QMS
Quality Meat Scotland

Liver fluke control in grazing livestock

Contents

The information in this booklet has been compiled by Lesley Stubbings (LSSC Limited), Dr Philip Skuce (Moredun Research Institute) and Professor Diana Williams (University of Liverpool): and produced in collaboration between AHDB, HCC and QMS.

COWS Control Of Worms Sustainably

SCOPS Sustainable Control of Parasites

In association with AHDB

Introduction

Liver fluke (*Fasciola hepatica*) can have a devastating effect on the health and welfare of grazing livestock and historically, control has relied heavily on the routine blanket use of flukicide treatments. While these medicines remain a vital component of liver fluke control, it is important to ensure that flukicides are only used when necessary, choosing the right product, at the right time and administering it effectively for the type of worm.

The RIGHT approach – follow the 5 Rs

1. The **RIGHT** product for the type of worm
2. The **RIGHT** animal
3. The **RIGHT** time
4. The **RIGHT** dose rate
5. Administered in the **RIGHT** way

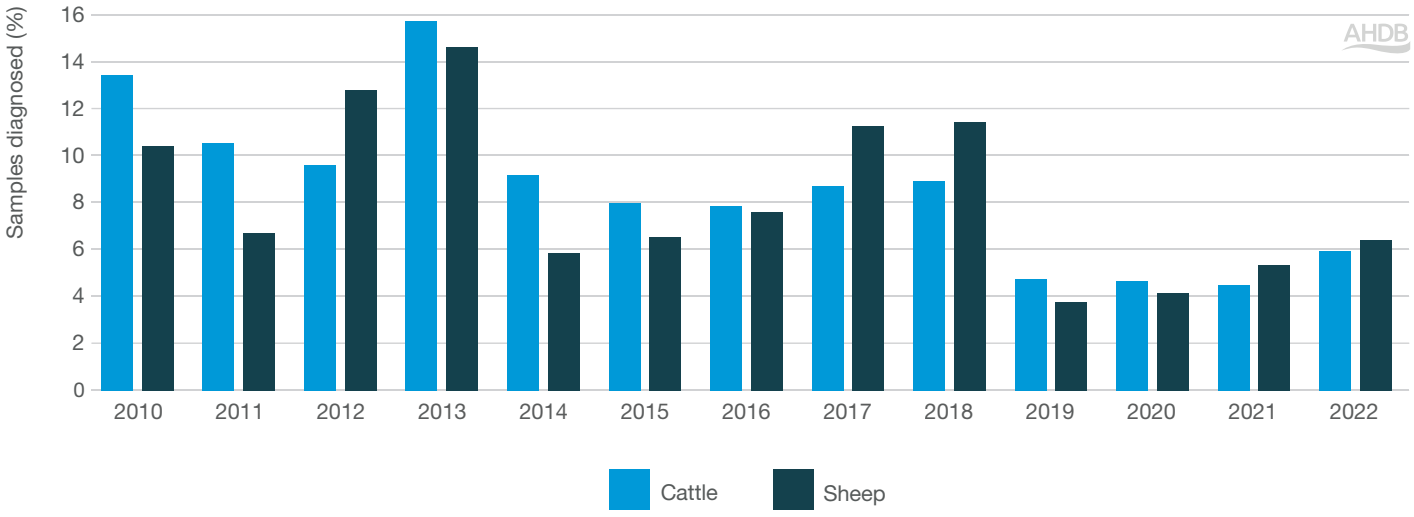
This can be a daunting prospect for livestock farmers because of the unpredictability of the risk posed by liver fluke. Year-to-year variation can be dramatic, as can farm-to-farm and even field-to-field variation. This variation in risk is based on a number of factors, including fluctuations in weather patterns, time of year, farm location, underlying geology, ground conditions and farm management practices. Work through the liver fluke risk assessment on pages 22 and 23 with your vet to help identify potential risk factors on your farm and tailor a fluke control plan with these in mind.

Key to the overall risk is the role of the liver fluke's intermediate host, a tiny mud snail, without which the liver fluke cannot complete its life cycle. Pages 4 and 5 show the latest knowledge on mud snails and how this can be used to assess risk on-farm.

To ensure an effective control programme, risk must be assessed on each farm and every year to decide what steps are necessary to protect grazing livestock.

This manual has been created to outline good practice and sustainable control of liver fluke, to protect livestock from potential damage posed by liver fluke, and to consider:

- Changes in climate, farm and land management practices
- The need to minimise use of veterinary medicines, treating only when necessary
- Minimising selection for flukicide resistance, to preserve the efficacy of the limited number of flukicides available
- Reducing the impact that treatments may have on the environment
- Mitigating negative impacts of fluke on livestock productivity, to reduce the carbon footprint of red meat production

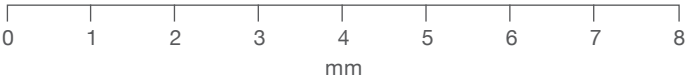


Source: APHA

Figure 1. Diagnoses of liver fluke in GB sheep and cattle 2010–2022 showing the year-to-year variation in risk of liver fluke. (2022 period still in progress at time of print)

Note: diagnoses presented as a percentage of diagnosable submissions of fasciolosis in cattle and chronic fasciolosis in sheep, excluding continuation diagnoses of acute and chronic fasciolosis and submissions recorded as 'diagnosis not applicable'.

Meet the snail

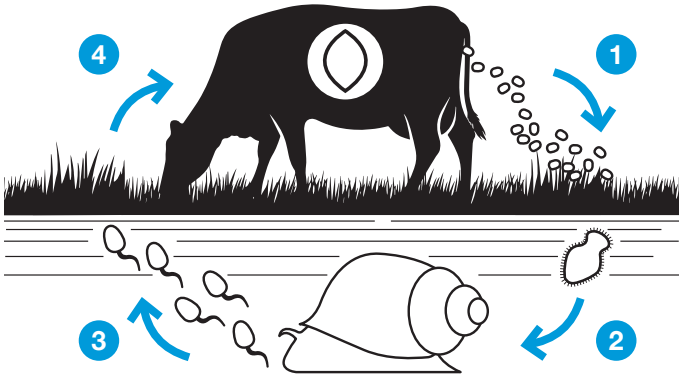


The main intermediate host of the liver fluke is the dwarf pond snail, *Galba truncatula*. This is a tiny mud-coloured snail, approximately 3–5mm in length, with a pointy spiral shell. *Galba* snails thrive in damp conditions and prefer mild temperatures ranging from 5–25°C. In the UK, they start to breed when spring arrives, the population can increase rapidly under the right conditions.

Some snails, including infected snails, can hibernate over winter particularly if the winter is mild. They emerge the following spring to start the cycle again. Heavy rainfall can wash the snails away, possibly to establish new colonies. A very dry spell makes them quiescent (dormant), and they survive deep in the mud until it rains again. Very cold weather over winter reduces the snail population and prolonged freezing temperatures will kill most snails, but these conditions are becoming increasingly rare as our climate warms.

