Flystrike field lab discussion event handout

Blowflies are 'the most widespread ectoparasite affecting sheep in the UK with surveys showing that every year 80% of flocks will have 1 or more cases of strike' (SCOPS)

Figures from 2015 suggests blowfly strike costs the sheep industry £2.2 million per year (NADIS./ELANCO).

The flies species and larval stages

Lucilia sericata lifecycle:

Adult

The adult greenbottle can start laying eggs 4-5 days after emergence from the pupae and can lay around 200 eggs at one time. Emergence starts at 9 degrees soil temp

Eggs

The eggs are laid on decomposing flesh from previous wounds or on fleece soiled by faeces and urine. They are 1-2mm long and are in this stage for 12-48 hours depending on temperature. At 21 degrees Celsius, they take around 21 hours to hatch and around 18 hours at 27 degrees.

Larvae/ Maggots

Blowfly maggots are smooth with many segments. The length of larval development is influenced by temperature, humidity and nutrient availability but takes approximately 4 days at 20 degrees Celsius. There are 3 instars (development stages) which the larvae must go through before pupation. The 1st instar is when the larvae are small, slender and transparent, lasting 12-24 hours. The 2nd instar is comprised of larger larvae with distinct spiracles, lasting 12-48 hours and the 3rd instar is when the larvae are at their largest with prominent spiracles and have developed mouthparts. This stage lasts for the duration of 24-72 hours. Maggots reaching the 3rd instar then burrow into the soil to pupate.

Pupae

This is a non-feeding, resting stage which can last days to weeks. At 21 degrees Celsius this stage can last 10 days, or at higher temperatures of 27 degrees this can last 7 days. The pupae then emerge as adult flies. Pupae killed by dung beetles and parasitic wasps

Lucilia sericata (Greenbottle)	Phormia terraenovae (Blackbottle)	Calliphora erythrocephala (Bluebottle)	Wohlfahrtia magnifica
			
Greenbottle flies initiate the primary strike on a sheep, secreting enzymes on the skin before eating into the flesh and causing painful inflammation. They have a green-blue metallic appearance and reflections of gold with black details. These are 10-14mm in size.	Blackbottles are secondary blowflies meaning they attack a wound on a sheep initiated by a primary fly. They are commonly known as the northern blowfly and have deep blue colourations. They are typically 7-12mm in length when adults.	Bluebottles are also secondary blowflies. They have a bright metallic blue abdomen and a grey/black thorax. They have red eyes and blunt antennae. Adults are 10-12mm.	This species is of an increasing risk in the UK due to climate change as the fly is moving further north with the increasing temperatures. Adults are 6-10mm in length and have a spotted appearance. This species lays live maggots, which cause traumatic myiasis rather than egg, giving added complications when considering treatment options.

New species coming our way

Wohlfahrtia magnifica, a Myiasis-Causing Flesh Fly, lays live maggots not eggs. It's now as far north as Limouges, western central France

Whole Health Approach

As with all disease, it's a balance between the vitality of the host animal and the vitality of the parasite, so it's important to consider reducing triggers; dagging shitty bums, dealing with bad feet, calling in or clearing up road kill carcases, considering which fields are grazed in high risk weather, looking at genetic susceptibility, and indicator sheep and making appropriate culling choices. Promoting numbers of dung beetles and parasitic wasps that kill blow fly pupae will help decrease numbers of blow fly, along with using bait traps which, if done early in the season, can help control numbers all season long.

What can be used and at what cost

There are many well-known effective chemicals out there. What is less known is the true cost of these to sheep, shepherd and the environment. Also less well known are the natural products and the research on them. For example, these are not currently found in most farm supplies stores or included in booklets from AHDB and others, so they take some time and effort to find out about. This Soil Association Innovative Farmers fly strike field lab was set up to test some of the off the shelf, natural, less harmful alternatives in real farm situations and to increase awareness of them.

