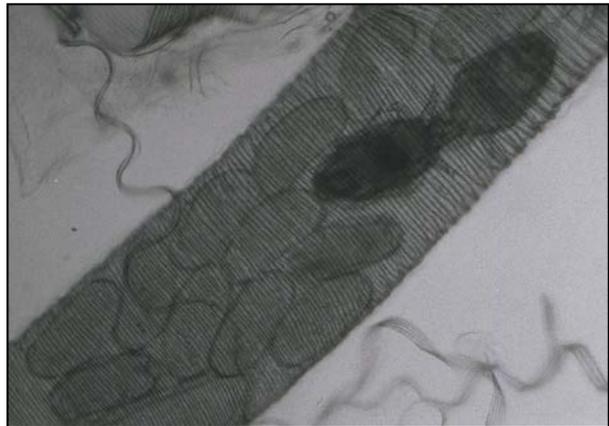


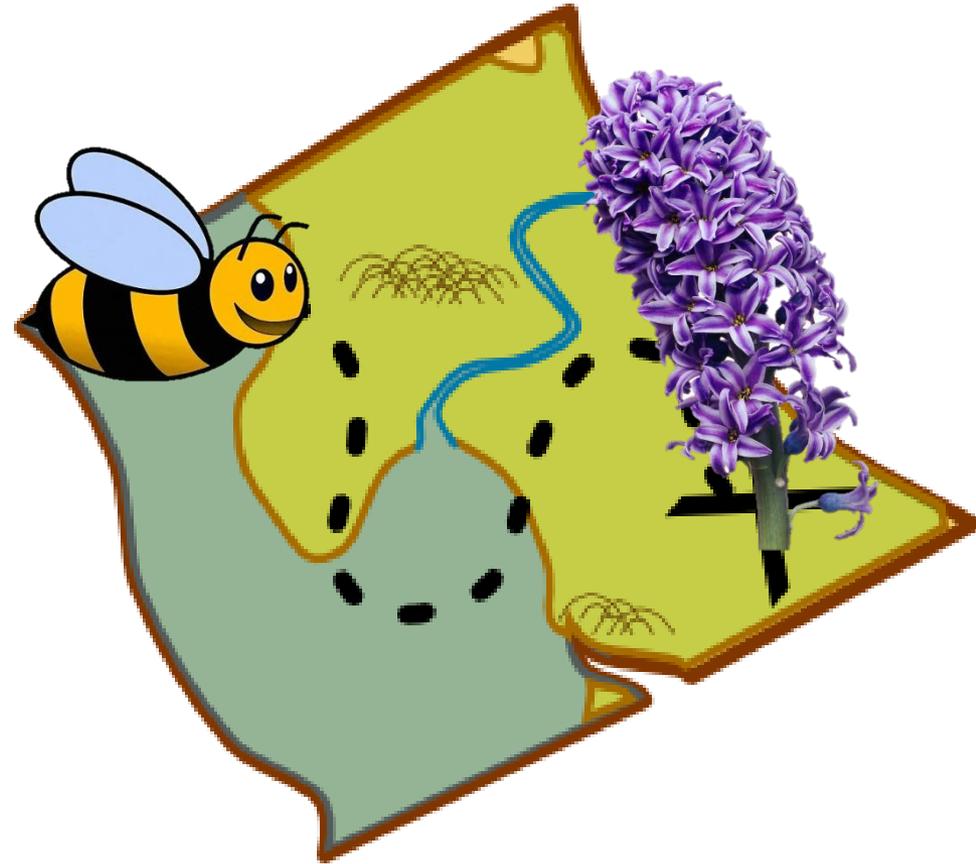
Parasites, Diseases, and Pests of Honey Bees

Great Plains Growers Conference 2015



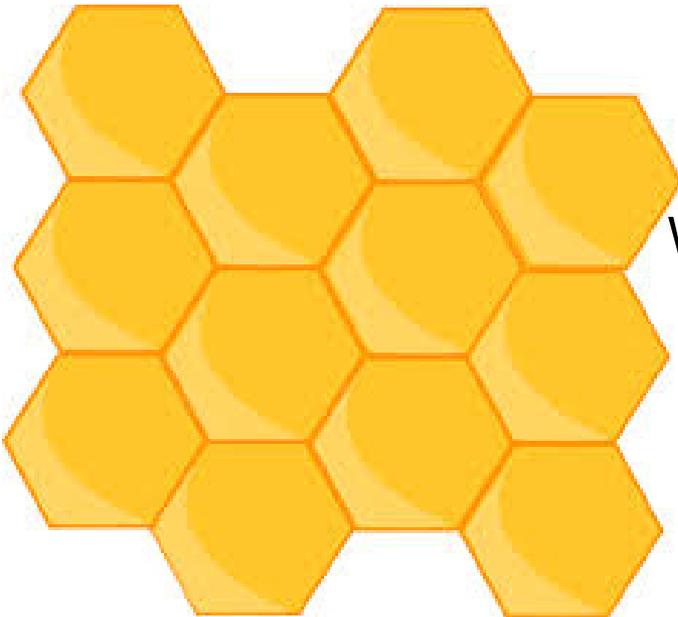
Road Map

- Brood
 - Diseases
 - Parasite
- Adults
 - Diseases
 - Parasites
- General hive pests



Honey bee brood diseases

- American foulbrood
- European foulbrood
- Sacbrood
- Chalkbrood
- Stonebrood



What happened to the kids?



The first step in managing brood diseases and pests is learning how to recognize them



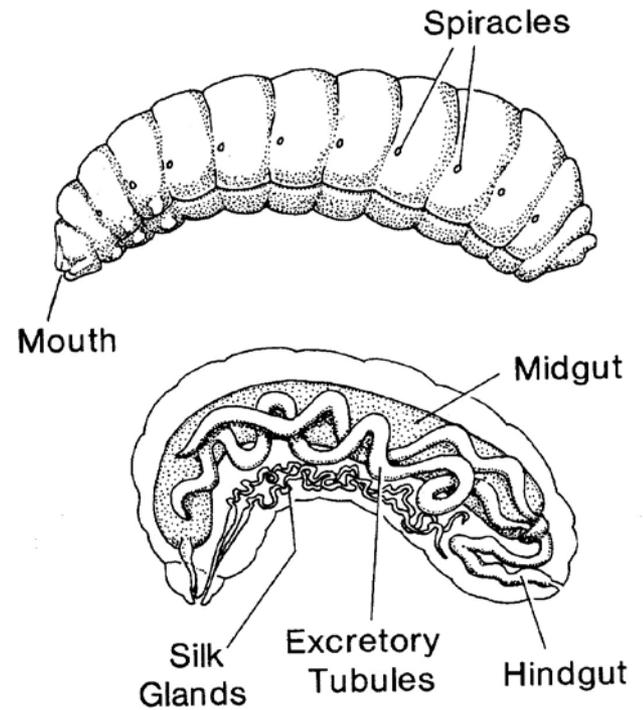
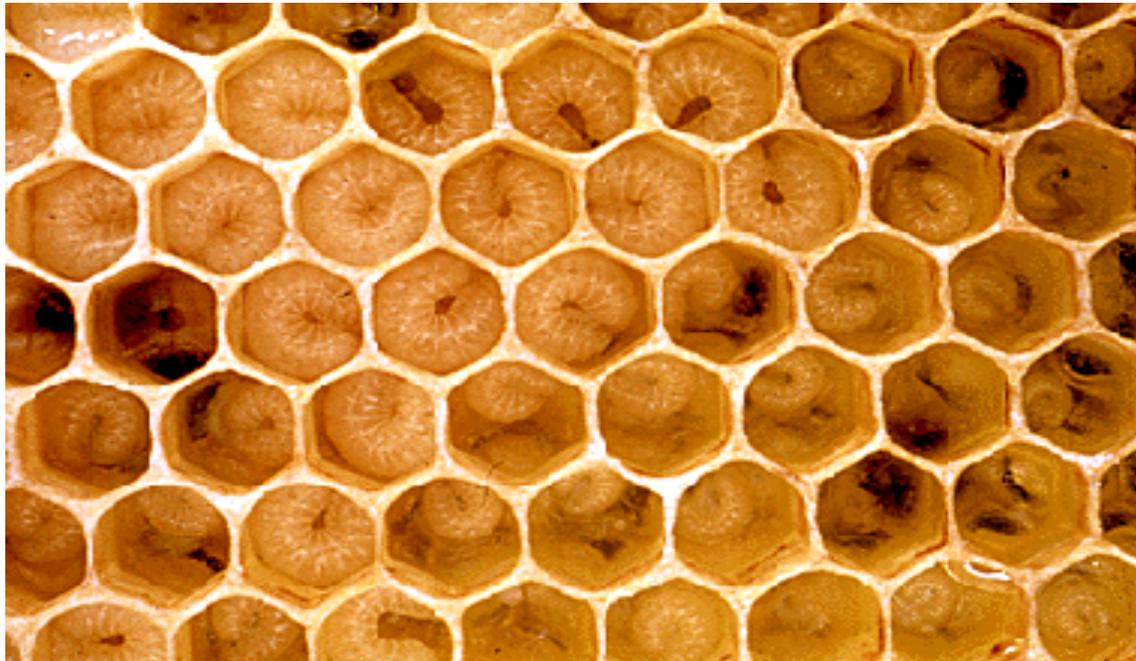
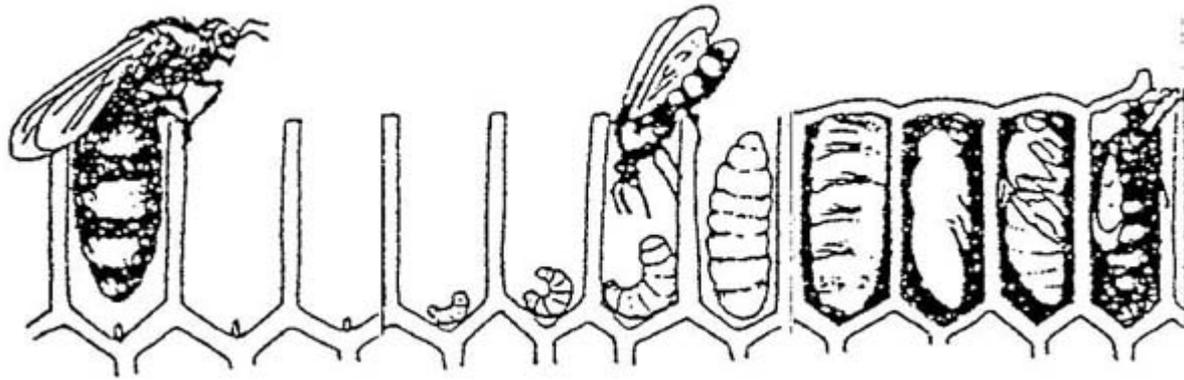
Let's just say, I hope you have good insurance



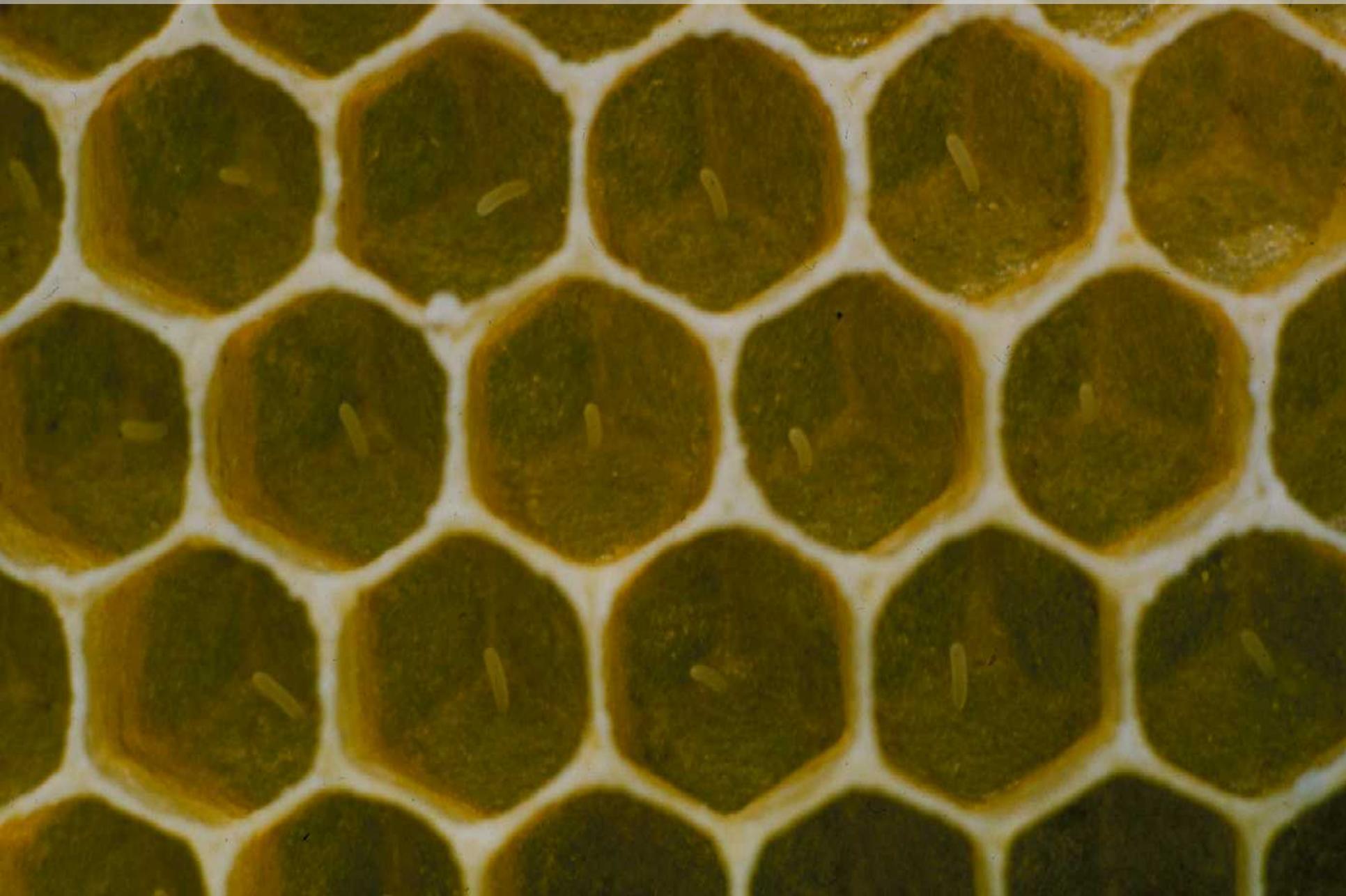
Alex Wild

© Alex Wild
all rights reserved

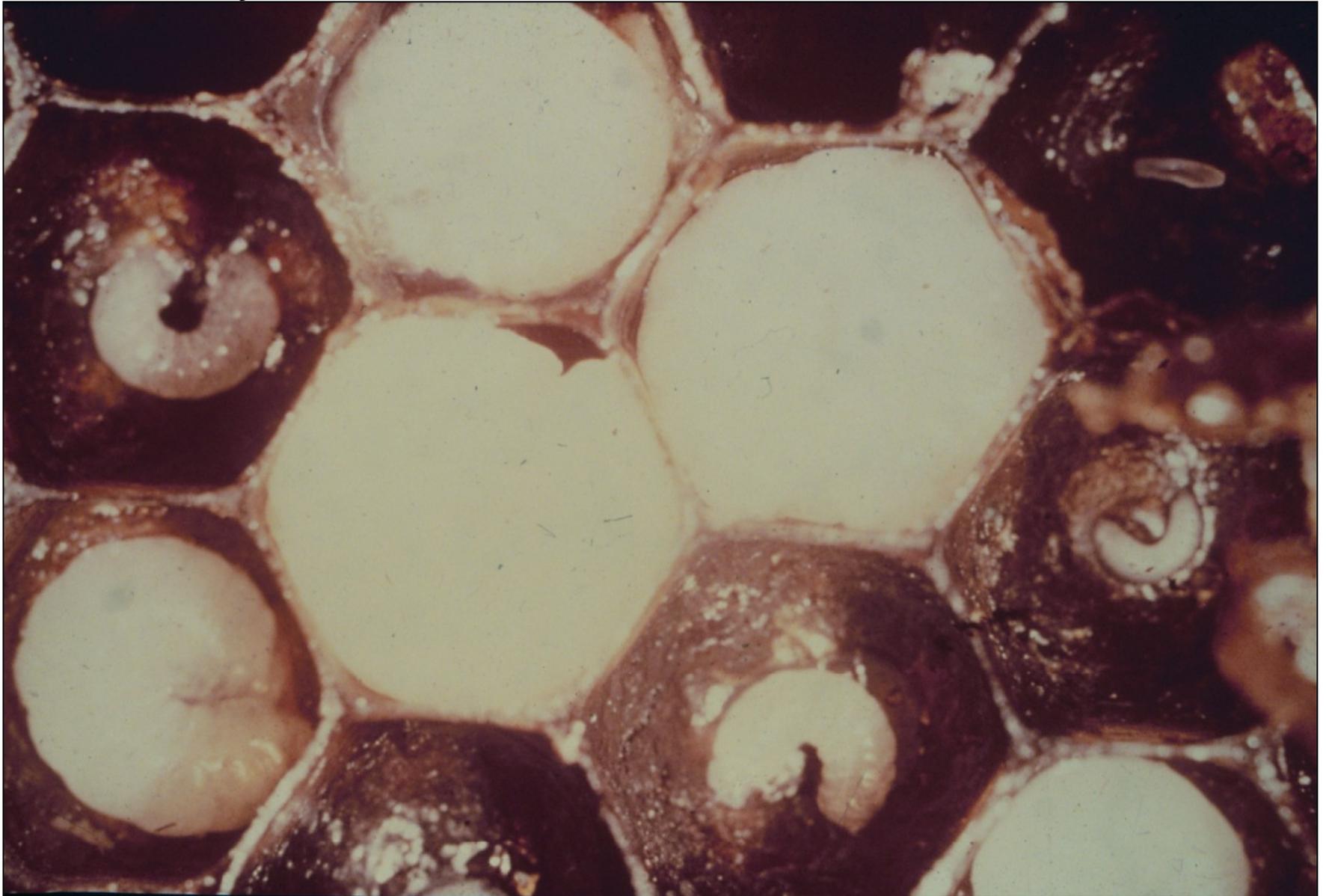
To know if something is wrong, you need to know what's normal



