TECHNICAL NOTE TN677 (Revised) / October 2024

Treatment and control of liver fluke (*fasciola hepatica*) in sheep and cattle

Farm Advisory Service

National Advice Hub
T: 0300 323 0161
E: advice@fas.scot
W: www.fas.scot

Summary

- **Liver fluke (*Fasciola hepatica*) has a significant impact on livestock production, animal welfare, economics, and greenhouse gas emissions.**
- **High rainfall in May, June, and July increases the risk of liver fluke in autumn.**
- **The most appropriate diagnostic test or treatment to use depends on the season and age of flukes most likely to be present.**
- **Triclabendazole resistant liver flukes are present in the UK.**

The threat of liver fluke

Liver fluke poses a threat to animal welfare and causes economic loss.

This can be due to:

- Mortality
- Increased number of days to slaughter
- Lower carcase weight
- Lower conformation scores at slaughter
- Liver condemnation at slaughter
- Reduced milk yield
- Lower milk solids content
- Extension of service period
- More services per conception
- Reduced scanning rate
- Reduced lamb survival
- Increased risk of other diseases e.g. Black disease
- Cost of treatment and control

As a result, liver fluke is recognised as a priority area for reducing greenhouse gas emission intensity.

Figure 1. Adult *fasciola hepatica* in the bile ducts of a chronically infected liver

Life cycle

Liver fluke eggs passed in the faeces of a mammalian host (e.g. cattle, sheep, deer, rabbits, hares) develop and hatch releasing miracidia. The miracidia have a short lifespan and must come into contact with mud snails (*Galba truncatula*) within a few hours. They penetrate the snail and develop and multiply within it until cercariae are produced. These are shed from the snail and attach themselves to firm surfaces such as grass blades where they form the infective cysts (metacercariae). Cattle and sheep, ingest the infective cysts along with grass.

SAC CONSULTING
Part of Scotland's Rural College (SRUC)

Scottish Government
Riaghaltas na h-Alba
gov.scot

081124FJ

Once they reach the intestine the liver flukes pass through the gut wall and travel to the liver. The young flukes tunnel through the liver for six to eight weeks and then enter the bile ducts where they take another four weeks to mature into adults. The average time from ingestion of infective cysts to the presence of fluke eggs in the faeces is 10 to 12 weeks.

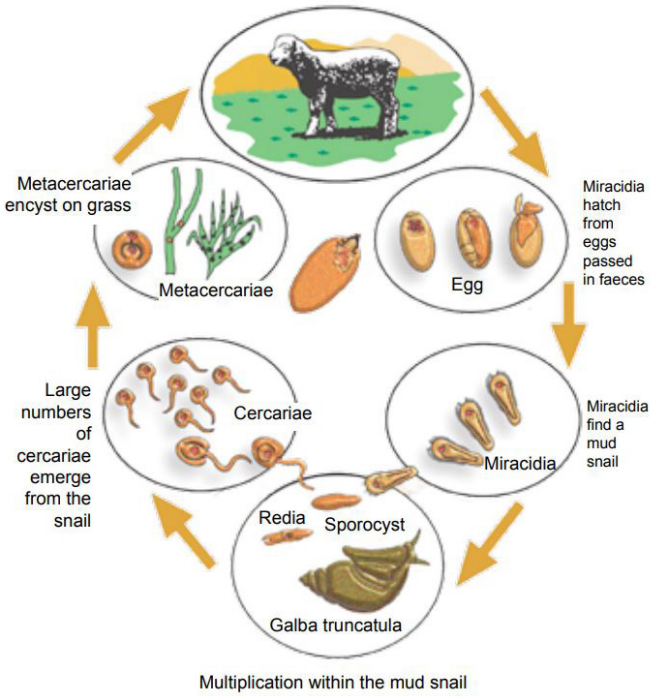

Figure 2. Life cycle of *fasciola hepatica*

Factors affecting disease risk

Wet conditions and a mean day/night temperature of at least 10°C are required for both mud snail (*Galba truncatula*) breeding and development/movement of the environmental stages of liver fluke (miracidia to metacercariae). This means that disease risk is closely linked to summer rainfall.

