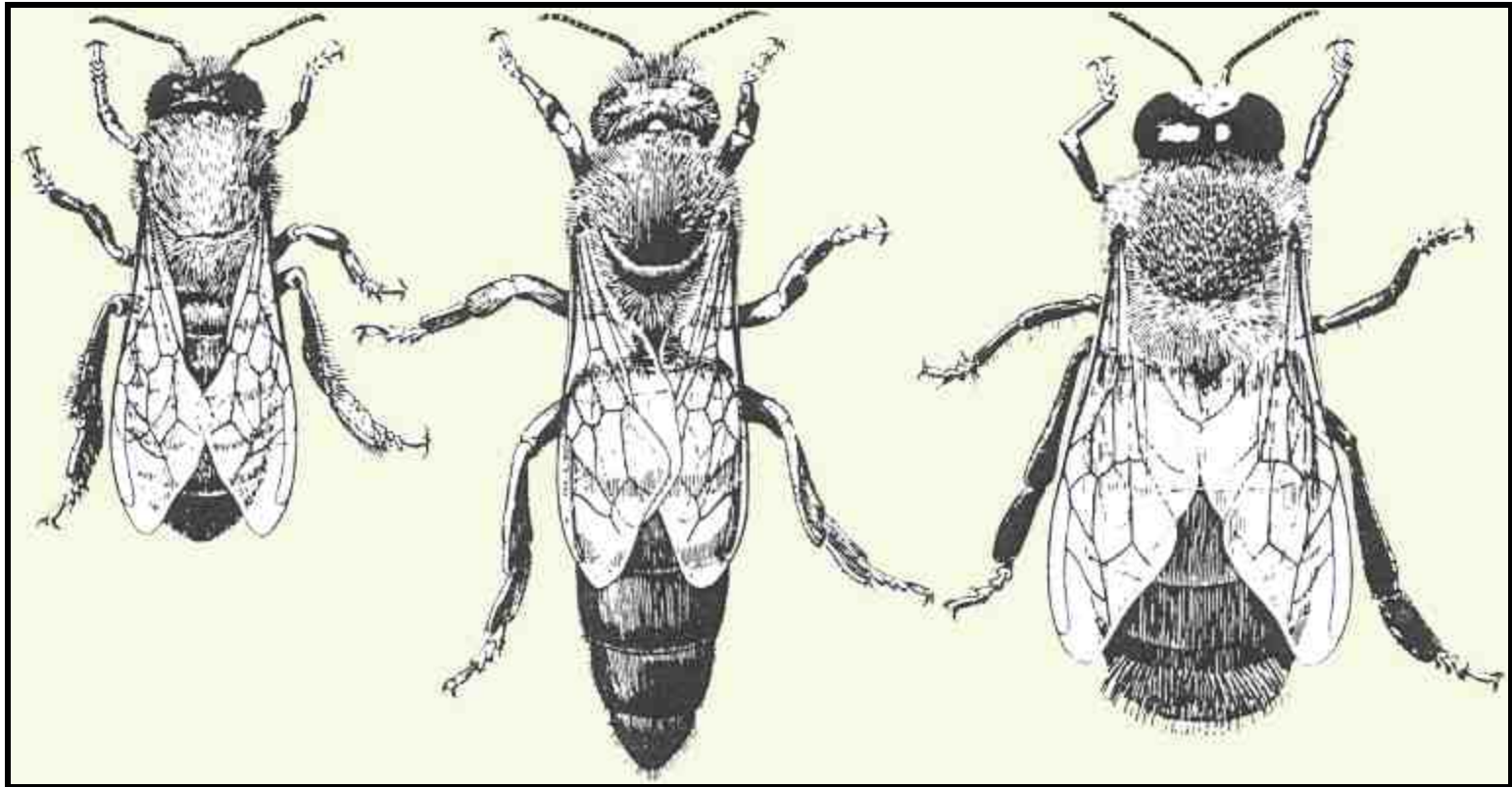


# Honey Bee Caste

Worker

Queen

Drone



# Honey Bee Development Cycle

- Egg Phase
- Larva Phase
- Pupa Phase
- Adult Phase





# Honey Bee Diseases

- Nosema (*Nosema apis* & *Nosema ceranae*)
- Viral infections (e.g., CBPV, ABPV, IAPV)
- Varroa mite (*Varroa destructor*)
- Chalkbrood (*Ascosphaera apis*)
- European Foulbrood (*Melissococcus pluton*)
- American Foulbrood (*Paenibacillus larvae*)





# American Foulbrood



Aristotle credited with the first description of foulbrood diseases.

