Control of liver and rumen fluke in cattle

This document is part of the COWS Technical Guide which aims to provide a sound basis for advice to industry.

The guide also comprises chapters on controlling roundworms, lungworm and practical parasite control planning.

COWS
Control Of Worms Sustainably

COWS is an industry initiative promoting sustainable control strategies for parasites in cattle

With thanks to Professor Diana Williams and Dr John Graham-Brown, University of Liverpool for help and guidance in updating this COWS chapter

Section 1: Top tips for controlling liver fluke in cattle

Informed and sound preparation will minimise liver fluke infection with positive effects on enterprise returns.

Identify Risk

Both sheep and cattle are infected with the same species of liver fluke and infection can be spread from sheep to cattle and vice versa. The parasite relies on an intermediate host, a small mud snail. The parasite has to pass through the snail to release infectious stages onto pasture for cattle and sheep to eat.

Co-grazing sheep with cattle is a risk factor for infection in cattle. Damp, permanent pastures which may support the snail intermediate hosts are a particular risk.

Changing weather patterns and climatic conditions are influencing the seasonality and rates of parasite development of liver fluke, both on pasture and in snails

Test before treating

As the climate changes, the time of year when sheep and cattle are exposed to liver fluke is also changing. Timing of infection is less predictable. Consequently, rather than treating at a fixed point each year based on historic risk, diagnostic monitoring is recommended to identify if, and when treatment is required.

Resistance

Resistance to triclabendazole – the most widely used flukicide in the UK – is widespread in sheep and has been reported in cattle. If treatment failure is suspected, consider a faecal egg count reduction test (FECRT) to investigate this further.

Quarantine all incoming stock

It is important to reduce the risk of importing resistant liver fluke parasites when buying cattle and sheep. Quarantine measures will take considerable planning and implementation, but failure to do so could result in loss of stock and/or reduced productivity. Discuss the options with the vet or Suitably Qualified Person (SQP) or Registered Animal Medicines Adviser (RAMA).

Treat Appropriately

Consider the 5 'R's for the effective use of flukicides:

1. Use the **right** flukicide
   - Flukicides belong to different classes, each of which are active against different developmental stages of fluke
   - Products should be chosen to target the specific stage of infection, ie juvenile/acute or adult/chronic that has been identified or considered to of greatest concern
   - Diagnostic testing can help inform appropriate product choice
   - Other considerations, such as withdrawal periods and any known resistance issues should also be taken into account
   - Farmers should consult with the vet or SQP/RAMA for detailed advice on choosing the right product for specific on-farm problems
   - Only use products legally authorised for use in the UK against the specific parasite of concern, in the relevant type/age of animal
2. Treat the **right** animal
   - Consider which groups of animals have been exposed to liver fluke. Those grazing 'flukey' pastures through high risk periods can potentially be exposed to high levels. Conversely, there is nothing to be gained from treating animals that have never been exposed to liver fluke-infected pastures
   - Effective treatment of animals at risk will reduce egg contamination onto pasture
   - There is little evidence that cattle develop immunity to liver fluke infection, so animals of all ages must be included in liver fluke control plans
3. Treat cattle at the **right** time
   - There is no 'one-size fits all' solution to liver fluke control. Treatment depends on assessing various factors including pasture-risk, animal type and time of year
   - Diagnostic monitoring, particularly serum antibody testing, can help determine whether youngstock are at imminent risk from the more seasonal acute disease
4. Dose cattle at the **right** rate
   - In most situations, anthelmintics are administered at a specific dose rate according

to the animal's live weight (kg). It is therefore important to:
- Read the product label or Summary of Product Characteristics (SPC)
- Ensure dosing equipment is well maintained, clean and calibrated
- Weigh animals accurately or estimate weights using calibrated scales or a weigh band

5. Administer the treatment in the **right** way
   - Flukicides can be administered to cattle in different ways. These include injections, pour-on products and oral drenches
   - Always read the product label to ensure the selected product is administered in the correct way. Flukicides should not be mixed with any other products

Section 2: Introduction to Liver fluke

The liver fluke (*Fasciola hepatica*) is a common and ubiquitous parasite affecting the health and welfare of cattle and other ruminants worldwide.

Control of liver fluke in cattle requires a thorough understanding of its biology, life cycle and epidemiology, and to the control options available.

Evidence from various sources suggests patterns of infection in the UK are changing due to a number of factors, including climate change and its impact on the farm environment, as well as changing farm practices and approaches to land management.

Due to historic over-reliance, triclabendazole resistance is widely documented in the more 'flukey' parts of the UK, with reports of its emergence in lower risk areas. Treatment failures with closantel have also been reported in northern Europe.

