

Swindon Honeybee Conservation Group (UK)

Really do have Varroa Hygienic Bees

As I write this I am mindful that as far as it is known Australia is still free of the Varroa Mite though it is quite probable it will eventually arrive. Many beekeepers in the UK thought it would not manage to get here as we are an island. We were wrong and we were ill prepared when it was found in the South West in 1992. Within about four years it managed to find its way into nearly every beehive in England and Wales which is amazing as it is blind and does not fly. Drifting, robbing or picking a single mite from a pre-visited flower was all it needed. Along the way varroa destroyed almost 100% of feral colonies. We had no authorised treatments to use. Other countries were able to use proprietary chemicals produced solely for the purpose of attacking varroa, but not us. The product manufacturers had to go through the process of getting their product through a stringent evaluation by our government Veterinary Medical Directorate (VMD) which meant it was best part of two years before we had a legal product.

The VMD also reclassified the honeybee so they could control which chemicals may, or may not, be used to control varroa. In the UK now the honeybee is no longer an insect; it is now called A *Food Producing Animal*. (Still looks like an insect to me).

In that first couple of years a wide variety of chemicals were used, (and misused), mainly in desperation and the fear of losing bees. I mostly used Formic Acid as did many others.

I'm sure most of you will know about varroa but I will cover the basics for those who may not.

The adult female varroa mite, being already mated, enters the bee larval cell before the cell is capped over. She lays her eggs and makes a wound in the larvae bee body for her blood sucking babies to feed from. The bee larvae will moult a number of times during pupation and the adult mite must keep the wound open for her young. One of her babies is male; he mates with his sisters then dies. When the young bee emerges from its cell the mites will exit with it. For a while mites will become a parasite of an adult bee, often burying their body deeply between the bees' thorax and abdomen, the only place they have access to the bees 'blood'. It is almost impossible for the bee to remove the mite from that position. After a while, may be days, the varroa will leave the bee and find its way into a larval cell to breed and the process starts over. Their numbers increase quickly so need to be kept low. They are the vectors of viruses transmitted during their blood sucking activity. Some viruses can kill; the main killer is DWV (Deformed Wing Virus).

Keeping varroa infestation at a low levels means keeping DWV at low levels too. At the moment there are no known methods to totally eradicate varroa.

What I am about to write for you has recently been published elsewhere. You will understand that this had to be when you read to the end. I am now the very proud owner of a Super Bee, a *Really* Super Bee and I want the world to know about it. It could be the Bee to Save All Bees? I kid you not but I need to start from the beginning.

You must understand that when I write about varroa it has to be biased toward how it has affected beekeeping in the UK as we have had live with it for 23 years. I just hope you can learn from us and don't make the same mistakes.

Varroa invaded my hives in 1993. My story starts about a year after that when I chose to collect some mites to photograph. They were from single hive but I found many of them were damaged. When I looked for the cause of that damage I discovered the bees in that hive were able to keep the number of varroa under control by having developed the ability to groom them off each other. Such activity was unheard of in those early days.

I was able to prove this ability to be 'genetic' by swapping the queen with that of another hive where grooming was not observed. Later tests showed her new colony had now become groomers and the initial colony had stopped. That fact proved to me that grooming was not a learned ability or it would have continued under their new queen.

The breeding of queens from this hive followed with the first batch being artificially inseminated using drones from the same colony then sharing the new queens among my eighty colonies.

By re-queening all my hives meant I was soon able to dispense with the use of chemicals altogether and have never used them since and my bees survive. Soon all my hives were grooming. Special mesh floors with a removable collecting tray beneath were placed under each hive. The trays were taken into the apiary shed where a very fine artist brush was used to gently collect all varroa. Hives were numbered and the pots with their mites in carried

the same number for recording purposes. These continuous collections were microscopically studied for damage signs and recorded.

A program of queen breeding has continued ever since (now twenty years), always selecting from the best of the groomers. Line breeding has been essential to avoid inbreeding. Over the years many, many thousands of varroa have been studied.