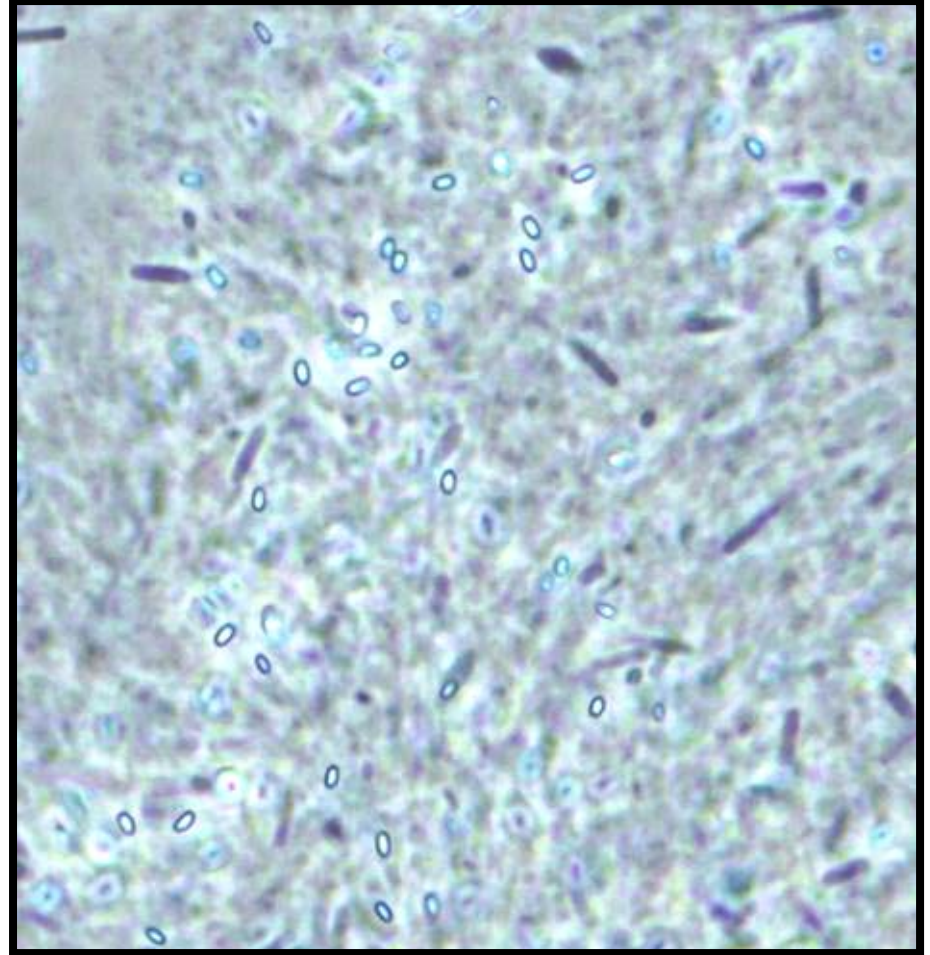
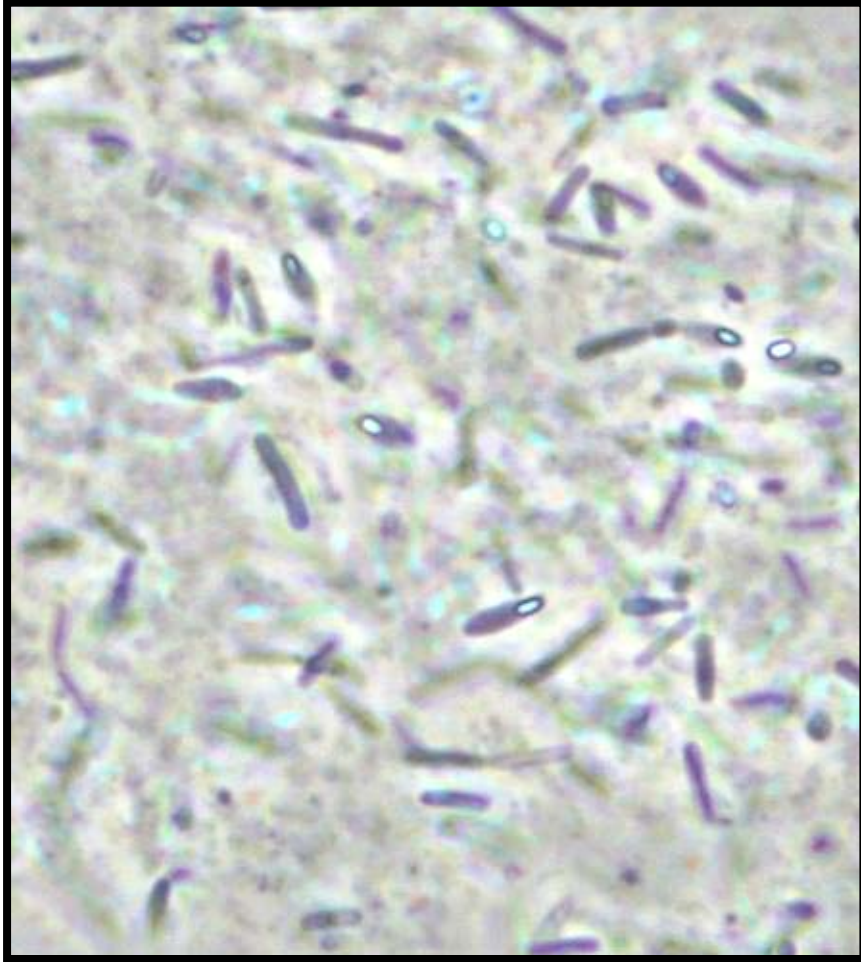
In 1906, G. F. White identified *Bacillus larvae*, via Koch's postulates, as the cause of AFB.