Current commonly used chemical options are Ectoparasiticides, which act either systemically - carried in the bloodstream - or topically, by direct contact with the target organisms. Systemic acting products may be given by injection or applied topically to the skin as pour-on or spot-on formulations, from which the chemical compound is absorbed through the skin and is taken up into the blood then excreted onto the soil. Most existing products act on the parasites' nervous system eg, Molecto. whereas Clik and Clikzin are IGRs (insect growth regulators) containing Dicyclanil – which stops the moult from first to second stage larva rather than stopping eggs being laid. Organophosphates and synthetic pyrethroids, have broad-spectrum activity against ectoparasites not just blow flies and some, like Crovect, Dysect and Ectofly, are effective strike treatments as well as being preventative. So, our field lab is considering alternative treatments as well as preventatives.

These chemicals may currently be effective but there are other costs to consider.

The British Veterinary Association (BVA) is calling on vets, livestock owners, horse owners and Suitably Qualified Persons (SQPs) to take a holistic and evidence-based approach to parasite control in grazing animals to tackle increasing drug resistance and concerns around environmental damage.

- **The health and welfare implications** for sheep, shepherd and sheerer aren't often spoken about. E.g., a Molecto data sheet states you should wear 'eye protection, protective clothing, rubber gloves and boots along with a disposable face mask when applying'.

  Clickzins data sheet states 'you should minimise handling after treatment but if you need to handle within 2 months of treatment wear synthetic rubber

gloves, long trousers or coveralls, and if sheep are wet waterproof trousers.' Some shearers now won't clip animals that have been treated with certain insecticides and certainly not those that still have weeks left on their efficacy dates. Health concerns for shepherds include the common practice of treating strike in the field by clipping out the wool and maggots and rubbing in a chemical treatment with bare hands

- **The increase of resistance** is an increasing issue. Molectos' data sheet has a special warning – 'frequent and repeated use of antiparasitics from the same class may increase the risk of development of resistance.' BVA 'Drug resistance is a threat to the efficacy of all parasiticide groups.'
- **The effect on dung beetles** which of course aid us in the control of internal parasites on the farm, so this cycle is important. Molecto's data sheet states Cypermethrin is toxic to dung insects. Clickzin's states 'the use of the vet med product has harmful effects on dung flies and beetles'. Dectospot states its' very toxic to dung flora, aquatic organisms and honey bees, is persistent in soils and may accumulate in soils.' It recommends 'reducing risk by only using a single treatment in one year on the same pasture.' BVA states 'There is also substantial evidence on the impact of parasiticides on invertebrate species in the environment, many of which are key to biodiversity and soil health'. In its new policy position on the responsible use of parasiticides in grazing animals, launched July 2025, BVA is recommending that the use of ectoparasiticides in cattle, sheep, horses, goats and camelids needs to be more targeted and based on diagnostics, rather than relying on blanket treatments at certain times of year.
- **The lower value of chemically sprayed fleece** may be an issue for some producers and those marketing skins. Organic fleece is now attracting a premium payment from BWMB and others and non sprayed fleece is wanted by those handling raw wool for spinning, etc. The problems of scouring plant effluent are also important to consider. Some smaller wool processors are refusing wool that has been treated with organo-phosphates (OPs) or synthetic pyrethroids (SPs) because they are potentially dangerous to human health and to the environment. The Natural Fibre Company, for example, won't accept wool treated with OPs/SPs in the 4 months prior to shearing., Haworth Scouring, one of the only two large commercial scouring plants left in Europe, are currently having a number of huge digester tanks installed to manage/improve the effluent situation.
- **The effect of these chemicals on water sources is also important.** Clickzin's data sheet states 'treated sheep should be kept away from water courses for at least one hour after treatment as there is a serious risk to aquatic life', Molectos says 'it's extremely dangerous to fish and other aquatic life and empty containers should be disposed of appropriately.'

