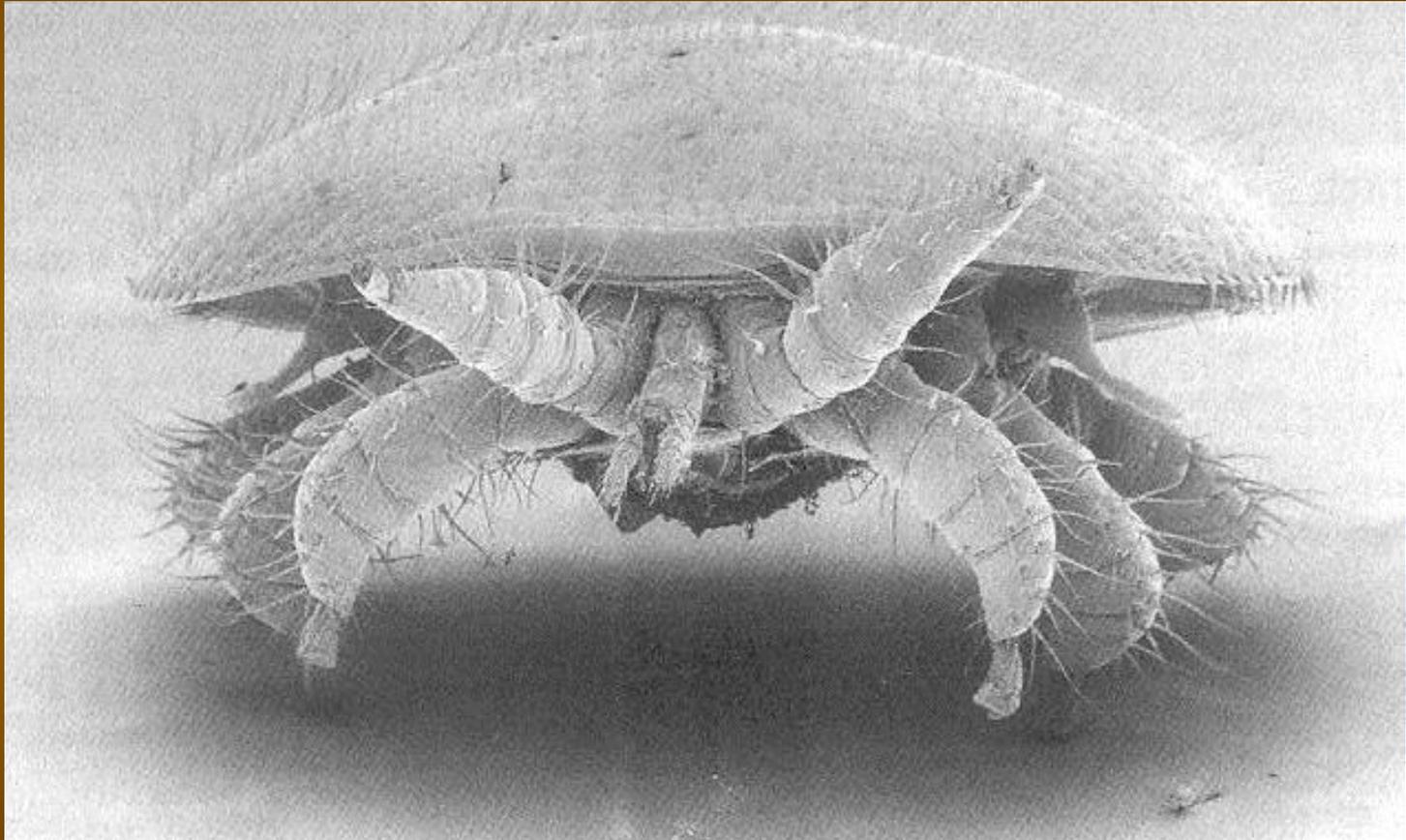


Why Treat for Varroa ?



Buddy Marterre, MD

Possible reasons

- Because if I don't I will lose all my bees
- So I can have 100 % overwinter survival
- The Varroa mites are worse than the treatment effects on the colony
- Fear

What are your goals?