The dwarf pond snail, *Galba truncatula*, is a vital part of the life cycle of the liver fluke.

The liver fluke life cycle



1. Liver fluke eggs are shed onto pasture in livestock dung. After a period of time, dictated largely by the prevailing weather conditions, especially temperature and rainfall, the eggs develop and hatch to release a microscopic ciliated larval stage called miracidia. These glide on films of water on the leaves of grass and other plants, and only have a few hours in which to find and penetrate a suitable snail host.
2. Once inside the snail, the miracidia develop through a number of different larval stages but, most importantly, become amplified, such that a single miracidium infecting a snail can become 100s, if not 1,000s of the final stage, the cercaria.
3. The cercaria is a microscopic tadpole-like stage, which breaks out of the snail and swims until it meets a solid object, usually grass or other vegetation. The cercaria sticks to the grass, loses its tail and develops a protective layer to become the infectious metacercaria or cyst stage.
4. Livestock ingest these infective cysts while grazing. Once inside the final (definitive) host, the cysts are activated and hatch out to release tiny immature flukes, which penetrate the intestine and cross into the liver. Once in the liver, the flukes burrow through the liver tissue, feeding and growing, and causing considerable damage and pathology in the process. Between 8–12 weeks following initial livestock infection, mature fluke reproduce and lay eggs which restarts the life cycle.

Mud snail FAQs

What do the snails feed on?

The snails like to graze on fine films of algae on exposed muddy surfaces. This is why snails prefer habitats that have bare mud, but that have not been recently disturbed as that destroys the layer of algae growing on the surface.

What conditions suit the snails?

Typical mud snail (or 'flukey') habitat tends to be areas that become waterlogged and boggy, characterised by rushes and open patches of mud. The snails like wet conditions, but not underwater, bare mud not recently disturbed, and open areas that are not shaded by hedges, trees or long vegetation. Such areas include depressions caused by tractor tyre ruts, poaching and natural landscape features, cleared drainage ditches, banks on the sides of streams or ponds and soft ground around leaking water troughs, taps or broken water pipes.

Do the snails have any natural predators?

Snails do have natural predators. Birds such as mallard ducks, lapwings, starlings and thrushes feed on snails and there is some evidence that commercial duck and goose systems may eliminate lymnaeid snails from their habitat. Ground beetles and water beetle larvae are voracious predators and may feed on *Galba* snails, plus the larvae of Marsh flies (*Sciomyzidae* flies) are parasitic and can kill snails. Finally, *Zonitoides* snails, a type of land snail found in wet pasture and close to water bodies, are carnivorous, feeding on other snails. These have been suggested as possible means of biological control for *Galba*.

Can I get rid of the snails?

Simple answer is no, not easily. Back in the late 1950s/ early 1960s, farmers would spray flukey fields with a range of toxic molluscicides to kill the mud snails. This practice has been banned for several decades, due to off-target environmental impacts on other important soil invertebrates and fish. At present, there are no licensed products available for killing the snails. Drainage of permanently wet parts of fields may help make the farm or field less snail-friendly but is becoming less popular with the advent of wetland conservation grazing schemes. Another option is fencing, to deny livestock access to flukey fields at flukey times of the year, but this can be expensive and impractical in many cases.

What about soil and water pH?

Galba snails prefer a neutral pH but will tolerate a slightly acidic pH. *Galba* is not typically found in upland, peaty areas, although other snail species are found in those areas, some of which can harbour liver fluke. Typically, the pH reflects the underlying geology. Acidic environments tend to be peaty and waterlogged, whereas alkaline environments tend to be chalky and dry – *Galba* is a bit like Goldilocks and likes it 'just right'!

How far can snails and fluke stages travel?

On their own, the snails probably don't move very far, but we know that the snails can float, so if they get caught in a stream or river, or in floodwater, they can float away to a new location, possibly taking any fluke stages with them. There is also evidence of *Galba* snails being transported long distances on the feet of migrating birds.

Is liver fluke the only trematode (fluke) parasite that snails can harbour and transmit?

No, snails are intermediate hosts for lots of parasites. *Galba* is the intermediate host for another common fluke, called the rumen fluke (*Calicophoron daubneyi*), which is increasingly seen in sheep and cattle but does not always cause clinical signs of disease. These snails can also harbour the intermediate stages of trematode (fluke) parasites of amphibians, birds, fish and mammals.

Post-mortem information

Liver fluke can be a cause of sudden death in both cattle and sheep, when high numbers of cysts are eaten and simultaneously develop into immature fluke. Damage is caused by mass migration of these immature fluke from the gut to the liver and their blood-feeding activity in the liver. This often results in internal scarring, weight loss, anaemia and possible bacterial complications with Black disease (infectious necrotic hepatitis).

Investigation of sudden deaths by post-mortem is still the gold standard diagnostic test for liver fluke.

Abattoir feedback

This can be a very useful source of information, warning that liver fluke is active on the farm. Even where there are no deaths or serious losses, animals infected with fluke can have permanent liver damage, reducing body condition and fertility. In 2021, 6.6% of cattle livers and 4% of sheep livers were excluded from the human food chain because of liver fluke.

474,187 sheep and 119,168 cattle livers were rejected in 2021.

Watch for clinical signs

- Weight loss
- Ill-thrift
- Sudden death
- Oedema under the chin (bottle jaw)
- Anaemia (pale eyes and gums)
- Abdominal pain
- Respiratory distress (heavy fast breathing)

Also use performance indicators such as liveweight gain, milk yields, scanning results and body condition score (BCS).