British Veterinary Association President Dr. Elizabeth Mullineaux said in July 25 'the treatment of grazing animals with parasiticides is one of the ways in which these products enter the environment, which is why it is vital they are used appropriately, when needed, and

their impact monitored. Maintaining the safety and efficacy of parasiticides in the future is important not only for animal health and welfare but also human health and food security.'

Many Farmers are now looking for solutions to protect sheep from blow fly strike that also protect our farms, the livestock and the environment.

More research is needed and solutions have to be practical and work on the ground. As a group of farmers, we were already aware of and some of us were using off the shelf natural alternatives for fly strike prevention and treatment along with some farmers using 'home made' mixes. We also found some interesting lab research, e.g., tee tree oil at 20% killing eggs, lava and maggots in lab conditions. (The use of essential oils in veterinary ectoparasite control: a review L. ELLSE and R. WALL Veterinary Parasitology and Ecology Group, School of Biological Sciences, University of Bristol.**)**

The field lab restricted us to off the shelf products, so we decided to test 2 of those for fly prevention and 2 for treatment of strike patches against what was normally used on each farm, along with a product to boost the vitality of the sheep against attack from strike.

Trial stage 1 - Raising vitality and resistance of sheep to parasites

'Fly Strike Combo 30' – Cina, Staphasagria, Sulphur, Psorinum, Lav-ls

This is a homeopathic combination of remedies put together by Helios Homeopathic Pharmacy. Homeopathy is a well-established system of medicine that supports the sheep's innate vitality and resilience. The remedies were selected based on:

- Cina – known to help with a number of parasite issues
- Staphysagria – commonly useful to the individuals that are more prone to parasite attack
- Sulphur – well recognised as being useful for helping boost the vitality to make less prone to parasites.
- Psorinum – particularly useful for parasite issues affecting the skin.
- Lav-ls – a specific remedy to help deal with the larval stages of flystrike.

The combination of remedies were administered via the drinking water.

Sulphur 12ch has been shown in trials to inhibit c. Hominivorax lavea (Brazilian fly strike fly) development in fly strike wounds on sheep. A further study on how the emergence of adult insects is affected by homeopathic medicines showed a 94.6% larvae mortality rate when sulphur 12ch was used.

Trial farmers thoughts so far

‘Combo mix-easy to use, only downside for me is where I don’t have mains water to the majority of the fields, so it was a daily case of putting a few drops into the water buckets. I only saw one case of fly while using this and they were very small maggots which were just in the fleece not on the skin and didn’t seem to be causing any irritation to the sheep.’

‘Started out with the combo remedy in the water toughs, noted that the couple cases of strike I had there was no skin damage, the maggots seemed to be in the fleece only’

‘Sheep less bothered by all types of flies and couple of cases of strike small patches but unusually full size maggots high up on fleece no other signs and no skin damage’

‘Feel it would be better to carry this on right through season, for trial we stopped when spraying started’

‘feel it slowed down the strike’

Trial stage 2 – Preventatives, the products

Two natural alternatives, plus farmers usual treatment. Each group of sheep divided into 3, with a third of receiving each treatment.

Blow fly repel from Barrier Health, 4-week duration

The label states when struck ‘rids sheep of maggots, protects against further strike’, sooths, protects aids natural healing’, ‘natural plant derived ingredients’, ‘blood sucking and biting pests stay away from sheep’, ‘soothing antibacterial and antifungal properties’.

Duration ease of use 5 ltr, 20 ltr and 500 ml packs spray 3 mils per squirt, 8 squirts per ewe, 3-9 squirts per lamb, depending on size. Suitable for organic systems (Barrier also make a sheep bath, not used in this trial as none of the farmers have dips)

Trial farmers thoughts so far

‘I used the big 5 litre bottle with the spray lance that comes with it. Can adjust the end to have mist spray or hose pipe type spray. I usually set somewhere in between when spraying them all. Maybe I find it easy as I don’t know any different :) but I have them penned up and walk amongst them. They are used to it as happens often’.

