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Sustainable parasite control: Test don't guess!



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introduction



PARASITE infections are an economic as well as an animal health and welfare concern in livestock systems. Many parasites are endemic in the UK and in this factsheet we explore the control of three major parasites, roundworms, liver fluke and sheep scab, focusing on their sheep and cattle hosts. It is important to remember that our livestock may have one or more of these parasites at any one time and often in combination, and this can have a severely limiting effect on a wide range of different production parameters, as illustrated in Figure 1.

Why do I need to monitor parasite burden?

By focusing on the benefits of monitoring we will illustrate:

- The importance of using monitoring tools in parasite control
- The benefits of monitoring for improved livestock production
- How monitoring can save money on wasted or ineffective treatments, reduce the frequency of treatments and optimise treatment timing and product choice
- What monitoring tools are available for the three parasite groups
- How and when the use of these tools can help in the control of these diseases
- How they can slow down the development of parasite resistance to treatments



The chemicals we use for the control of these parasites can sometimes be the same products, but can be formulated differently and applied at different times of year for maximum effect. Through careful use of monitoring tools, we can prolong the efficacy and useful life of available chemicals used to treat parasites, ensuring that they remain useful in the future when we need them.

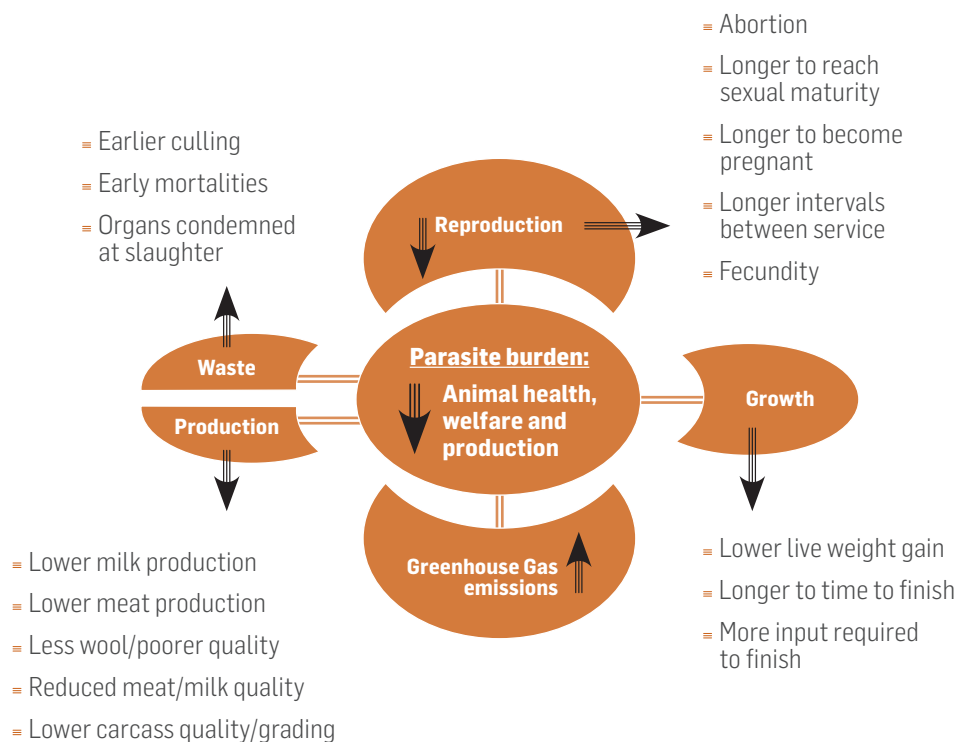


Figure 1:
The potential effects of parasite infections on livestock production.

Animations: Further information on all of the parasites featured here can be found at <https://www.moredun.org.uk/foundation/outreach/animation-series>



Resistant parasites

The current situation in the UK is that all three parasite groups featured here have been shown to have developed resistance to commonly used treatments. Figure 2 shows some of the factors affecting parasite survival, treatment requirements and the development of resistance. We need to take this seriously or face losing the few chemical options we have to treat these parasites. The good news is that monitoring parasite infection status in your animals can help you achieve this!

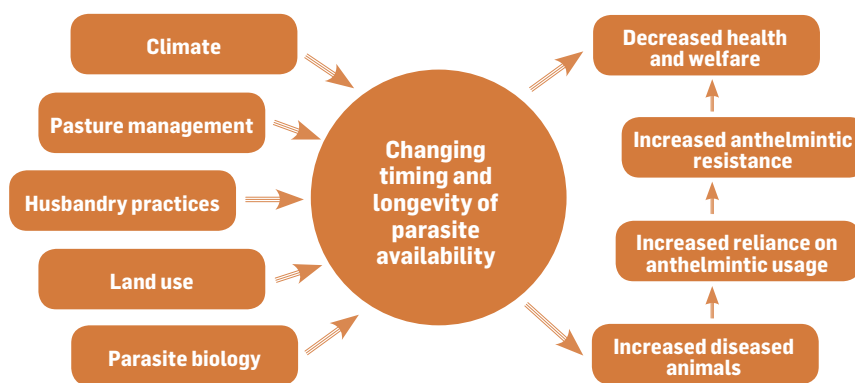


Figure 2: Factors affecting parasite survival, treatment requirements and the development of resistance.