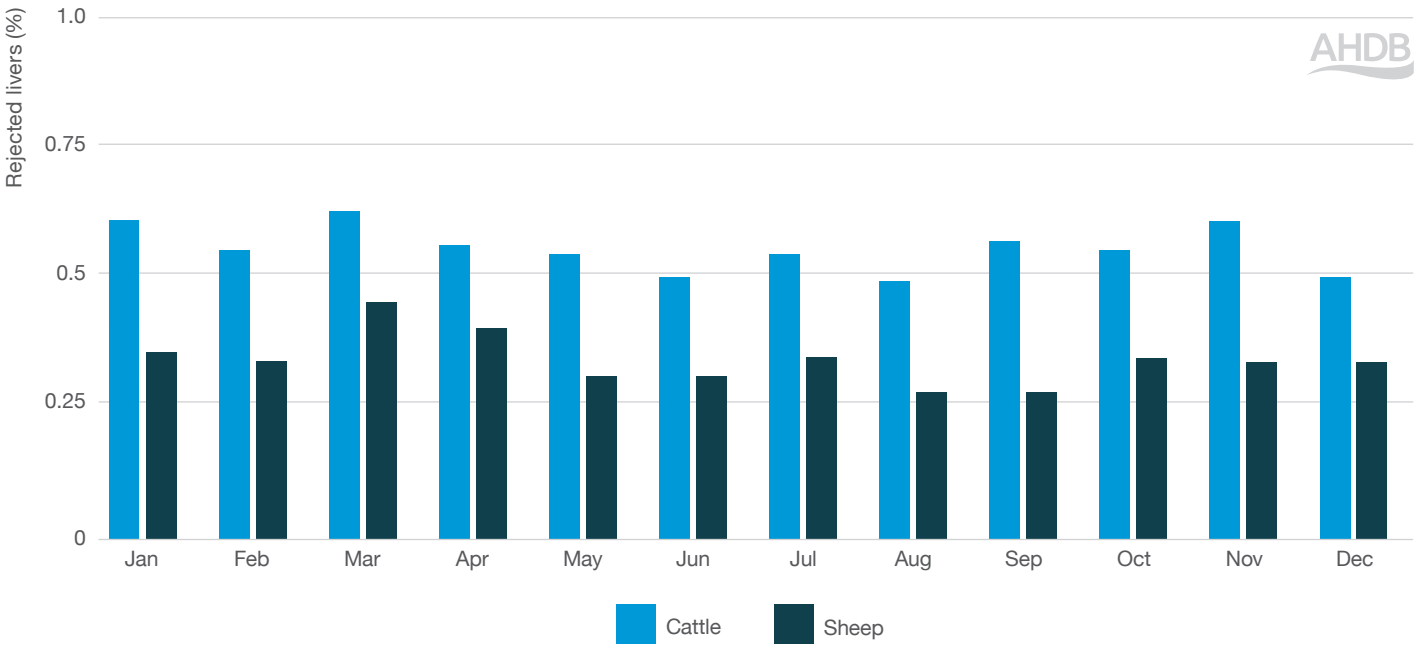


Figure 2. Monthly liver fluke rejections for cattle and sheep slaughtered in England in 2021

Management options to reduce the risks

There are several actions you can take to reduce or avoid the risk of liver fluke infection to grazing livestock.

Fencing off high-risk areas – prevent livestock accessing pasture contaminated with fluke cysts. The snails need muddy conditions which may only be present in patches within the grazed area and can be fenced off. For example, around drinking areas or streams that can be replaced by water troughs. In dry years, both the snails and livestock concentrate in these areas, which means the risk of infection can be very high.

Prevent/repair leaks from pipes and water troughs – leaks can create a perfect habitat for the mud snails, even if only temporary.

Housing of cattle and sheep – removing animals from high-risk pastures and housing is a strategy some farms have to employ. This may be the only way to prevent re-infection from flukey pastures, where further losses would be faced as flukicides do not have any persistent effect after dosing.

A risk factor to consider when housing livestock is feeding poorly conserved grass silage. A recent study by the University of Liverpool found that liver fluke cysts do not survive for more than two weeks in well-made silages. However a small number of viable cysts were recovered from ensiled grass of 20% dry matter exposed to oxygen for the duration of the ensiling process. No viable cysts were recovered from spoiled silage of higher DM content after 10 weeks.

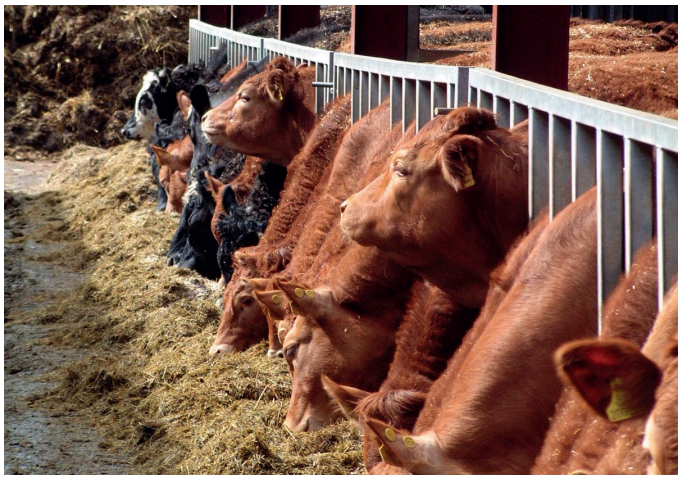
Well-made silage poses no risk of fluke infection to livestock.

Getting to know your risk areas - mapping where the flukey areas are on the farm over time is a useful step in understanding the risks and options for control. It also means you can target the right groups of livestock if you are using faecal egg count (FEC) tests and serology (blood testing) to monitor exposure to liver fluke.

See pages 22 and 23 for a quick-look risk assessment and example of mapping the risk areas on your farm.

Quarantine treatments for incoming stock are also a very important control measure. The objective varies according to the farm. For example, a high-risk farm needs to guard against introducing resistant fluke, whereas a low-risk farm may be trying to avoid any snails becoming infected for the first time. Isolate incoming livestock and carry out diagnostic testing to determine if treatment is required before incorporating these individuals into your wider flock or herd.

For more information, see the **Sustainable Control of Parasites in Sheep (SCOPS)** or **Control of Worms Sustainably in Cattle (COWS)** websites.



Flukicide treatments and resistance

There is a very limited choice of flukicides available to livestock farmers and with little prospect of any new ones in the future, they must be used carefully. Testing and monitoring to ensure treatment is only given when needed, is the first step to safeguarding these products. If treatment is necessary, then choosing the right product and checking it has worked effectively are key to maintaining successful control.

The table below shows the different flukicide active compounds available in the UK. They are distinguished by the maturity of liver fluke they kill, and this determines when and how we should use them.

Triclabendazole (TCBZ) has the widest range of activity, killing liver fluke in sheep from two days old, and from two weeks old for cattle (depending on the formulation). As a result, this active ingredient has been used widely and there are increasing reports of resistance to TCBZ in liver fluke in the UK, so it is imperative to only use this when necessary and to make sure that it has been effective post-treatment. Where appropriate, aim to reduce the pressure on TCBZ by using the other products. For example, in spring, when liver fluke in livestock is likely to be at mature adult stage, you can use albendazole or oxyclozanide, both of which have good activity against adult fluke. For more information about products, see the **AHDB Parasite control guide** or **SCOPS 'Know Your Anthelmintics Groups' Guide**.

Table 1. Flukicide active compounds available in the UK and the efficacy of their kill rate

Active ingredient	Kill rate (%) for fluke aged 1–12+ weeks												Optimum time of year to use
	1	2	3	4	5	6	7	8	9	10	11	12+	
Albendazole										50–70		80–99	Spring/summer
Oxyclozanide										50–70		80–99	Spring/summer
Clorsulon			30		43		53			99			Late autumn, spring/summer
Closantel			23–73		91	91–95				97–100			Late autumn
Triclabendazole	90–99	99–99.9											Autumn

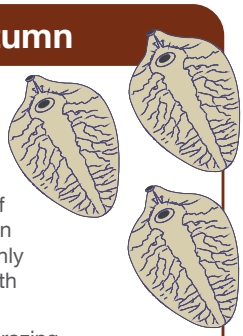
Testing the efficacy of treatment

It is always good practice to follow a flukicide treatment with a faecal egg reduction count (FERC) test (or coproantigen equivalent) to make sure it has been effective. This is best achieved by testing a sub-group of animals (e.g.10 sheep) using a composite FEC or individual coproantigen on the day of treatment and again 21 days later. This method is validated for triclabendazole, but not for other products that only target more mature stages of fluke.