I recognise that Selective Queen Rearing is not natural and must have quite an impact upon the kind of bees which will inhabit our future world. Honeybees are wild creatures even though many may think otherwise. Their long term success, and ours, depends upon them staying independent and able to take care of themselves. Bees have been surviving on their own for millions of years without our care or our interference, and we really should try to not get in the way of them adapting to a changing world.

Since varroa became a major part of that changing world most beekeepers throughout the world have purposely 'got in their way' by allowing their bees to become dependent upon constant chemical treatments against Varroa. The resultant affect could be that in the future all honeybees may become totally dependent upon humans and their chemicals if they are to survive. Beekeepers would need to 'buy-and-apply' chemicals forever. Some chemicals, which if properly tested on bees, would prove to be so damaging that they should never see the light of day let alone be used on our poor unsuspecting honeybees.

Lisa Marie Burley (USA) published her degree thesis on the web in 2007. [1] She refers to the works of several scientists. They tell about the honeybee damage caused by varroa control chemicals. Download and read some of her paper. The first few pages tell of the damage such chemicals really do cause to honeybees.

I learnt my beekeeping 72 years ago as a 12 year-old WW2 evacuee sent from London to Oxfordshire. I became quite experienced over the years though it was not until the UK arrival of varroa in 1992 that beekeeping and beekeepers had to adapt to the changes forced upon them. I soon became very concerned about the major losses of bees and the reducing numbers of bee keepers. I suspect that those who are in the craft today are mostly concerned about the future of honeybees. None-the-less I suggest we beekeepers should question everything we know about bees and our bee management techniques. We need to adapt to the changes forced upon us.

Some may be just waiting for others to research and find an answer to their varroa problems? In the meantime colonies are collapsing around them and in a vain attempt to prevent that happening many are resorting to the use of toxic chemicals and drone culling.

The latter does not mean going after adult drones with a shotgun. One method is to dig a multi-pronged fork through the domed cappings of drone cells and extracting drones which may, or may not, be varroa infested. Another method is to encourage drone comb building and once laid-up and cells capped it is removed and frozen, killing larvae and any resident varroa.

In 2014 the National Bee Unit (UK) published an email about recent reports of very high varroa numbers. In it they noted that if a beekeeper, when culling drones, should find 5 varroa mites on 100 uncapped drones (5%) they have a major varroa infestation and should take chemical action. That figure merely suggests to me that 95% of the drones were being destroyed unnecessarily.

Many beekeepers today regularly use various drone culling methods as a means of varroa control; advised to do this by a National Bee Unit (UK) leaflet. [2] This practice is weakening drone congregation areas but also seriously weakening valuable genetic diversity. Early queen failure is all too regular these days possibly due to poor mating through lack of drones? If this method is adopted in Australia you will no doubt have a higher queen failure. Prof. Keith Deleplane, USA tells us that many American beekeepers are now re-queening several times a year.

Those who regularly cull drones in the UK will usually find less than five varroa per hundred drones so are not really conducting a valid control or reducing the drone population much?

To me the use of chemicals is no better. There is the probability that continued chemical usage may only attack the weaker mites causing others to become much stronger and immune to any chemical. This is natural selection operating under a strong selective pressure.

On its natural host *Apis Cerana*, varroa is a nuisance, not a pest. *Cerana* has evolved defences, notably grooming behaviour and the removal of infested brood. Varroa and *Cerana* now coexist with varroa kept at low levels. This represents an expected host/parasite relationship which until recently was not found in the European honeybee. *My bees do now coexist!*

I am doing my bit and my results are really encouraging. For twenty years my bees have been controlling varroa numbers without my intervention other than speeding up the process by breeding from the best. Never have I resorted to using chemicals in that time. I seldom lose bees, certainly not to varroa. My only intervention has been to help them increase their grooming ability quicker.

I don't have 20/20 vision and though I can make out the brown adult mite I still need a lens to collect them from the trays. After purchasing a 7x loupe [3] I made a further discovery. I discovered transparent antennae of pupal bees on the varroa tray of one hive. That was in 2007. I also found very tiny baby varroa mites. With the new lens I have little problem seeing tiny transparent baby varroa substantially smaller than a pinhead. My bees are actually uncapping and removing larvae from infested cells on quite a lot of my hives. [4][5][6] I have a video made by a colleague of this happening with my bees. I also made a video of a worker bee grooming a mite off another bee.