- To be an expert in something
- Maximize honey production
- Help the environment
- Own an exotic pet
- Get out of the house
- Keep every colony alive
- Have something cool to talk about
- Spend more time with nature
- Having enough colony deaths to make nucs with the next spring
- Having enough honey money to buy some packages to replace your losses

Varroa destructor is like CANCER

- Original host is *Apis cerana* (Asian honey bee)
- Present in every single colony on the planet Earth
- Carries many viruses
- EXTREMELY VIRULENT PEST
- Will kill most colonies within 2 – 3 years if nothing is done



Be a good doctor

- Having Varroa in your colony is like ***you*** (personally) having cancer, but you – the beekeeper – are the doctor
- What would it be like to go to the doctor for cancer?
- What would you expect your doctor to know about the drugs he/she had to treat you with?
- Do you expect a 100 % cure with chemotherapy?
- Do you expect no side effects?
- What is marginal benefit of treatment?
 - The amount of benefit you receive over doing nothing
 - If you have a 70 % chance of survival with ***no*** treatment and a 80 % chance of survival ***with*** treatment, the marginal benefit of treatment is 10 %

Varroa chemical treatment studies

- All varroicides have been tested for their ability to kill Varroa mites
- Lethal effects on adult bees have been tested for all
- A few sublethal effects have been studied
- Synergistic effects on bees are just now beginning to be addressed
- No randomized controlled field trials have ever been published on overwinter survival

Varroicides are like chemotherapy

- All are lipophilic and collect in beeswax
 - This is where the brood is reared!
- Every varroicide is poisonous to bees too
- Some strains of Varroa mites have developed resistance to Fluvalinate and Coumaphos



Matching Question

- Coumaphos
- Fluvalinate
- Amitraz
- Thymol-based essential oil products
- Organic acids (Formic)
- Organophosphate; worst effects on the environment
- Worst 'synergist'; has serious sublethal activity
- Quite safe but breakdown products are very unsafe
- The lowest selectivity ratio (LD50 mite / LD50 bee)
- Bees 'dislike' the most

'Hard' chemicals in foundation

- 98 % of 259 comb and foundation wax samples contained:
 - Fluvalinate (up to 204 ppm)
 - Coumaphos (up to 94 ppm)
 - C Mullin, *PLoS ONE* 5(3): e9754
- Queen acceptance and weight decrease at a queen cell wax concentration between 10 and 100 ppm of coumaphos
 - J Pettis, *Apidologie*, 2004
- Frame 1 coumaphos concentration 256 ppm after a single treatment on frame 5!
 - J Berry, *Bee Culture*, 2009
- Fluvalinate has sublethal (weight and sperm number) and coumaphos has lethal effects on queen rearing
 - Haarmann, *J Econ Entomol*, 2002
- Plastic foundation alters vibrational signaling (and heat transfer), comb building AND honey production
 - T Seeley, *Apidologie*, 2005; *ABJ*, 2006
- No drone sized cells (17% feral)
- Bees pull it 'wrong'