Remember that resistance is only one reason for an apparent lack of efficacy or treatment failure.

Re-infection of treated livestock is often mistakenly linked to treatment failure. However, no flukicide products offer persistent protection as they only treat the current infection (even if formulated with a roundworm treatment which may offer persistent activity). Product choice and timing are key for sustainable control of liver fluke. Always match the product choice to the stage of fluke most likely to be in your animals at time of treatment, and best of all, supported by diagnostic information from faecal or blood tests. If after following these steps, you suspect a treatment failure always report to your supplier and/or vet.

Autumn



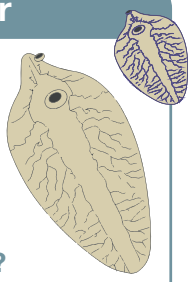
Fluke activity and disease risk

- Significant risk of livestock infection as pasture is highly contaminated with fluke cysts
- Cysts eaten by grazing livestock and immature fluke start migrating to host liver and feeding
- Risk of disease, especially in sheep

What should I do?

- Test first season grazing lambs and calves using blood tests
- Test adult stock using faecal egg counts or coproantigen tests
- Investigate sudden deaths by post-mortem and use abattoir feedback to prompt further testing
- Treat for immature fluke by using products containing triclabendazole (know your resistance status) or closantel

Winter



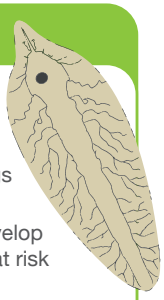
Fluke activity and disease risk

- Risk of chronic disease with adult and late immature fluke

What should I do?

- Test using faecal egg count or coproantigen test and use abattoir feedback to prompt further testing
- Treat for late immature and adult fluke using products containing closantel

Spring



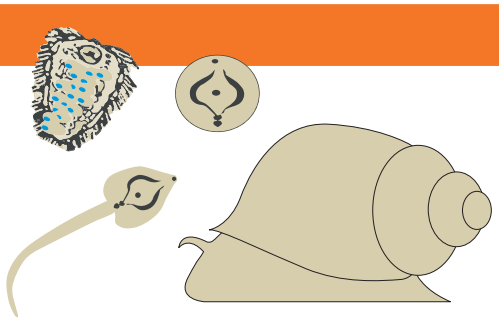
Fluke activity and disease risk

- Adult fluke producing eggs in the host faeces
- Fluke eggs hatch and develop into miracidia, snails are at risk of infection

What should I do?

- Test livestock using faecal egg counts, and use abattoir feedback to inform further testing
- Treat for adult fluke using products containing oxyclozanide, albendazole or clorsulon
- Prevent pasture contamination with fluke eggs from the faeces of infected livestock, and prevent snail infections by using avoidance tactics such as fencing and drainage

Summer



Fluke activity and disease risk

- Fluke eggs are hatching and developing
- Fluke eggs are infecting snails and multiplying
- Snails are shedding fluke cysts onto vegetation
- Fluke stages develop inside infected snails and are shed as cysts after eight weeks

What should I do?

- Test adult stock for resistance using composite faecal egg count reduction test
- Quarantine, test and treat purchased cattle and sheep (including tups and bulls)
- Snail numbers increase in warmer weather. Identify snail habitat and focus on reducing habitat with drainage and limit poached ground
- Prevent grazing livestock access to snail habitats

Source: Adapted from Dr Scott Lawton (SRUC) and the University of Liverpool

Figure 3. Testing the efficacy of flukicide treatment in sheep and cattle

Minimising the environmental impacts of flukicides

As interest in the value of grazing livestock for conservation increases, so does the need to be aware of the potential fluke risk to livestock and the environmental impacts of any control measures used.

All anthelmintics (wormers and flukicides) approved for use in UK livestock have undergone a rigorous Environmental Risk Assessment, reviewed by the Veterinary Medicines Directorate (VMD), before any license is granted.

SCOPS and COWS principles aim to reduce our reliance on anthelmintics, which will help to minimise our environmental impact. However, some products can have a negative impact on soil and aquatic invertebrates when they are excreted in the dung and/or urine of treated animals or if they are allowed to contaminate water courses or soils through incorrect storage or disposal.

For more information on any environmental impact identified regarding a product, check the Summary of Product Characteristics (SPC), available at **www.vmd.defra.gov.uk/productinformationdatabase**

Always

- Make sure you read, understand, and follow instructions given on the SPC for each product used
- Take note of any specific warnings, for example, those regarding the potential to damage soil or aquatic life. Warnings may include keeping treated stock away from streams, ponds, ditches and water courses for a period of time, co-grazing with untreated stock and guidance on the safe spreading of manure
- Remember that meat and milk withdrawal periods are not a measure of potential environmental impacts or when it might be 'safe' to graze sensitive conservation areas
- Dispose of empty containers or residual unwanted product responsibly. These pose a huge risk to the environment if they are allowed to contaminate water courses or soil. Do not dispose of unused product with domestic rubbish or pour animal medicines down the drain or toilet unless advised to do so. For more information contact your Vet, Registered Animal Medicines Advisor (RAMA) or SQP (Suitably Qualified Person) or see the **VMD Code of Practice on the responsible use of animal medicines on the farm**.

Case studies

Regional parasite forecasts, based on prevailing weather patterns, are useful in identifying risk periods but they cannot be used on their own as a trigger for treatment. The decision to treat requires testing, monitoring and risk assessment for your farm, because every farm is different. To help guide you through this process, pages 12 to 21 are commercial farm case studies from around the UK, which cover a variety of levels of fluke risk. Each farm and their approach to testing, monitoring and treatment is detailed to show how fluke risk is managed, and how to recognise when treatment is necessary.

Farm locations are shown on the map. The key shows the overall risk level that each farm experiences. For example, in Argyll, in the west of Scotland, the prevailing climatic and ground conditions mean that liver fluke is invariably a **very high risk**. However, in recent years, cooler drier springs followed by hotter drier summers have lowered fluke risk and shifted it to later in the year, and the local view of a 'traditional' fluke season is changing. In contrast, the Kent case study is from a farm with a **low risk**, where effective testing is needed to make sure they don't miss a year when there is a risk and treatment is necessary to prevent losses.

1. Rawfoot Farm **High risk**
2. Carloonan Farm **High risk**
3. G H Dean and Co **Low risk**
4. Spittal Mains **Medium risk**
5. Nant Moch **High risk**

Rawfoot Farm – Cumbria, England

About the farm

Richard Carruthers manages Rawfoot Farm, a 400-acre upland farm in the Lake District. The farm receives 65–75 inches of rainfall per year and is a mix of productive and non-productive land, which runs 850 ewes producing homebred replacements, 150 lambs, and 65 predominately Simling cattle. This includes common grazing land in a higher-level stewardship, and less productive wet land and some hedgerows in a mid-tier Countryside Stewardship scheme.