Further information can also be obtained from the Moredun Foundation factsheets:

- Sustainable Roundworm Control in Sheep Volume 6, No. 12
- Fighting Fluke in Sheep and Cattle Volume 6, No. 16
- Sheep Scab Volume 6, No. 11



Roundworms



Nematodirus battus adult worm.

Introduction

In the UK, roundworms impact on the health, welfare and productivity of sheep and cattle. The commonest are *Teladorsagia* (Brown stomach worm), *Nematodirus*, *Trichostrongylus* and *Haemonchus* (Barber's pole worm) in sheep and *Cooperia* and *Ostertagia* in cattle.

The extent of disease and timings of problems observed in an infected animal depend on many factors, including:

- The roundworm species involved
- Treatment, pasture and grazing management strategies used previously
- Climate / season / location

Treatment

Control of gastrointestinal nematodes in production animals globally has largely been achieved through the use of anthelmintics, either therapeutically (to treat) or prophylactically (to prevent) infection.



Resistant roundworms

The widespread, frequent and often indiscriminate use of anthelmintics has led to the development of anthelmintic resistance in small ruminant nematodes. The prevalence of resistance is increasing in all roundworm types, but at different rates for each species and on different farms. Anthelmintic resistance to the three traditional classes of commercially available broad-spectrum anthelmintics (benzimidazoles (white; 1-BZ), levamisoles (yellow; 2-LV) and macrocyclic lactones (clear; 3-ML) has been widely reported. Recently, the first cases of monepantel (orange, 4-AD) resistance have also appeared.

The emergence of multi-drug resistant populations in sheep roundworms now gives some farmers limited options for parasite control.



In cattle, the situation is slightly better, although recent reports from Ireland suggest that there are cases of 1-BZ, 2-LV and 3-ML resistance that involved both *Cooperia* and the more pathogenic roundworm, *Ostertagia*.



There are three stages in the progression of anthelmintic resistance (AR) in gastrointestinal nematodes of livestock:

- 1. Establishment:** During which stage the number of worms resistant to treatment is generally low, all products work and productivity is not affected.
- 2. Development:** Frequent and inappropriate treatments can lead to a rapid increase in the number of worms resistant to treatment. Products will appear to be working effectively at this point but production losses will be apparent if animals are monitored. Remedial action can be taken.
- 3. Expression:** This is the stage at which the number of worms resistant to treatment is high, production losses are apparent and clinical disease may be detected in animals. Control strategies at this point require significantly more effort to implement, if possible at all.



Haemonchus contortus.

Monitoring

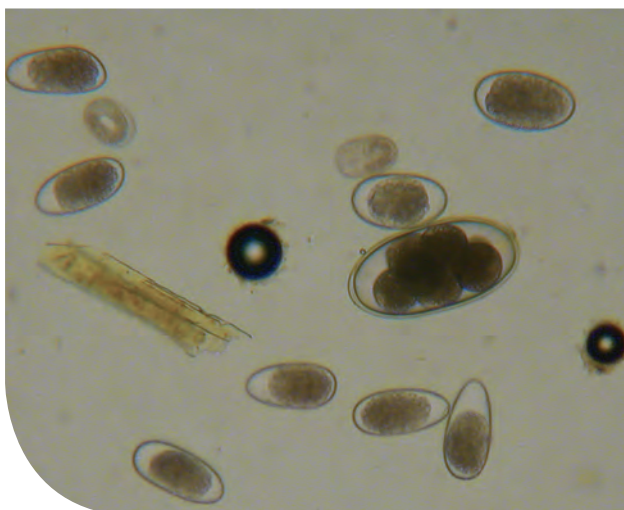
The same diagnostic tools, outlined below, are used for routine monitoring, for troubleshooting or for quarantine investigations.

1. Faecal egg counts (FECs): The basic monitoring tool of choice:

- Quick, easy and cheap to perform
- Confirms that worms are the problem
- Useful monitoring or risk assessment tool on-farm
- Using FECs regularly will also help predict contamination levels on pastures
- Aids timing of treatments
- Tests efficacy of anthelmintic (FECRT)
- Ensures treatment has fully cleared eggs (PDEC)
- See <https://www.moredun.org.uk/research/diseases/parasitic-roundworms-sheep> for FEC video

2. Efficacy testing: Two different methods available:

- a) Post-Drench Efficacy Check (PDEC) – Simply, are there any eggs left following treatment?
 - FEC is carried out post-treatment (timings for assessment in Table 1)
 - Any eggs present suggest that the treatment has not been fully effective
- b) Faecal Egg Count Reduction Test (FECRT) – True efficacy testing
 - FEC carried out before AND after treatment
 - Timing of FEC post-treatment depends on class of chemical used (see Table 1)
 - If treatment has been effective, there should be a >95% reduction in FEC



Various roundworm eggs found in sheep faeces.



