

Inconsistent hygiene against freeze-killed brood and *Varroa*

1. The Issue

- *Varroa* sensitive hygiene (VSH) provides useful resistance to *Varroa*
- VSH is too difficult for most bee breeders to measure, and this hampers adoption of *Varroa*-resistant bees
- Bee breeders are becoming proficient at improving hygiene by measuring removal of freeze-killed brood (FKB)
- **Is there a relationship between hygiene against FKB and hygiene against *Varroa*? If so, this suggests that selecting for removal of FKB could be used to select for VSH-based *Varroa*-resistance.**

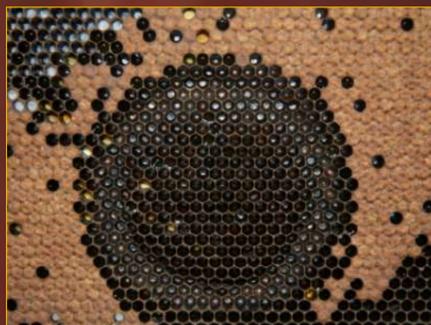
2. The Test:

- 15 colonies of each four types of bees were established. The types were Italian, Minnesota Hygienic, VSH and F₁ VSH (that is, VSH queens X non-VSH drones)
- The colonies were each tested for response against FKB and *Varroa*

Testing hygiene against FKB involved killing a patch of brood with liquid nitrogen and then measuring removal 24 hours later



Freezing brood with liquid nitrogen. (Photo by Univ. Minnesota.)



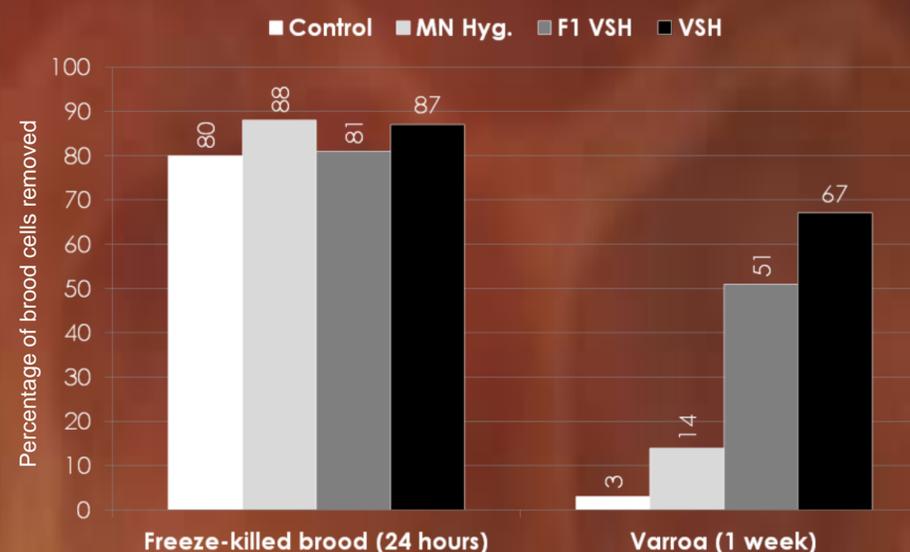
Highly hygienic colonies remove almost all dead brood within 24 hours.

Testing for hygiene against *Varroa* involved measuring the decrease in the percentage of infested brood cells after a 1-week exposure in a test colony



VSH bees detect and remove mite-infested brood

3. The Results:



4. Our Conclusion:

- **The relationship between the ability of bees to remove FKB and remove *Varroa*-infested brood is not strong. Thus, selecting for VSH by selecting for removal of FKB does not seem feasible.**
- All four bee types removed much FKB within 24 hours.
- The bee types varied greatly in their removal of *Varroa*-infested brood.
- Bees that have been selected for hygiene against FKB (Minnesota hygienic and Italian) removed much FKB but removed much less *Varroa*-infested brood.
- VSH bees, which have been selected for response to *Varroa*, removed much more mite-infested brood.
- Removal of mite-infested brood was less by F₁ VSH, showing the additive genetics of the VSH trait.