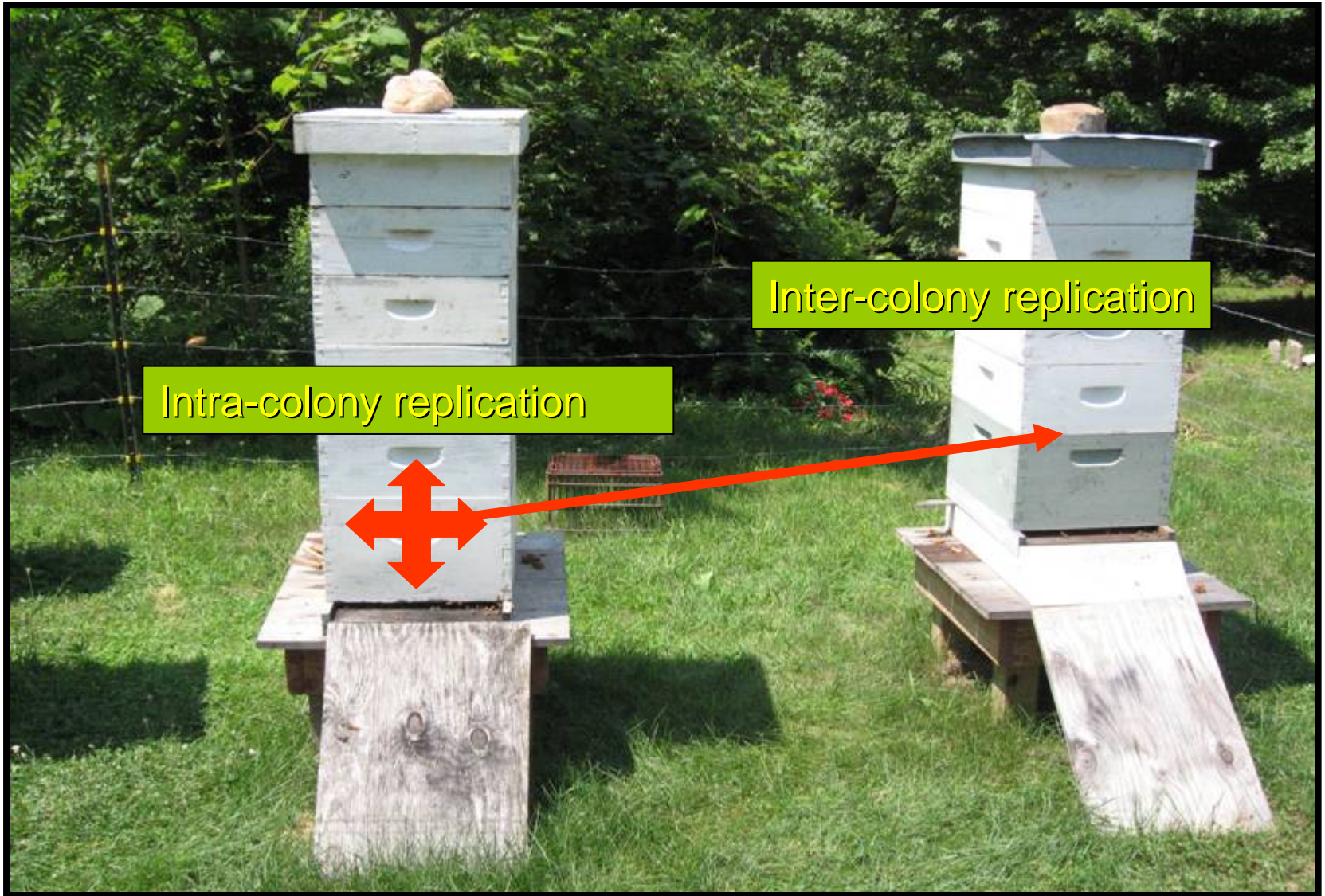
# AFB

- The name is derived from the foul odor of the brood chamber in an infected colony.
- This disease occurs world-wide.
- Only brood appear naturally susceptible to the bacterium.
- The *Paenibacillus larvae* endospore is the contagion for AFB.



# *P. larvae* Endospores





# Colony Inspection







# Diagnosis of AFB

- Presence of foul odor.
- Observation of sunken or broken brood caps.
- Pupa appears as a degraded gelatinous mass with a ropy texture (classical ID).
- Microscopic appearance of endospores in diseased pupae.