Fluke history

Fluke has been an ongoing issue in the area, due to a large sheep population. Some years are notably worse than others for fluke challenge, and historically weather has played a role in this risk. Having lost ewes in these high challenge years, Richard has had more vet involvement in the fluke protocol and tries to review this every year. Richard treats the whole farm as being fluke infested from a management perspective when creating the fluke protocol.

Main challenges

- Lots of wet ground and high rainfall
- Common grazing shared with 4–5 other grazers
- No housing available for sheep to break the fluke cycle
- Fluke is a whole-farm challenge

Current strategy

Richard's fluke strategy has changed over the last few years. Previously treating at weaning, pre-tupping and once more in February, Richard comments this used to be a typical approach in the area but maybe wasn't right for the timing of the product(s) used.

> "We just did the standard farmer treatment, it wasn't great. There wasn't a lot of science in it, but I think it was just historically what we did in the area. That's how we probably came into the problem of losing quite a few sheep in those challenging years because we just weren't timing the product right."
>
> **Richard Carruthers**

The dry springs in 2020 and 2021 changed the normal timing of the fluke life cycle significantly, which meant that the standard treatment timings were not appropriate.

Now, the fluke strategy focuses on vet input and fluke egg counts. Richard does roundworm egg counts throughout the season and gets fluke egg counts done at the same time. This highlights any problems in the pipeline, and with advice from the vet, Richard decides which product to use to time appropriately. After treatment, Richard re-tests for fluke egg counts, so there is continuous monitoring.

Management actions

Rawfoot Farm has limited preventative measures for fluke control. Sharing common grazing complicates the flock health plan and creates a weak link for biosecurity. Housing sheep to break the fluke cycle isn't an option either. Richard has fenced off a few wet areas, however, most of the farm is wet ground, and he suspects that the fluke challenge is across the farm. The farm breeds all its own replacements, only buying in breeding rams from high health flocks.

These changes have made a big difference to the ewe flock, with improved production and ewe body condition and considerably fewer ewes lost to fluke. Richard attributes this to having vet involvement and using the right product at the right time. Using the vet's advice reduced the guesswork and helped put the right protocol together. Doing fluke and worm egg counts also provides specific information to Rawfoot Farm, which Richard uses alongside NADIS and SCOPS forecasts.

Next steps for the farm

TCBZ resistance was highlighted when the farm underwent a high fluke challenge a few years ago. As a result of this, the farm doesn't currently use TCBZ, but is looking into doing another test to confirm resistance before considering reintroduction of this product at the appropriate time of year. This test would involve confirming the presence of fluke using a faecal egg count or a coproantigen test, then testing again after treatment with TCBZ.

Richard is planning to fence more marginally wet areas and keep stock off really wet paddocks at critical times. The aim is to reduce the risk of stock being exposed to a high challenge from liver fluke whilst trying to minimise the infrastructure costs and management changes. A major challenge is managing the life cycle of the fluke with rotational grazing, and what to do with paddocks taken out of rotation.

Richard is also focusing on correct drenching technique, "A lot of sheep are missed or inappropriately drenched. The proper position is right to the back of the throat and down, and this then goes into the correct stomach. But if it does not get over the tongue, it doesn't go to the appropriate stomach and the animal hasn't been wormed or fluked correctly. It's not going to do what it's meant to if it's not going to the right place".

Summary

- The liver fluke risk is high on this farm
- Control is challenging due to wet ground and common grazing
- Richard works closely with the vet to review the fluke protocol and act at appropriate times to reduce fluke challenge
- Replacements are bred on-farm and bought-in stock are from high health flocks
- Egg counts are the main form of monitoring and help provide a farm-specific picture

Carloonan Farm – Argyll, Scotland

About the farm

Carloonan Farm is in Mid-Argyll, on the west coast of Scotland, and covers approximately 1060 ha from the coast to 1,700 ft above sea-level. Farmer Brian Walker runs 950 ewes and 80 Aberdeen Angus Cross cows. The area is famed for its mild wet climate and can experience an average of 100 inches of rain per year. The ground is typically wet all year round, even on the higher ground.

Fluke history

Liver fluke has always been a problem in Argyll, and it was here that the first confirmed case of triclabendazole (TCBZ) resistance in the UK was reported, back in the late 1990s.

Brian knew there was a problem with fluke in the area when he took on the farm some 20 years ago, and regularly rotated flukicidal products, based on advice received from local merchants and drug company reps. In 2012 Novartis AH and Dalriada Vets, Lochgilphead carried out a TCBZ efficacy trial involving sheep on ten Mid-Argyll farms. Carloonan was one of the three study farms where TCBZ appeared to be still working, and TCBZ inefficacy was demonstrated on the other seven.

Alternative fluke management practices other than strategic dosing are limited at Carloonan. Fencing off wet ground is not an option, and there is little to no housing available, so the livestock are typically outwintered.

Current strategy

Brian started routine monitoring when he became involved in a recent trial with Livestock Health Scotland, Dalriada Vets and the Moredun Research Institute in the summer of 2018. This involved submitting faecal samples from a group of ten sheep every month for composite faecal egg count and individual coproantigen testing. This not only indicated when the fluke challenge had started, but also tested the efficacy of TCBZ, and other products, on this farm.

The results from the trial showed that the fluke challenge in 2018 proved to be ‘low and late’, sentinel animals did not become egg count or coproantigen positive until February–March of the following year. Also, despite TCBZ working six years ago, the trial found clear evidence of TCBZ not working well, most likely due to resistance, because alternative products such as closantel were effective. Had Brian treated his animals with TCBZ in autumn as usual, he would’ve treated approximately four months too early and with a product that didn’t work.

> “It has helped me do a bit of fine tuning with the management of my sheep stock and saved a bit of money and time with less dosing.”
>
> **Brian Walker**

Brian is acutely aware of liver fluke risk year-to-year and has already seen evidence of fluke on his farm this year (2021), despite it being one of the driest summers in the region for some time. This is most likely due to stock seeking out the lusher, wetter parts of the farm, where the highest fluke risk would be. He is a great advocate of fluke risk assessment and ‘getting to know your farm’.

Brian is also keen to continue FEC and coproantigen testing, and increasingly seeks advice from his local vet practice about product choice and timing of treatment. He sees real benefit in doing so, as following from the trial and more strategic fluke control programme, his ewes are in great condition. Looking forward, Brian still holds out hope for a new flukicide that can kill immature and TCBZ resistant (TCBZ-R) fluke, and for a liver fluke vaccine to protect his animals.

"The Moredun's monitoring of FECs and cELISAs in lambs at Carloonan has been helpful in determining timing of first treatment. The challenge of fluke control in Mid-Argyll is ongoing, with the added hardship of a diminished choice of flukicides. I think the monitoring has shown that a single sentinel farm can yield useful information relevant to many, as most crofters and farmers couldn't finance such frequent testing for cELISAs."