Permanent snail habitats can include the banks of ditches or streams and the edges of small ponds. Following heavy rainfall hoof marks, wheel ruts or flooded areas may provide temporary snail habitats. Fields with clumps of rushes are common snail sites. As the mean temperature increases the development time for the environmental stages of liver fluke becomes shorter, reaching a minimum of five weeks in mid-summer.

Mean day/night temperatures of at least 10°C have historically occurred between April and October. As a result, the main factor influencing the size of snail populations and subsequent fluke risk is rainfall in May, June and July. When these months are wet it is easier for miracidia hatching from liver fluke eggs deposited in the spring/early summer to locate a mud snail. This in turn results in higher numbers of infective cysts on the pasture in autumn and an increased disease. Cyst numbers peak in October/November then start to fall due to ingestion, trampling, and natural mortality. However, some will survive through the winter. The mud snails survive dry periods by moving deeper into the soil.

Mud snails may also be infected in late summer/early autumn. The liver fluke will remain dormant within the snail through the winter and cercariae will be shed in the spring.

Warmer conditions from November to March will extend the length of time when temperatures are suitable for mud snail multiplication and development of the environmental liver fluke stages. Above average spring/summer rainfall will increase the possibility of disease on farms in traditionally drier lower risk areas.

Livestock movements and the development of flukicide resistance in some populations of liver fluke will also play a role.

Cattle and sheep produce antibodies to liver fluke but these do not confer immunity. Thickening of the bile duct walls in response to liver fluke infection can limit the lifespan of flukes in cattle by making it harder for them to feed. In contrast, untreated sheep can remain infected for life.

Rumen fluke

- The rumen fluke present in the UK is *Calicophoron daubneyi.*
- The environmental stages of rumen fluke also develop and multiply within mud snails (*Galba truncatula*).
- Once the infective cysts are ingested, the immature rumen fluke remain in the small intestine for few weeks and then travel back to the rumen.
- Large numbers of immature rumen fluke can cause severe diarrhoea, but this is currently very rare. Adult rumen fluke are well tolerated.
- Co-infection with rumen and liver fluke can occur.
- Rumen fluke eggs can be identified in faecal samples and rumen flukes are visible on postmortem examination.
- There is no licensed treatment for rumen fluke in the UK. Contact your vet if you have concerns about rumen fluke in your herd/flock.

Clinical signs

Liver fluke disease (fasciolosis) is classified as acute, subacute or chronic depending on the number and ages of flukes present in the liver. However, there is overlap between these categories. Fasciolosis is a group problem even though only a few individuals may be showing obvious clinical signs.

Acute fasciolosis

Outbreaks of acute disease are most common in sheep during late autumn/early winter and are associated with large numbers of immature flukes in the liver. This follows the ingestion of large numbers of infective cysts over a short period of time. The immature flukes tunnel through the liver causing haemorrhage and anaemia. Sudden deaths can be the first sign of a problem. Other animals in the group may be weak and lethargic with

pale conjunctiva and gums. Some may have abdominal pain which can mimic pneumonia by making them breathe quickly.

Subacute fasciolosis

This can be seen from late autumn to spring and also causes anaemia. This form of the disease occurs when large numbers of cysts have been ingested over a longer period, or the number ingested at any one time has not been sufficient to cause acute disease. It is not as rapidly fatal, and animals may show clinical signs for one or two weeks prior to death. Affected sheep lose condition rapidly and appear pale. Immature flukes will be present in the liver but are not as numerous. Adult flukes will also be present in the bile ducts and gall bladder.

Figure 3. Fatal liver haemorrhage in a case of acute fasciolosis

Figure 4. White conjunctiva due to fluke induced anaemia

Chronic fasciolosis

Chronic disease is due to the blood feeding activities of adult flukes and is most common in winter/spring but can be seen at any time of year. Both sheep and cattle can be affected and show progressive weight loss and anaemia. Bottle jaw (submandibular oedema) develops in severe cases and emaciation and death will follow if the animal remains untreated.