‘Barrier spray – not too bad to put on the sheep but quite thick. I used the smaller spray bottle and found it quite easy to do when the sheep were in a pen or the trailer when moving them. Only one case of fly with using that and that was underneath, between the back legs on s lamb, that was a little bit mucky as well. Noted that this was also one of my Teeswater x Herdwick long-wool cross bred lambs as well. With

the added tea tree oil maggots seemed to last for a few minutes before dying. It seemed to make them all come out rather than die in the fleece as you get with Crovect. Nothing on the shorter wool Derbyshire Gritstones. Longevity would be the main issue and I would reapply after 4 weeks. I also used this product in some sheep that picked up maggots in the feet due to some footrot. Aside from causing the maggots to crawl out pretty much instantly it also seemed to help with lameness.'

'found the 5 litre bottle cumbersome to carry/wear and spray gun not easy to get right width of spray with'

Barrier Health have replied 'we don't offer knapsack format but most people decant our larger volume products into knapsack sprayers themselves, so that would be a solution to carrying it.'

'Application difficult for entire groups, sprayer is quite week'

'Of the 3 sheep that had strike, 2 were in this group, 1 in Crovect group'

'Very difficult to see which sheep have been treated with blow fly repel'

'Not coloured so had to use marker spray as doing in pens not race'

Barrier Health have replied 'Re colour, it is often used before shows where customers do not want colour, but this feedback is extremely helpful. We will now develop Blowfly Repel with colour for pen treatment, so that there is a choice'.

'Easy to use and apply'

'The positives being no chemicals, no meat withdrawal.'

'Only real negative for me with these natural products is they don't last as long as conventional ones. Reapplying every 4 weeks or so is needed, possibly sooner depending on the weather'.

'Only lasted 3 weeks when there was torrential hard rain'

'Barrier Blowfly - quite difficult to apply as it blows about a lot and you can't see which sheep it's on. Most lambs that got struck when they had cocci had been treated with barrier blowfly. Also had an ewe who is susceptible to flystrike I treated before I went away and 5 days later she had a mild but widespread case of flystrike. Personally, I would not use this product again'.

Oxylis from Vetalis - 4 week duration

Label states ‘biocidal effect’ ‘prevention against flies, ticks, lice, mites, fleas, myasis flies’ ‘java citronella and geraniol from palmarosa, geranium species’ suitable for organic systems

French product widely used there, use to be easily available here via Local vets, now have to import via Ireland from Interchem.

Duration ease of use 5lt, 2.5lt or 1 litre packs, easy back pack ewe 10mil, lamb 8 mil.

Trial farmers thoughts so far

‘Oxylis being my favourite for ease of application. The positives being no chemicals, no meat withdrawal’

‘Easy backpack, good gun, quick to use’

‘Coloured green, so easy to see which ones you’ve done’

‘Oxylis – Easy to apply once I found a decent applicator gun to use. An old Clikzin gun worked ideal and gave a nice fanned application. No fly strike problems were seen with this product. No lingering chemical smell that gets in your mouth and nose as found with Crovect. No chemical products on the fleece is key for me due to the wool being one of the main products off the sheep for me.’

‘Oxylis - the consistency is much more like a conventional product and it’s dark green so easy to see the lambs you have treated and how good the coverage is. Only 1 lamb treated with Oxylis had a mild case of strike when the group had cocci. I have continued with this product as it seems much more effective’.

‘Only real negative for me with these natural products is they don’t last as long as conventional ones. Reapplying every 4 weeks or so is needed, possibly sooner depending on the weather’.

‘Can get a better spray across the animal, green is easy to see, dosage is clear,’

‘Had no problems with sheep in this group, would definitely use in future dependant on cost’

Trial stage 3 - Treatments

Blowfly repel or tea tree oil mix-

Tea tree oil mix – research in lab shows tea tree oil at 20% killing eggs larvae and maggots, on sheep needs a carrier oil to keep it in fleece and make it easy to use.