Alison Barr, Vet at Dalriada Vet Practice, Lochgilphead

Quarantine

Quarantine is also a key tool for Carloonan Farm. As a closed flock, only a few tups are bought in, which are well isolated and treated before being introduced to the flock, mostly using closantel. None of the flock are away wintered, with all the ewe hoggs wintered at home, which keeps the quarantine protocol straightforward.

Summary

- Overall, the liver fluke risk is consistently high on this farm
- The main concern is timing treatment to have optimal effect, and product choice in the face of TCBZ-R
- Blood sampling lambs in the mid-late summer has been used to indicate first exposure, and composite faecal sampling from ewes later in the year is used to help time treatments and inform product choice
- The farm works closely with their vet and all the tests are integrated into the wider health plan
- Testing saves time and costs as well as avoiding over-use of medicines which helps to safeguard their efficacy for the future

G H Dean and Co – Kent, England

About the farm

G H Dean and Co run a flock of 1,500 Suffolk Mule and Aberdale Romney ewes near Sittingbourne in Kent under the management of Richard Frampton, who has run the flock for over 20 years. Ewes are managed on a high-cost, high-output system which relies on selling high numbers of lambs in the early part of the season. Richard consistently achieves over 170% lambs reared to ewes tupped.

Fluke history

A detailed health and management plan is vital to the system at G H Dean and Co. Overall, the risk of liver fluke in this area is considered low, but the sheep grazing includes areas of marshland which are under Environmental Stewardship agreements, and it is these areas that are a potential threat when it comes to liver fluke. The farm also has a history of haemonchosis, the clinical signs of which can look at lot like liver fluke (e.g. anaemia, bottle jaw and poor body condition), so he needs to make sure he isn't caught out.

Historically, this farm would have given an autumn blanket treatment for liver fluke in years when forecasts predicted a high-risk season. This meant that, in most years, treatments were probably given unnecessarily on a 'just in case' basis to mitigate the possible threat.

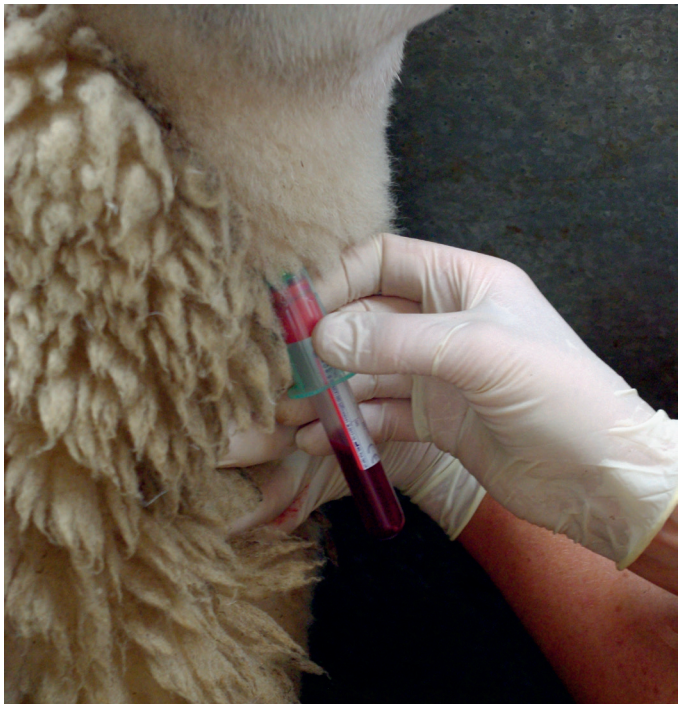
Current strategy

The objective of the current strategy on liver fluke is two-fold:

- To make sure that any treatment is only given if it is needed and at the optimum time to avoid any negative impact on ewe condition and performance
- To ensure that replacement ewe lambs are not bringing liver fluke in with them because this can result in losses and reduce their growth over the winter and could pose a threat to areas of the farm that currently may not carry liver fluke but that may have mud snails

Testing

Serology (blood testing) is the first line of defence for this farm. Lambs that have grazed the highest risk areas are blood tested in the late summer to see if they have had any exposure to liver fluke that season. The test looks for anti-fluke antibodies and because lambs can only have been exposed this season, they are a good first indicator that there may be a problem. If necessary, this can be repeated at roughly monthly intervals into the autumn and early winter until either the risk is considered to be over, or liver fluke is confirmed, and treatment carried out.



In the early winter, faecal samples from ewes are tested. The coproantigen test can give a slightly earlier warning if required, but on this farm, if the serology is negative, then the follow-up is to look for fluke eggs in ewe faeces once confident that the liver fluke have had time to mature and start to produce eggs. Richard makes sure he knows where the potential risk areas are and, when he grazes new areas, he remembers to prioritise these sheep for testing later that season.

"The real benefit of this approach is that we would only ever treat based on good evidence that liver fluke is present. I have learned over the years that every year is different, and some parts of the farm have a higher risk than others and testing means I no longer have to treat as an insurance and I can target those higher risk areas."

Richard Frampton

Quarantine

Replacements are bought in as ewe lambs and are tupped as shearlings. Quarantine and treatments for these and any rams purchased are an essential part of the health plan. The ewe lambs are given two doses of closantel six weeks apart, which deals with any threat of liver fluke and also covers *Haemonchus*. *Haemonchus* is endemic in the Southeast of England and carries a high risk of resistance to the broad spectrum anthelmintics. If *Haemonchus* wasn't an issue, Richard could use the serology test on the ewe lambs to determine the need to treat for liver fluke.

Summary

- Overall, the liver fluke risk is low on this farm
- The main concern is making sure liver fluke isn't missed in the years when it is an issue, while avoiding unnecessary treatments
- *Haemonchus* is a complicating factor that can give similar clinical signs and for which closantel is also used as a treatment, so avoiding over-use of this product is very important. The farm works closely with their vet and all the tests are integrated into the wider health plan
- A combination of blood testing lambs to detect antibodies and faecal samples from ewes later in the year is used – testing saves time and costs as well as avoiding over-use of medicines which helps to safeguard their efficacy for the future
- Quarantine and appropriate treatments are an important part of the strategy for low-risk farms

Spittal Mains – Caithness, Scotland

About the farm

Vets Scye and Tom Southall moved to Spittal Mains, a 700 ha low-input mixed farm in Caithness, in 2014. The farm comprises pasture which is partly rotationally grazed, some wet areas, and some less productive rough moorland-type ground, peaking at 400 feet above sea level. The farm runs 100 spring-calving suckler cows, moving from native breeds towards Stabilisers, and 250 mule ewes, bringing in RomTex tups for a self-replacement strategy.