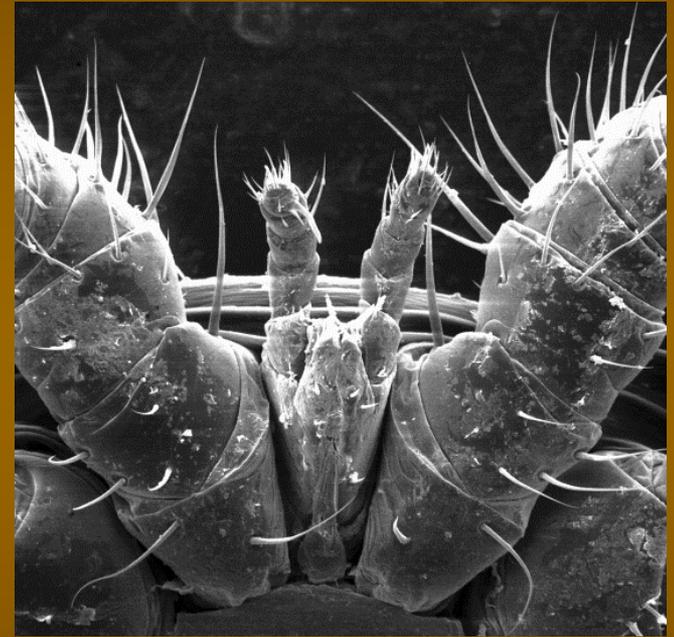


'Soft' chemical effects

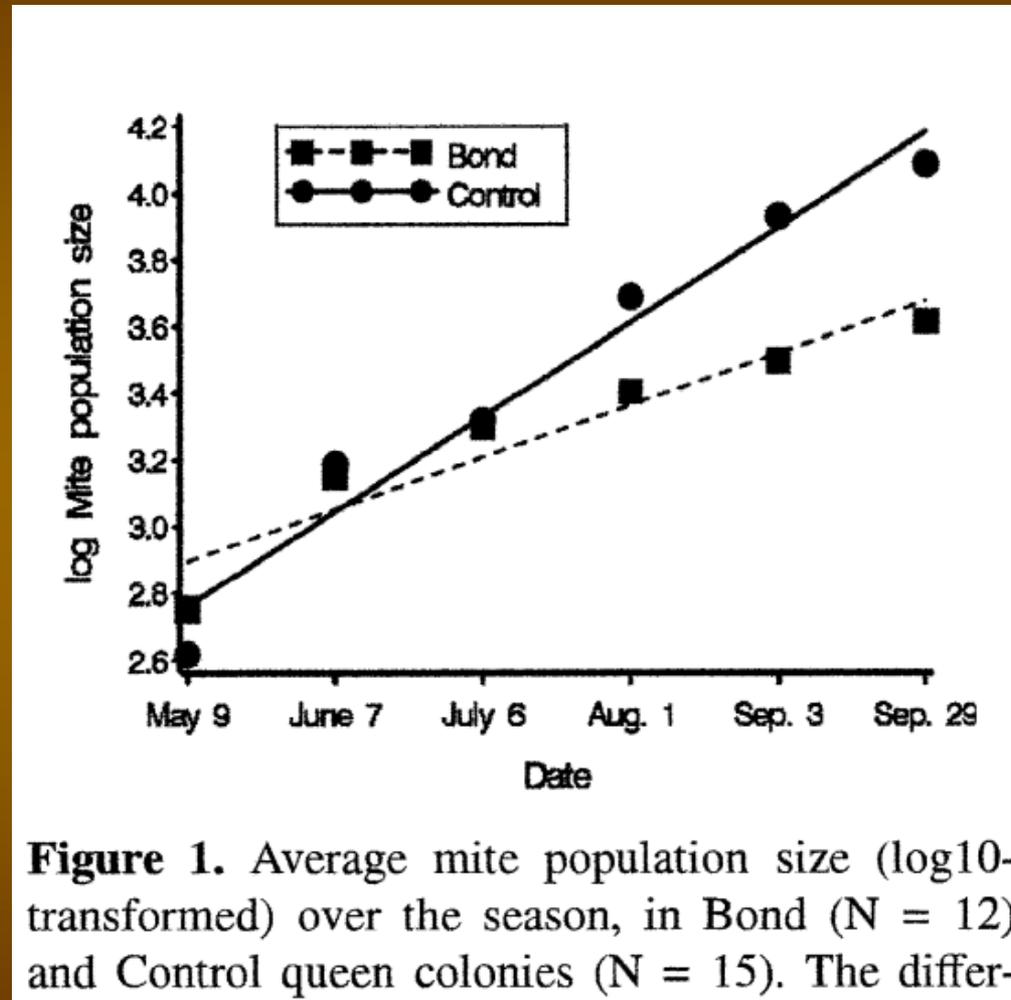
- Formic acid reduces adult drone survival, worker longevity, and brood survival
 - - de Guzman, ABJ, 1999
 - - Fries, ABJ, 1991
 - - Underwood, Exp Entomol Acarol, 2003
- Thymol induces brood removal and decreases sperm viability
 - - Floris, J Econ Entomol, 2004
 - - Burley, VT Masters, 2007
- Organic acids and essential oils have strong odors and really disrupt honey bee colonies during (and probably after) treatments

To treat (w/ chemicals) or not to treat...

- Resistant strains of mites are selected by over-treatment because unnecessary drug exposure favors their survival over non-resistant strains
- Varroa mites reproduce faster in managed colonies than in feral 'survivor' colonies
 - Seeley TD, Honey Bees of the Arnot Forest..., Apidologie, 2007



NO chemicals? Slower reproducing mites



my over-wintering experience

<u>Winter</u>	<u># of Fall Hives</u>	<u># Spring Hives</u>	<u>Over-Winter Survival</u>	<u># Treated for Varroa</u>	<u>Pollen In Fall</u>	<u>Varroa Treatment</u>
03 - 04	3	3	100 %	3	no	Thymol
04 - 05	5	5	100 %	2	no	ApiLife Var
05 - 06	8	5	63 %	5	no	Apistan
06 - 07	11	11	100 %	4	yes	ApiLife VAR
07 - 08	14	11	79 %	0	yes	NONE
08 - 09	12	8	67 %	0	yes	NONE
09 - 10	14	4	29 %	0	no	NONE
10 - 11	14	12	86 %	0	yes	NONE
11 - 12	11	8	73 %	0	yes	NONE
12 - 13	5	3	60 %	0	yes	NONE