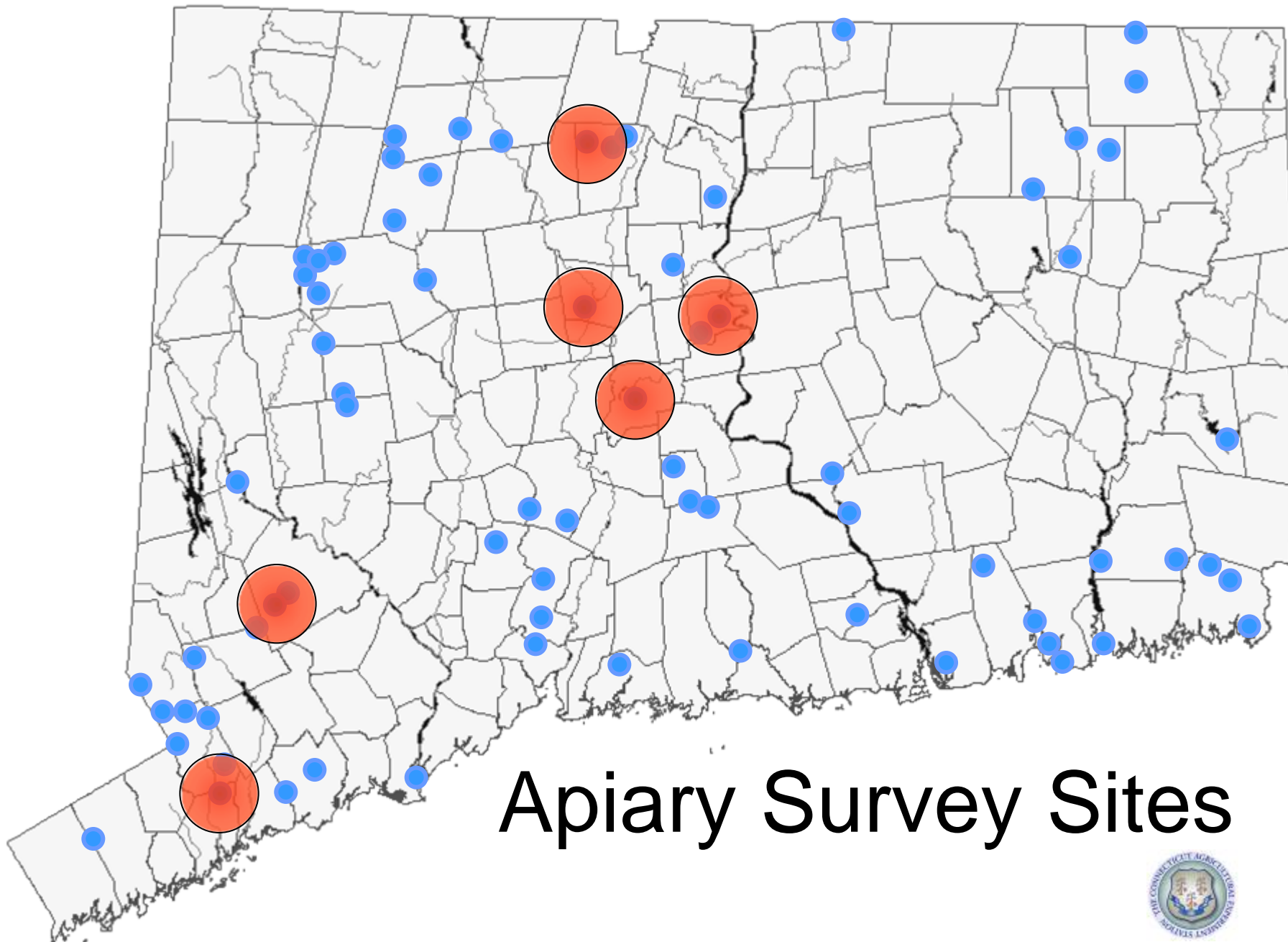


# Field Test for Clinical AFB



# AFB Survey in CT



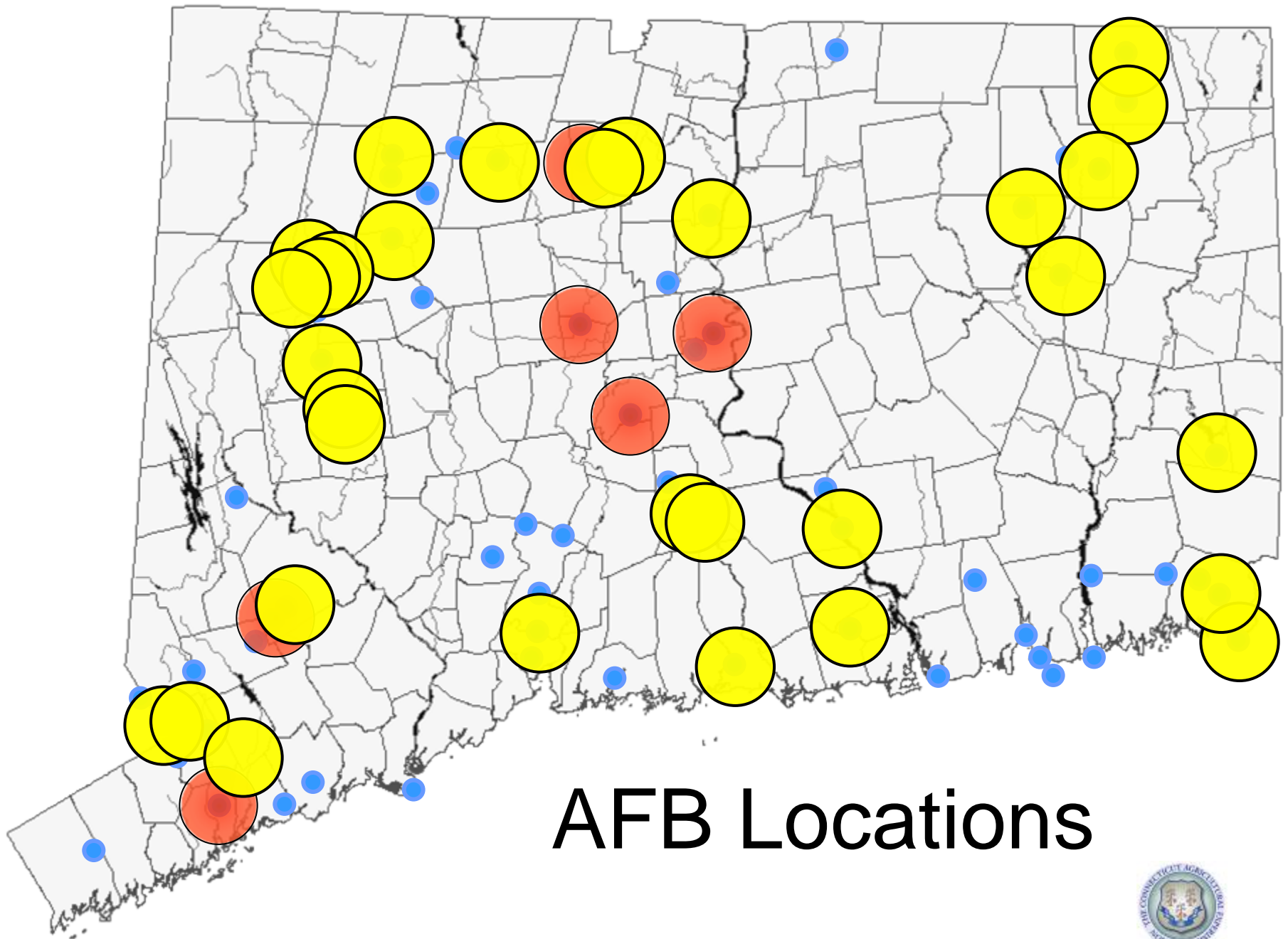


# Apiary Survey Sites



# AFB Assay





# AFB Locations



# Survey Results

- To date, have tested approximately 243 hives from 73 different apiaries.
- 6 apiaries (~8%) had a hive with clinical AFB.