Teladorsagia circumcincta.

Anthelmintic actives		Days post-treatment for checking efficacy
Colour	Symbol(s)	
Yellow	2-LV	3-7 days post-treatment
White, clear, orange, purple	1-BZ 3-ML 4-AD 5-SI	10 to 14 days post-treatment

Table 1:

Timing of post-treatment FECs for each anthelmintic group.

How to manage issues of resistance in roundworms

- Avoid under-dosing animals and ensure you follow advice on handling, storage and administration of anthelmintics
- Adopt stringent quarantine measures for imported stock
- Checking anthelmintic efficacy every time they are used provides the best option for optimising use, but any testing for efficacy of these drugs is better than none. It may be that drugs are still useful at different times of the year when different roundworm species predominate on farm
- Monitor performance, grazing history and egg counts to reduce treatment frequency
- Target treatments effectively (targeted treatment/targeted selective treatments)
- Breeding for resistance/resilience (may take time to achieve results)
- Use parasite forecasting aids (SCOPS/NADIS) to help determine best time for treatment
- Reduce treatment frequency and eliminate unnecessary or wasted treatments by using the monitoring tools outlined in this booklet. For example routine use of FECs to ensure animals are only treated when there will be a clinical benefit
- Consider management options and, if you need to treat, use right drug at right time on right animals at right dose
- Ensure nutrition is correct
- Work with your vet and animal health advisor to devise sustainable worm control strategies tailored to your individual farm
- Reduce pasture contamination to reduce stock exposure to roundworms:
 - ✓ Consider stocking densities
 - ✓ Consider grazing management options (use of ewes or cattle as parasite mowers)
 - ✓ Re-seeding pastures – this may not fully resolve the issue but will help reduce contamination



Fenbendazole resistance in a herd of Friesian bull calves

Natalie Jewell and Sian Mitchell, Animal and Plant Health Agency (APHA)

In June 2018, a 5 month-old Friesian bull calf was presented for post mortem examination to APHA, to investigate malaise, anorexia and weight loss over the preceding three weeks. Poor weight gain and diarrhoea were reported in the remaining 27 calves within the group. Parasitic gastro-enteritis, due to *Ostertagia ostertagi* was diagnosed in the submitted animal. The calves had been turned out in early May and a continuous-release fenbendazole bolus had been administered at this time. A bolus had been found at post mortem examination. Clinical signs were noted approximately 4 weeks later.

The permanent pasture grazed by the calves had been used for several years for calves in their first grazing season. Older calves also had access to the pasture during winter months. The farmer had used fenbendazole boluses in first season grazers for the previous 4 years. It was reported that, in previous years, calves had looked poor at the end of the grazing season. Faecal samples were obtained from nine calves in the group and faecal egg counts were undertaken; these averaged 143 eggs per gram (median 80; range 0-900). The remaining calves were treated with an ivermectin product with good clinical response. No other cause of diarrhoea or ill thrift was detected. The clinical and laboratory findings suggested a lack of efficacy of benzimidazole to gastrointestinal nematodes.



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So what did we learn?

1. Grazing management choices are important

Grazing management has a huge impact on the level of worm challenge faced by grazing animals both within and between seasons.

2. *Ostertagia* infections can have rapid impact on calf productivity

Poor weight gain and diarrhoea were observed in the calves quickly after turn out - monitoring productivity would allow you to act in a timely fashion and mitigate against the worst of the impact.

3. Know what you are treating

A number of possible causative agents/factors could be involved and treatment is very dependent on what is found. Getting the right diagnosis is paramount in allowing you to act quickly.

4. Know if your treatment is effective

It is easy to think that a long-acting product will continue to work as it has done in the past. Products can have reduced efficacy for a number of reasons. It is cheaper in the long run to investigate if there is any suspicion that the chosen product has not worked.

5. Discuss treatment and monitoring options with your vet or animal health advisor

If a product is being used on a repeated basis, or permanent pasture is being used for young stock on an annual basis, more monitoring is required to ensure that issues are identified early.

6. Anthelmintic resistance is not just an issue for sheep farmers

Albeit that anthelmintic resistance in *Ostertagia* is still relatively uncommon, reports are increasing. Don't ignore the possibility of anthelmintic resistance in cattle roundworms.

This investigation was part of APHA's scanning surveillance programme funded by Defra and the Welsh Government.



Roundworm



Yard 48 hrs post anthelmintic treatment and keep separate for 3 weeks



Lungworm only. Not protected for 6 weeks after 1st vaccine



Treatment



Diagnostic/testing advised





Best practice guidelines

Biosecurity and quarantine advice

- ✓ Use an anthelmintic recommended for quarantine treatment (see Table 2)
- ✓ Hold animals off pasture for 24 – 48 hours until any worm eggs present in host gut have passed out in faeces
- ✓ Animals should be turned out onto 'dirty pasture' i.e. contaminated with eggs & larvae representative of worm population on-farm
- ✓ Efficacy should be tested post-treatment (see Table 1 for timings)

Table 2:

Recommended anthelmintics for quarantine treatment of sheep and cattle.