Subclinical fasciolosis

Small numbers of liver fluke may be responsible for subclinical disease resulting in reduced productivity due to poor food conversion rates and loss of body condition. Knock on effects can include reduced lambing percentages and poor milk yields. It may increase milk fever risk in dairy cows.

Diagnosis

Postmortem examination

Postmortem examination of a fresh carcase is the quickest and most reliable method of diagnosis if liver fluke is suspected to be the cause of death.

If it is not the cause of death, inspection of the liver will give an indication of the level of fluke challenge. Infection with liver fluke can increase the risk of death due to Black disease which can be prevented by clostridial vaccination.

Abattoir inspection

Damage caused by current or previous liver fluke infection is a common reason for livers to be condemned at slaughter. Abattoir feedback can provide useful information with regards to the animals remaining on farm.

Laboratory testing

Laboratory diagnosis of liver fluke infection in the liver animal is based on a variety of tests carried out on faecal, blood or milk samples.

Fluke egg count

This will only detect the presence of adult liver flukes with positive results only found 10 to 12 weeks after infection. Six to ten faecal samples should be collected and can be pooled prior to testing to reduce cost.

The test can detect and distinguish between both liver and rumen fluke eggs.

Coproantigen ELISA (cELISA)

This test can confirm infection two to three weeks before fluke eggs can be detected in faeces. A positive result confirms active infection with older immature or adult liver flukes. It is a useful test for assessing whether or not treatment has been effective (see below).

Antibody ELISA

This test detects antibodies to liver fluke and can be carried out on blood or milk samples. It can give a positive result from two to four weeks post infection. However, a positive result does not confirm active infection as antibodies can be detected for up to ten months after fluke death e.g. following treatment. This test is useful in animals during their first grazing season and these can be used as sentinels for infection. Six to ten animals per risk group should be sampled and testing can be repeated at monthly intervals in the autumn and winter until either positive results are found or the risk period comes to an end. Using this test as a monitoring tool can reduce the number of treatments given.

Testing a sample of bulk tank milk gives an estimate of the number of antibody positive cows in the milking herd.

Treatment and control

There are four main objectives to liver fluke control:

- Reduce pasture contamination with eggs in spring
- Reduce and avoid areas of snail habitat
- Avoid exposure to infectious cysts (metacercariae) in autumn
- Testing and strategic treatments in autumn/winter

Reduce pasture contamination with eggs in spring

Carrying out a fluke egg count before turn-out will determine if treatment for adult flukes is required in order to reduce pasture contamination with fluke eggs.

Reduce/avoid snail habitat on farm

An assessment of potential snail habitats should be made. The best long-term method for permanent eradication of snail habitats is drainage, but this may be too costly or prohibited under environmental schemes. Techniques such as subsoiling to reduce compaction can be useful. Where snail habitats are localised fencing off wet areas is useful where practical.

Control of snail populations using molluscides is not permitted in the UK due to adverse environmental effects.

A risk map of the fields can be created to help plan grazing management throughout the year and highlight priority areas for the reduction of snail habitat.

