Meditating on Medicines

By Jason Learner, National Bee Unit

In this new, four-part series Jason Learner meditates on medicaments for treating varroa. In this first article, Jason shares his ample knowledge on the available varroacides, their dosing regimens and approved application methods.

The use of medicines for treating the dreaded varroa mite is always a hot topic and one which generates many opinions. When it comes to deciding what to do with your colonies when mites are present you can opt for one of two solutions. The first option is not to treat a colony; a style known as 'let alone', 'natural' or 'treatment-free' beekeeping. This style appears to be growing in popularity with more beekeepers choosing to opt for it. As you are probably aware, this style of beekeeping uses no treatments to control the varroa mite in the belief that the bees have adapted, or will adapt, and co-exist with the parasite. Unfortunately, I am still yet to see significant evidence that *Apis mellifera* has developed this ability; untreated colonies usually just die out as a result of the ever-increasing, unmanaged, varroa population, although there are some promising beginnings through studies of hygienic behaviour.

The second option is to control mite populations either by using a registered varroacide, or by using integrated pest management (IPM) techniques such as comb trapping, artificial swarming/splitting a colony etc. In this four-part series, we will explore first, how to control mite populations through the use of varroacides (part 1) and then what might happen if you misuse a medicine (part 2). Next, we will look at some of the possible ways to reduce mite populations through an IPM programme (part 3) and finally, what could happen if this is not followed properly (part 4). So without further ado, let us get started.

As I have said before, when opting to control varroa mites with a varroacide it is vital that you use a registered varroa treatment and not opt for an off-the-shelf generic alternative or home-made concoction. Registered treatments are a bit more expensive, but they offer a safe and assured method of application for the user and bees. A registered treatment will have a proven efficacy i.e. the percentage of effectiveness against killing mites and, if the label instructions are adhered to, a proven method of application for food safety. There are currently eleven registered treatments for the control of varroa, with an additional one, Hop-guard, due to come out later this year. The list of registered treatments for use in the UK is given in Table 1. It is expected that the registered treatments not currently available from a UK distributor will be likely to become available during the 2017 season.

A few points to remember

Monitor your mite populations before and after treatment

There are numerous ways to do this, most of which can be found on page 16 of the *Managing Varroa* leaflet on BeeBase at: http://www.nationalbeeunit.com/index.cfm?pageid=167 . Each method will offer differing levels of accuracy for estimating mite populations and, ideally, you should monitor all colonies in the apiary. However, if this is not practical then a representative proportion of your strongest colonies will do.

Treat all colonies in the apiary at the same time

It is important to treat all colonies in the apiary at the same time so that mites from a neighbouring untreated colony do not infest the colonies you have just treated. Mite invasions, where a colony has died from parasitic mite syndrome (PMS) and its remaining bees, along with their phoretic mites move to the neighbouring colony, can have disastrous consequences. It will increase mite populations in that neighbouring colony and could cause another case of PMS. That colony gradually starts to get sick and the above process happens again to that colony and it's neighbouring colony, creating a snowball effect in the apiary.

The label is law. Follow it!

When you treat a colony, do not be tempted to deviate from the instructions on the label, otherwise you will have no comeback if anything should go wrong. Instructions for all the treatments can also be found on the VMD's website at: http://www.vmd.defra.gov.uk/ProductInformationDatabase/Search.aspx Select 'bees' as the species from the drop down box and click 'Run Search'.

Some of the instructions provided on the SPC data sheets (these are the summary of product characteristics – the official and comprehensive product data sheets) have not been translated across very well so below I have provided a list of the treatment instructions and paraphrased them without altering the meaning. Hopefully, this will allow you to make an informed decision on what treatment might be best for your colony management programme. At the time of writing, these instructions were correct, but they could change over time so check the label before treating to ensure the method of application of the treatment has not changed.

PRODUCT	ACTIVE INGREDIENT(S)	TREATMENT PERIOD	USE DURING HONEY PRODUCTION		? AVAILABLE FROM A UK DISTRIBUTOR
			CAN USE	CANNOT USE	
Apiguard	Thymol	4–6 weeks		X	
Api-Bioxal	Oxalic acid	Single dose on broodless colony		X	
Apilife-Var	Thymol, eucalyptol menthol, camphor	4–6 weeks (26–30 days)		X	
Apistan	Flumethrin	6 weeks		X	
Apitraz 500	Amitraz	6 weeks		X	X
Bayvarol	Tau fluvalinate	6 weeks			
MAQS*	Formic acid	1 week	X		
Oxuvar	Oxalic acid	Single dose on broodless colony		X	X
Polyvar Yellow	Flumethrin	9 weeks		X	X
Thymovar	Thymol			X	
VarroaMed	Formic acid, oxalic acid citric acid monohydrate star anise oil, lemon oil purified water, tincture of propolis	Single dose in winter but multiple doses every 6 days when brood is present		X	X

*MAQS = Mite away quick strips; X = affirmative

Table 1. A list of all the veterinary medicines registered for use in the UK.