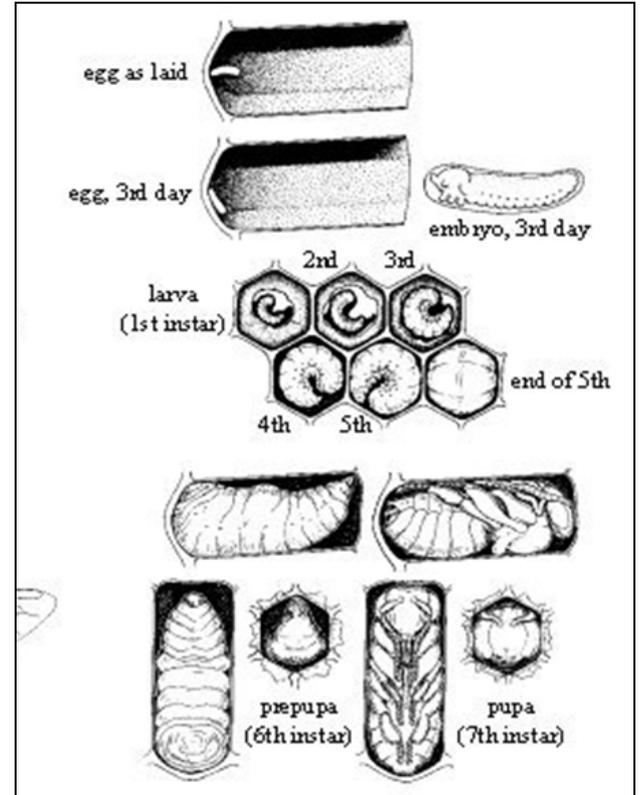
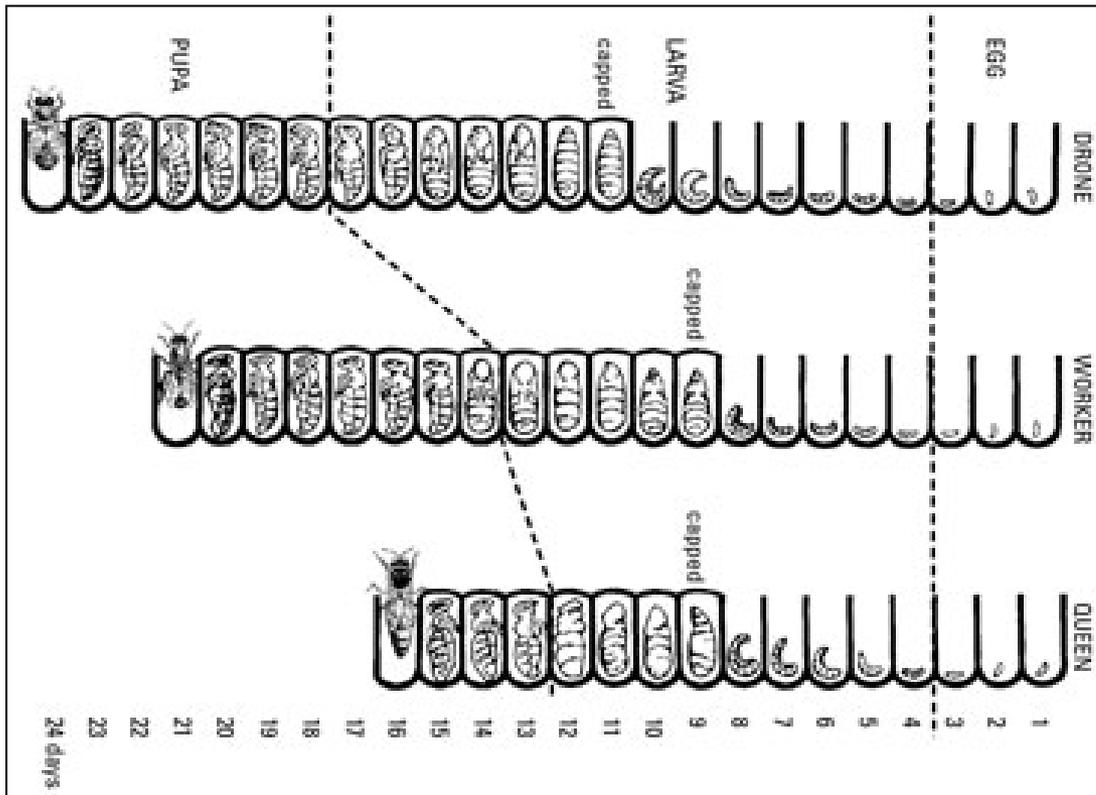
Embryo develops for 3 days in the egg



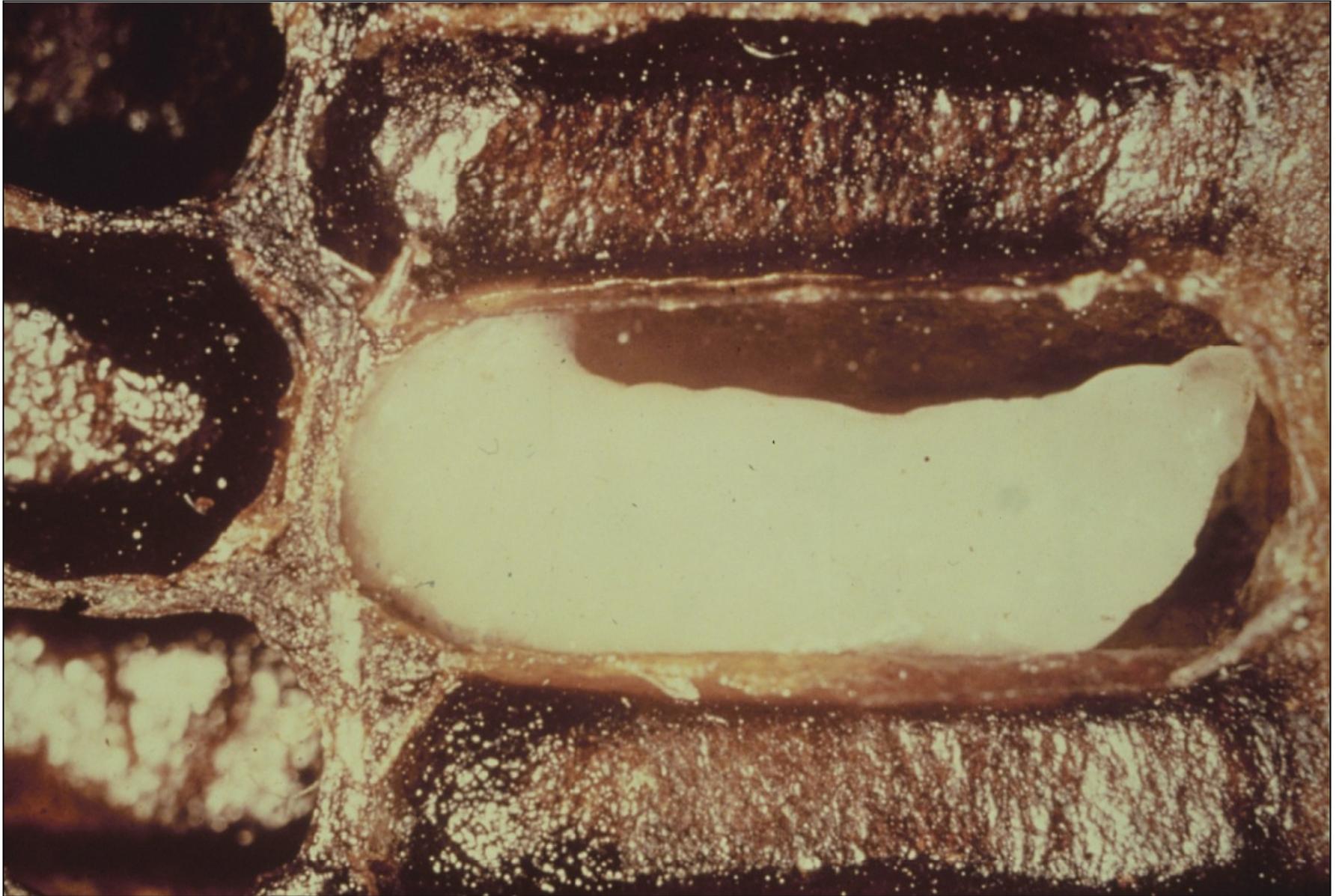
When egg hatches, larva feeds continuously for 5 days



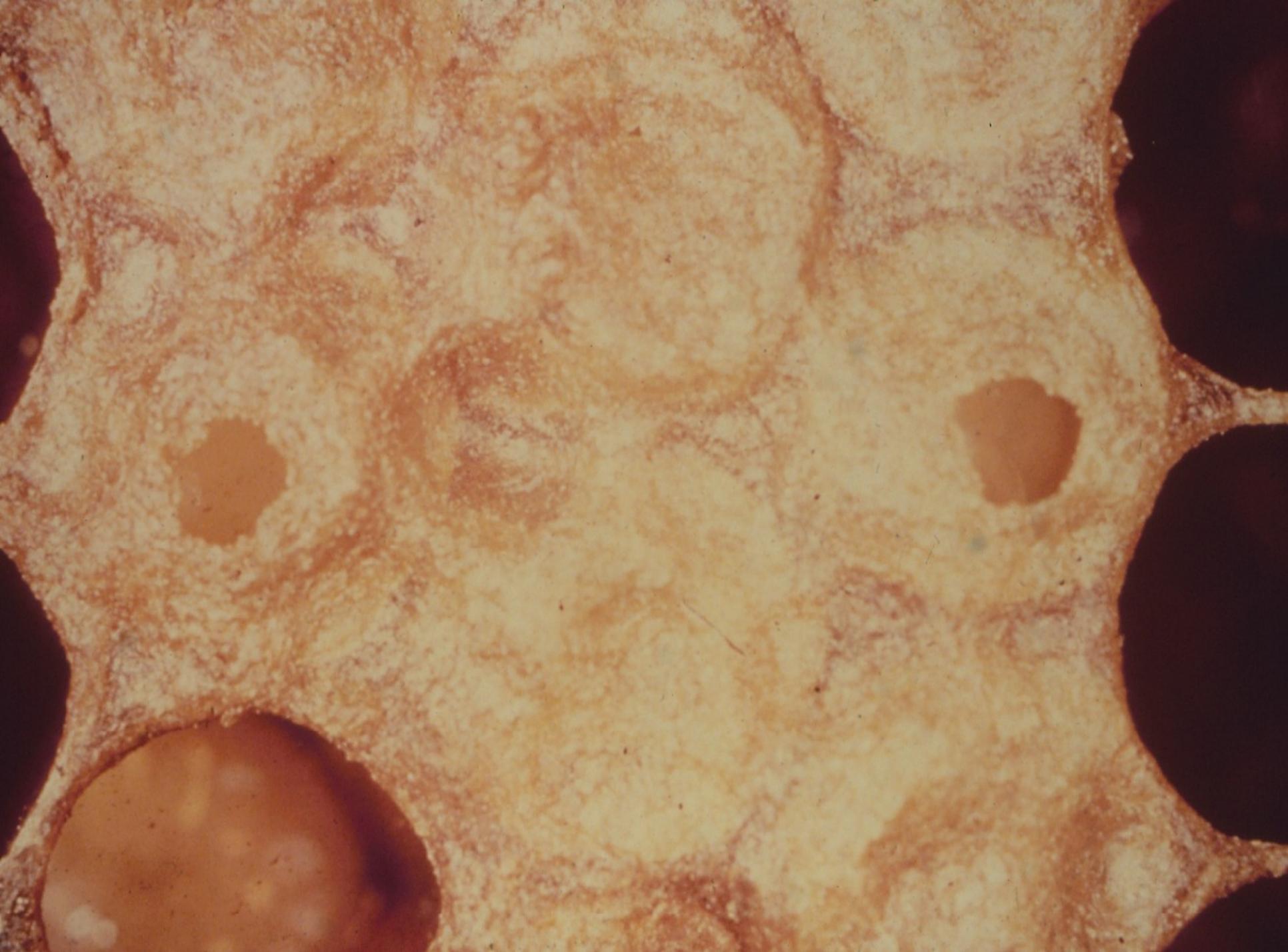
Larvae sheds its skin about every 24 hours



Larvae spins cocoon, defecates and undergoes final molt

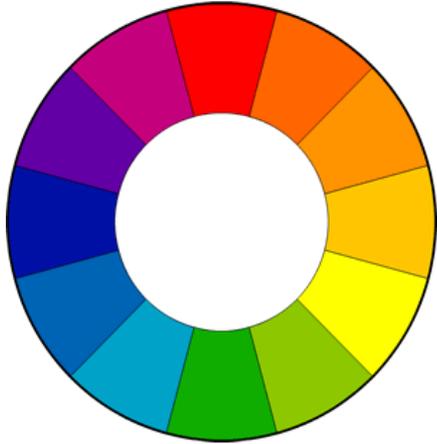








During inspection pay attention to brood-



Color



Age



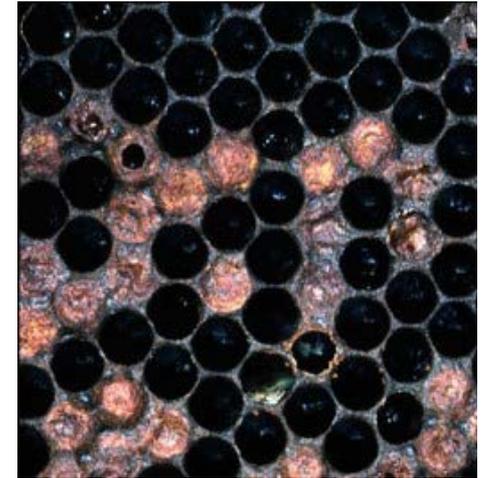
Texture



Smell

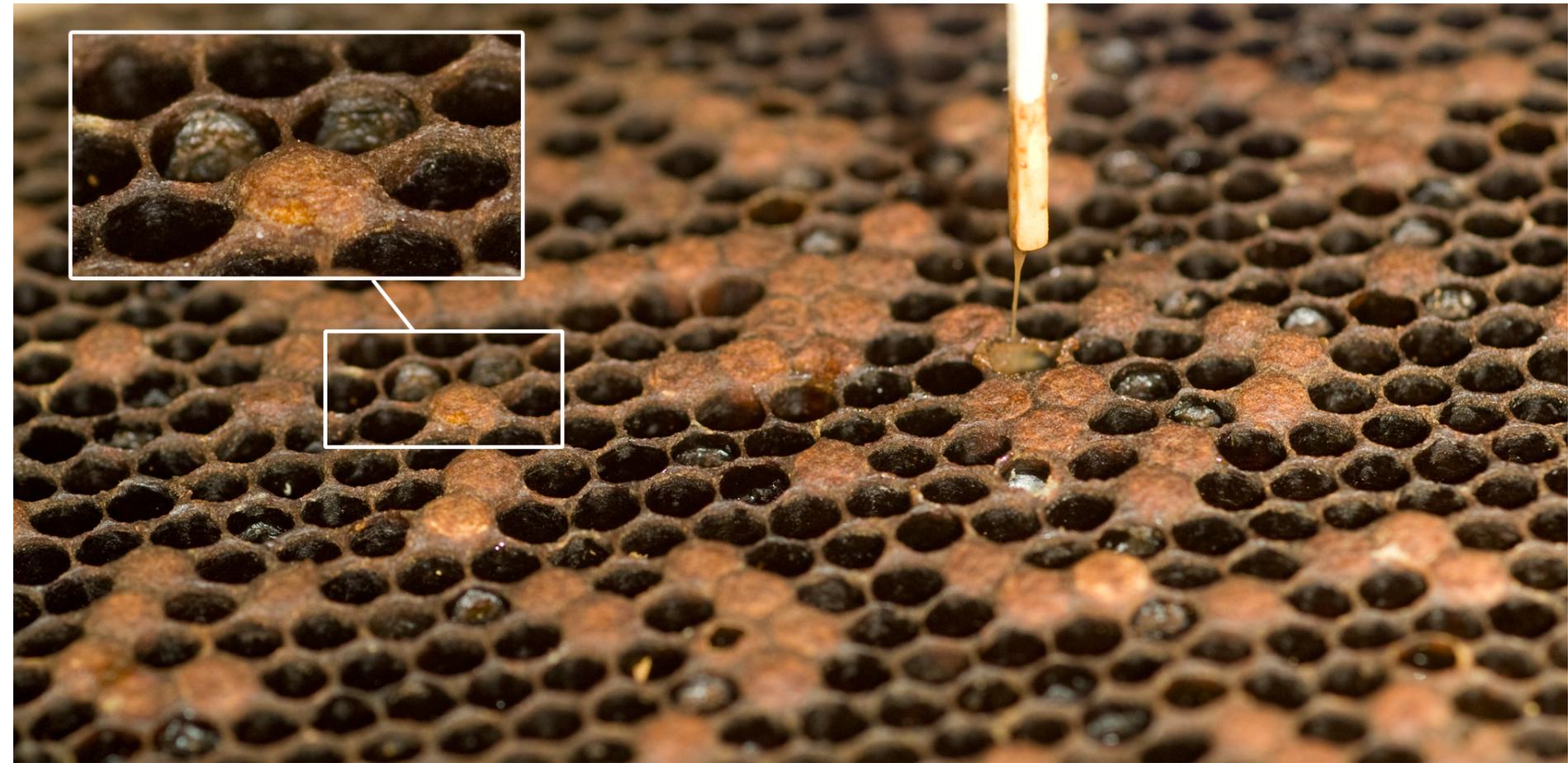


Position



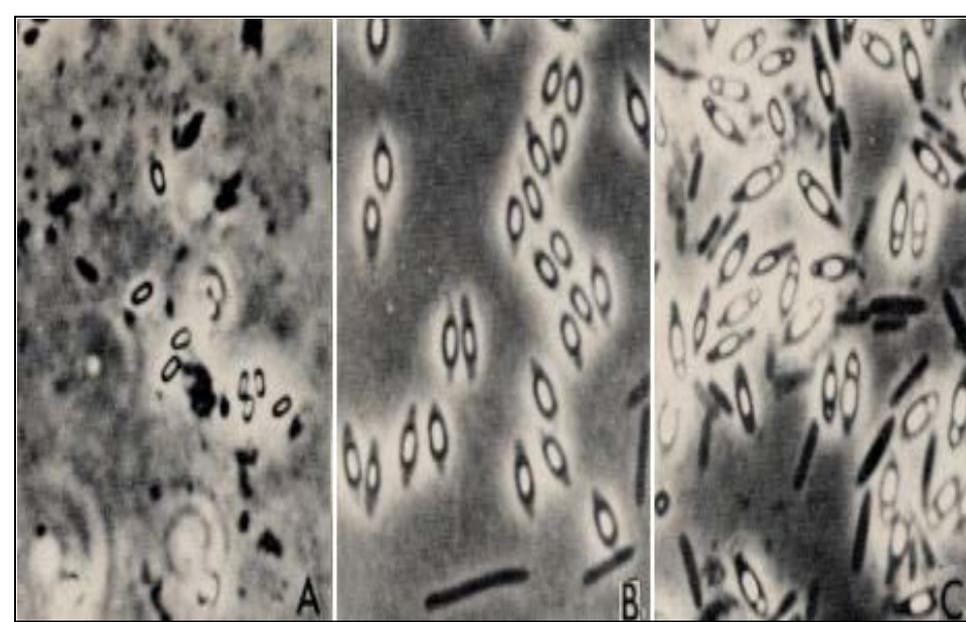
Location of abnormal brood

American foulbrood: A spore forming bacterium



2.5 billion spores are produced in each infected larva

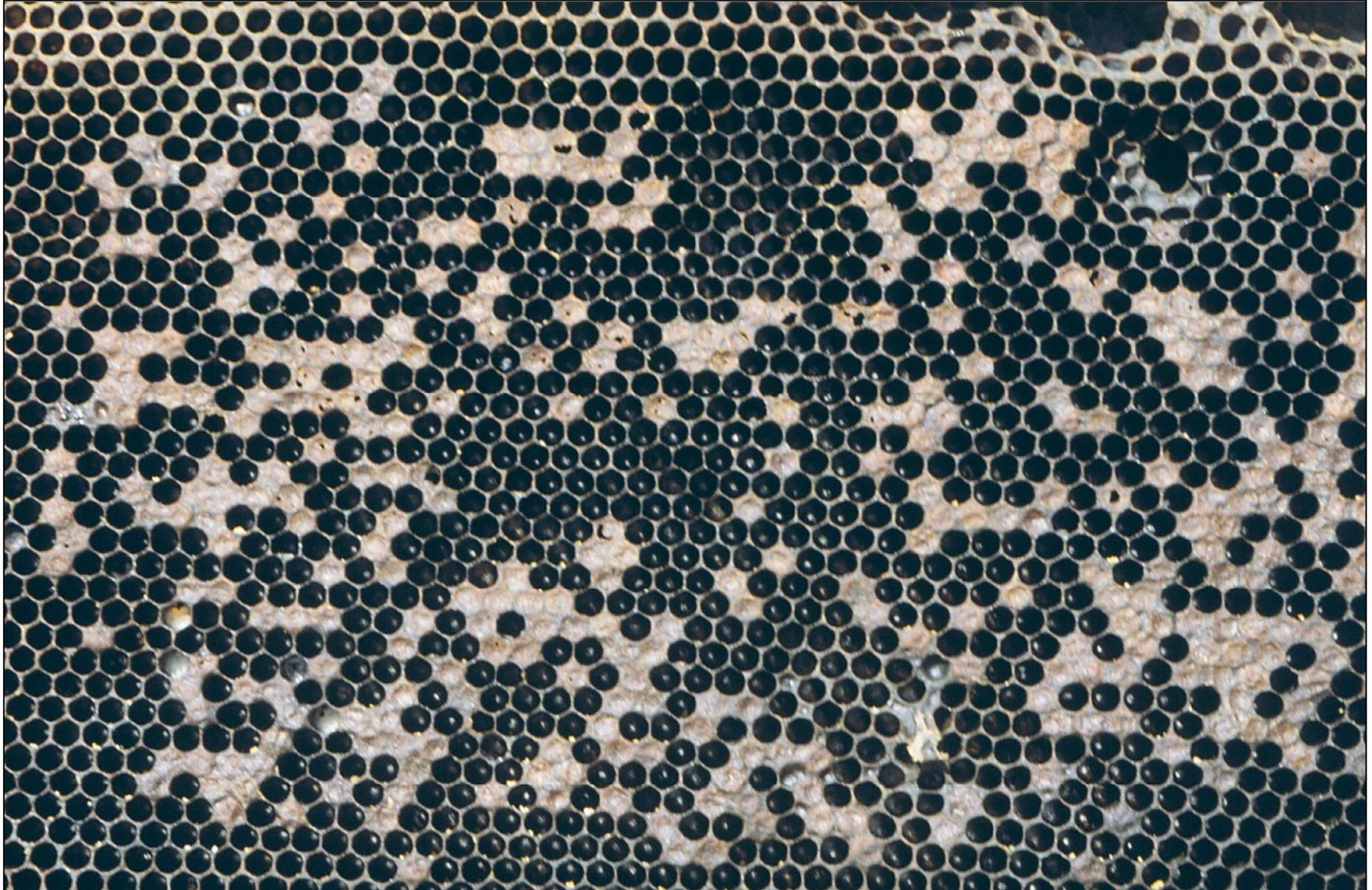
American foulbrood: A spore forming bacterium