Fluke history

Fluke had been a problem historically, with cows occasionally losing body condition and developing bottle jaw. The cattle were treated for fluke once annually, 6–10 weeks after housing, and sheep would typically have a single dose of flukicide before tupping. There was a suspicion that suboptimal fertility and a long calving period could in part be due to chronic fluke burdens in the cattle and so improved fluke control was an objective.

Abattoir feedback was hard to come by as no cattle were sold directly, and there were no lamb liver condemnations. Any sheep deaths on farm had a quick post-mortem, with adult fluke found in some cases. Tom undertook a blood screening opportunity through XLVets, of which his practice is a member. He also participated in a testing study through SRUC Veterinary Services looking at dung sampling.

Current strategy

In the cattle, Tom started by blood sampling some calves just after they were housed in November, choosing the older ones that would have grazed for longest. Four of the nine calves had antibodies to liver fluke, suggesting that exposure had occurred. On this basis, he went in to treat the whole group, including the cows and bull, which had been on the same pasture.

Last year, this approach was also carried out in lambs, with blood samples in the autumn showing that some had been exposed to liver fluke. To make best use of this information, Tom used a strategy where ewes followed the lambs on the grazing, so that the lambs' blood results could give information on the risk for the ewes, which helped determine the timing of treatment with triclabendazole.

This year, as part of the SRUC study, ten dung samples were collected monthly through the autumn from the sheep. Dung samples were tested for fluke eggs and faecal coproantigen. Following the dry summer, each month the results have been negative, and no treatment has been required so far into the winter.

> "Testing has allowed us to move away from routine treatments without compromising the performance of the stock. As numbers grow, this strategy means we know our replacements are getting the best start."
>
> **Tom Southall**

Next steps for the farm

Testing has allowed the Southalls to move away from relying on rigid treatment regimens and target their fluke control more accurately. Timely treatment means these animals are not carrying a burden of liver fluke for any longer than necessary, meaning they enter pregnancy and winter in better shape. Most recently, they have gone a season with no need to treat at all, making a significant financial saving, not to mention the reduction in labour and handling. The sheep appear to be thriving, with the ewes in good body condition and scanning at over 200%.

Other actions being considered are the inclusion of post-dosing dung testing to confirm that the treatment has been effective, and dung testing the ewes at lambing to minimize pasture contamination in spring.

While no resistance to triclabendazole had been identified on the farm, development of resistance is always a concern. When establishing the flock in 2014, the Southalls ensured the sheep that established the flock had undergone a quarantine treatment and isolation protocol, so were clear of parasites at the outset. Coupled with close monitoring through regular autumn testing, this helps to minimize the risk of resistance developing, so triclabendazole will hopefully remain effective for years where wet weather means fluke risk is high, and they need to treat in the autumn. The protocol for this farm would be to treat cattle for immature fluke in autumn if testing positive, otherwise using an adulticide product such as closantel in winter/spring.

The Southalls plan to address inadequate drainage on the farm. Some pastures have burns and ditches, which provide ideal mud snail habitat, and serving these with alternative water sources is a priority. They hope to get the wetter areas of the farm into an agri-environment scheme for the dual benefits of generating some income while livestock are kept off riskier ground.

Summary

- Moderate-risk mixed farm
- Quick on-farm post-mortems and abattoir feedback can be valuable sources of information
- Lambs and calves can be used as sentinels to increase the precision of treatment timing. Trialling a leader-follower grazing system for ewes and lambs meant that the lambs' blood results helped determine the timing of treatment with triclabendazole
- Blood screening and faecal testing has saved money and time – as no treatments have been needed for lambs
- Next steps include addressing drainage and water supply in grazing areas

Nant Moch – Black Mountain, Wales

About the farm

Colin Evans and his family run 25 Welsh black sucklers and followers alongside a 400-ewe Welsh flock at 850 ft above sea level, on over 200 acres with hill rights on the Black Mountain. With an average annual rainfall of over 5 ft, the farm is an area of high risk for fluke in livestock. The ewes are run on a drift lambing system with no concentrates, which allows Colin to be flexible. Ewes are moved daily as grass cover dictates, thus minimizing poaching and the associated fluke risk.

The farm has been part of agri-environment schemes for many years, which has benefitted the overall farm system, as well as fluke control. A good example includes a bog restoration area, which enables the very wet (and high-risk) area to be fenced off from livestock to benefit both the environment and reduce the risk of fluke. Rush control is also a key area of improvement and, following participation in a project, Colin controls rushes to improve grassland but also reduce potential snail habitat.

Fluke history

Following a spate of sudden deaths in ewes in the autumn in a particularly high-risk year, the farm put in place a fluke treatment regime, dosing twice a year at set times. Joining HCC's RMDP Stoc+ health planning project has prompted a more detailed review of the strategy and another check on anthelmintic efficacy on-farm, particularly for flukicides. This has resulted in a detailed action plan including testing and monitoring to determine the liver fluke treatments for both cattle and sheep.

Current strategy

A traditional post-weaning dose in September will now occur only after a positive blood test in the lambs, unless the NADIS/SCOPS fluke forecasts indicate a high risk. If there is a positive antibody test, both the ewes and lambs will be treated, except those lambs which are very close to finishing and growing well. It is important to reduce the risk of contamination of the in-bye area for the spring. As the ewes return to the hill and lambs are finished inside, it is the ewe lambs that remain on the in-bye and represent the biggest fluke contamination risk.

A key time to break the fluke cycle for the sheep flock on this farm is when lambs are housed for further finishing. The lambs will be treated in January at housing and a coproantigen test done in Febuary to check that the treatment has been effective. It is important to determine treatment efficacy against adult and immature fluke. This year, faecal samples will be taken before and after treating with TCBZ for FEC and coproantigen testing. Samples for coproantigen testing will be taken two weeks after treating, and three weeks after treating for FEC testing.

Ewes are treated with TCBZ pre-tupping if the risk is forecast to be high, or if a test indicates the need to treat (even in a low forecast risk). At scanning, a coproantigen test will be repeated to ensure the ewes are not carrying a fluke burden. In order to minimise pasture contamination at lambing, ewes will be dosed with an adulticide. The vet will also perform a composite worm and fluke efficacy test to assess the anthelmintic efficacy status of both. As there is a concern that there could be an issue with TCBZ not working effectively on the farm, an efficacy test will be done on the sheep.

"Being in a high-risk area and having experienced losses from fluke in the past, I felt it was time to review my policy on control and use the tools of testing and monitoring that are available to me. I now have an action plan to follow with decisions on treating, based on checking risk forecasts, diagnostics and weather conditions."

Colin Evans

Changes made

Cattle dosing historically was to treat calves in November, however this year the 7-month-old calves will be blood-tested to check for antibodies and their exposure to fluke and then only be treated if needed. If adult fluke is found, the rest of the cohort may need treating, but this will be discussed with the vet before any decisions are made. Additionally, if any cows and calves are turned out in a dry winter spell, these animals will have samples taken to undergo a coproantigen test after they are re-housed to check for re-infection of fluke.