Apiguard: To use Apiguard, you will need additional equipment, such as an eke or empty super to allow space for the bees to reach the gel. You will also need to ensure that an insert is placed in your open mesh floor when using it. Ideally, temperatures should be 15°C or above. Place the opened tray face upwards in the top of the brood frames, preferably centred over the colony. After ten days examine the tray and if it is almost empty, replace it with a second tray. If any of the product is left in the tray after ten days leave the tray in place until day fourteen and then replace with a new tray of Apiguard. Leave the second tray in position for a further two to four weeks, until all the gel has evaporated. When the second tray has evaporated, the treatment has been completed. Although the product has a zero-day withdrawal period, the manufacturer's recommendation is not to use it during a honey flow to avoid adulterating the taste of honey. A more comprehensive list of the questions asked about Apiguard can be found in Vita's *Frequently Asked Questions* pdf file: http://www.vita-europe.com/wp-content/uploads/VitaApiguardFAQ201607a.pdf

Api-Bioxal: Api-Bioxal has now been on the market for four years and was the first oxalic acid based product to be registered in the UK. It can be administered to a colony in one of two ways. The first method is by far the easiest; the trickling method. This involves making up a sugar solution and then dissolving the packet of Api-Bioxal into it. You then apply 5ml of the solution per seam of bees. The second method of application is through the use of a vapouriser, which will require the use of personal protective equipment such as a protective mask (FFP2), acid resistant gloves and safety goggles. It would also be worth adding a layer of tin foil over the tray where the powder sits to prevent the sucrose in the Api-bioxal from charring the pan. Once charred, sucrose becomes very difficult to clean off. To administer Api-Bioxal using a vapouriser apply 2/3g of the powder to the pan above the heating element and then place the device in the colony through the entrance. Then seal the entrance with a foam entrance block or an old damp tea towel. Next connect the vapouriser to a battery pack and wait until you can see the vapour coming out of the gaps in the

Application of Apiguard to a colony. Courtesy of Frank Gelatly.

Apply 5ml of oxalic acid solution per seam of bees. APHA crown copyright.

Remember to lift the top brood box and apply Api-Bioxal to the seams in bottom box if running a double brood system. APHA crown copyright.

hive roof, and between the crown board and brood box. Keep the element turned on for around three minutes. After this, disconnect the device from the battery and remove the device, but leave the hive sealed for a further fifteen minutes. With the vapouriser disconnected from the battery, dip the heated tray in a bucket of water to cool it off; if you do not cool it and then apply another dose of Api-Bioxal onto the element, the residual heat will cause the crystals to vapourise and you could end up inhaling the treatment. If running a double brood system, do not forget to lift the top box and apply Api-Bioxal to the bottom seams too.

Apilife-Var: Take one tablet and break it into four equal pieces. Place each piece on the top corners of the brood chamber, but avoid placing them directly above the brood nest. After seven to ten days, replace the tablets with a fresh batch, broken and administered in the same way. Repeat the procedure again, seven to ten days later and leave the last tablets in for twelve days, then remove the tablets from the colony. Those who keep bees in polyhives and/or on plastic frames may want to note that this medicine has been known to melt plastic. Chemicals Laif recommends that the packaging is placed above or underneath the tablet to prevent this. Although the product has a zero-day withdrawal period, the manufacturer's recommendation is not to use it during a honey flow to avoid adulterating the taste of honey.

Apistan: Before using this product, ensure that you carry out a mite resistance test, which you can find on page 30 in the NBU's *Managing Varroa* leaflet, to ensure you do not have varroa that are resistant to the active ingredient. Insert two strips centrally in the brood box and spaced three to five frames apart (depending on nest size) for a period of six weeks. After six weeks remove the strips and treatment is then complete. It is worth monitoring mite fall after treatment to assess the efficacy on mites. Although the product has a zero-day withdrawal period, the manufacturer's recommendation is not to use it during a honey flow.

Apitraz 500: This contains Amitraz, the active ingredient of Apivar, a contact treatment which is usually imported through the Cascade system and used in a similar way to Bayvarol and Apistan. Although Apitraz is registered for use in the UK, it has yet to hit the UK market and it is currently unavailable from any of the beekeeping suppliers. The strip has a larger contact area than other branded impregnated strips, measuring twelve inches in length making it perfect for the 14x12 hive. The strip should not be cut as this could decrease the efficacy of the treatment, which could make it awkward if needing to use the strips in a standard National hive. To apply the medicine, place one strip between the fifth and sixth brood comb and the other strip between the ninth and tenth brood

Applying Apistan to a strong colony. APHA crown copyright.

comb and leave in place for nine weeks. The withdrawal period for honey is zero-days, but manufacturer's instructions state not to use it during a honey flow.