Spores are viable for over 70 years

Adult bees are not susceptible

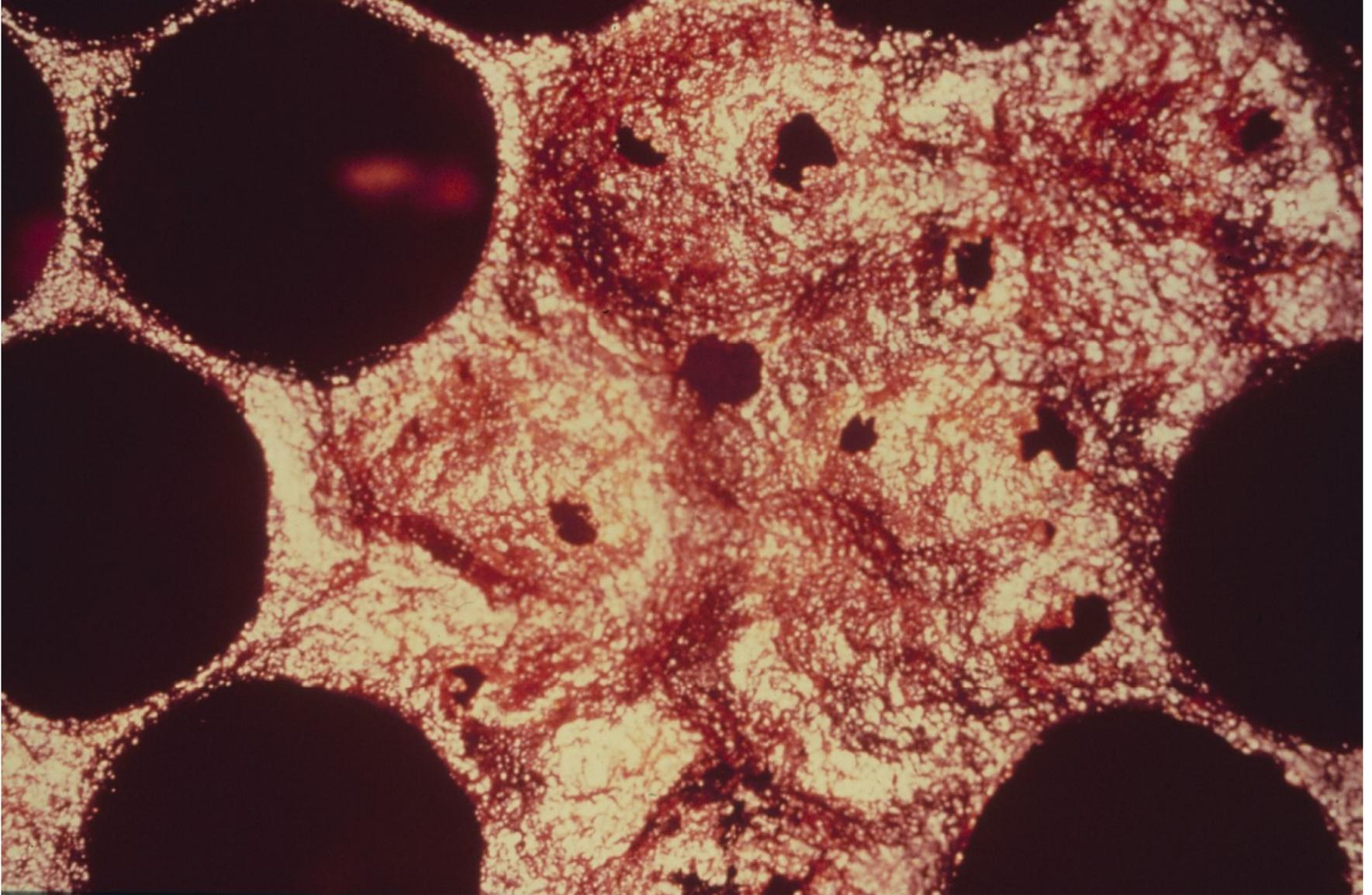
AFB Symptoms: Spotty brood pattern; “Pepper-Pot Pattern”



AFB Symptoms: Sunken and concave cappings on cells



AFB Symptoms: Perforated cappings on cells



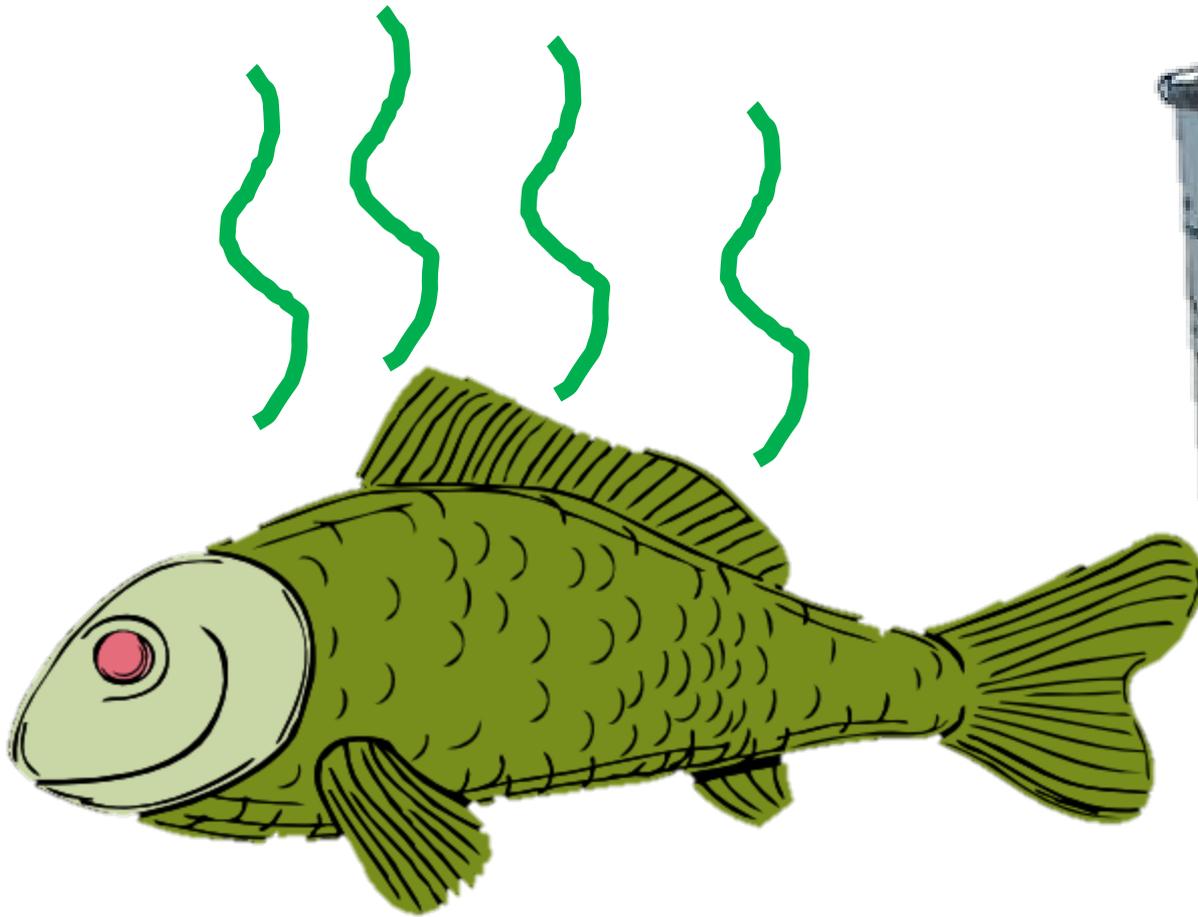
AFB Symptoms: Greasy appearance of sealed brood



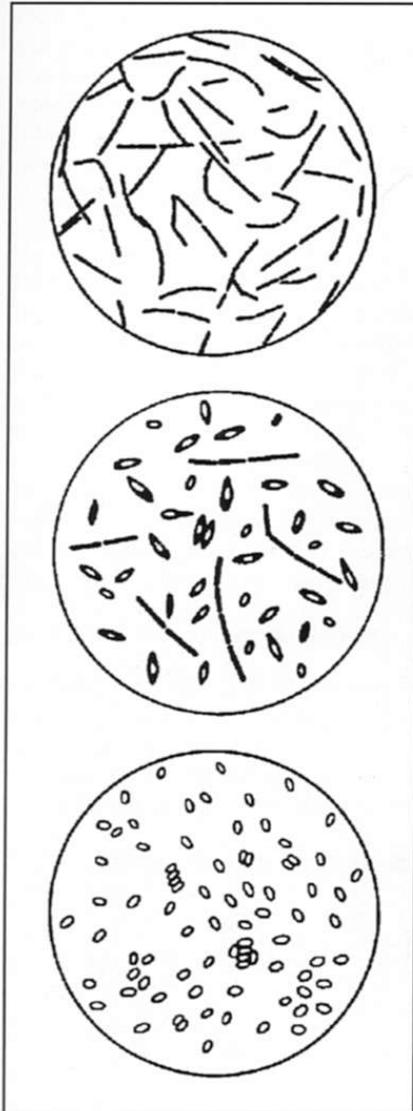
AFB Symptoms: The greasy remains
come out in a “ropy” goo



AFB Symptoms: Distinctive smell is associated with AFB



Paenibacillus larvae



Vegetative cells

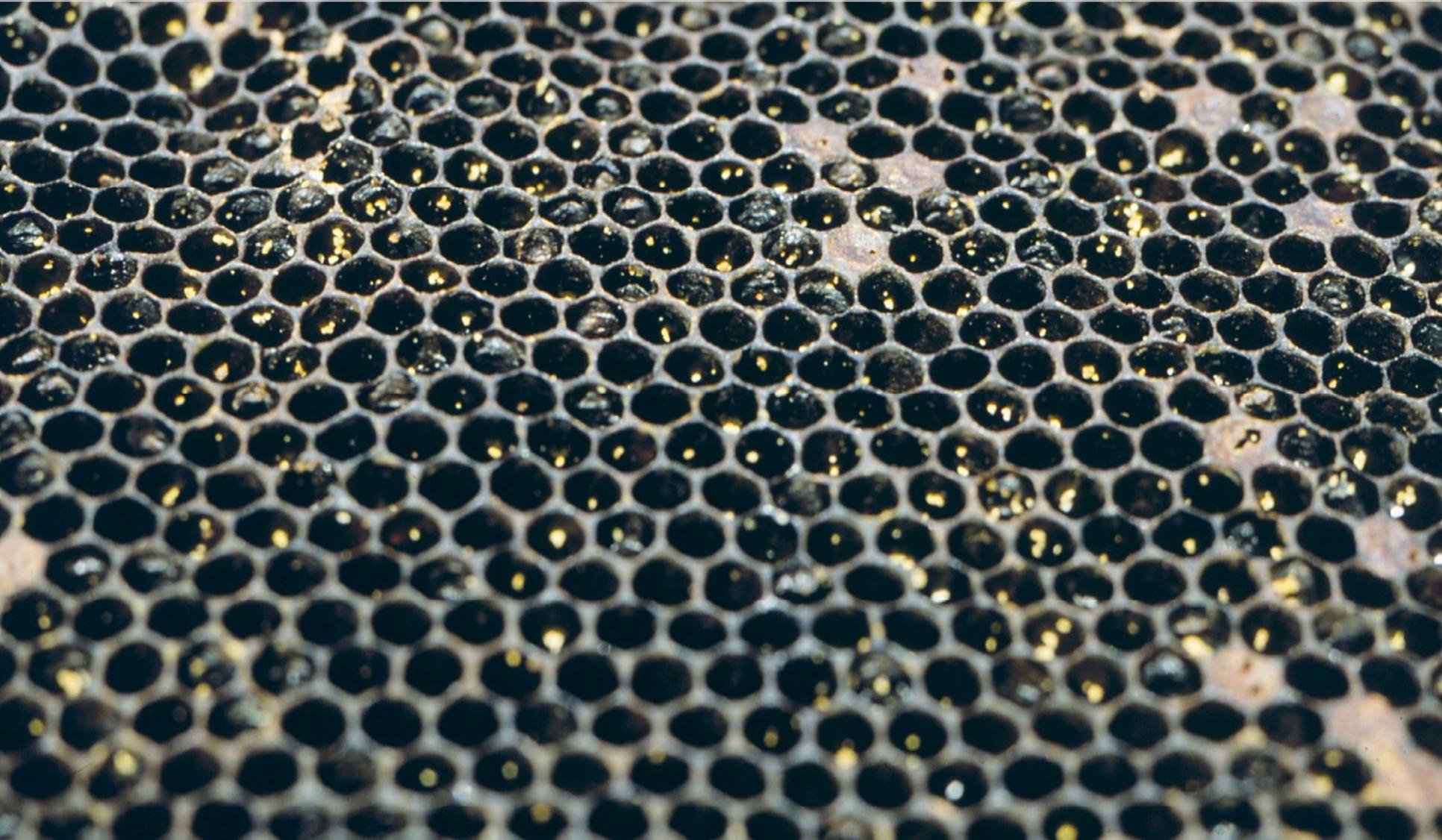


Spore formation



Spores

Spore flakes are left in each cell,, bees can never remove them all



AFB is spread by robbing bees



Can be spread by swapping equipment
or feeding infected honey



Human assisted AFB transmission

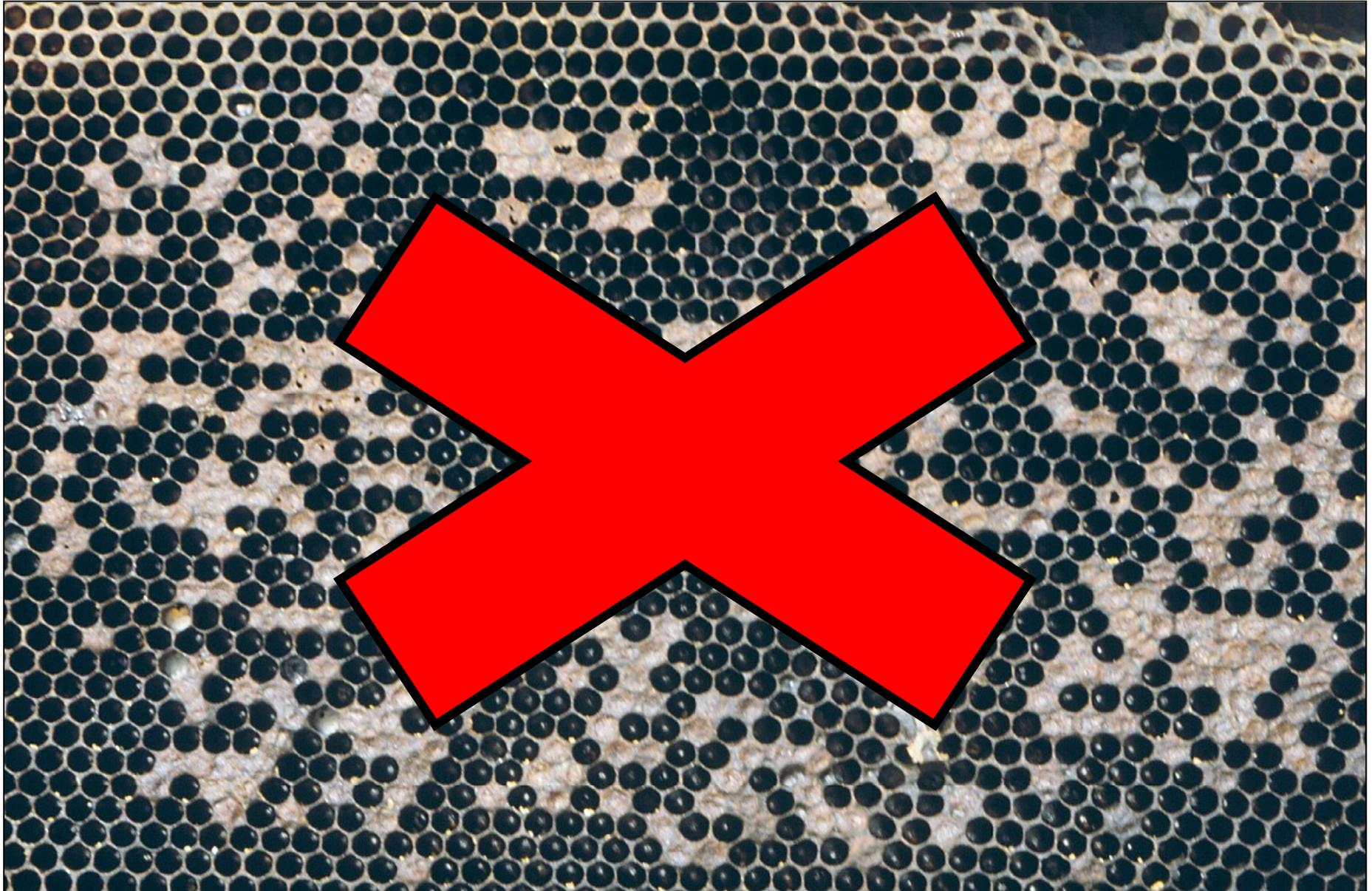


Switching combs
from diseased to
healthy colonies



Moving bees from
site to site

Integrated approach to managing AFB



Legal measures: Inspection before sales or shipment



JP/2010
GeorgiaBees.blogspot.com

Sanitation



Clean hands and tools after handling AFB

Sanitation: Some beekeepers mark & return supers to the same hive



University of Florida

Heat therapy



Disease resistant stock: displays hygienic behavior of uncapping and removing diseased larvae



Albert DeWilde

Determined by recessive alleles and requires ongoing selection to maintain

Antibiotic approach: Oxytetracycline

- **Terramycin** soluble powder – TM-25
- To treat one colony one time, mix one teaspoon TM-25 with 5 teaspoons powdered sugar.
- Mix larger volumes 1 part TM-25 to 5 parts powdered sugar and apply 2 tablespoons per treatment
- Treat 3X in spring 7 days apart and 1-2X in fall after removing surplus honey
- **Stop treatments at least 4 weeks prior** to adding surplus honey supers