Figure 5. Improving drainage can reduce the area of snail habitat

Figure 6. Low risk field with no snail habitat

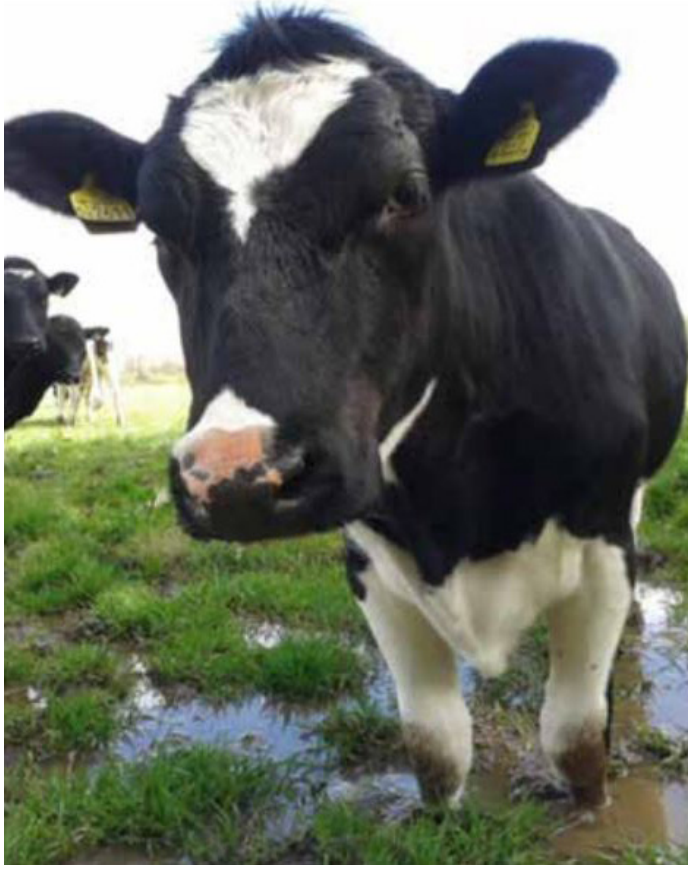

Figure 7. Heifer standing in a permanently wet area of localised snail habitat

Avoid exposure to fluke in autumn

If possible, graze susceptible stock (especially sheep) on lower risk areas from mid-August onwards as infectious cysts will be absent, or fewer in number, in these areas. Lower risk areas could include fields with no snail habitats, fields not grazed by sheep earlier in the year, stubble fields, re-seeds or alternative forages such as brassicas. High risk fields will have large numbers of cysts on the pasture. They will contain areas of permanent snail habitat and may have been heavily grazed by sheep earlier in the year. If animals are grazing forage crops be alert to any risk of infection from grass run backs. During autumn it may also be appropriate to allocate lower risk areas to certain classes of stock such as lactating dairy cows or animals approaching slaughter weight.

On farms where lower risk areas are limited or unavailable, try to reduce the stocking density in autumn. Finish or sell lambs as soon as possible or consider housing to finish. High risk areas which remain ungrazed in autumn can still pose a danger to livestock introduced to them later in the winter.

Studies have shown that the pH, dry matter content and anaerobic fermentation of good quality silage kills any infectious cysts within two weeks of sealing.

Forecasting Disease Risk

Forecasting systems are based on climate data from late spring until early autumn. Look out for forecasts in the farming press.

Strategic treatments in autumn and winter

Liver fluke risk varies annually and from farm to farm making it impossible to produce a blueprint for treatment. All flukicides are effective against adult fluke but activity against immature flukes is variable (see Table 1). It is extremely important to check product datasheets for information about expected activity before treating animals. This is particularly the case in autumn when immature flukes may predominate. Some products are not licensed for use in lactating cows, dry cows or in-calf heifers from mid-pregnancy on. Decisions on the timing and frequency of flukicide treatment should be based on the annual risk forecast, previous farm history, abattoir feedback, and results of monitoring tests. No flukicide protects against reinfection, therefore treated animals can be re-infected immediately after treatment.

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

Active ingredient	Route of administration	Species and effective dose	Kill rate (%) for fluke ages 1 - 12+ weeks							Optimum time of year to use
			1- 2	3 - 4	5 - 6	7- 8	9 - 10	11 - 12	12+	
Triclabendazole	Oral	Cattle 12 mg/kg	46 – 100	61 – 99	81 – 99.6	96 – 99.9	99.8	100	100	Autumn
		Sheep 10 mg/kg	62 – 99	86 – 100	98.5 – 100	94.5	100	98 - 100		
	Pour on	Cattle 20 mg/kg		90.9	98	99.5		99.9		
Closantel	Pour on	Cattle 20 mg/kg		27	68	91		99		Late autumn
	Oral	Sheep 10 mg/kg		83	70 - 98	93 - 97			99.9	
Clorsulon	Subcutaneous injection	Cattle 2 mg/kg		30	43	53 - 63		99.2	97.5	Late autumn, spring/ summer
Albendazole	Oral	Cattle 10 mg/kg					89	54	92.8	Spring/ summer
		Sheep 7.5 mg/kg				43.6		94	94.5	
Oxyclozanide	Oral	Cattle 10 mg/kg		5		59	81			Spring/ summer
		Sheep 15 mg/kg					95.5	90 - 99.6		