- Overall, 49% of the apiaries were found to have AFB.



# Control of AFB

- This is the one bacterial disease that can completely destroy a colony, decimate an apiary, and render equipment unusable.
- Due to the contagious nature of the disease, most countries mandate destruction of infected (i.e., clinical cases) beehives.





# Methods Available to Beekeepers



Fire



Antibiotic Treatment

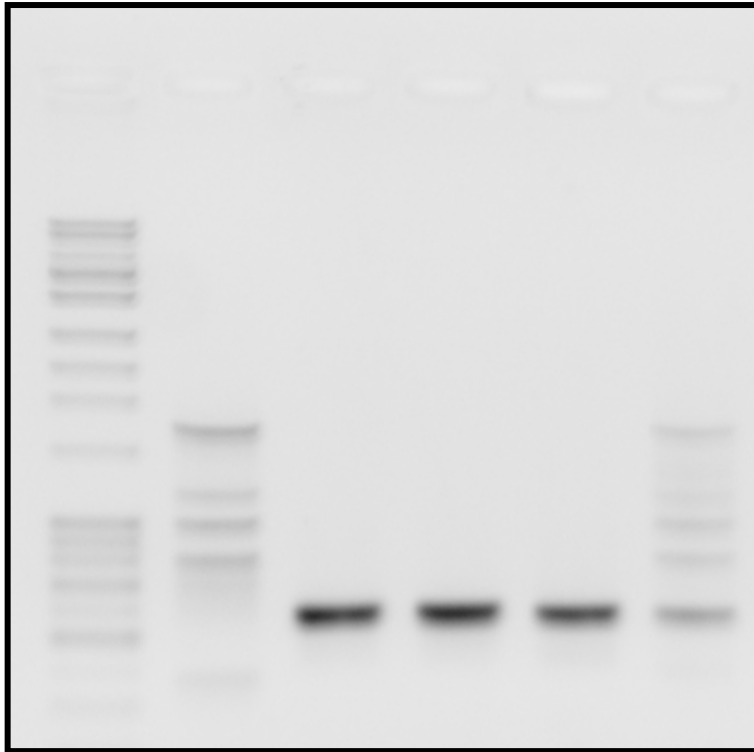
# Antibiotic Treatment

- Oxytetracycline compound
- Suppresses the disease but does not eradicate
- Tetracyclines are rapidly degraded (especially by light and heat)
- Microbial resistance has been reported