Automatic Drip

Folk

105

KOST TAKI - 1986

OF ME

OF ME

OF ME

OF ME

OF ME

NEW

Some strains of AFB are resistant to oxytetracycline

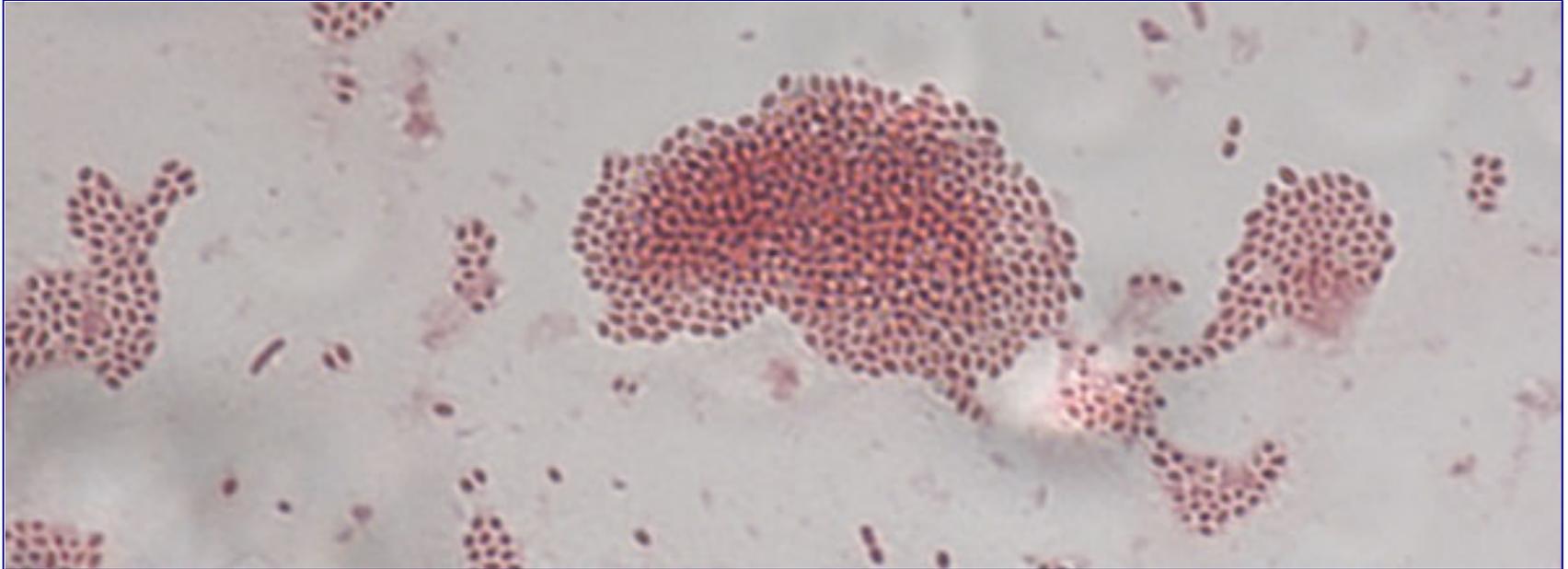
- **Tylan** For control of AFB, not prophylactic
- Single dose-apply 200 mg mixed in 20 grams powdered sugar (measure accurately, mix well)
- Apply over top bars of brood chamber 1X per week for 3 weeks



Tylan use precautions

- Use as a soluble powder, other forms available not suitable for bees
- Measure accurately and mix well
- Unlike terramycin, Tylosin is stable in honey, and great care must be taken to avoid residues in honey
- **Stop treatment 4 weeks** before applying surplus honey supers – use only as a dust
- Oxytetracycline is a better choice if effective

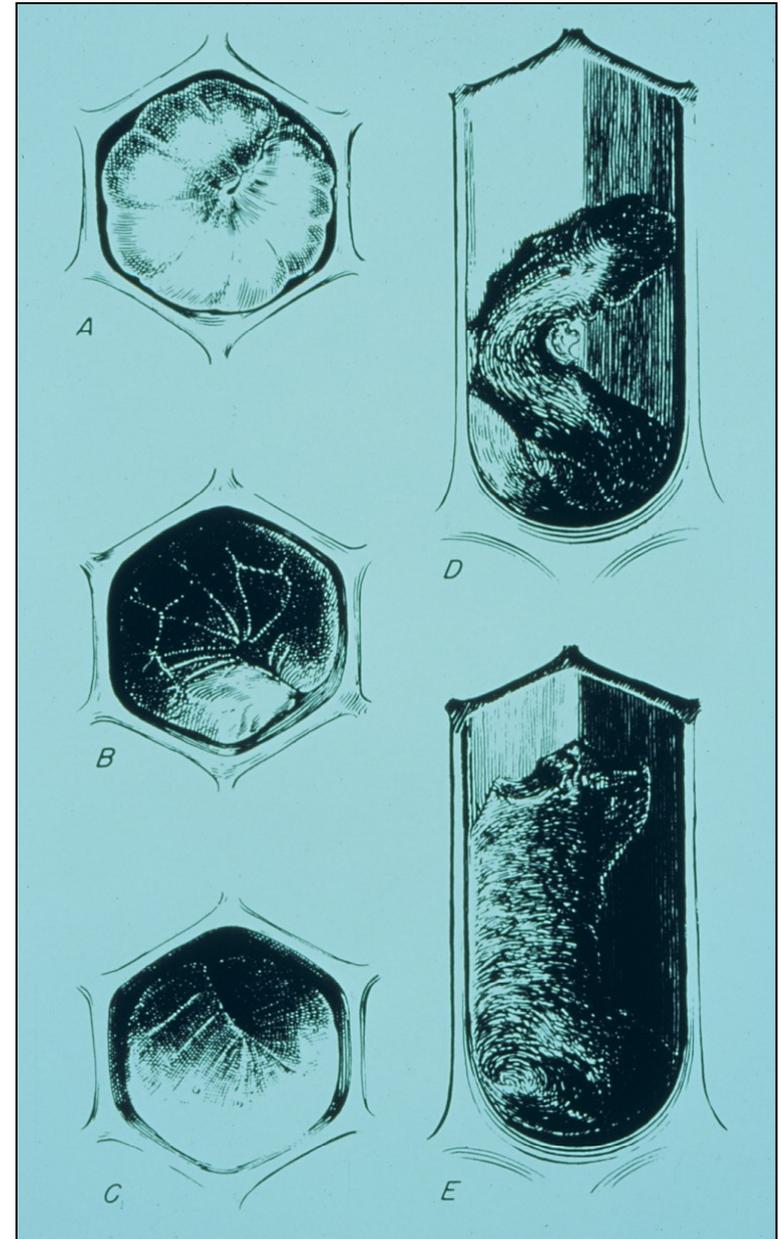
European foulbrood: Non-spore forming bacterium

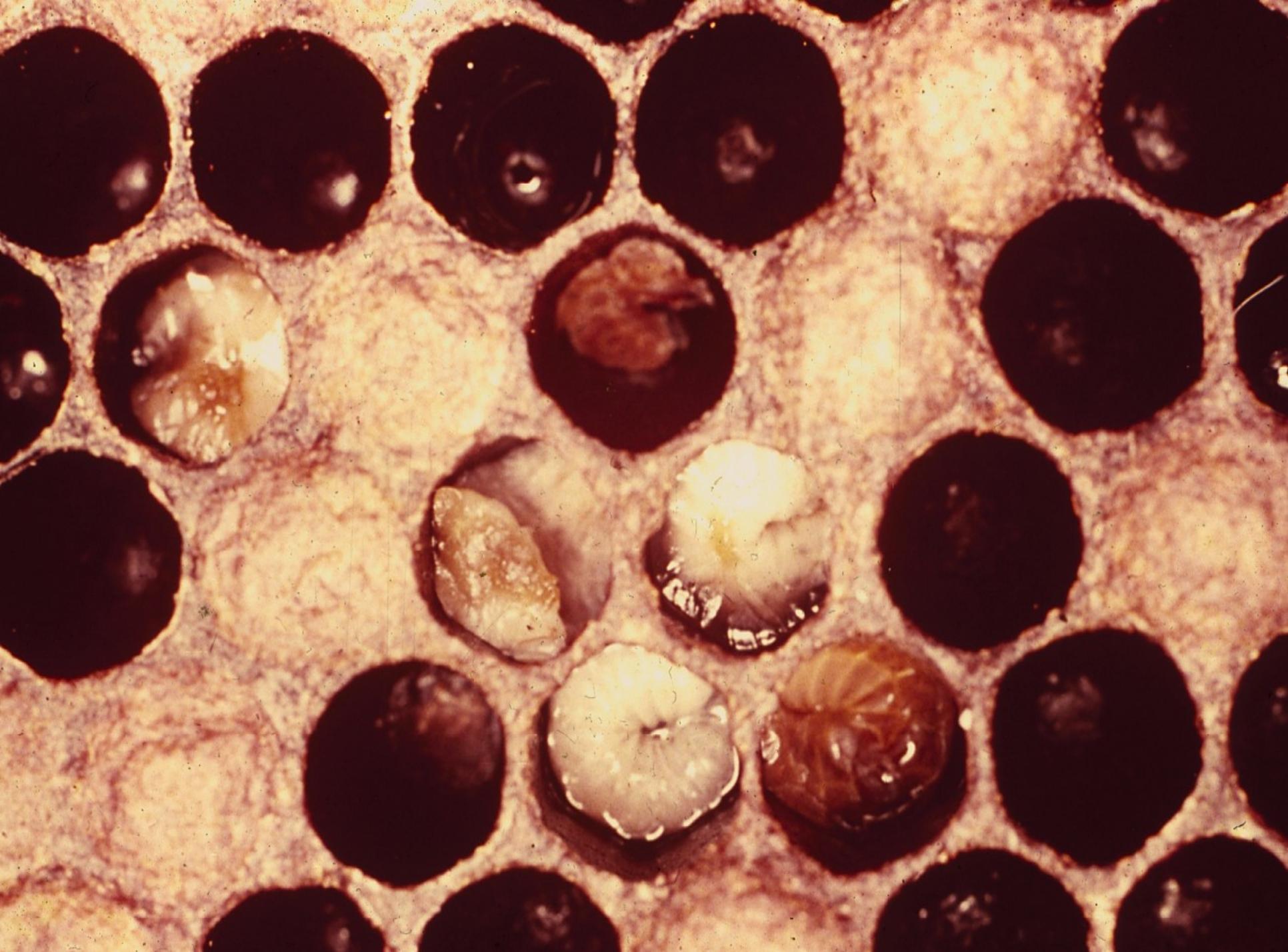


Microscopic examination reveals lancet shaped cells

EFB diseased larvae

- Discolored
- Abnormally positioned
- Die in coiling stage
- Easy to remove from cell
- Color, odor and texture vary



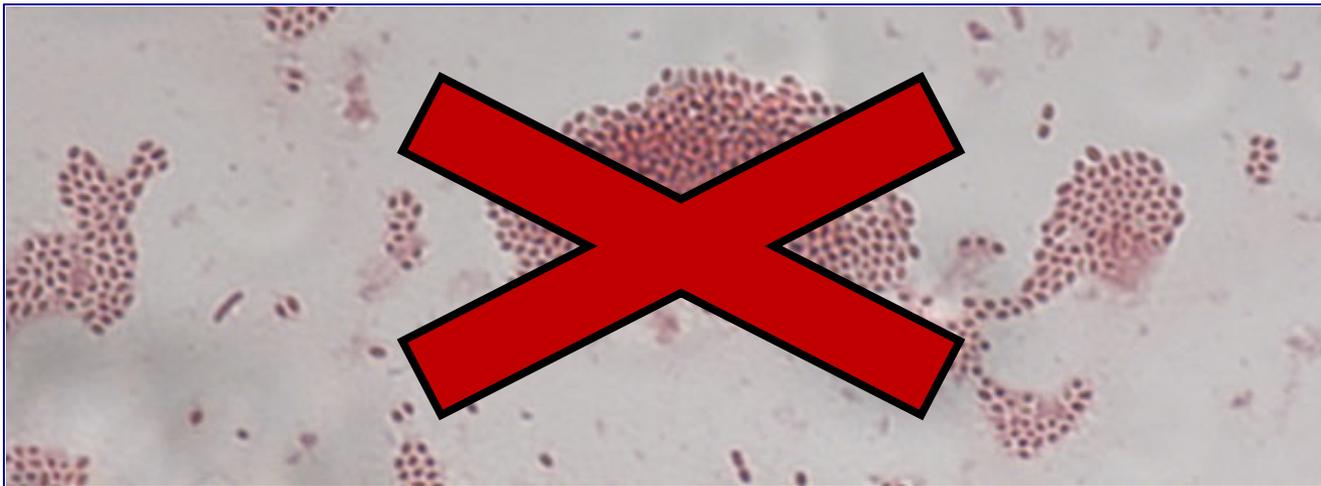




European foulbrood control is similar to American foulbrood control

Use the antibiotic approach (Oxytetracycline) if needed

But, maintaining colony strength, reducing stress, and re-queening will help to prevent out breaks



Sacbrood: Only common brood disease caused by a virus

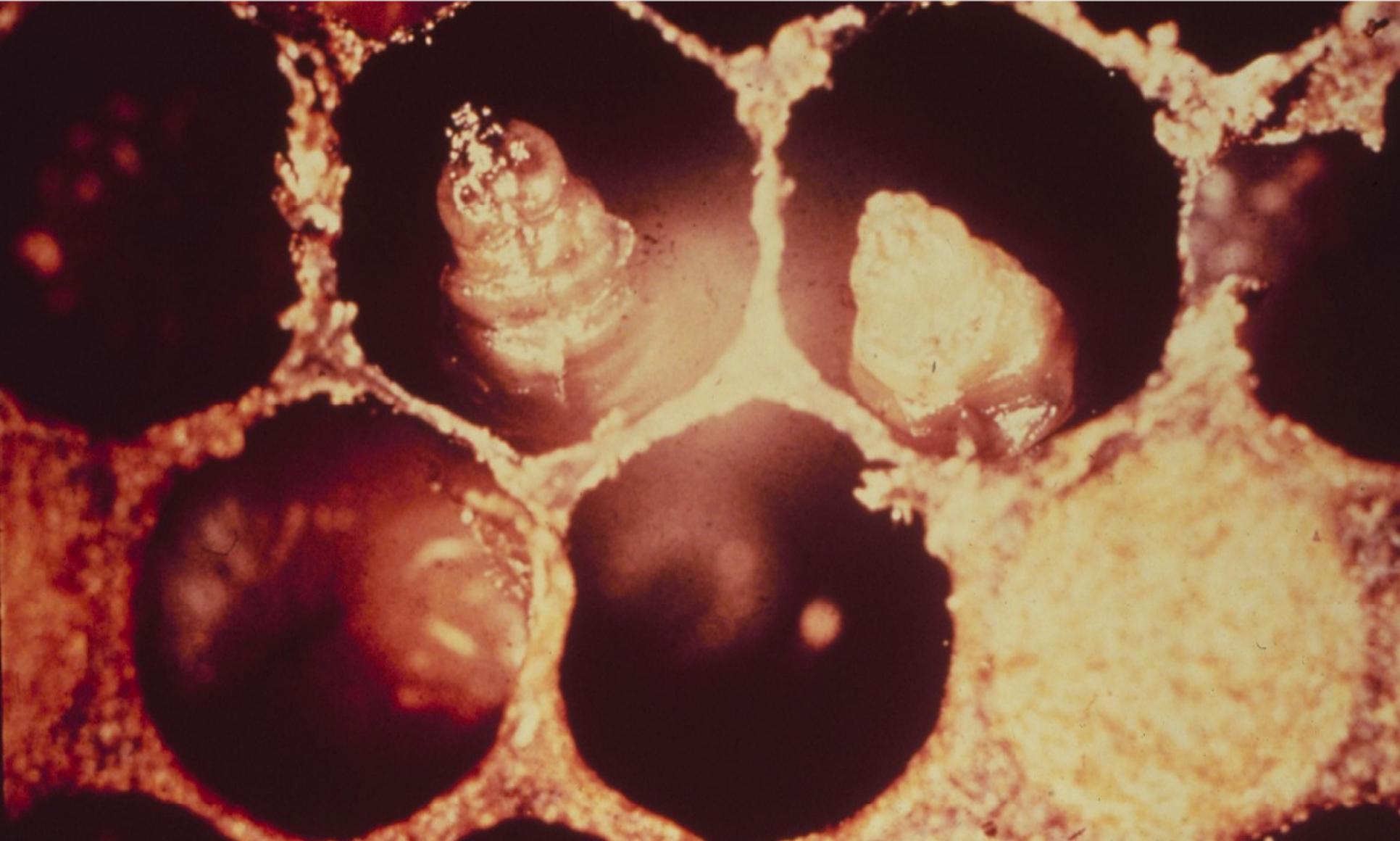


Larvae die in prepupal stage, can be confused with AFB

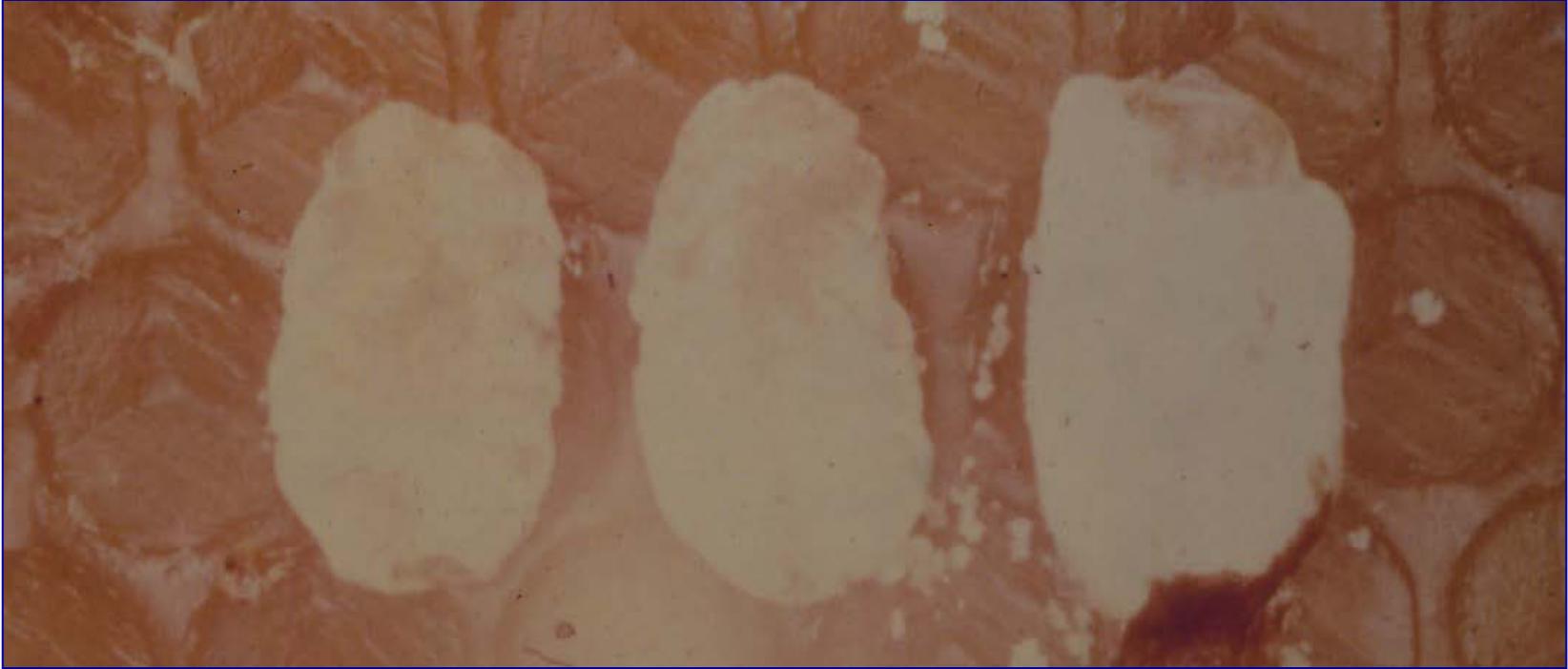
Larval remnants yellow and watery, then shift to brown scale that's easily removed ("Chinese Slipper")



Abatement by stress reduction and re-queening



Chalkbrood: A fungus that affects the brood



Characteristic mummies – can be white or mottled found on bottom and in combs

Varroa mite (*Varroa destructor*) is an obligate parasite of honey bee



First detected in U.S. in 1987 this parasite feeds on both adult bees and brood

They attach to bees and feed on their hemolymph



Basically, your hive is under attack by vampires

Since its invasion Varroa has had far reaching effects on the bee population in the US