My raw data

- 12/14 treated colonies survived
 - 86 %
- 58/82 untreated colonies survived
 - 71 %
- Marginal benefit 15 % ?

results by *intention* to treat

	# of Fall <u>Hives</u>	# Spring <u>Hives</u>	Over- Winter <u>Survival</u>	# Treated <u>for Varroa</u>
TOTAL	97	70	72 %	
selectively to treat	27	24	89 %	14/27
not to treat but pollen	63	49	78 %	

Bee Informed survival ('10 – '11)

- Any treatment used 70.5 % survival
- No treatment used 63.3 % survival
 - Marginal benefit 7 % ?

- NO-treatment philosophy (3,590)
 - 66.4 % survival 1 % beekeepers
- Mostly natural-treatment philosophy (92,919)
 - 66.6 % survival 35 % beekeepers
- Any-treatment philosophy (171,594)
 - 64.3 % survival 64 % beekeepers

treatment risk vs. benefit

BENEFIT

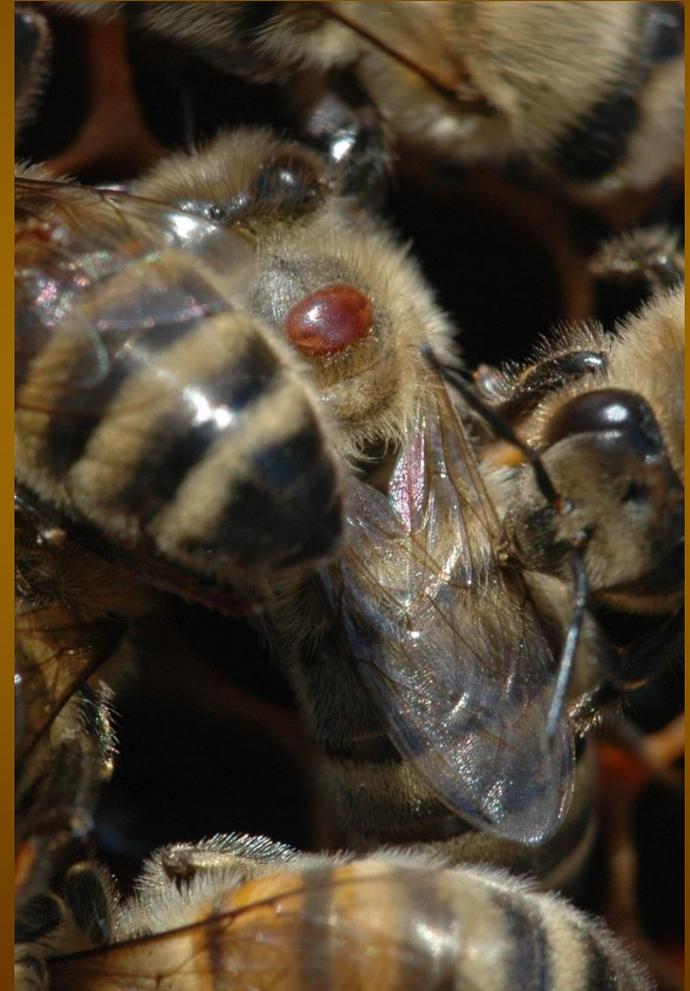
- Spend less time
- Marginal survival benefit of *perhaps* 7 – 15 %
 - No randomized field trial of overwinter survival has ever been published on any varroicide!

RISKS

- Weaker bees
- Stronger mites
- Poisoned wax
- Harmed environment
- Spend more money
- Spend less time

what if you *have to* treat for Varroa?

- Sugar shake tests in the summer AND after treatments
- Don't treat every hive indiscriminately
- Don't treat for too long (> 3 to 4 weeks)
- Alternate between Formic Acid and Thymol (ApiLife VAR, ApiGuard) treatment every other year in the summer ONLY if the threshold is reached
- Use HopGuard in broodless period
- Don't treat severely infested colonies - Just let them perish!