Host	Recommended anthelmintics	Advice source	Website
	4-AD (Zolvix®) + 5-SI (Startect®) ± organophosphate dip OR injectable 3-ML (if scab is suspected)*	SCOPS	https://www.scops.org.uk/
	Effective product(s) e.g. 1-BZ + 2-LV	COWS	https://www.cattleparasites.org.uk/

*Seek advice if Footvax® has been used on animals to be quarantine treated



Liver fluke



Figure 3A

Adult liver fluke, *Fasciola hepatica*, scale bar = 1cm.

(image © Sinclair Stammers)

Introduction

The liver fluke (see Figure 3A) is a highly pathogenic flatworm parasite, which affects sheep, cattle and other grazing animals. Because it has an intermediate mud snail host (Figure 3B), liver fluke is typically associated with low-lying, boggy ground and can be particularly serious in wet years.

Clinical signs

Sheep are particularly susceptible to acute fluke disease, caused by mass migration of immature fluke through the liver. This is typically seen in autumn after a wet summer. Chronic fluke, the form usually seen in cattle, is caused by a build-up of adult fluke in the bile ducts and can cause anaemia, reduced liveweight gain and poor reproductive performance in older animals later in the year. Figure 4 shows adult liver flukes emerging from the bile duct of a sheep liver during chronic infection.

Control

This comprises chemical treatment, pasture/grazing management and stock management strategies.

- Avoidance of grazing boggy or 'fluky' ground at high risk times, particularly in the autumn, can help reduce the risk of infection
- Housing animals at high risk times can help keep them out of harm's way
- Fencing, even temporarily, of high risk pastures can help reduce infection levels
- Drainage can help reduce mud snail habitat and the resultant risk of infection
- The main control method, however, is anthelmintic (or flukicide) treatment
 - ✓ There is only a limited number of actives to choose from, each with a different spectrum of activity against the different fluke stages i.e. juveniles, immatures and adults
 - ✓ You need to use the right product to kill the stage of fluke most likely (or confirmed i.e. diagnosed) to be present in your flock/herd at that time
 - ✓ There is currently no vaccine to protect animals against liver fluke infection



Figure 3B

Its intermediate mud snail host, *Galba truncatula*, circled, scale bar = 0.5cm.

(Image © Grace Cuthill, PhD)

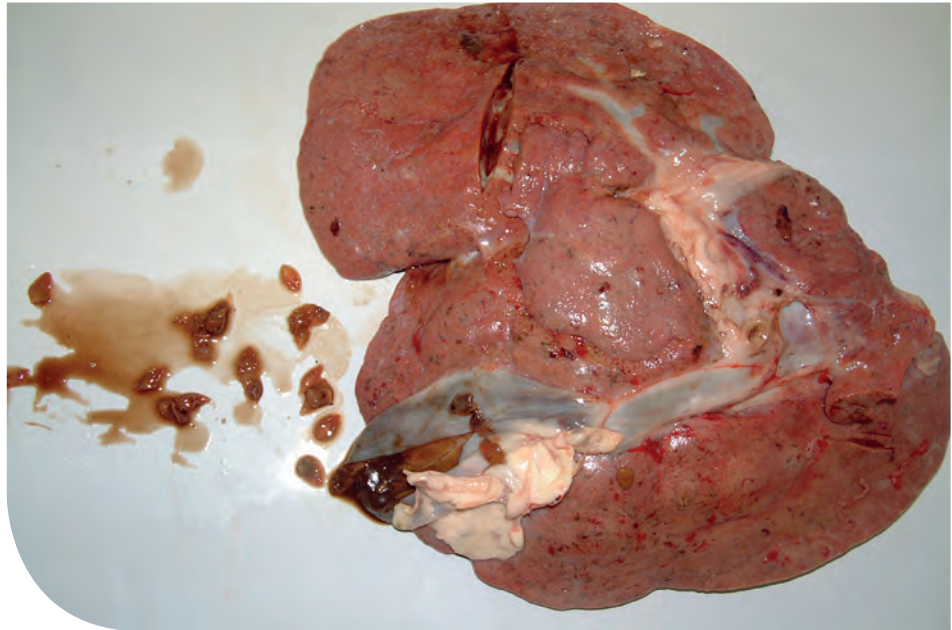
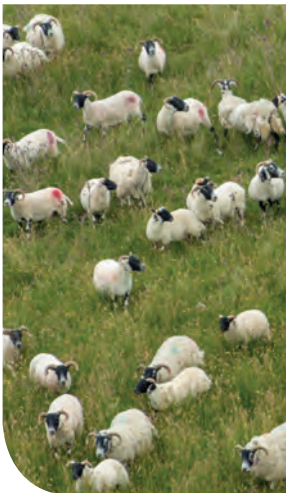


Figure 4
Chronic fluke disease in sheep liver, note adult fluke spilling out of the bile duct.



Vaccine development against liver fluke has been challenging for a number of reasons, including the fact that neither sheep nor cattle mount a protective immune response against fluke; the presence of the mud snail intermediate host to amplify infection and wildlife reservoir hosts, e.g. rabbits and deer, to spread it.