Jerry Dunbar

Devastation of American feral bee population



Indiana DNR

Knocked some beekeepers out and changed our methods



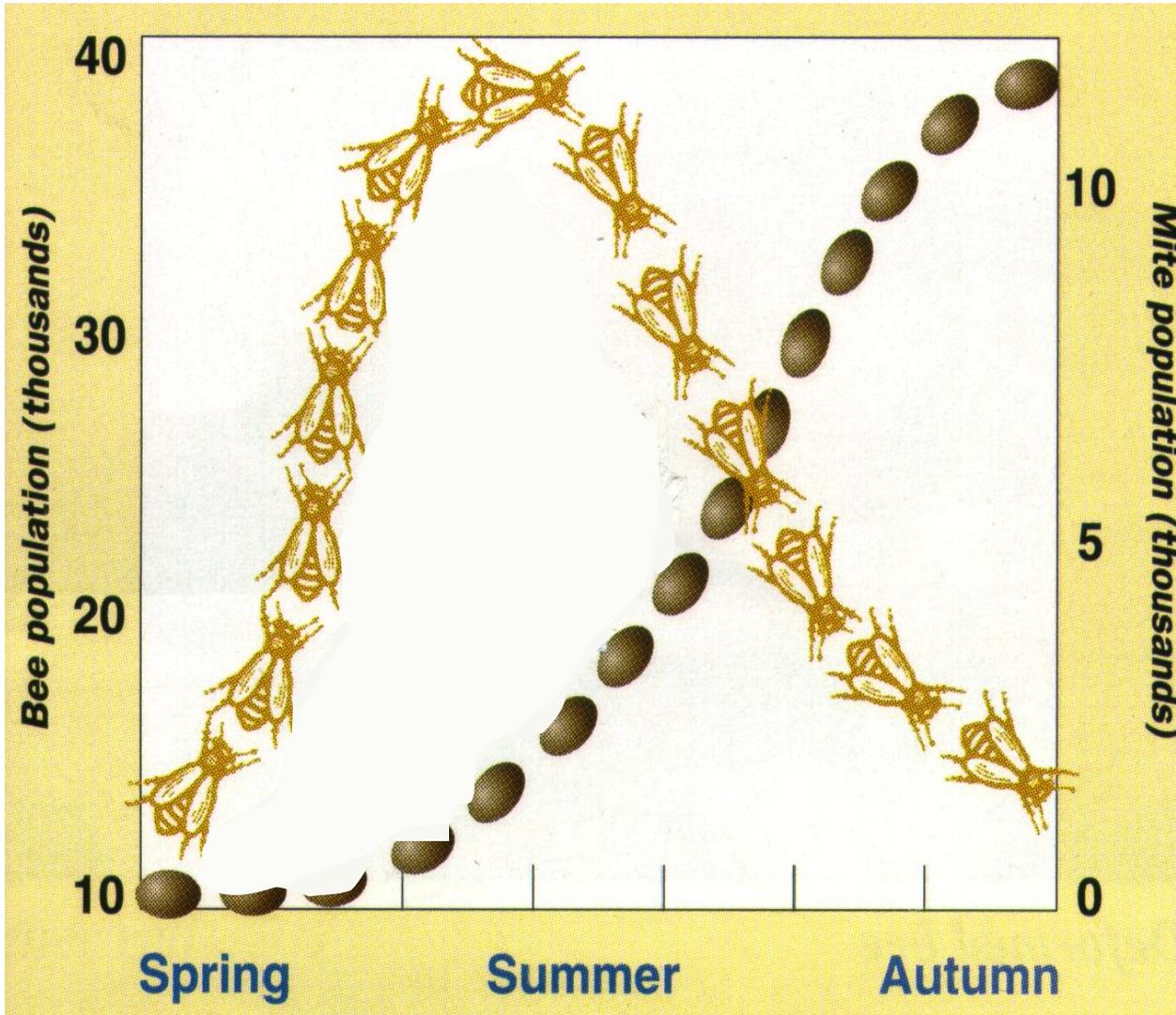








Mite Population Growth



American Association Of Professional Apiculturists, 1997

Varroa population growth factors

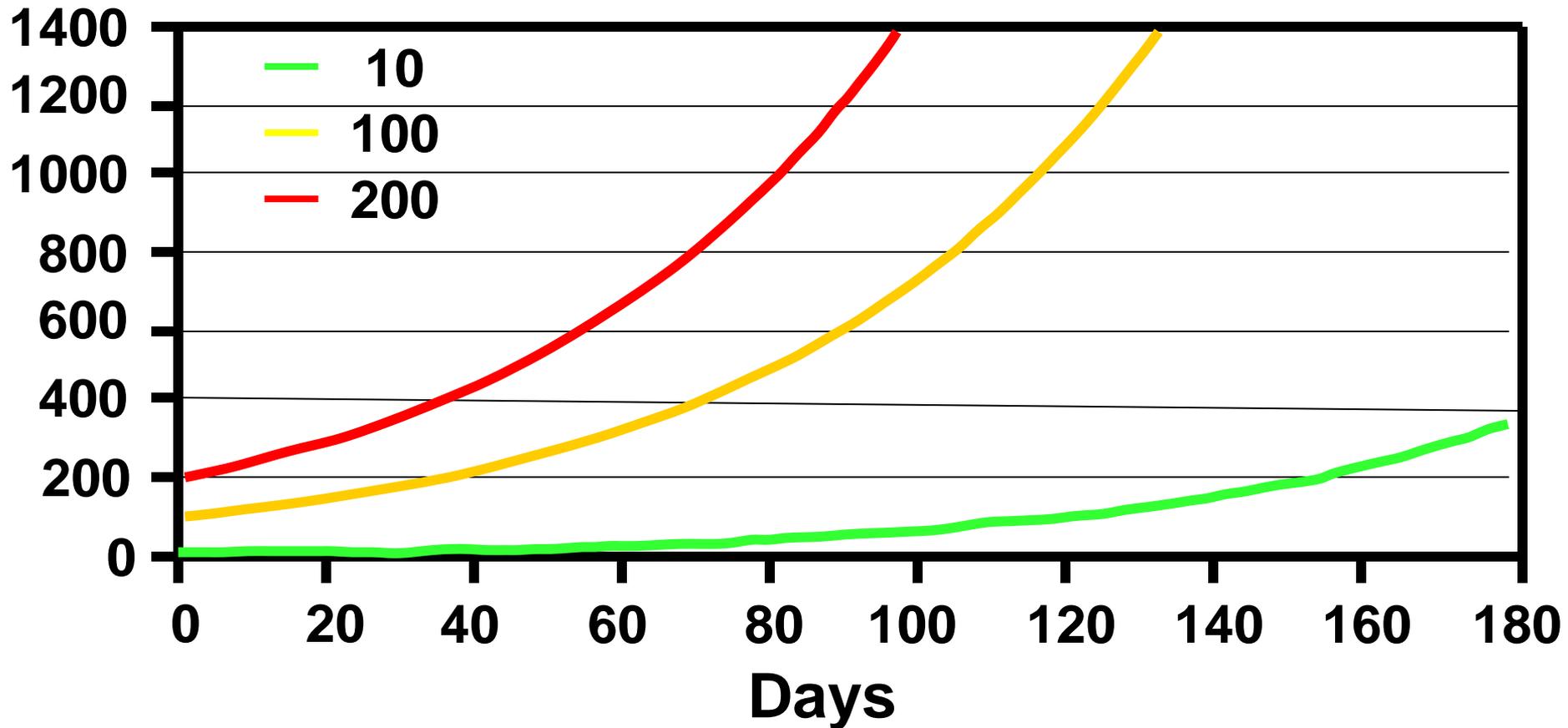
- Intrinsic rate of growth
- Invasion pressure
- Innate resistance in bee population
- Foraging conditions
- Temperature and humidity

Intrinsic rate of growth

- 12 fold increase per year
- .021-.024 daily when drone brood is present
- When drone brood is present population can double in a month
- When mite populations exceed 1,000 colonies can die out
- Associated diseases can alter varroa population required to injure a colony

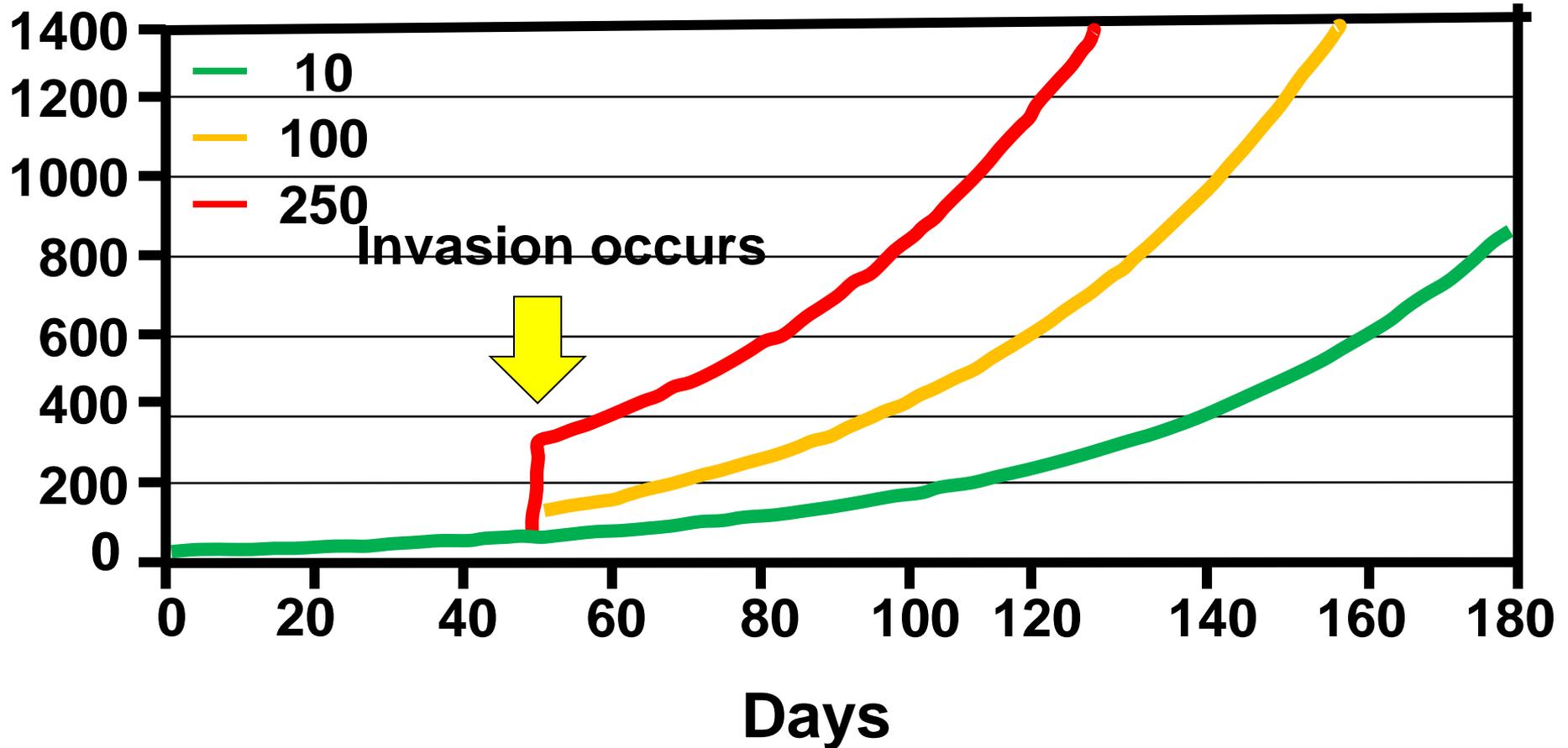
Initial mite numbers and subsequent population growth

Number of Varroa mites



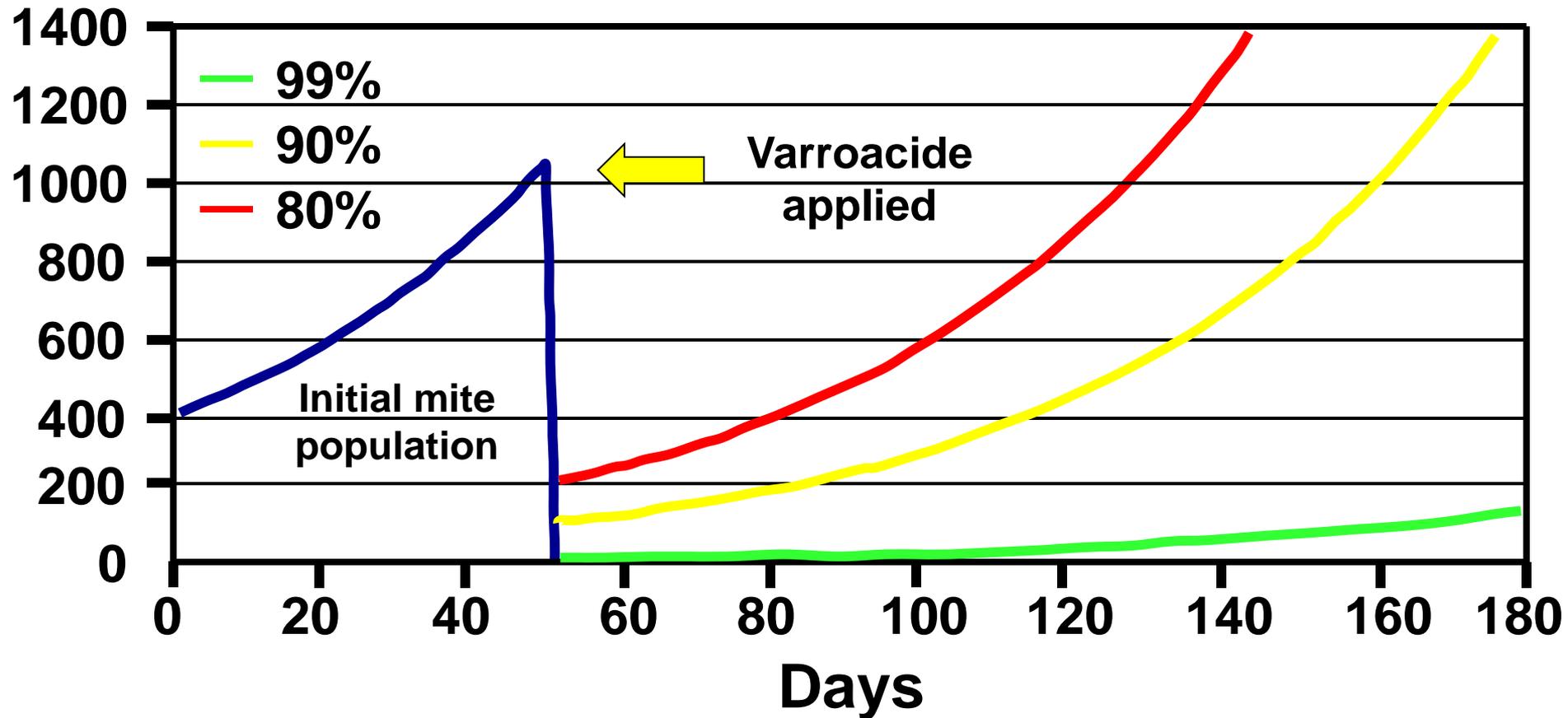
Effects of mite invasion on subsequent mite population growth

Number of Varroa mites



Effects of treatment efficacy on subsequent mite population growth

Number of varroa mites



Detection methods

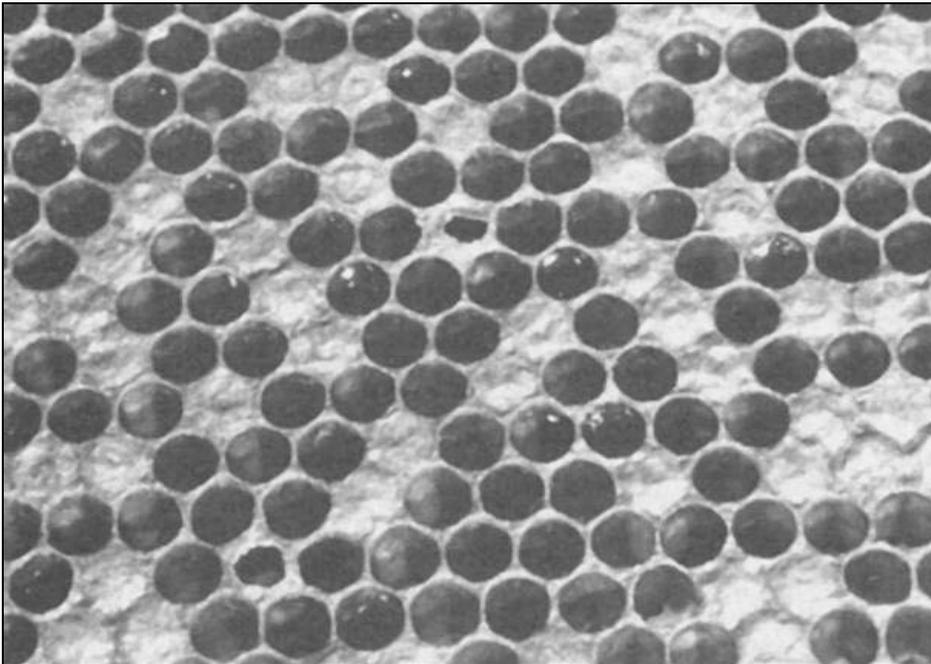
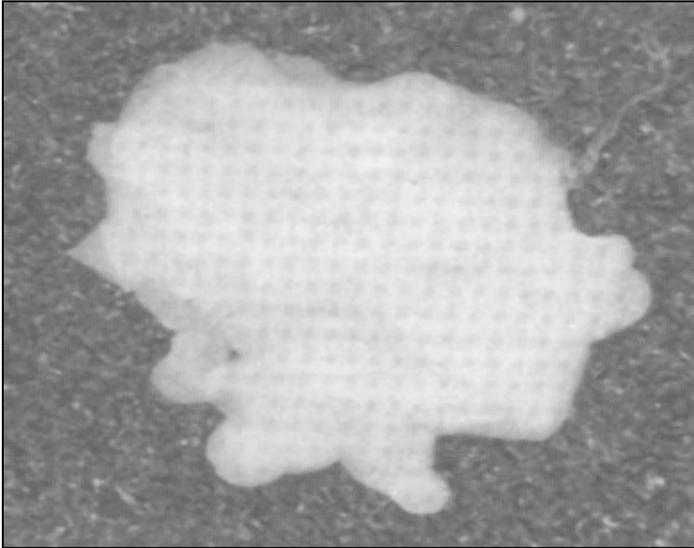
- Ether roll
- Sugar roll
- Alcohol wash
- Brood examination
- Feces examination
- Natural mite fall