Although it is ideal to make the most of pasture available at the shoulders of the year and reduce housing costs, this must be balanced against the risk of poaching and creating an ideal habitat for the mud snail host in wet areas.

There is a concern regarding TCBZ resistance on the farm so this winter, when the sheep are down from the hill, the opportunity to test TCBZ efficacy will be taken.

Summary

- Farm is within a high-risk area for fluke in cattle and sheep, and historic high infection led to a routine dosing strategy
- Recent intervention through Stoc+ has resulted in a more strategic approach using testing, monitoring and management that aims to treat fluke but optimise anthelmintic use
- Each year is different, according to weather conditions, so Colin adapts his management using the combination of diagnostic tests and forecasting tools provided by NADIS, SCOPS and COWS
- Colin works with his vet to control and treat in a proactive manner, using reliable and up-to-date information to develop an overall strategy
- The cattle play a role in the control of fluke in sheep by reducing pasture contamination and the sheep are used to test for the anthelmintic efficacy across both host species

Liver fluke risk assessment

Use the infographic below to assess your risk of liver fluke and see the actions to take depending on your perceived risk.

High

- Regularly test stock – blood test or faecal tests in autumn and spring
- Target treatment when livestock test positive – think about timing and product choice depending on time of year (see pages 8 and 9)
- Are products working? If in doubt about treatment success speak with your vet about resistance testing
- Develop a plan of avoidance strategies such as housing and fencing, so you have options depending on the fluke risk for that season
- Quarantine incoming and returning stock – isolate, test, treat

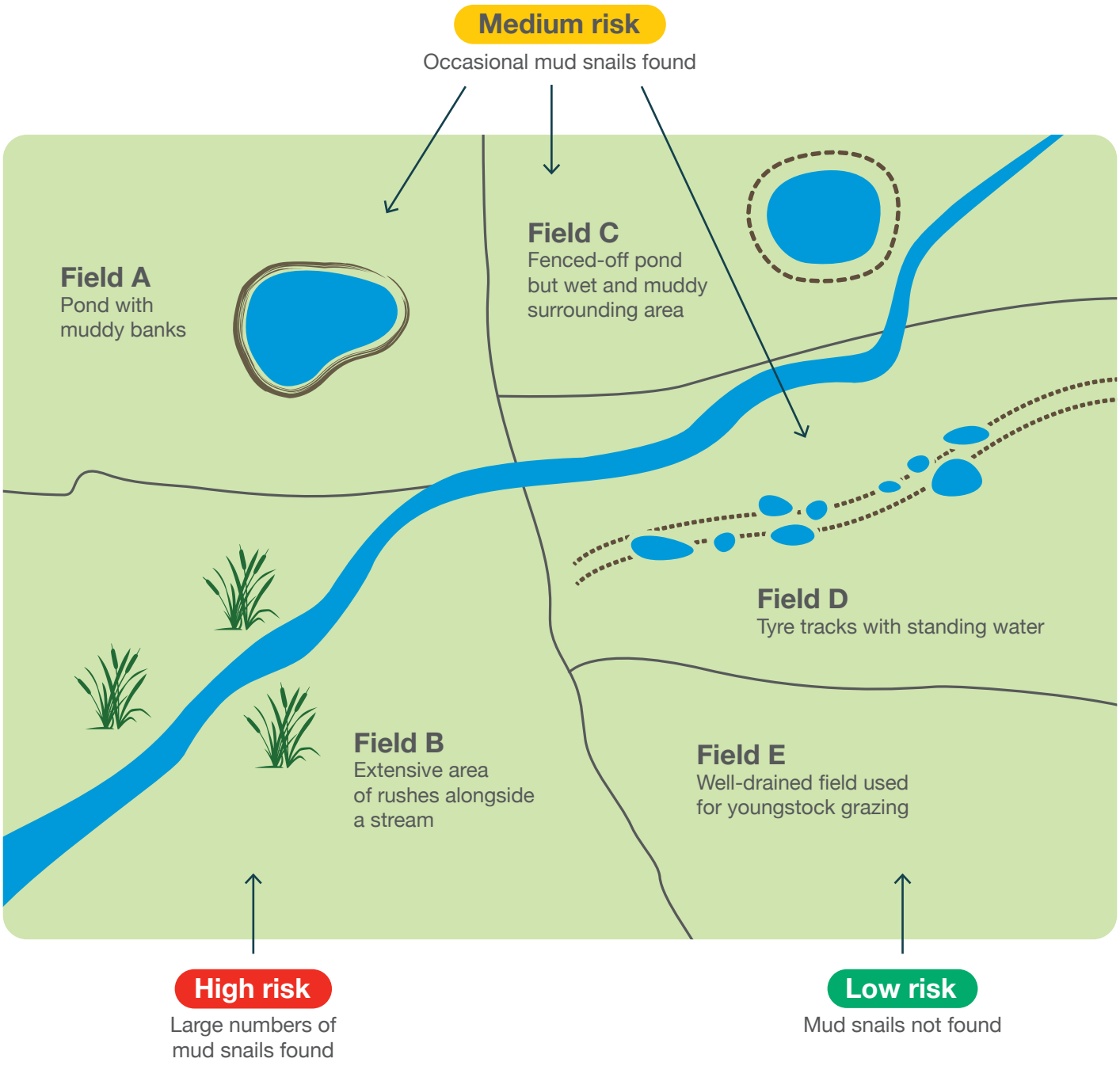
Medium

- Look for mud snail habitats and risk map your farm
- Regularly test stock – blood test or faecal tests
- Target treatment – think about timing and product choice depending on time of year (pages 8 and 9)
- Are products working? If in doubt about treatment success speak with your vet about resistance testing
- Use avoidance strategies such as housing and fencing
- Quarantine incoming and returning stock – isolate, test, treat
- Consult the NADIS fluke forecast to monitor monthly risk (**www.nadis.org.uk/parasite-forecast.aspx**)

Low

- Look for mud snail habitats and risk map your farm
- Use avoidance strategies such as housing and fencing
- Quarantine incoming and returning stock – isolate, test, treat
- Monitor stock through post-mortems, abattoir feedback and test using group FEC's in late winter and spring
- Consult the NADIS fluke forecast to monitor monthly risk

Map your farm for fluke risk



Disclaimer – this map and risk assessment are to be used as a guide. Remember to account for prevailing weather conditions, time of year, management actions, and veterinary advice

Further information

AHDB publications

Minimising carcase losses for better returns
Worm control in sheep for better returns
Beef diseases directory
Sheep diseases directory
Parasite control guide
Using medicines responsibly

Online resources

Control of Worms Sustainably (COWS)
Sustainable Control of Parasites in Sheep (SCOPS)
Video: Life cycle of the Liver Fluke Fasciola hepatica
Video: Controlling Liver Fluke in Sheep
Moredun Research Institute – Liver Fluke
NADIS Parasite Forecasts

See the **AHDB Beef & Lamb website ahdb.org.uk/beef-lamb** for the full list of publications for beef and sheep producers.

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