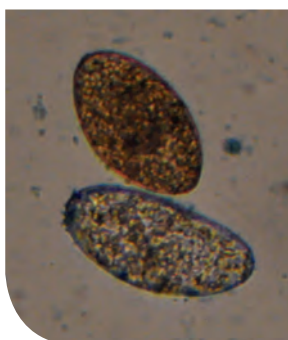
Issues with control: Flukicide product choice and timing are very important. Currently, there is only reported resistance to triclabendazole (TCBZ) in the UK. TCBZ resistance levels in fluke are currently unknown as there is no active surveillance, but it is likely to be widespread and has been detected in most studies that have looked for it.

Monitoring Tools

It is important to understand what tests are available, when you might use them, and what each tells you about fluke infection status of your animals

- Faecal Egg Count (FEC) – most widely used diagnostic test, easy sample to take, cheap and straightforward to perform. Unfortunately, FEC can only detect the presence of adult, egg-laying fluke, which will be at least 10-12 weeks old. Works well as a composite (or mob*) test, especially useful for monitoring, but individual FEC provides more information. See <https://www.moredun.org.uk/research/diseases/liver-fluke> for fluke FEC video
- Coproantigen ELISA (cELISA) – this is a lab-based test that can detect a fluke secretion (antigen) in the host animal's faeces, so same sampling strategy as above. cELISA is more sensitive than FEC and can detect infection a few weeks earlier. Only works on individual animals, composite (or mob) samples not recommended
- Blood test – this is invasive and requires a vet to take the sample, but is the earliest indication of fluke infection, animals going positive (seroconverting) within ~2 weeks of infection. Antibodies can persist in older animals and even after successful treatment. Blood testing of sentinel lambs is a very useful indication of fluke burden in any given season, it is also very useful to detect when the fluke challenge starts for any group, preventing wasted treatments in advance of any fluke infection
- Post mortem or abattoir inspection of the livers for signs of historic and/or active fluke provides unequivocal evidence of fluke infection in your stock, so always investigate fallen stock and ask for abattoir returns, as this represents invaluable diagnostic information

*Composite (or mob) test involves taking a faecal sample from ~12 animals within a group, mixing sub-samples in the lab and taking one FEC reading.



Fluke eggs following FEC sedimentation, with liver fluke (above) and rumen fluke (below).

Efficacy testing

- Fluke Faecal Egg Count Reduction Test (FECRT) – typically comparing FEC on the day of treatment with the FEC from the same animals 21 days later. Fluke test not as robust as the FECRT for roundworms, but still a very useful indicator of treatment outcome. Main drawback is that a significant number of animals in the flock/herd need to be FEC positive before treatment for test to be meaningful

There is a scientifically validated composite FECRT protocol for TCBZ resistance testing in sheep, produced by researchers at the University of Liverpool Vet School.
<https://veterinaryrecord.bmj.com/content/171/6/153.long>

- Coproantigen Reduction Test (CRT) – similar to FECRT, above, comparing the coproantigen levels in individual animals on day of treatment and again 21 days later. Also need ~12 animals to be positive on day of treatment (www.scops.org.uk and www.cattleparasites.org.uk)

How to manage issues of resistance

- Test the efficacy of any product you use, don't assume or guess
- If resistance confirmed, use a different product(s), based on spectrum of activity and diagnostic test results
- Be aware of how the different flukicides may work differently
- Check that they have actually worked!

Liver fluke



3 weeks post treatment



Treatment



Diagnostic/testing advised



Best practice guidelines

Biosecurity/Quarantine advice

- ✓ Quarantine and treat incoming or returning stock with an effective flukicide
- ✓ Prove that the treatment has been effective by FECRT and/or CRT
- ✓ Try to keep stock housed or on low-risk pasture until tests are clear
- ✓ Historically, TCBZ was the quarantine treatment of choice, but with the emergence of TCBZ resistance, other products may need to be used strategically e.g. closantel and/or nitroxylin, 6 weeks apart
- ✓ Exact protocol and product choice depend on risk assessment and diagnostic test results i.e. do your animals have fluke, what stage is it likely to be, what is the most appropriate product etc.





Liver fluke in Argyll (2018-2019)

Nigel Miller, Livestock Health Scotland



In Spring 2018 Livestock Health Scotland (LHS) approached the fluke team at Moredun to see if they could investigate the liver fluke situation in Argyll, which is a notorious hotspot for liver fluke in Scotland, due to its mild wet climate. We had concerns about the efficacy of triclabendazole (TCBZ), the first line of defence against liver fluke infection due to its unique activity against both immature and adult fluke.

With help from the two local vet practices, Dalriada and Westwards, and with backing from SAC Consulting and NFUS, we recruited two groups of five farms from each practice with known or suspected fluke and TCBZ resistance. All study group farms across both Kintyre and mid-Argyll had a history of significant fluke impact and ongoing challenges with control. Our aims were to:

1. Monitor fluke infection status of groups of individually identified sentinel animals (selected from that season's lamb crop) over the course of the grazing season using FEC and cELISA
2. Treat selected animals with TCBZ at the optimum time, based on FEC & cELISA test results
3. Determine the efficacy of TCBZ treatment by using FEC and cELISA reduction testing

In a 'normal' fluke year, we would have expected fluke eggs & coproantigen to peak late autumn/early winter, but things didn't quite turn out like that!