Detection methods



Dead colony assessment

Varroa feces, a white amorphous mass

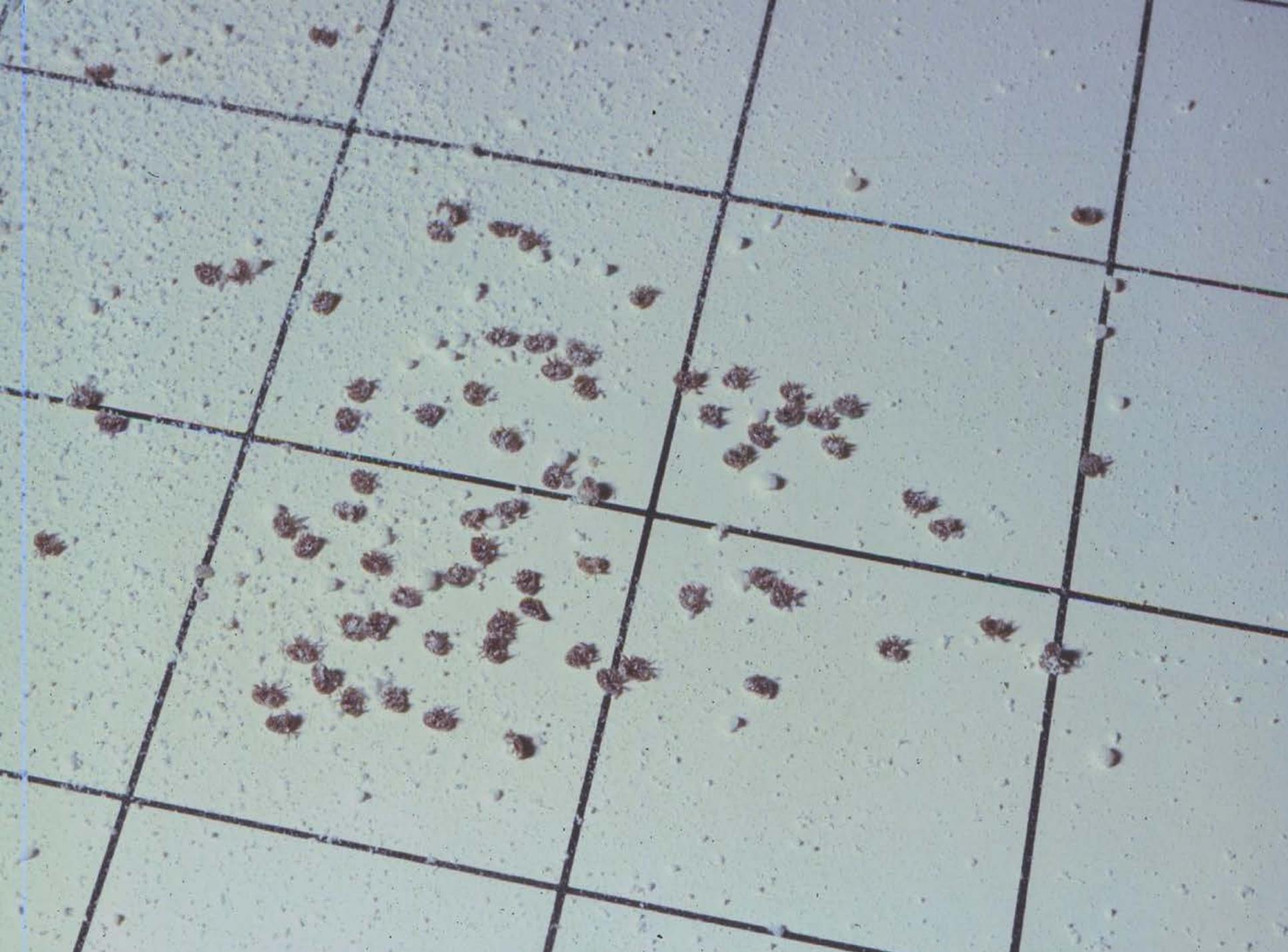


Feces are deposited on the ceiling of the cell wall

Live colony assessment







Resistant / tolerant bee stocks

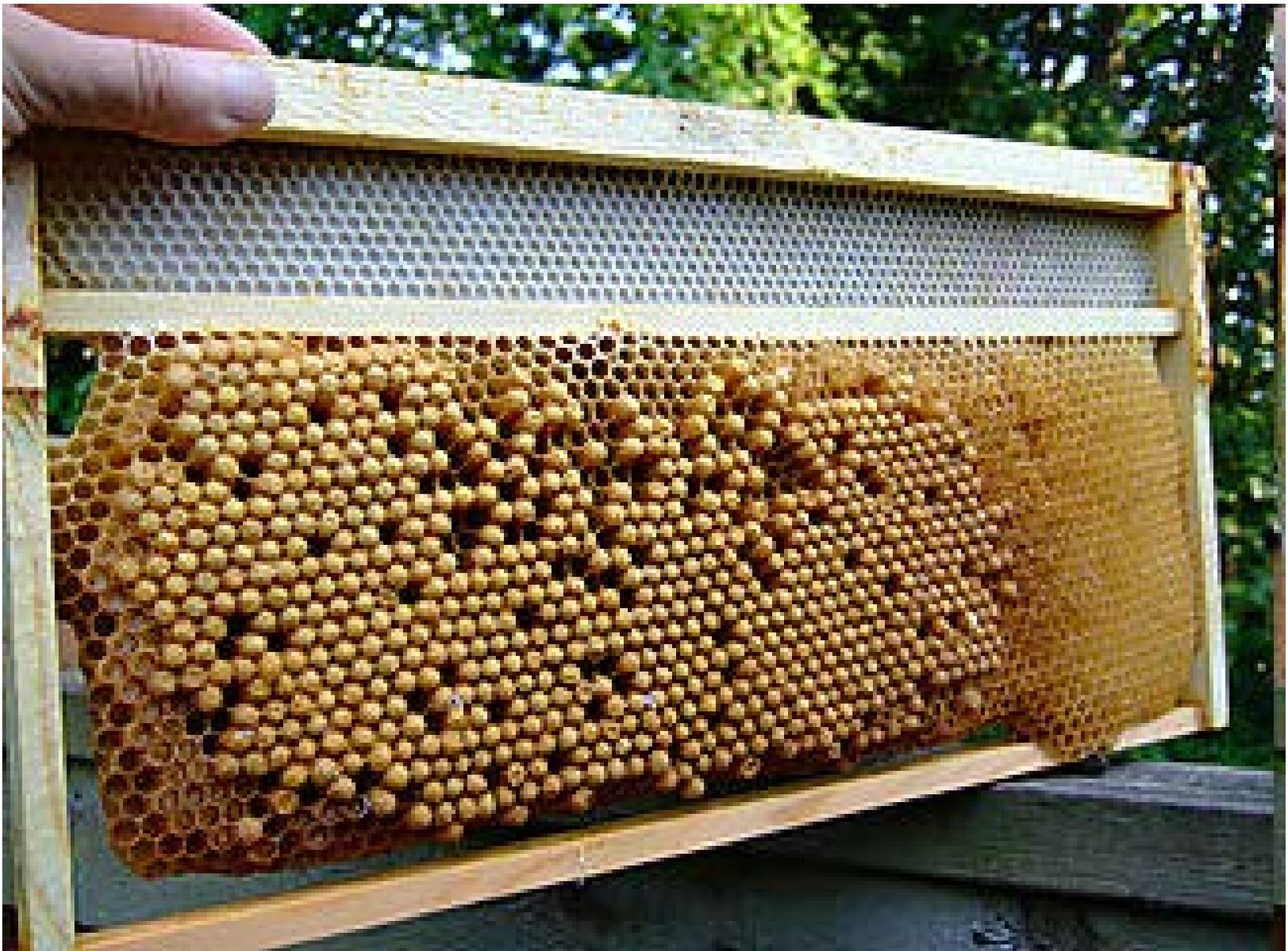
Varying levels of hygienic behavior exists in all bee populations and can be augmented by selection

Management modifications

- Adult bees
 - Screened bottom boards
 - Screened bottom + sticky boards
- Brood
 - Drone brood removal
 - Restrictive trapping + brood removal

Screened bottom board

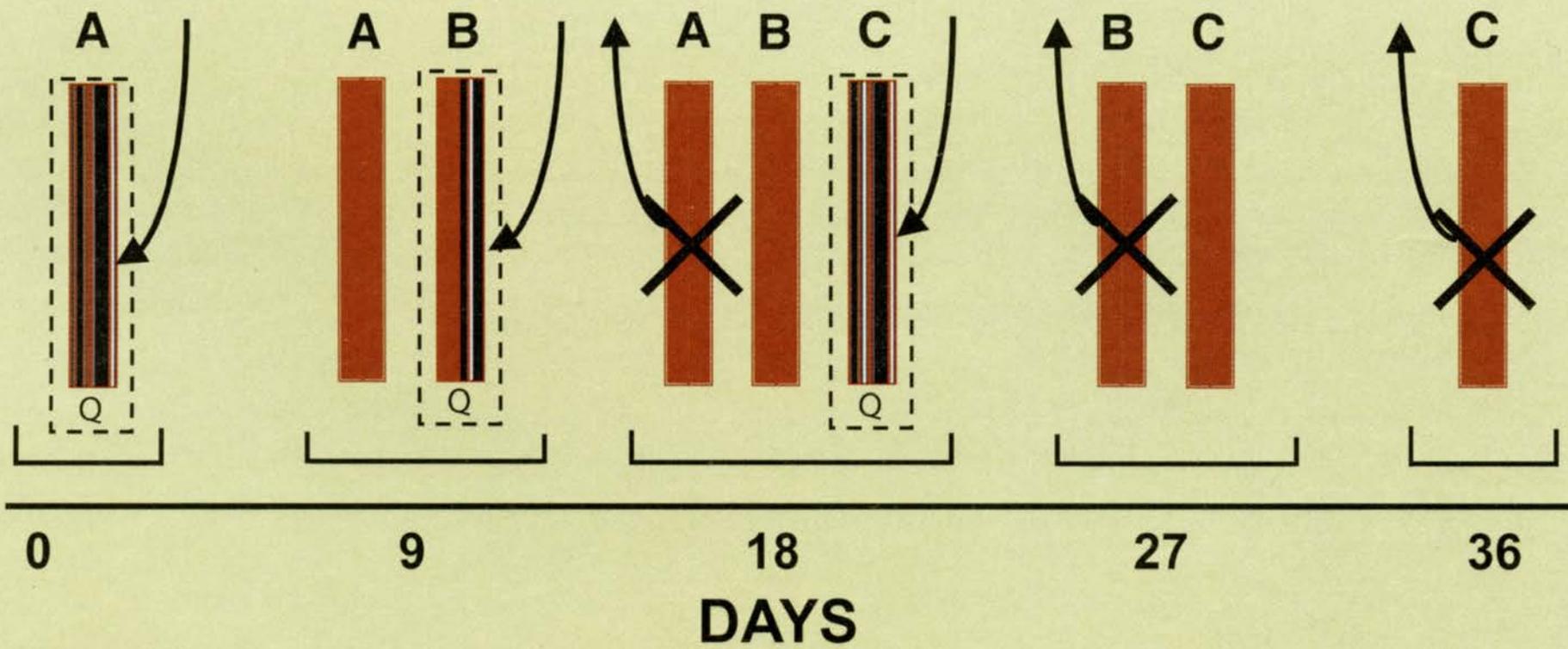




Drone brood removal



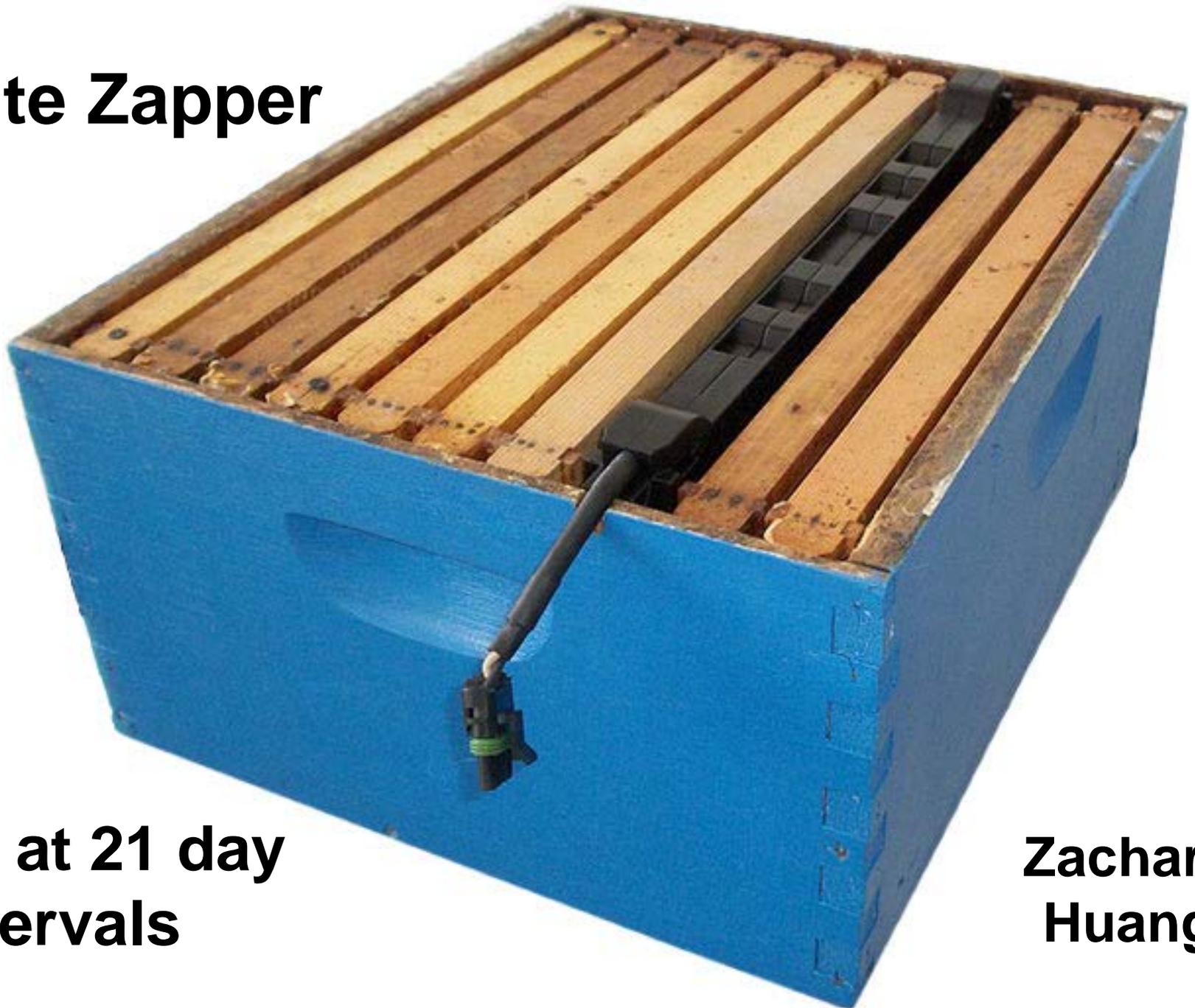
Comb trapping



Physical Control - Heat treatment

- Apitherm 2 Solar®
- German vendor, 2 devices, hold 2 or 4 combs
 - 40°C (104°F) kills Varroa
 - 45°C (113°F) kills brood
 - 3 hour treatment period

Mite Zapper



**5X at 21 day
intervals**

**Zachary
Huang**



**Physical control with
inert dust**



Folgers
FRENCH ROAST



Varroacides registered in U.S.

- Section 3
 - Apistan - NE
 - ApiGuard – S,F
 - Apilife Var – S,F
 - MAQS S,S,F
 - Sucrocide - NE
- Section 24c
 - None registered
- Section 18
 - Checkmite+ NE
 - Hop Guard – S,S,F
 - Apivar S,F
- Registered in Canada
 - Oxalic acid F,W



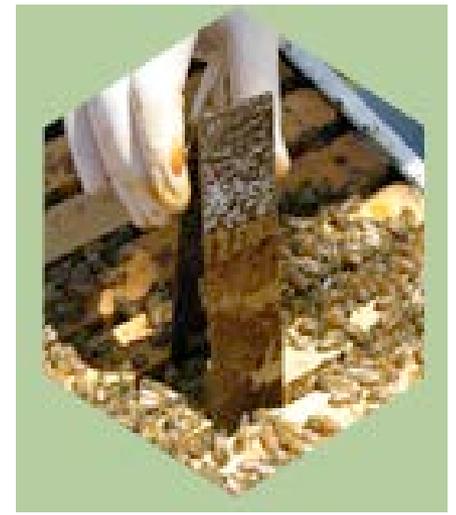
Apistan



Api Guard



Api Life-Var



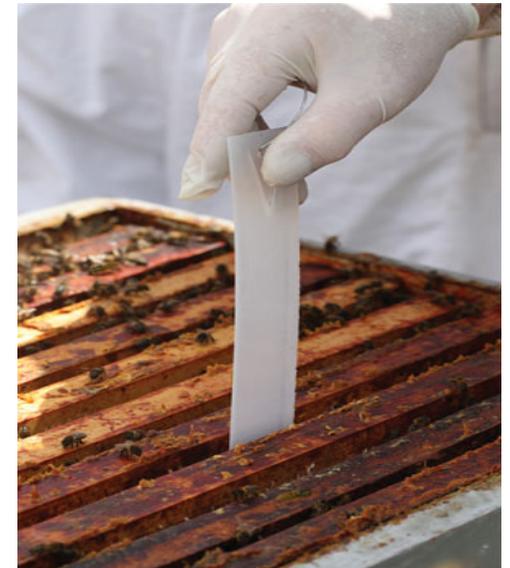
Hop Guard



Checkmite+



MAQS



Apivar





Hop Guard

- Anytime
- Up to 6X per year
- Best results when broodless
- Messy to handle

When to treat

- In the spring, take action to reduce mite populations if they are detectable using the sugar roll technique
- Sample again in mid-August. If you detect 3 or more mites per 100 bees (9 mites on a 300 bee sample), remove crop and suppress mite populations
- If you detect less than 3 mites per 100 bees in mid-August you can delay suppression measures until colonies are broodless

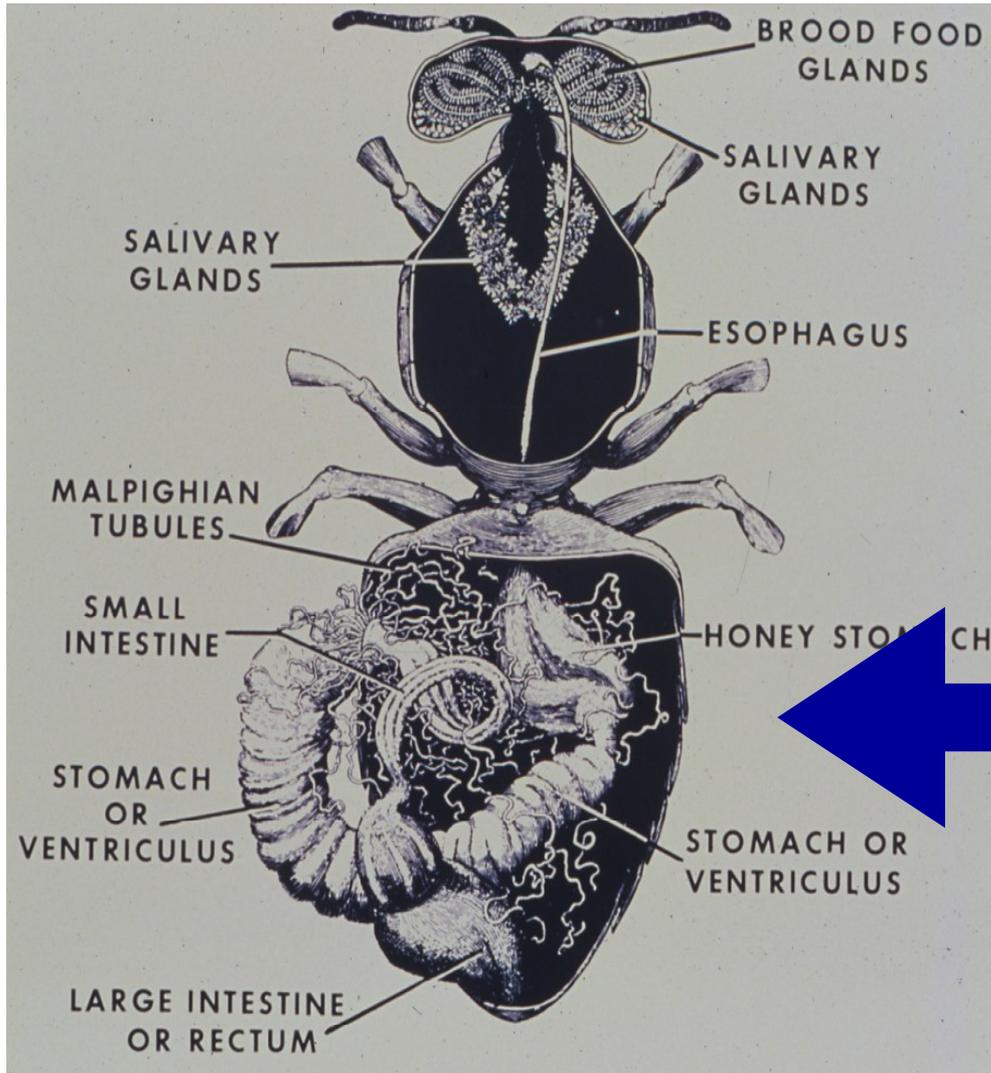
Adult honey bee diseases and pests

- *Nosema apis* & *ceranae*
- Virus infections
- Tracheal mites



Yeah, dude. i'm
totally not gonna
make it in
today.