20 percent tea tree oil in v-6 young living carrier oil, currently have to mix the two but easy to put in spray bottle or small drinks bottle, to keep handy in truck.

Trial farmers thoughts so far

‘Sooths skin, kills maggots and eggs’

‘Easy to use in spray or small bottle’

‘No more eggs laid on it’

‘Nice to use with bare hands in field situation’

‘Both the barrier and tea tree seem effective at killing maggots and stopping further strike.’

‘With the added tea tree oil maggots seemed to last for a few minutes before dying’

Blow fly repel from Barrier Health – when struck ‘rids sheep of maggots, protects against further strike, sooths, protects aids natural healing’, ‘natural plant derived ingredients’, ‘ blood sucking and biting pests stay away from sheep’, ‘soothing antibacterial and antifungal properties’, handy 500m spray bottle.

Trial farmers thoughts so far

‘Both the barrier and tea tree seem effective at killing maggots and stopping further strike’.

‘500mil spray easy to carry and use, definitely drives struck maggots out’

‘keeps skin supple’

Other options for fly control farmers are currently using - Not trialled in this field lab as it had to use off the shelf products for consistency

Farm A – Romneys **-** genetic worm susceptibility so culling for fly strike, as two go together. Sheering twice, once early then again in August, giving 6 weeks protection each time. Now uses 10 percent of topical sprays compared to what they used to down on Pevensey Marsh and Isle of Sheppey, extra cost of sheering worth it and no caste ewes.

Farm B – on South coast Devon and Dorset last 4 years we used Neam up to end July, then sheering, then half dose of Clikzin. 2024 didn’t need half dose Clikzin after sheering - recipe 1.5 litres neem (warmed in bowl of hot water), add to 5 litres water, add good glug of washing up liquid Ecover or Method brands. Tried putting food colouring in, doesn’t work just congeals! Sprays 100 ewes every two weeks in pen using patten. As for Clikzin, 160 lambs sprays couple of times each two weeks, then

moved to higher, drier ground so didn't need to repeat. Farm mostly low-lying wet ground, plus some higher ground.

Farm C – low weald farm, 150 sheep, plus 500 store lambs in autumn winter, uses sheering and dagging for preventative. Doesn't spray, uses citronella horse cream (citronella, citronella, geranio; geranial, limonene, eugenol, lialool and farnesol) after sheering anystrike patch to keep biting flies off wounds, so they heal quicker.

Farm D – south wales mountain terrain but damp overnights even in summer, 120 long wools, pedigree breeds. Uses crushed garlic in water buckets and remedies sulphur, psorinum, staphasagria in water troughs.

Plus, when needed home made spray; organic neam 500mil in 5 ltrs warm water, tea tree essential oil, eucalyptus essential oil, squirt of bio D washing up liquid in back pack as conventional sprayed through conventional gun in field situation, reapplied every week.

Farm E - for treatment of any wounds. Aloe vera plus essential oils of tea tree, lavender, rosemary, calendula, and/or to cover wound and stop flies annoying sheep, paste made from 40% fullers earth, 60% green clay plus drops of seaweed extract, yarrow.

Natural Fibre Company https://www.thenaturalfibre.co.uk/ – have an info leaflet on approaches to flies, which includes the following: 'Various oils are naturally fly repellent, particularly tea tree oil, lavender, citronella, eucalyptus, camphor, peppermint, sandalwood and lemongrass. They can be mixed with a little washing up liquid and then diluted with water (3:1 ratio) and a splash of white vinegar. Apple cider vinegar (50/50 dilution with water) is said to be effective'.

'Linseed Oil applied to the midline of the animal is also a very good fly repellent but will linger in the fleece. If you are a wool producer, contact your processor to see how difficult individual oils are to scour.'

'Research into parasitic wasps for control of blowfly populations is in progress.'

