

# THE PROS AND CONS OF LIVE AND LET DIE

by Dr. David Tarpy



For all you fans of James Bond out there, you can relate to the following analogy of equating various honey bee pests with Bond villains.

- Auric Goldfinger has to be American foulbrood, one of the original and most memorable diseases who really helped launch our respective State Apiary programs just like Goldfinger defined the Bond villain in the then-fledgling Bond franchise.
- Mr. White is IAPV (Israeli Acute Paralysis Virus), linked by some to Colony Collapse Disorder: relatively new on the scene, mysterious, and hard to pin down.
- Emilio Largo from *Thunderball* reminds me of chalkbrood, with the white hair and black eye patch not unlike those spore-ridden mummies that pesky fungus create, but

otherwise harmless (without stealing an atomic bomb, at least).

- Rosa Klebb, the Russian arch-villain, is about as harmless as sacbrood; compared to the others, a poison-tipped blade in a shoe isn't really all that scary anymore.
- Dr. No from the very first *Bond* film of the same name was a Chinese nuclear physicist aimed at holding the West for ransom, just like wax moths were the first notorious pest of beekeepers but have lost their notoriety in light of newer diseases.
- Elliot Carver, the media mogul modeled after Rupert Murdoch, created fictitious military conflicts to sell newspapers. He is clearly analogous to tracheal mites (internal, blood-sucking parasites—need I say more?!).
- Janus, the double-agent from *GoldenEye* is named after the two-faced Roman god, is just like *Nosema apis* and the newer *N. ceranae*.

While each posed their own problem for James Bond and MI-6, none live up to the notorious Ernst Stavro Blofeld—the bald, scarred, cat-petting super-villain that keeps

popping up from movie to movie and served as Bond's great nemesis. Just as he was "Number 1" in SPECTRE (**SP**ecial **E**xecutive for **C**ounter-intelligence, **T**errorism, **R**evenge and **E**xortion), Blofeld quite obviously represents public enemy #1 to beekeepers, which of course is the varroa mite: ubiquitous, insidious, and devastating.

To take the analogy just a little bit further, Blofeld's character was summarily dispatched in the opening scene of Roger Moore's debut *Live and Let Die* (and hence the demise of SPECTRE from the film franchise). Some beekeepers and apiculture scientists have argued that the same approach is the best answer to finally defeating varroa mites.

The "live and let die" approach to varroa control is based on the premise to allow

natural selection to take its course—impose the (extremely high) parasite selection pressure on honey bees. Let the "weak" die out so that only the "strong" will survive and leave us with resistant bees.

There have been several studies that have used this approach in an effort to breed bees tolerant or even outright resistant to varroa. These studies have shown that it is possible for bees to be able to co-exist with mites without the need of beekeeper intervention (particularly with chemical controls). In doing so, there is a raging debate as to the means by which this new harmonious balance is reached: by fostering resistance among the bees, or by avirulence among the mites.

The answer? Both. Evidence on the (continued on page 10, see "resistance")



*Bond villains, from <http://www.adamtglass.com>.*

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“resistance” side, a research team in Europe let an isolated population in Sweden of honey bees go unmanaged for 7 years. They called it the “Bond Project”, since they were letting them *Live and Let Die* (and no, I’m not making that up). This population survived varroa-mite parasitism without chemical treatment, letting those that succumbed die and those that lived reproduce.

The researchers then produced queens from these ‘Bond colonies’, placed them into standard commercial hives, and compared them with those headed by queens from Control colonies (main-land hives regularly treated for varroa using standard chemical applications). Not only were the mite levels lower in the Bond colonies compared to controls, subsequent genomic studies showed that there were indeed genetic differences between the two bee populations, showing that selection really did change the host bees towards being more tolerant of mites.

For evidence on the “avirulence” side, Tom Seeley at Cornell University discovered a population of feral honey bees, all infested with varroa mites, living in an isolated nature preserve in upstate New York. He measured mite levels in the hives using sticky boards over the course of the summer and showed that the number of mites remained relatively low over time (maximum mite drop of 21 mites in 24 hours, well below the suggested threshold for being a problem for the bees).

He then raised new queens from one of the captured feral colonies, let them mate in the forest, transferred them back to his research station, and placed them along side an equal number of hives headed by commercially produced queens. He then measured each of the six pairs of ‘Arnot Forest’ hives and ‘New Carniolan’ hives for mite levels every month, again using sticky boards. He showed that mite levels increased over the course of the summer, and they did so similarly in both types of colonies in each pair. These results suggest that the feral bees were not resistant to the mites in some way, but rather that the mites are more virulent in a managed setting compared to a feral setting.

So these studies show that it is indeed possible to reach a new balance with varroa mites by letting bees “live and let die”. However, such an approach will **ONLY** work under certain conditions.

First, the honey bee population needs to be isolated. Selection only works in closed populations so that the favorable alleles have a chance to increase in frequency. So if you take a live-and-let-die approach but then buy new packages from out-of-state to replenish your colonies every year, you will never make any progress and your bees (and mites) will never be selected for resistance (and avirulence).

Second, a closed population has to be sufficiently large to start out with sufficient (Continued on page 12, see genetic)

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genetic diversity and allow genetic change while avoiding inbreeding. Population genetic studies have shown that this requires at least 50 colonies or more to make this possible.

Third, survival is a very general trait; that is, many other factors influence whether or not a colony dies (e.g., nutrition, other diseases, etc...). Thus the rate of selection for varroa tolerance is much increased by measuring the trait in question (varroa mites). So you will never make a lot of progress by letting bees live and let die if you don't routinely measure the mite levels in your colonies.

While it is just prior to the new year as I write this article, I predict that this spring will likely see an unusually high level of winter mortality among honey bee colonies. In some ways, this can be predicted by the long-term cycle that beekeepers have experienced over the past year. The previous winter was one of the mildest on record, meaning that the broodless period was shorter than normal or non-existent. This resulted in varroa mites getting a head start in building up their populations, so that they were higher than normal by the end of the season. For beekeepers who did not measure their mite levels or took no action to control their numbers last fall, the long-lived "winter bees" that overwinter in the cluster were unusually parasitized and thus much weaker physiologically than required to survive until the next spring. As such, I predict that there will be many more reports of "colony

collapse," particularly among beekeepers who "live and let die" but do not account for a closed population or routine mite monitoring.

If the Bond villains teach us anything, it is that the criminal mind comes in many forms. But unlike Bond's ability to eventually overcome the seemingly impossible odds, there is no simple or magical solution. So if you do subscribe to a live-and-let-die approach to beekeeping, this inherently assumes that you keep your population closed and isolated, have a sufficiently large number of colonies (>50 hives), and routinely monitor your mite levels. To do otherwise is to simply allow the SPECTRE of varroa to persist.

David R. Tarpy, NC State Extension Apiculturist, Department of Entomology, NC State University

<http://entomology.ncsu.edu/apiculture>

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&  
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By the time this goes to press, the 2013 North American Beekeeping Conference & Trade show will have been held in Hershey, Pennsylvania at the Hershey® Lodge, January 8-12, 2013. This conference boasts that it brings the most up-to-date information within the beekeeping industry and the latest products and services offered by their many exhibitors and sponsors.

The 2013 conference is a very special one because the American Beekeeping Federation will be celebrating its 70th anniversary! Your ABF delegates have plans to bring you as much information as they can muster. Stay tuned...or for immediate information about the lineup, go to <http://www.nabeekeepingconference.com>