# Resistance in CT

PCR test for *tet(K)*      Growth on MYPGP+Tet



Have found 5 apiaries with Tet<sup>r</sup> *P. larvae*

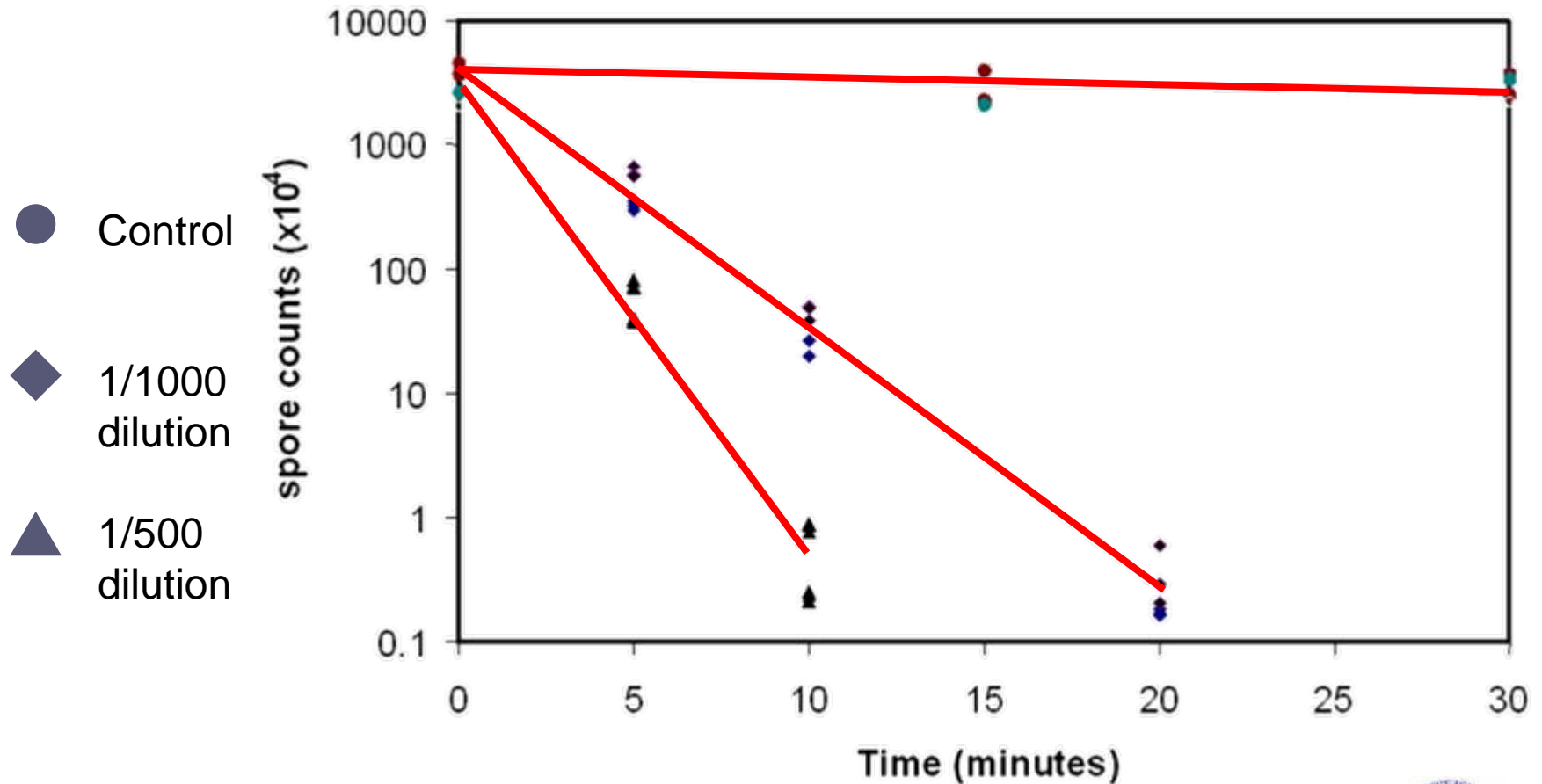


# Swarming and Sanitation



Hydrogen peroxide &  
Peroxyacetic acid

# Inactivation of *P. larvae* Endospores



- 
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