'Australian research has shown how a non-insecticidal blowfly trap significantly reduced the incidence of flystrike. And the volume of flies in the traps gives an early warning signal for shepherds to increase their flystrike monitoring and treatment efforts. Natural fibre tried using a synthetic bait product called Red Top Fly Trap and found it very effective if rather smelly. The trap is capable of catching up to 20,000 flies which, once trapped, can't escape. The bait is especially appealing to female flies, breaking down the breeding cycle - so reducing the next generation. You simply hang the fly trap **away** from the area you wish to protect and the bait lasts up to 12 weeks. If you have sheep in several fields, you will need several traps'.

'Internal deterrent – as an internal fly repellent the addition of garlic to your sheep's feed, either whole or in a molassed lick (Crystalyx do a garlic lick), causes the skin to secrete garlic-scented oils that deter flies and midges. A dash of apple cider vinegar in the water trough changes the pH of the sheep's blood making them unattractive to flies'

Research - Relevant research papers used in the field lab trial

- **The use of essential oils in veterinary ectoparasite control: a review L. E L L S E and R. W A L L Veterinary Parasitology and Ecology Group, School of Biological Sciences, University of Bristol, Bristol, UK** Medical and Veterinary Entomology (2014) 28, 233–243

- **Ovicidal Aroma Shields for Prevention of Blow Fly Strikes Caused by *Lucilia sericata* (Meigen), Diptera: Calliphoridae** Hanem F Khater[1], Ziam Hocine[2], Mohamed M Baz[3], Abdelfattah Selim[4], Nazeer Ahemed[5], Sahar A Kandeel[4], Mustapha Debboun[6] https://pubmed.ncbi.nlm.nih.gov/36044016/ NCBI Literature Resources. 2022 Sep;22(9):459-464. doi: 10.1089/vbz.2021.0107. Epub 2022 Aug 30.

- CONTROL OF SHEEP MYIASIS WITH A NATURAL PRODUCT STOPMYASIS® Mage C1 , Corre M2 1 Mage Consultant- Santé Animale- France 2 M. C. Consulting - Annecy- France international sheep veterinary congress 2013

- **us govt national library of meds, national center for biotech info**

  Effect of Homeopathic Medicines and a Nosode on Larvae of Cochliomyia hominivorax (Diptera: Calliphoridae)

  Giuliano Pereira de Barros[1], Jaqueline Seugling[1], Patrizia Ana Bricarello[1]

- Homeopathic Sulphur Ointment as Adjuvant in the Treatment of Sheep with Myiasis by Cochliomyia hominivorax (Diptera: Calliphoridae): A Case Series

  Giuliano Pereira de Barros[1], Denise Pereira Leme[1], Laura Livia Arias Avilés[1], Patrizia Ana Bricarello[1]

- **Homeopathic Pyrogenium Ointment as Adjuvant in Treatment of Traumatic and Infected Myiasis by Cochliomyia Hominivorax (Diptera: Calliphoridae) in Sheep: A Case Series**

  Giuliano Pereira de Barros[1], Denise Pereira Leme[1], Patrizia Ana Bricarello[1]

- Genome and Transcriptome Analyses Facilitate Genetic Control of Wohlfahrtia magnifica, a Myiasis-Causing Flesh Fly Zhipeng Jia 1 , Surong Hasi 2 , Deng Zhan 2 , Bin Hou 2 , Claus Vogl 3 and Pamela A. Burger 1 ,*

- Morphological identification of Lucilia sericata, Lucilia cuprina and their hybrids (Diptera, Calliphoridae) Kirstin A. Williams1 , Martin H. Villet2 ZooKeys 420: 69–85 (2014) doi: 10.3897/zookeys.420.7645 www.zookeys.org

- Effects of environmental temperature on oviposition behavior in three blow fly species of forensic importanceOdy, Helen, Bulling, Mark T. and Barnes, Kate M. https://doi.org/10.1016/j.forsciint.2017.03.001

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