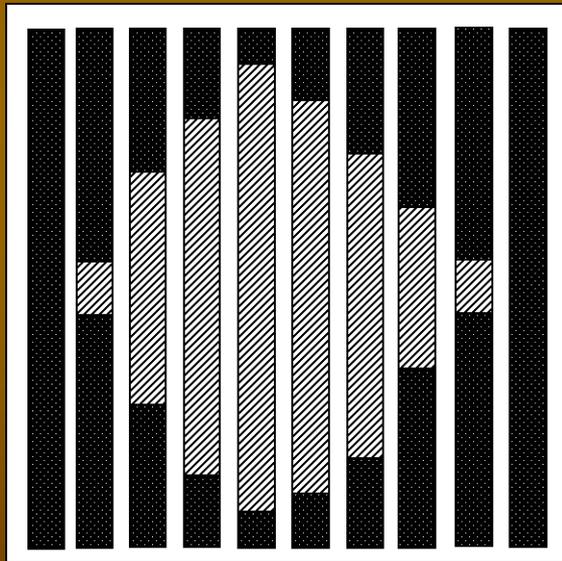


natural varroa mite strategies

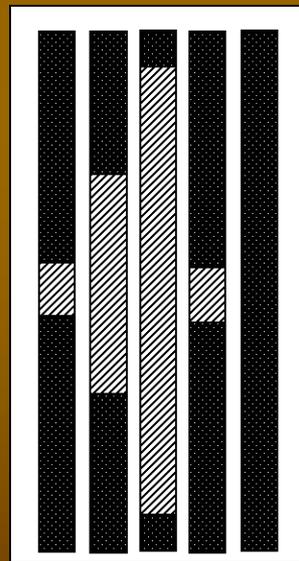
- VSH, Minnesota Hygienic, Russian, and 'Survivor' queens
- Screened bottom boards
- Sunshine
- Drone brood trapping / removal
- Dowda method of powdered sugar dusting
- MAKING SPLITS AND REARING QUEENS
 - Splits the mites
 - Rear queens from the survivors (tolerant)
 - Keeps the mites 'nicer' than treatments

making a reverse split

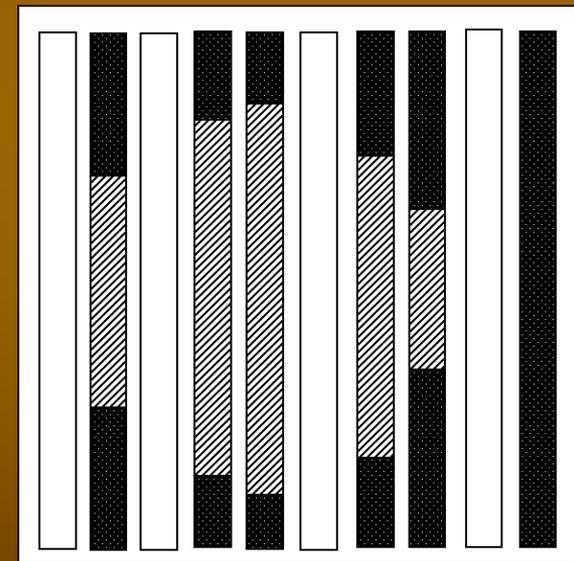
In the Summer, after the honey flow
Transfer the queen!



original donor colony



nuc
OLD Queen
No capped brood



rearranged original colony
Rears the New queen
Has all the capped brood

Advantages of summer reverse splits

- Varroa exposed
 - Majority of Varroa left in strong colony which undergoes a brood cycle interruption and can be treated once
- No damage from SHBs
 - Small nuc is queenright, queenless colony strong
- Lower robbing risk
 - (Mostly) feed strong queenless colony
- Improved overwinter survival
 - Established queen more likely to survive in nuc
- Lower swarm potential the following spring
 - Strong colony has young queen
 - Old queen allowed to re-expand into new hive

NO capped brood for 5+ days

Age	Queen Stage	Age	Drone Brood Stage
0	Egg Layed (to become new Q)		
2	* Split Day	0	Last Drone Egg Layed by Old Queen
7	* Cut Capped Queen Cells		
16 / 0	New Queen Emerges		
4	Earliest Virgin Queen Mating		
7	New Queen Starts Laying Eggs		
10	* Check For Egg-Laying Queen	24 / 0	Last Old Q's Drone Brood Emerges
16	New Queen's Brood Capped	6	First New Queen's Brood Capped
~ 21	* Cut Supercedure Cells		