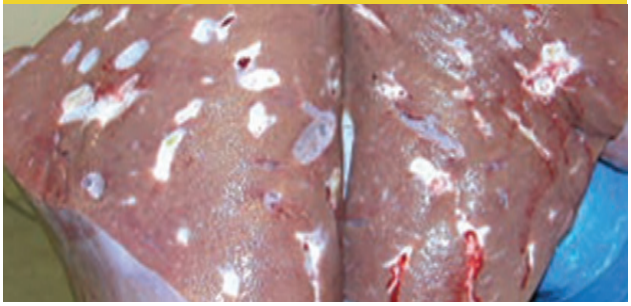
Liver fluke can modulate the host's immune system. This affects diagnosis of bovine tuberculosis and susceptibility to other pathogens such as *E. coli* 0157, *clostridia* and *Salmonella* Dublin.

Disease

The disease caused by *F. hepatica* is known as fasciolosis. Cattle typically develop chronic disease and classically show loss of weight and condition and may become anaemic. Sometimes cattle develop diarrhoea, but whether this a direct consequence of fluke infection or due to other reasons, such as co-infection with *Salmonella* Dublin, is not clear.

Severity of disease depends on the number of parasites present. Cattle become infected through ingestion of the infective stage called the metacercaria, which is found on contaminated grass and other vegetation. These pass through the rumen to excyst (or hatch) in the small intestine, migrating across the gut wall towards the liver.

Figure 1: Liver showing fluke damage



Merial

Sub-clinical signs of fasciolosis
- Youngstock: Reduced weight gain and delayed sexual maturity
- Adult dairy cattle: Poor body condition and reduced milk yields

These juvenile flukes migrate through the liver tissue, feeding and growing as they go. This process typically occurs in the first two to eight weeks of infection and causes tissue damage and haemorrhage. In sheep, this stage is commonly associated with an acute onset of disease, often leading to death in heavily infected animals. While acute disease is rarely seen in cattle in the UK, these infections can have more subtle, sub-clinical impacts on an animal's health and productivity.

Juvenile flukes ultimately reach the bile ducts, where they mature into adult egg-laying parasites from ten to 12 weeks post-infection. Adult parasites cause significant irritation to the walls of the bile ducts resulting in further damage. This causes biliary hyperplasia and calcification (pipestem liver) and enlargement of the gall bladder.

Cattle infected with lower fluke numbers rarely

show overt clinical signs, but sub-clinical effects become apparent. In adult dairy cattle, this manifests as reduced milk yield and changes in milk quality.

In younger stock, sub-clinical infection may result in reduced feed conversion ratios, poor growth and reduced carcase quality (as well as liver condemnation: Figure 1), and delayed sexual maturity in heifers intended for breeding heifers. Whilst these effects on health may be subtle, the economic impact can be considerable.

Section 3: The parasite

Liver fluke biology

Liver flukes are a type of flatworm (trematode) and have a very different life cycle to parasitic roundworms (nematodes) that can be found in cattle.

Other trematodes include:

- The paramphistomes, including rumen fluke (see Section 7)
- *Dicrocoelium dendriticum*, the lancet fluke

Mature liver fluke are wide and leaf-shaped, measuring 3cm to 5cm long and around 1cm wide (Figure 2).

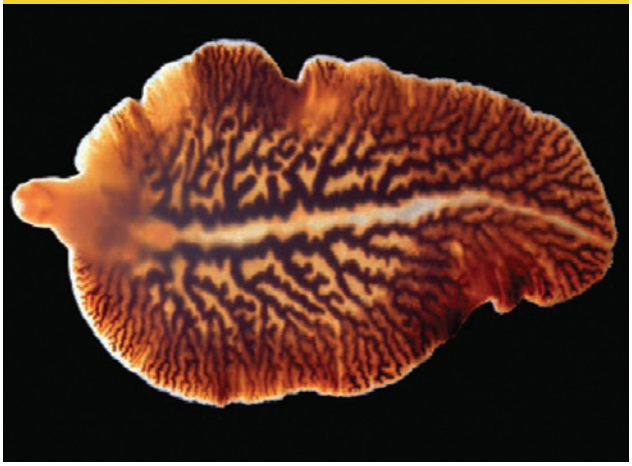
They are hermaphrodites, meaning each parasite has both male and female sex organs. They feed by secreting and excreting enzymes which break down blood and tissue they can then consume.

Liver fluke parasitise a range of animals. Sheep and cattle are the main hosts in the UK, but liver fluke infection can also cause disease in llamas, alpacas, reindeer, donkeys, horses and buffalo. Wild animals including deer, hares and rabbits can also be infected.

The World Health Organisation also considers *F. hepatica* to be an important threat to human health in some parts of the world, and human cases do occasionally occur in the UK.