Bayvarol: Before using this medicine you will also need to carry out a resistance test to find out whether Bayvarol would be suitable to use. Once this is done four Bayvarol strips are suspended in each brood nest, centrally down the bee space of the frames. Both tabs are bent upwards in the same direction at the marked fold lines and hooked over the top edge of the top-bar. For large colonies occupying several brood chambers, two strips can be joined together end-to-end which enables their insertion into and removal from the bee spaces without having to separate the brood chambers. Nuclei and young colonies can be given two strips. The treatments are to be left in the colony for a six-week period and then removed. There is no withdrawal period for this product in honey, regardless of when Bayvarol is used and unlike other contact strips there is no mention that it cannot be used while supers are on the hive. However, the instructions do state that other bee produce should not be taken for human consumption until the following spring. Although not specifically stated, this could refer to pollen or cut comb, but this will need clarifying with the manufacturer.

Mite Away Quick Strips (MAQS): MAQS currently come in sealed buckets of two hive treatments or ten hive treatments. Each dose is sealed in a plastic packaging and as soon as you open the bucket you are hit with a whiff of formic acid given off by the wafers. It is therefore important that you wear appropriate respiratory and

Application of MAQS on a single story hive. When applying to a double brood, place in between the two brood chambers. APHA crown copyright.

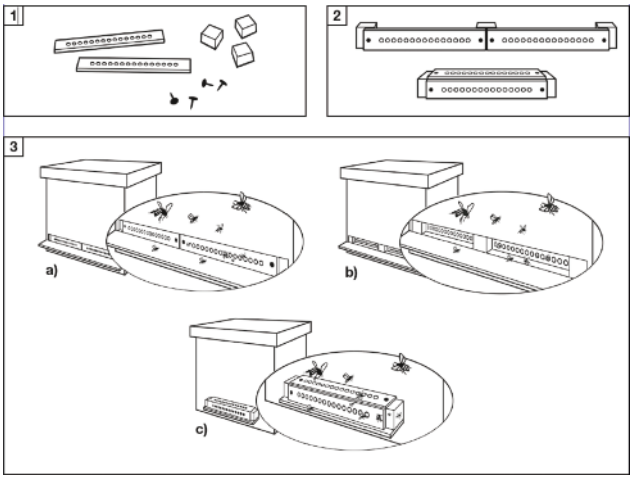
personal protective equipment. To apply the medicine, two wafers are applied per colony and placed at right angles to the top-bars, leaving about an inch gap between each wafer. It is really important to allow adequate ventilation so do not use this product while an entrance reducer is fitted. The strips may be applied during honey flow and you should put on honey supers if a honey flow is anticipated to allow adequate space for colony expansion. It is important not to disturb the colony for seven days.

Oxuvar: It is advised that this product should be used as a treatment within an IPM programme with mite drop regularly monitored before and after use. Additionally, the use of a veterinary medicine with a different active substance is recommended if a second treatment in a year cycle is needed. For example, if you treat with Oxuvar in the winter, the following spring, summer or autumn treatment should be with a medicine which contains thymol or a synthetic pyrethroid to avoid the risk of mites developing a resistance to the product. The treatment can be administered by one of two ways. The first is by trickling. To prepare a 3.5% (m/v) solution you need to pre-warm the oxalic acid dihydrate solution in a water bath (30–35°C). Then, remove it from the water bath and open the sealed container. Add the required amount of sugar (sucrose) as used for feeding bees. This will be 275 g sugar when using the 275 g bottle of Oxuvar and 1 kg sugar when using the 1000 g bottle of Oxuvar. Close the container and shake vigorously until the sugar is completely dissolved. Trickle 3–4 ml of the prepared solution per seam of bees in a National or equivalent type of hive and 5–6ml per seam of bees in a Dadant or equivalent hive. The solution must be used in the broodless colony in autumn/winter as a single treatment when outdoor temperatures are between 5°C and -15°C and you must ensure the solution is luke-warm when administering.

The other method is spraying. For this, prepare a 3% (m/v) solution by adding 250 g (250 ml) tap water to the 275 g bottle of Oxuvar or 900 g (900 ml) tap water to the 1000 g bottle of Oxuvar. Close the container and shake. The solution is now ready to use. An autumn/winter or spring/summer application must be carried out in a broodless colony as a single treatment at outdoor temperatures of 8°C or above. A second spraying treatment after a two-week interval can be used, but the manufacture's instructions should be consulted. The application of high amounts of oxalic acid could lead to higher bee mortality and queen losses; therefore, the exact dosing is necessary. Although the product has a zero withdrawal period, the SPC sheet states it should not be used when honey supers are on the hive.