FEC & cELISA monitoring

The summer of 2018 proved to be exceptionally dry and warm, even in Argyll! As a result, the liver fluke composite FEC stayed very low, and was indicative of a low-level chronic (i.e. adult) fluke infection, but was still too low an egg count to consider a treatment trial. This was also reflected in the individual coproantigen results so we continued monitoring into the New Year.

Flukicide treatment trial – triclabendazole (TCBZ) efficacy testing

Farmers treated their selected animals with TCBZ (Fasinex, kindly provided by Elanco AH) in Feb-March, according to manufacturer's recommendations, and took faecal samples on the day of treatment (Day 0) and again 3 weeks later (Day 21).

What did we find?

- Liver fluke infection was 'low and late' in Argyll, 2018-19
- TCBZ was not 100% effective on any of the study farms (0/10)
- Rumen fluke was present on most of the study farms (7/10)
- Closantel, oxclozanide & albendazole were all effective against the appropriate fluke stages

Conclusions and interpretation

The study highlights the importance of monitoring the emergence of liver fluke infection at flock level to ensure treatment interventions are properly timed and targeted. Closantel, oxclozanide and albendazole all proved to be viable alternatives to triclabendazole, but need to be used at the right time to have best effect. **It was interesting to note that most of our study farmers managed peak fluke season 2018/19 without having to treat their animals, but those that did, treated several months too early and with a product that ultimately didn't work!** As a footnote, follow-up work in 2019-20 again identified fluke disease at low levels and significantly delayed despite a more normal weather pattern, perhaps reflecting a reset of baseline snail and fluke populations after the prolonged dry period in 2018-19.





Sheep scab



Figure 5
Psoroptes ovis mites.

Introduction

Sheep scab, or psoroptic mange, is an allergic dermatitis caused by skin infestation with the sheep scab mite, *Psoroptes ovis* (Figure 5). Scab is one of the most important diseases for UK sheep farmers from both a financial and welfare perspective, costing the industry in excess of £8M per annum. Sheep scab used to be thought of as a disease of autumn and winter but is now common throughout the year, although the majority of outbreaks still occur between September and March.

Clinical signs and diagnosis

- Scratching and rubbing, (see Figure 6) but these signs can also indicate a chewing lice infestation, which is also common in UK sheep flocks. **Therefore, a positive diagnosis for sheep scab is essential**
- In early sheep scab, animals may appear clinically normal. Consult your vet for advice on effective diagnosis/monitoring
- This sub-clinical stage can last for several weeks or months, during which time animals can act as a source of infection
- In sheep suffering from an advanced stage of infestation, clinical signs include yellowish scabs, restlessness, scratching, yellow-stained fleece, wool-loss, head tossing, bleeding wounds and loss of condition



Figure 6
Sheep displaying symptoms of a sheep scab infestation.
Image © Prof. Neil Sargison (R(D)SVS)

Control: Co-ordination is key

If you have a sheep scab outbreak:

- Warn your neighbours and let them know when treatment for scab will begin
- Co-ordination of treatments within a 2-3 week period is critical
- All affected and in-contact animals must be treated
- For effective treatment of scab, only injectable endectocides (macrocyclic lactones (MLs)) and plunge dips (organo-phosphate) should be used. Showers should NOT be used
- For the most up-to-date information on treatment for sheep scab, please refer to the SCOPS website (<https://www.scops.org.uk/external-parasites/scab>)



Issues with control

- Some field populations of sheep scab mites in the UK have developed resistance to the macrocyclic lactone (ML) based injectables
- MLs are anthelmintics also used for the control of gastrointestinal nematodes. Our reliance on a single class of drugs to control multiple parasites is therefore unsustainable
- If you have ML resistant strains of *P. ovis* mites on your farm, plunge dip using OP
- However, in most flocks, MLs still represent an effective means of controlling sheep scab, if used correctly and according to the manufacturer’s instructions

Monitoring and Diagnostics

Whenever an outbreak of sheep scab is suspected, it is crucial that flock owners seek a definitive diagnosis, as signs of lice infestation are very similar and treatments can differ. For example, OP dips kill lice but MLs do not, therefore correct diagnosis is critical.