Nosema: Protozoan disease localized in the midgut



It feeds there and produces more spores

Nosema outbreaks tend to occur when bees are confined



This includes packed bees and wintered bees heading into spring

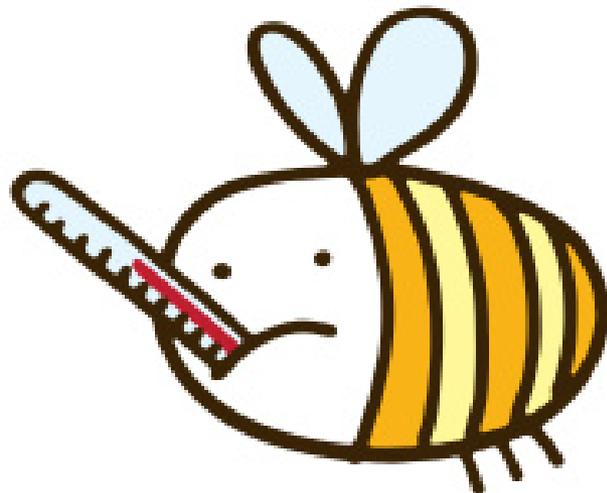
No single symptom typifies the disease



**Dysentary – high moisture honey
or *Nosema***

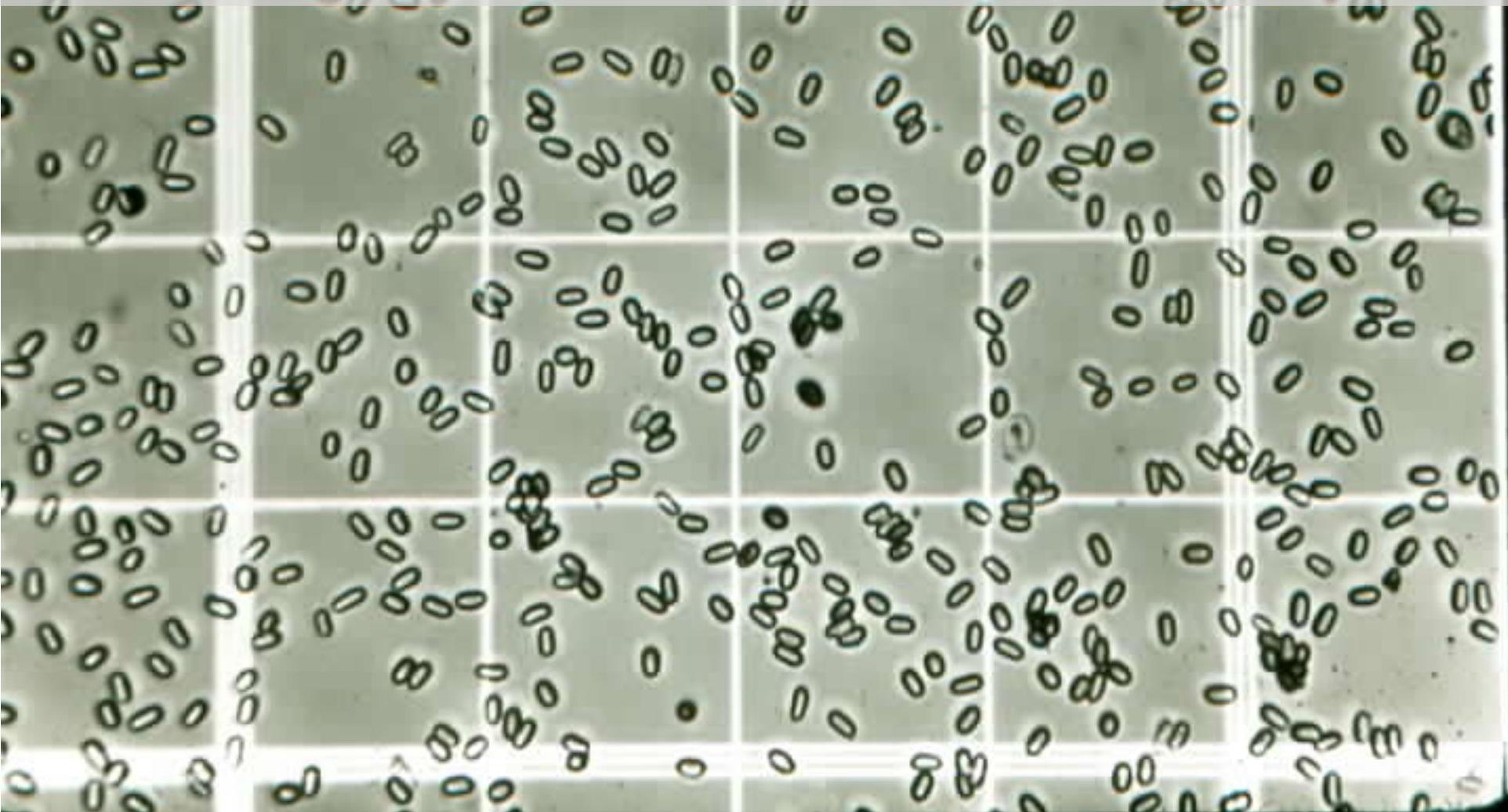
Nosema injury

- Mandibular & hypopharyngeal glands secretions reduced
- Bees supersede queens that become infected
- Infected bees are less able to feed brood



Microscopic examination is necessary for diagnosis

Economic threshold is 10,000 spores per bee



Integrated approach to reduce *Nosema* injury

- Stress reduction
- Install package bees as soon as possible
- Do not winter weak colonies
- Choose wintering locations carefully
- Insulate wintered colonies

Fumidil-b treatment instructions

- Dissolve one rounded teaspoon of fumidil-b in 4 oz. of water (100-120⁰ F.)
- Add to 1 gallon sugar syrup
- Feed 1 gallon medicated syrup to package bees upon installation
- Feed 2 gallons in fall to prepare colonies for winter
- Do not spring feed wintered colonies

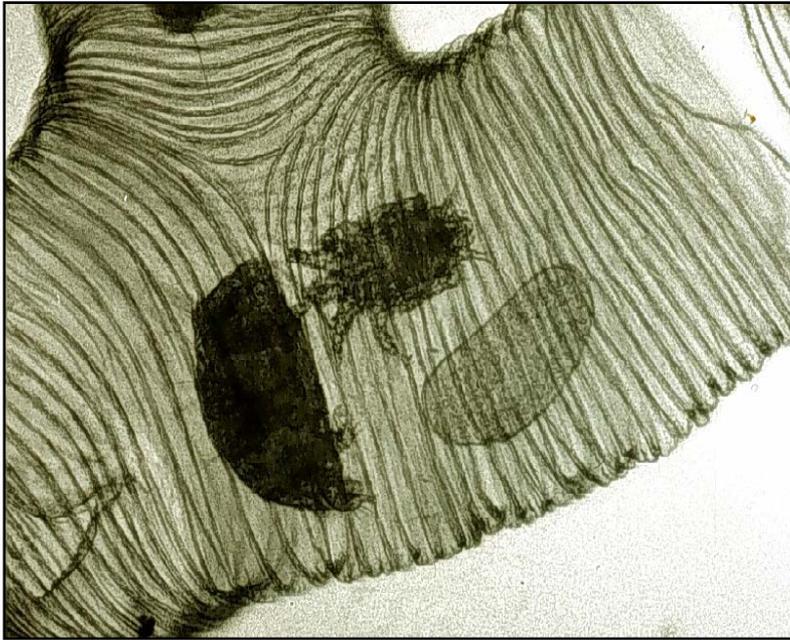
Adult honey bee viruses

18 known honey bee viruses

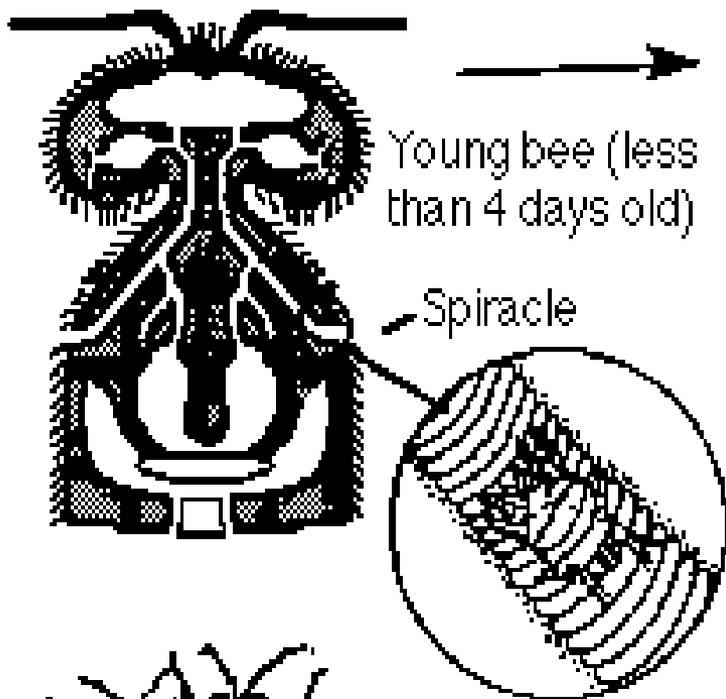
- Israeli acute paralysis virus
- Acute bee paralysis Virus
- Chronic bee paralysis virus
- Deformed wing virus
- Black queen cell virus

Best defense is a strong and vigorous colony

Tracheal mite: a microscopic internal mite parasite

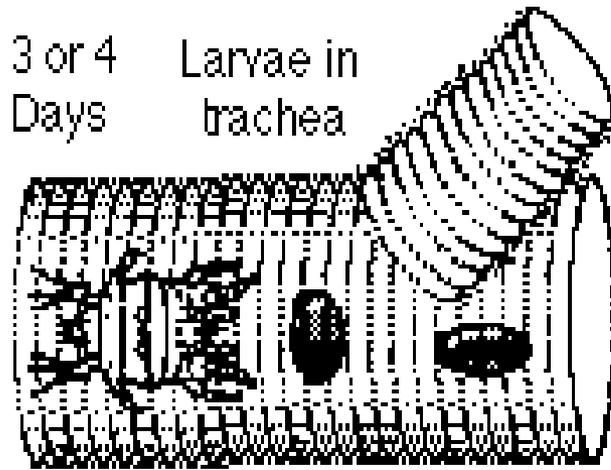


Cause damage by feeding on hemolymph but can also clog airways

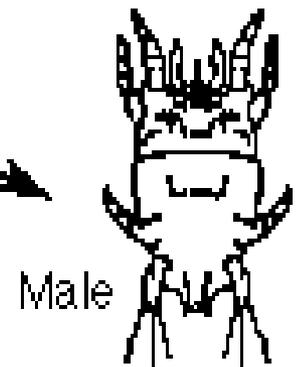


3 or 4 Days

Larvae in trachea



up to 14 eggs in trachea



Life Cycle of Trachea Mites

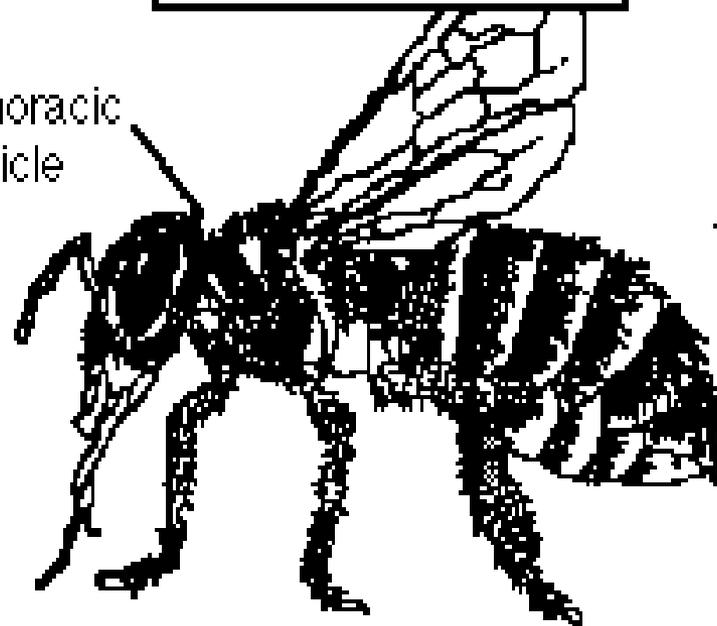
Adult Mites



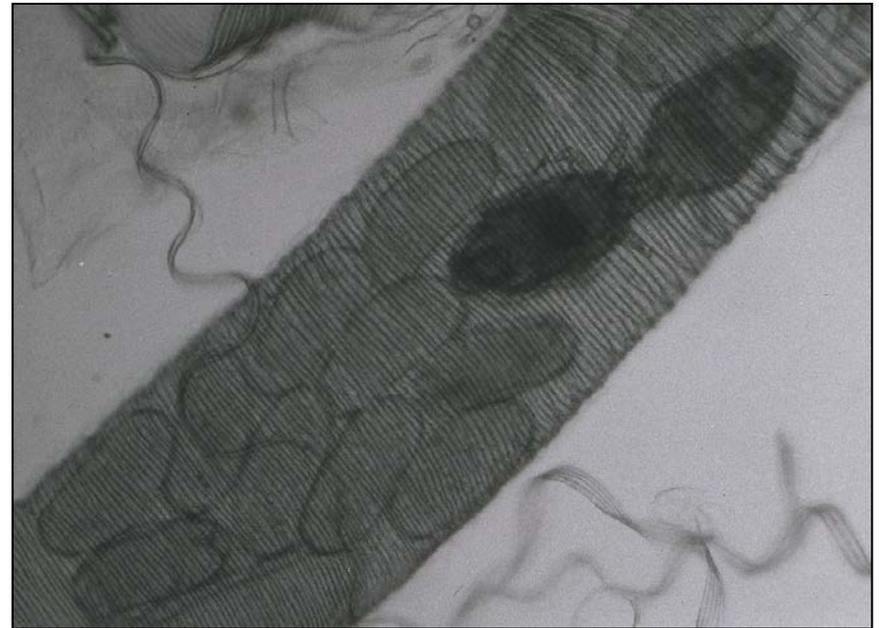
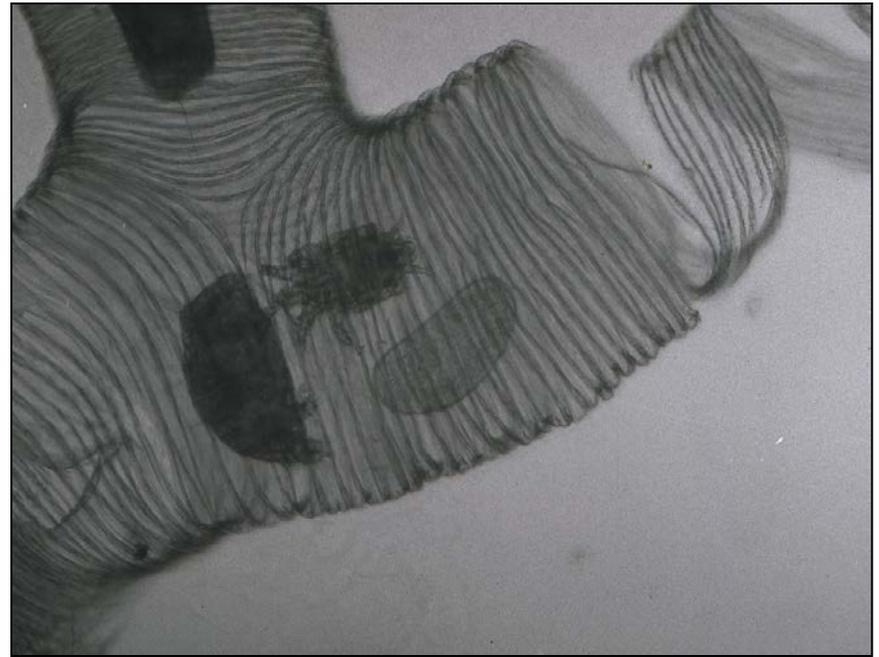
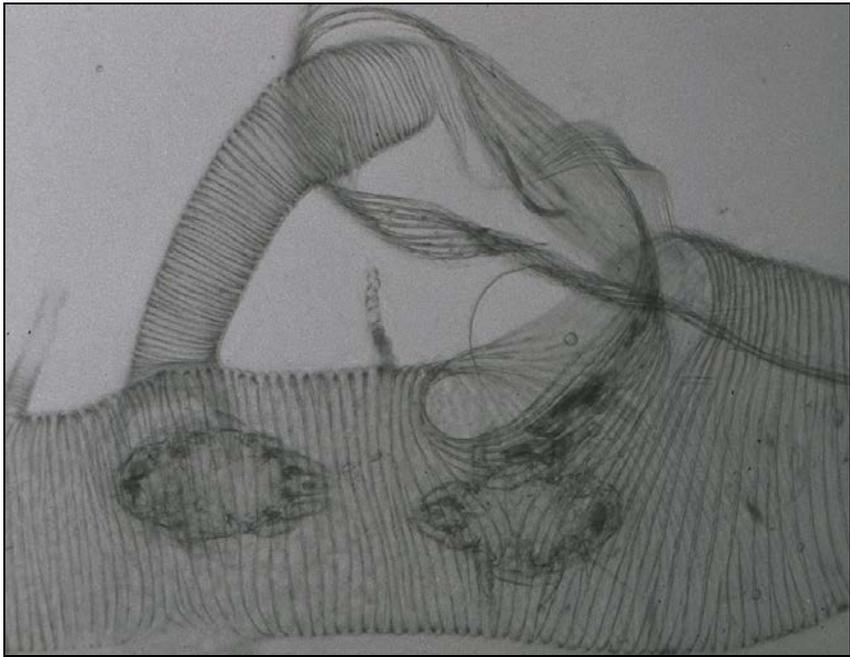
First Thoracic Spiracle



Close contact among bees permits passage of female mites from infested bee to young noninfested bees



Mated female migrates out of spiracle and attaches to tip of hair.



Tracheal mites in Midwest cause extensive population loss in Nov. - Feb.



Emma Tennant

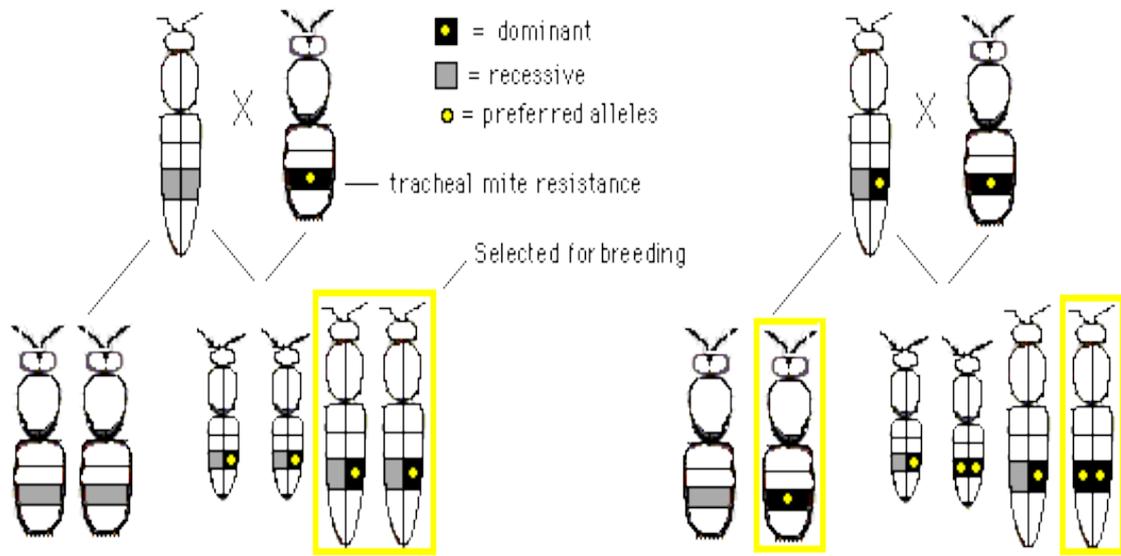
Affected bees exit the colony during winter and do not return

Tracheal mites are diagnosed with microscope



Collect bees in alcohol and send off for verification

Integrated approach to tracheal mite management



Use mite resistant queens

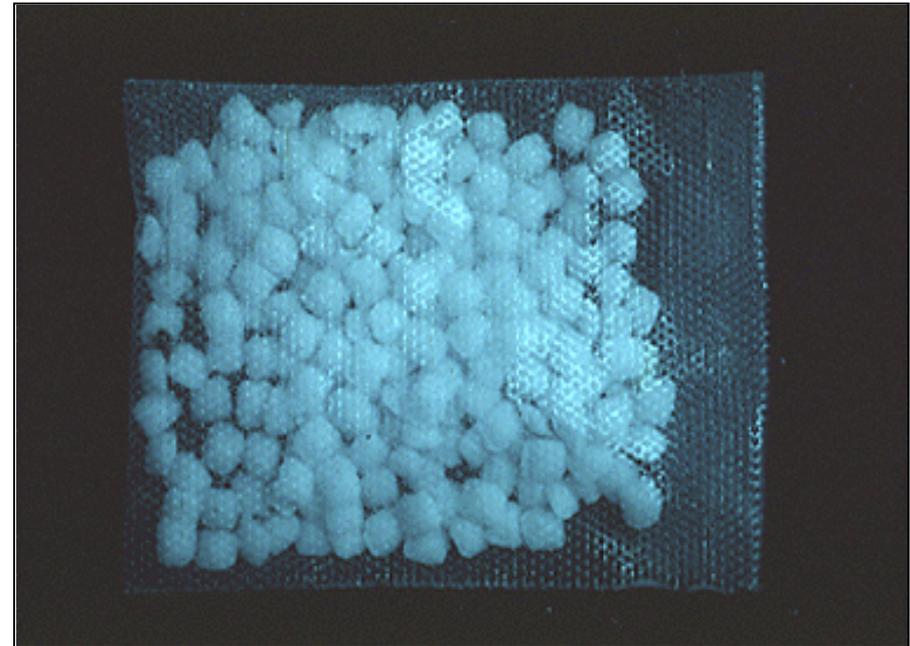


Stress reduction

Integrated approach to tracheal mite management



Grease patties
(sugar + Crisco)