If you do decide to use this medicine, personal protective equipment must be worn: chemical resistant gloves and safety glasses. Additionally, a protective mask, type FFP2, should be worn for the spraying application.

Polyvar Yellow: Although Polyvar Yellow is registered for use in the UK, there is currently no distributer for it and so it is currently difficult to obtain. The method of application is quite unique to other contact strips, although the principles are the same. There are holes punched down the centre of the impregnated strips which give them an appearance similar to that of a mouse guard. Apply the strips to the front entrance of a hive, in a similar fashion to a mouse guard. As the bees walk through the holes, any mites which come into contact with the strips come into contact with the Fluvalinate and are killed. It is important then to ensure the hive is in sound condition so that bees cannot enter and exit the colony through any other cracks or holes and are forced through the entrance with the contact strip on. Additionally, the Polyvar Yellow strip should not be covered in any way and the holes should not be filled in to ensure adequate ventilation. As the strips rely on phoretic mites coming into contact with the strips, the medicine



Three different application methods of Polyvar Yellow. Taken from the Veterinary Medicines Directorate SPC datasheets.

should only be used when there is a high amount of bee traffic going through the entrance way and, therefore, probably are not suitable for our winter climates. Instead, Polyvar Yellow should be used in the summer or spring, before the main honey flow. Treatment application lasts for nine weeks and although the product has a zero withdrawal period, the SPC sheet states it should not be used during a honey flow. It is important to note that although the brand of Polyvar is newly registered, it contains Flumethrin, a synthetic pyrethroid which has been used in other medicines such as Bayvarol for a number of decades and mite resistance to this ingredient has been recorded across the country. So before you consider using the product, a mite resistance test should be carried out and careful monitoring of the mite fall recorded before and after use to assess the efficacy of the treatment. Additionally, the product should not be used in consecutive years with similar products.

Thymovar: Place one or two strips on the top bars of the brood nest close to but not directly over open or sealed brood (preferable distance 4 cm). The number of strips has to be adapted to the size of the hive so take note of the arrangement for your particular hive style. If you use a double brood system the Thymovar strips are placed on the combs of the upper box, not between the brood boxes, as with some medicines and, if using an open mesh floor, ensure that the varroa tray/floor is in place.

Thymovar in use on a Smith colony. APHA crown copyright.

After three or four weeks, remove the strips and replace with a further two, placed on the top bars in the same manner as before. These should be left on for a further three or four weeks. Do not

Arrangement of Thymovar on different hive configurations. Taken from the Veterinary Medicines Directorate SPC datasheets.

treat with Thymovar more than twice in a year and only apply when honey intended for human consumption has been taken off of the hive.

VarroaMed: The VarroaMed solution is caramel in colour and contains formic acid, oxalic acid, citric acid monohydrate, star anise oil, lemon oil, purified water and tincture of propolis. It comes in two forms. The first is a 600 ml high-density polyethylene (HDPE) plastic bottle containing 555 ml of the product. The second type of packaging is single-dose opaque polyethylene terephthalate/aluminium/LDPE (PET/Alu/LDPE) laminated sachets, each containing 15ml of the product. These are supplied in a multipack, cardboard box of twelve sachets. Each single-dose sachet contains 75 mg formic acid and 660 mg oxalic acid dihydrate.

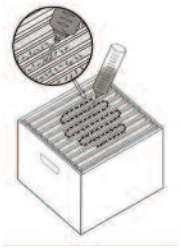
Application of VarroaMed

Determine the colony size and number of occupied bee spaces to be treated and select the correct amount of product required. Table 2 shows the correct dosing scheme to use.

No. of bees	Amount of VarroaMed to use
5000–7000	15ml
7000–12000	15–30ml
12000–30000	30–45ml
>30000	45ml

Table 2. Appropriate dosage of VarroaMed.

Shake the bottle well before use. Then apply the medicine by trickling down each seam between frames which are occupied by bees. This is illustrated in the sketch shown opposite, which has been taken from the Veterinary Medicines Directorate SPC datasheets. The plastic dosing bottle is incremented by 15ml notches to help with accurate dosing so do not worry about getting the dosage wrong.



And finally…

Hopefully this article has given you a better picture of what registered medicines are out there and an idea of which one you might want to use later in the year. More comprehensive information about varroa treatments in general, mite resistance to some of these products and further advice is available in the *Managing Varroa* leaflet on BeeBase. If you have not read it yet, I would recommend you do so. This will give you plenty of food for thought until next month's article where we will be discussing how some of the above registered products have been misused in the past.