1. Traditional diagnosis is a veterinary examination for clinical signs and a skin scraping (taken at the lesion edge for microscopic examination for presence of scab mites). This method can provide a definitive diagnosis, but is influenced by operator experience and accuracy of diagnosis can be as low as 18% if no lesion is obvious (i.e. subclinical animals).
2. The Moredun sheep scab ELISA test: Save money by testing!
 - This blood test can accurately detect that an infestation is due to the sheep scab mite
 - It can detect infested animals at an early stage, before the onset of clinical signs
 - At the flock level, test 12 animals from any size of flock and can be used instead of routine prophylactic treatments for scab, thus preventing unnecessary use of chemicals

Sheep scab



Accreditation or official control:
Notifiable, Scotland



Quarantine and time:
2 weeks minimum



Diagnostic/testing advised



Disinfection - premises etc



Best practice guidelines



Treatment

Biosecurity and Quarantine advice

Good biosecurity can prevent the introduction of scab into a flock

- ✓ Quarantine for 16 days, test or treat and observe
- ✓ Clean and disinfect trailers and equipment the sheep have been in contact with using an approved product
- ✓ Disinfect protective clothing and wash hands thoroughly
- ✓ Keep well-maintained fencing and double fencing (1m apart) at boundaries

Strategies for slowing down/reducing development of resistance

1. Do not use routine treatment to prevent scab unless in a high-risk situation such as common grazing.
2. Monitor and diagnose using clinical signs, skin scraping and the ELISA test.
3. Use injectable MLs and OPs to treat scab when it does occur.
4. It is unlikely that new classes of chemicals will be developed, so preserve the efficacy of these chemicals - only use them when you have a positive diagnosis from your vet.

Ensure that the right treatment is given to the right animals at the right time.



You could save yourself a lot of money by testing first



Treating a flock of 500 sheep **£1,100**

- £1.80/ewe for injectables
- or £1.50/ewe for contract dipping (plus £150 for dip disposal)
- £200 for 2 days labour required for either method



Testing 12 sheep from a flock of 500 ewes .. **£160**

- £72 for diagnostic testing for 12 sheep
- £60 for vets' costs bleeding, postage, etc
- £28 for call out fee

Managing resistance

1. Use treatments only when absolutely necessary and follow advice from your vet or registered animal medicines advisor (RAMA or SQP).
2. If you have treated sheep but after a few days they still appear to be infested, then it is crucial that you report this to your vet or RAMA.
3. Do not re-treat with the same product, as this is likely to be a waste of time and money. See SCOPS <https://www.scops.org.uk/workspace/pdfs/amtra-actions-following-suspected-lack-of-efficacy-report.pdf>



Photo | David Stephenson



Herdwick Sheep Breeders Association sheep scab project for sheep grazing common land

Amanda Carson, APHA, 2020

In 2018, following a report that resistance to MLs had been found in sheep scab mites, a study was set up with seven farmers grazing their hefted flocks on one common. None of the seven flocks had any obvious signs of sheep scab, but in January, some flocks reported that the sheep were pulling at their wool due to lice. Could sheep scab mites also be present at a low level, which would not show as signs associated with sheep scab? If not checked, sheep scab would continue to circulate.

The new blood test, developed at Moredun, was used as this test picks up antibodies to scab mites and tells us if the sheep have been exposed to mites. We detected low levels of exposure to sheep scab mites in 5 of the 7 flocks. These sheep had NO signs of sheep scab but clearly there were sheep scab mites about. A co-ordinated treatment of OP dipping was achieved and, post-dipping, all the same sheep were tested again and the antibody levels had declined – i.e. the dipping had been successful. So what did we learn?



Photo | Amanda Carson



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1. **That it is complicated!**
2. **Sheep scab can be present in a flock at a very low level!**

You may not see the classic signs you might normally associate with sheep scab, but the blood test allowed us to detect the presence of sheep scab at low levels, without there being any obvious signs.

3. **Know what you are treating!**
Getting the right diagnosis is paramount and this new blood test for sheep scab can detect scab before signs develop, allowing you to act quickly with the right treatments.
4. **Discuss treatment options with your vet or SQP/RAMA once a diagnosis has been made!**

There are different outcomes and protection times with different injectable treatments, therefore, it is important to use one that suits your flock and management. It is also important that sheep are all treated in the same time-frame on common ground.

5. **Some farmers without dipping tubs, brought in dipping contractors and found them to be efficient and effective!**

This can be a cost-effective way of controlling scab if neighbours co-ordinate dipping. Dips control scab AND lice and flies and ticks - so win-win!

The farmers on this common worked co-operatively and solved a problem, but what about adjoining hefts? Let's have wider cooperation - discuss sheep scab and consider testing to develop a co-ordinated plan.

Update 2020:

No "itchy sheep" or sheep pulling wool were observed in the seven flocks in January 2019, nor in January 2020. The collective and coordinated dipping in the late Autumn of 2018, and in 2019, appeared to have resolved the low level of sheep scab in the flocks and controlled the lice.

This project was possible thanks to funding and support from Wools of Cumbria Carpets, The National Trust, Emma Wheatcroft, Bimeda, Zoetis and Biobest.