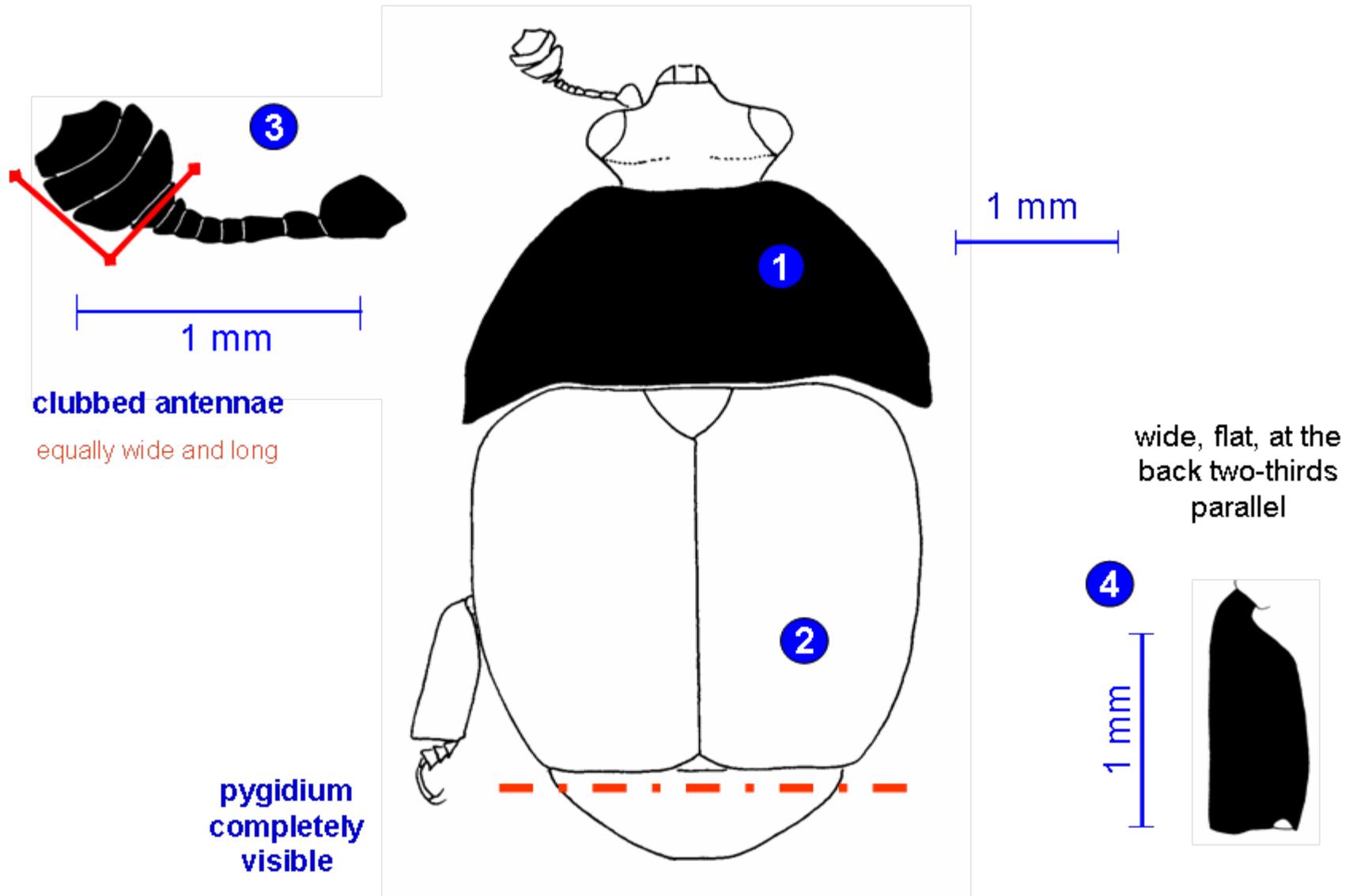
Chemical treatments

- Menthol
- Formic acid gel

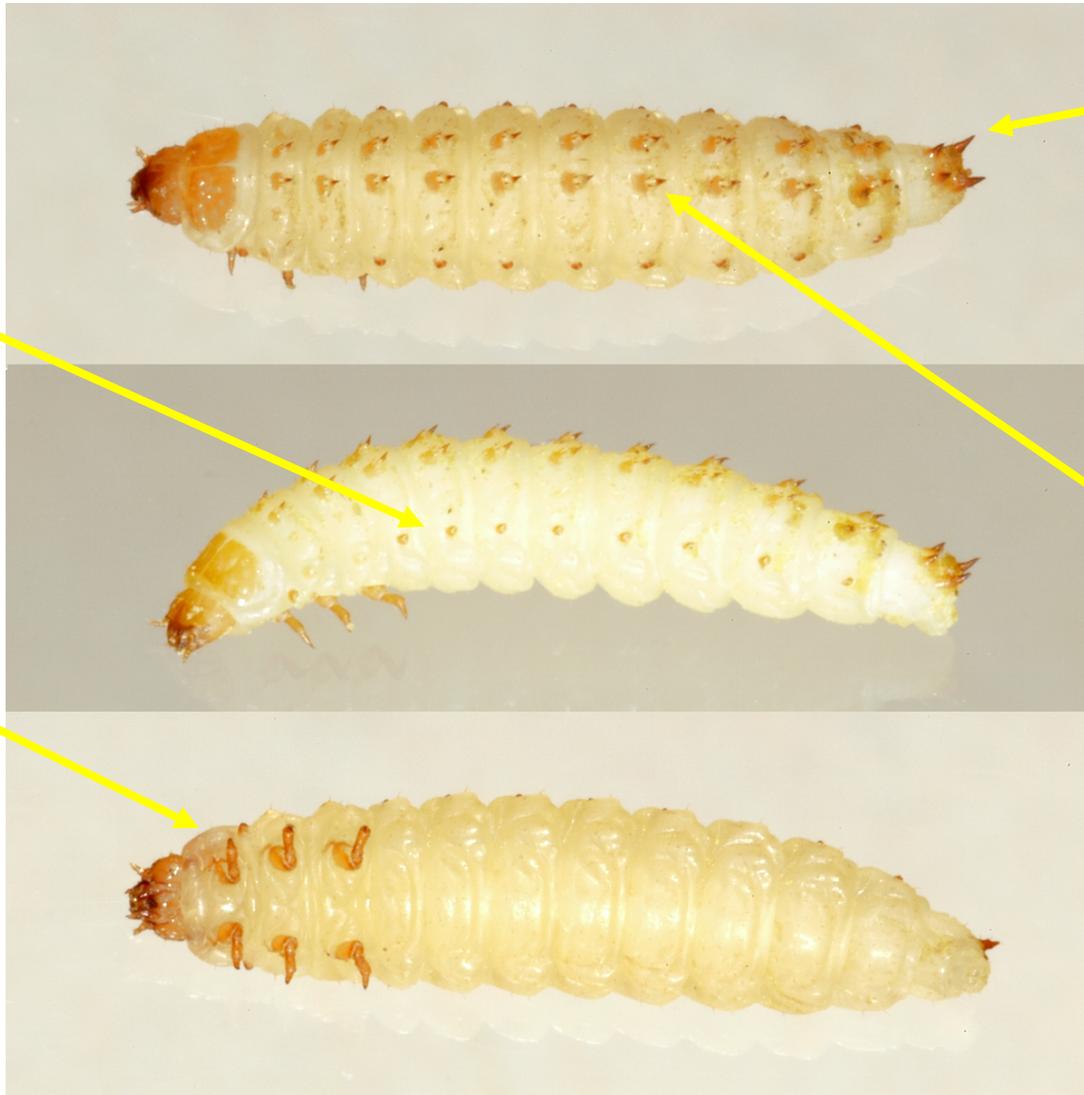
Hive pests: Small Hive Beetle



The small hive beetle *Aethina tumida* (Murray 1867)



The small hive beetle larva



Urogomphi

Stigmata

Two rows of dorsal spines

Three pair of prolegs

Opportunistic invader that compounds other problems

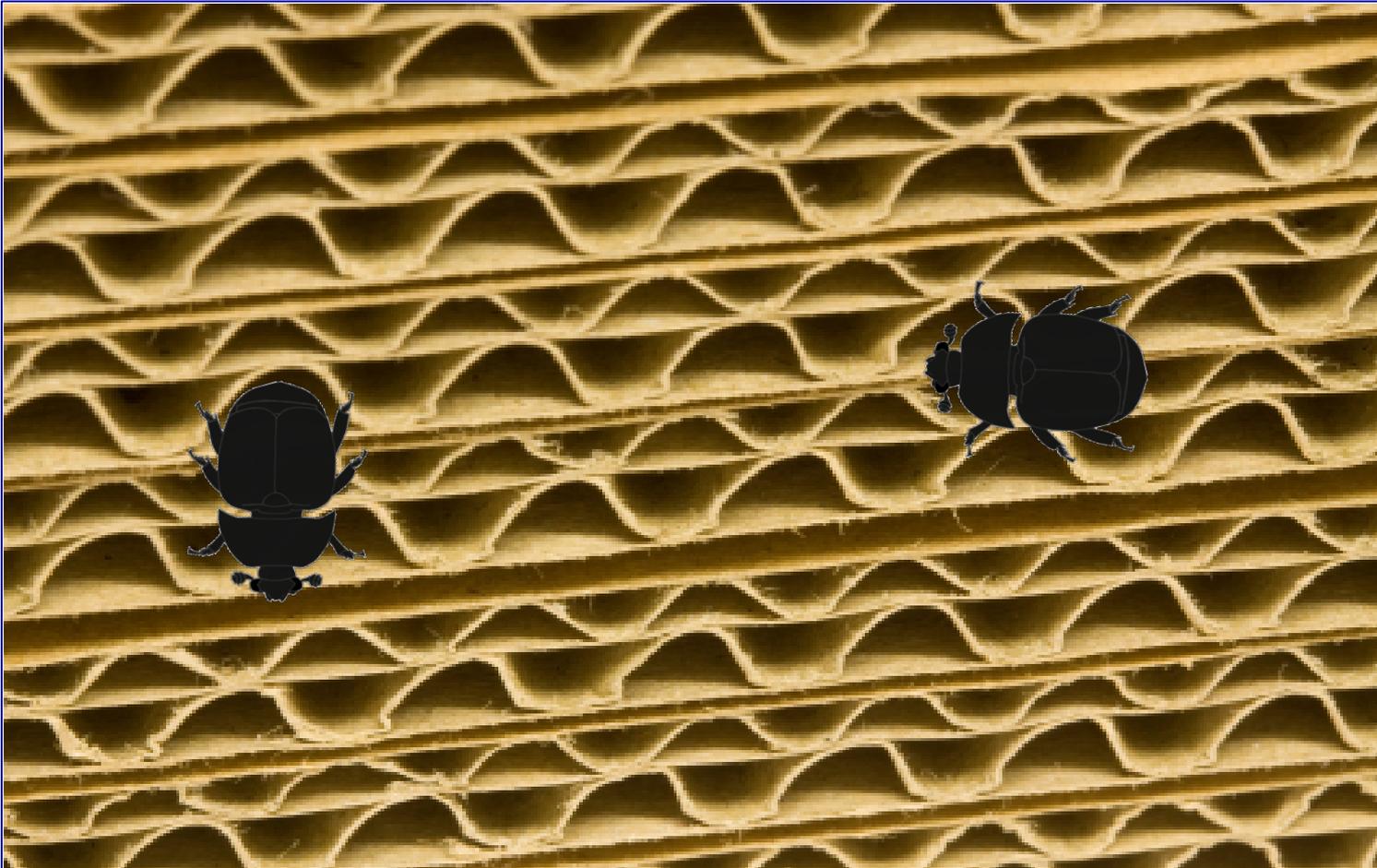


Both adult and larvae can damage hive

Creates a characteristic slimy appearance in high numbers



Inspecting colonies for SHB



Corrugated paper on bottom board



SHB traps



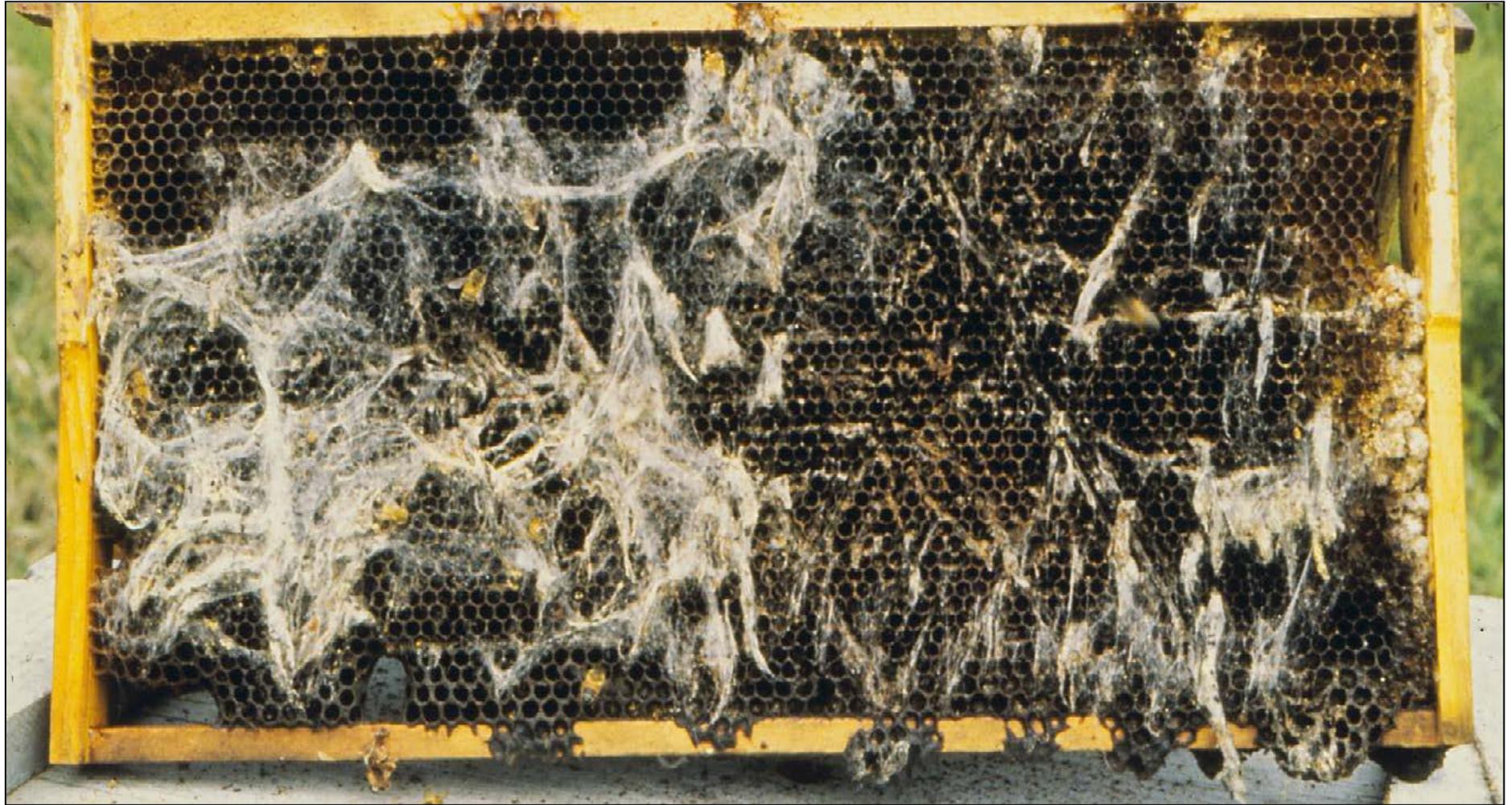
Mineral oil &
apple cider
vinegar used as
bait

Precautions in the honey house

- Use queen excluders and do not have upper entrances
- Extract honey and melt cappings within 2-3 days
- Keep relative humidity below 50%
- Fluorescent light will attract larvae seeking soil to pupate

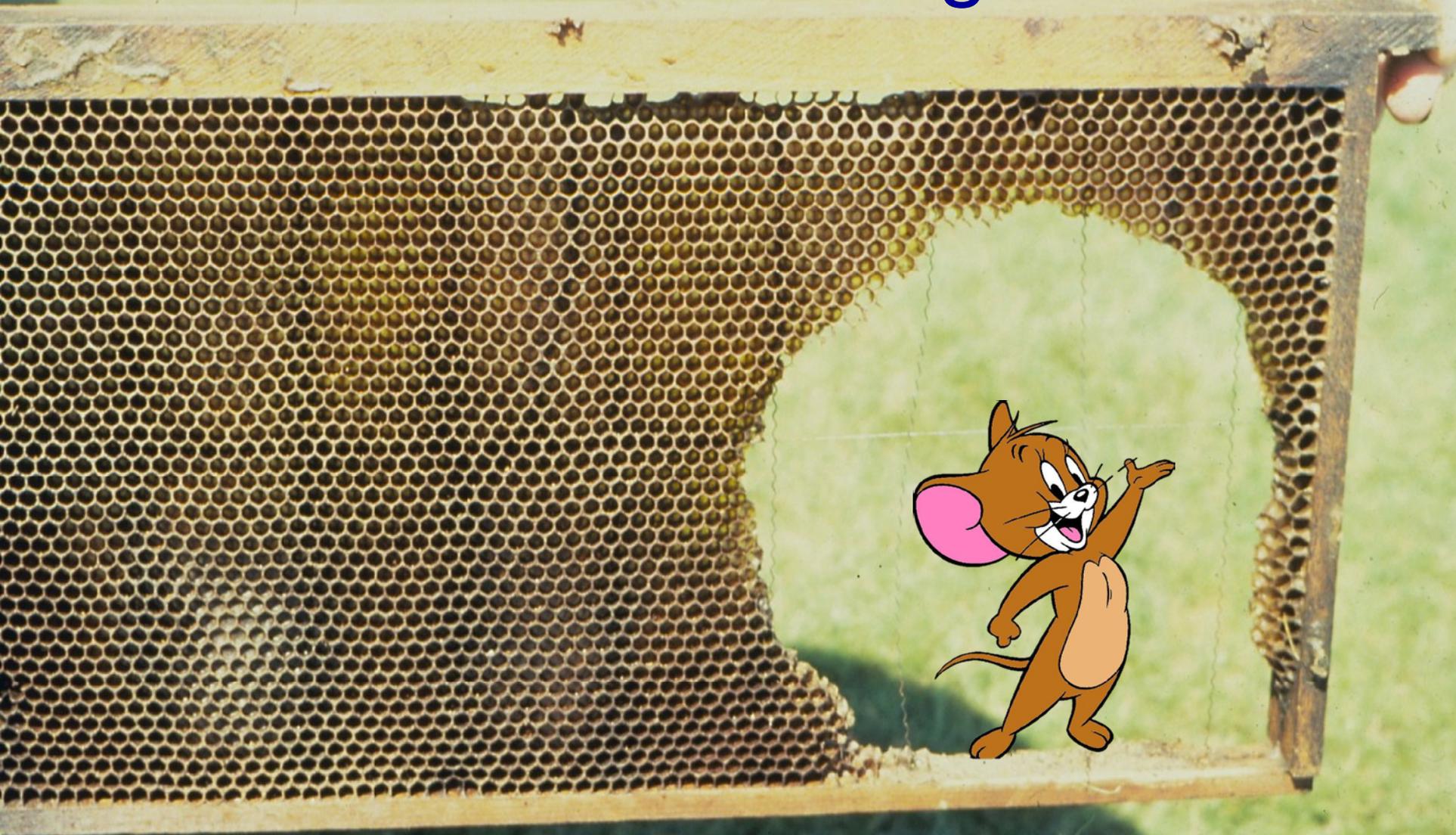


Wax moths consume wax, honey, pollen, even brood



Keeping colony strong is best defense

Rodent damage



Skunks enjoy gobbling up bees



You may find feces, pawed at ground, aggressive bees

Think ahead of vertebrate pests



Board accentuated with nails
to ward off skunks



An electric fence to prevent
bears from destroying your
hives

Think ahead of vertebrate pests



As part of your winter preparation you should install a mouse guard