Some years ago I formed the Swindon Honeybee Conservation Group. There are not many of us but we do have 100 or more colonies between us which are not chemically controlled, do not have drones culled and do not lose bees to varroa.

Instrumental Insemination has been used by me in the past to set desirable traits but natural mating is mostly used these days. That helps prevent inbreeding and does not appear to harm the hygienic behaviour.

Our data demonstrates that most colonies are above 60% Varroa Hygienic with several above 70% and two over 80% (2014). These figures relate to the numbers of bee-damaged mites vs the undamaged.

One frame with drone foundation is placed in the best hives to encourage drone production. For mating that is, not for drone-culling.

By 2012 my selective breeding program had ensured that most of my hives were very hygienic.

Varroa by itself is not the killer of bees. It is the viruses which are the cause of losses; the most damaging one being Deformed Wing Virus (DWV).

In 2012 I was approached by a scientist who wanted to study my bees. He had been informed that I do not use chemicals and I do not lose bees.

His initial studies showed that my bees appeared to be able to protect themselves from the only virus found in my varroa, DWV. The varroa were loaded with DWV but my bees had very low levels. He wanted more samples.

I provided regular supplies of bees and varroa throughout 2013 for him and his colleagues to study.

By July 2014 the results of their work became known to just a few people, pending a paper being prepared and published. That paper is being published next Tuesday 27th October 2015 in the scientific journal, *Nature*.

BBC TV South West has been to my apiary with Chris Packham to make a short film. That goes out on Monday 26th October 2015. I know these dates are before you read this but the paper will be available in a back copy and hopefully the TV program or the news of my breakthrough will be aired in Australia?

The scientists have proven that my bees have a high titre of a good virus that confers a protective status against DWV. The scientists are calling this newly found virus a Super Infection Exclusion Virus, (SIEV). I simplify that for this article and call it a Blocking Virus, (BV)

In a nutshell my bees are immune to DWV. I don't know how that came about. The scientists are reluctant to consider my breeding selection method or lack of chemical use may have brought it about as they have no way to verify or prove that is case. However it came about they are my super bees because no one else seems to have bees which cannot get DWV because they can block its entry!

It is a fact that all varroa mites in my hives have equally high volumes of both DWV and BV whereas my bees only have the BV which gives them full immunity.

I now wish to benefit the honeybee populations, kept and feral, so have the problem of trying to mass produce bees capable of reversing the loss of bees to DWV but first I must establish how this new virus can be bred into bees.

Experimental breeding tests are ongoing. A beekeeper in Salisbury has joined with me as his bees do have DWV and he uses chemicals. We can now swap bees, queens, bee semen and varroa as part of the following tests:

1. Can the queen pass BV on via her eggs? This would be the easiest way.
2. Can workers pass it on by feeding brood? e.g. my workers feeding Salisbury brood.
3. Can a drone pass it on via its semen when mating? Instrumental Insemination may prove this.
4. Are varroa capable of passing on the BV and withhold the DWV they carry?

Though simplified here these are just a few of the planned experiments. The results of each must be evaluated by a virologist. Positive tests will need replicating several times to prove consistent repetitive results.

I am seeking serious funding to pursue this exciting development. Can you help or advise where to obtain funding?

I would also welcome contact from any scientist or university group able to provide technical assistance for the screening of my bees for bee viruses. This could be a good exercise for a graduate's class but would need to be in the UK.

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- [1] Lisa Marie Burley (USA) published on the web the thesis for her degree.
“The Effects of Miticides on the Reproductive Physiology of Honey Bees”
- [2] Fact sheet 14 “Managing Varroa” – FERA 2009
- [3] Sensor Loupe for use on Digital SLR cameras. 1.5” dia. lens with 6 LED’s by ‘VisibleDust’, Canada.
- [4] www.swindonhoneybeeconservation.org.uk
- [5] Beecraft article <http://content.yudu.com/A1p6la/BC1010/resources/4.htm>
- [6] BBKA article in BBKA News No.187 February 2011