Moredun Research Update



Roundworms

- Development of monitoring tool that can identify both roundworm species, and where the markers are available, resistance status from faecal samples
- Investigating the role that livestock movement and wildlife play in the movement of anthelmintic resistant and susceptible roundworms
- Investigating mechanisms of macrocyclic lactone and monepantel resistance
- Assessing grazing and treatment strategies to improve advice and recommendations
- Assessing precision livestock farming tools to monitor animal health and welfare to better target treatments and interventions

Liver fluke

- Improved diagnosis in the live animal, especially early and non-invasive detection of flukicide efficacy – FEC, cELISA, PCR/LAMP, saliva biomarkers
- Gut antigen approach to vaccination vs liver fluke (i.e. same as Barbervax®)
- Detecting fluke stages in the environment e.g. silage, forage, pasture – snails, cysts, PCR, environmental DNA
- Rumen fluke epidemiology and production impact (including an experimental challenge model in sheep)
- Impact of liver fluke on livestock production and greenhouse gas emissions



Sheep scab

- Updated best practice advice for how to use the Moredun sheep scab ELISA test in the field
- Development of a pen-side version of the ELISA test to allow point of care testing and rapid disease diagnosis
- Improving our understanding of the mechanisms by which *P. ovis* mites develop resistance to the macrocyclic lactones (MLs) and developing strategies to slow the spread of resistant mites in the future, maintaining the efficacy of the existing drugs for as long as possible
- Developing a novel vaccine to provide a more sustainable means of controlling sheep scab in the future; early prototypes show great promise with >80% reductions in lesion size observed in vaccinated sheep, compared to control animals

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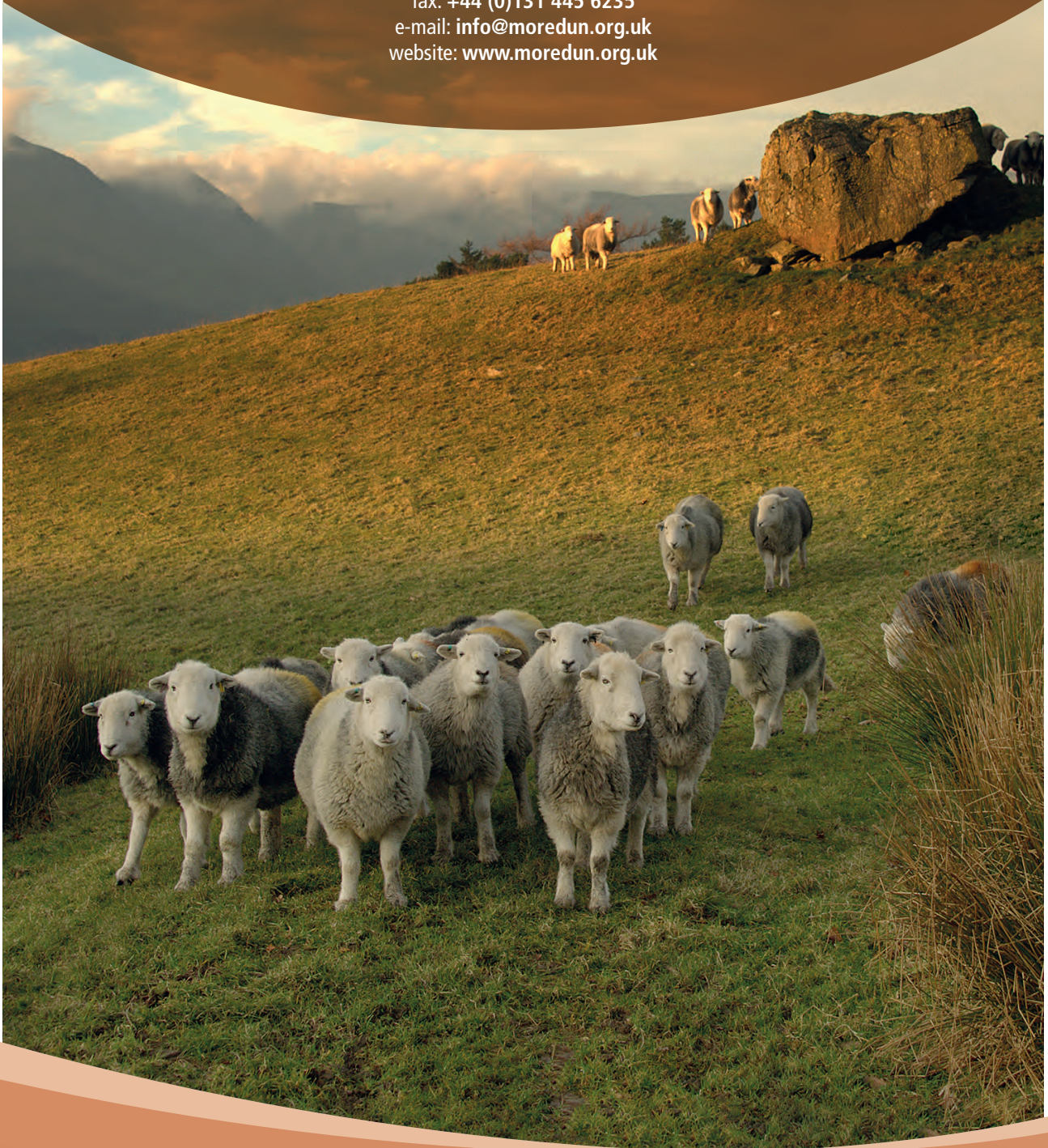


Photo | David Stephenson

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