Adapted from Castro-Herminda et al, 2021. Grey boxes show where there is no data currently available. Variations in product used, study design, and the presence of flukicide resistance may result in varying efficacy for the same age of liver fluke.

Flukicides

The choice of flukicide should be discussed with your vet or SQP/RAMA. Care should be taken when administering flukicides, especially products containing closantel or oxyclozanide as toxicity has been reported in both cattle and sheep. There is no longer a product containing nitroxynil licensed in the UK.

Combination products should only be used if treatment for both liver fluke and worms is required. The unnecessary use of combination products can speed up the development of anthelmintic and flukicide resistance through mistimed treatments or selection of an inappropriate product for the time of year.

Triclabendazole resistant liver flukes have been detected in the UK, Ireland and many other countries worldwide. Resistance to other flukicides has been reported in other countries. Deaths and ill thrift should be investigated promptly both before and after treatment.

Monitoring for resistance

Resistant liver flukes survive treatment with a dose of flukicide that would normally be expected to kill them. This advantage is passed genetically to their offspring so that the next generation of liver flukes is also resistant. Straying stock, farm to farm movement of fluke infected wildlife, or waterborne movement of snails and cysts (metacercariae) could also introduce flukicide resistant liver flukes to a holding. Mud snails may also be transported on the feet of birds.

Monitoring for resistance is complicated by the fact that it takes 10 to 12 weeks for eggs to produced following infection, and the variable activity of flukicides against immature flukes. Any investigation into suspected treatment failure must first rule out other explanations such as under dosing, inappropriate product use, reinfection and maturation of immature flukes before the possibility of resistance is considered. It is important that any testing carried out is timed to avoid any welfare impacts on the animals involved. Animals must be weighed, drenching guns calibrated, and treatments administered using good dosing practice.

Fluke Egg Count Reduction Test (FECRT)

This test can only be carried out when adult flukes are present in the liver, so may not be appropriate in autumn. Individually identified faecal samples are collected from the same ten animals pre-treatment and three weeks later, with fluke egg counts carried out on both occasions. It should be noted that small numbers of liver fluke eggs can be detected in faeces for a few weeks following successful treatment. Before requesting this test, you should ensure that the testing laboratory are able to provide a numerical result.

Coproantigen Reduction Test (CRT)

Faecal samples are collected from the same ten individual animals pre-treatment and two weeks later.

Samples are tested individually in the coproantigen ELISA and are expected to be negative post treatment. This test is useful following treatment with triclabendazole when older immature or adult flukes are present. It can be used to screen other products at times when all flukes in the liver are expected to be adult.

Quarantine Treatments

There are three main reasons to quarantine treat added animals:

1. To kill liver flukes and prevent disease and production losses.
2. To prevent the introduction of liver flukes onto fluke free farms where snail habitats exist.
3. To prevent the introduction of liver flukes that are resistant to any of the available flukicides, particularly triclabendazole.

The time of year and source of the added animals should be considered when planning quarantine treatments. All incoming livestock (including those returning from away grazing) should be assumed to be infected with resistant liver fluke. They should be housed/yarded or held in areas with no snail habitats until confirmed to be free of fluke infection.

Quarantine treatment for liver is not straightforward and you should seek advice if unsure. Treatment with more than one flukicide may be necessary, however two products should not be given at the same time.

Further information about liver fluke including quarantine treatments can be found at www.scops.org.uk and www.cattleparasites.org.uk

Authors:

Heather Stevenson, SRUC Veterinary Services
Laura Henderson, SAC Consulting

Production of this Technical Note was funded by the Scottish Government as part of its Farm Advisory Service.