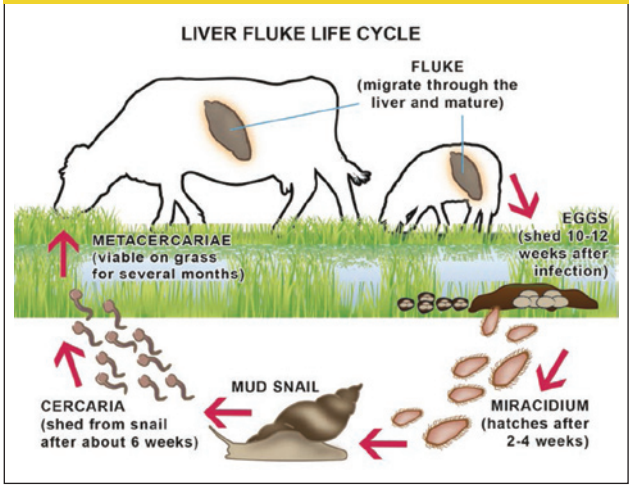
Humans can become infected in the same way as all other species – through consumption of contaminated plant material. Infected animals however, pose no direct infectious risk to people.

Figure 2: A mature liver fluke.



Sinclair Stammers, Micromacro

Figure 3: Liver fluke life cycle



Life cycle

Liver fluke have a complex life cycle involving an intermediate host, the mud snail *Galba truncatula*. This snail species plays an essential part in the life cycle (Figure 3).

Adult fluke can produce hundreds of eggs each day and these are passed out in the dung of infected hosts. They can take up to one month to develop, depending on external temperature. If it is summer and it is warm, development is rapid. Little development occurs in winter when temperatures fall below 10°C.

When the egg has developed, it hatches and the microscopic miracidium is released. The miracidium only lives for a few hours and requires water to swim through to reach the snail.

Once it finds a suitable snail, it burrows through the snail's foot and into the body cavity. Here the parasite grows and multiplies. This takes about six weeks and again is dependent on temperature – the warmer the weather, the faster the development.

The next stage of the fluke – the cercaria, is then released from the snail. Due to clonal amplification that occurs within the snail, a single miracidium can go on to produce hundreds of cercariae.

These swim through water and reach grass and vegetation around the habitat where the snails live. Here they form infective cysts called metacercariae. These can remain viable on pasture for several months, depending on the weather (Figure 4).

When eaten by a grazing animal, the cysts are swallowed, hatch and burrow through the gut and into the liver.

It takes about eight weeks for flukes to complete their migration through the liver and reach the bile ducts. Eggs can be detected in the dung about ten to 12 weeks after infection.

Figure 4: Metacercariae are viable on grass for several months



John Graham-Brown

Section 4: Environment and epidemiology

For liver fluke to be found in animals on a farm, mud snails must also be present.

These live on mud and areas of exposed ground such as the edges of ponds, streams and rivers, as well as in hoof prints or tractor ruts in muddy fields. They tend not to be found in shady or heavily poached areas, as these are not suitable for algal growth, the food of mud snails. They prefer slow moving water with a neutral to alkaline pH and also require calcium and other key minerals for their shells.

Snails reproduce rapidly in warm, wet summers. Warm temperatures increase development of the fluke as well. Both the snails and the fluke need water, so wet summers with high rainfall increase the risk of fluke infection.

Fasciolosis is a seasonal disease in terms of its transmission, with peak levels of infective cysts expected on pastures after prolonged periods (several months) of wet, warm (above 10°C) conditions. These suit the development of both liver fluke and the intermediate mud snail host.

Historically in the UK, such conditions occurred from May to October, leading to peak infection risk in late summer and autumn, with sub-clinical infections or overt chronic disease becoming apparent in cattle over winter.

Previously, UK winters were too cold (typically less than 10°C) for liver fluke to develop, while mud snails would go into hibernation until the following spring. However, the recent trend towards frost-free winters, and mild autumns and springs, mean both liver fluke and mud snails may now survive, remain active and develop through this longer period.

High risk conditions

- Wet muddy areas
- Warm summer weather
- High summer rainfall

Peak risk periods

- Following at least three months of warm, wet weather
- Classically disease is seen in late autumn and winter
- Risk periods may change after very dry summers

Conversely, hot, dry summers are far less favourable for mud snail habitats, thereby curtailing liver fluke development. Collectively, these changing weather patterns are making transmission and risk increasingly difficult to predict.

Eggs can survive on pasture over winter and when the weather warms up in spring, the eggs develop, snails come out of hibernation and the parasite life cycle resumes.

Survival of metacercariae

It is thought that metacercariae can survive on pasture for a year or more, but a proportion will die off over that time. Whilst there are peak periods of infective cysts on pasture, low numbers will be present all year.

Experimental studies suggest that 10% of metacercariae survive for one year at temperatures of 2–5°C. This survival depends on moisture and moderate temperatures. Metacercariae will not survive for more than six weeks at 25°C, but can survive for eight weeks at temperatures of -2°C.

It has been estimated that 50% of metacercariae will survive a typical UK winter.

Studies also suggest that metacercariae do not survive in silage produced under correct anaerobic conditions. However, freshly cut grass should certainly be regarded as a potential source of infection if harvested from fluke-contaminated pasture and fed in a zero-grazed system.

There is limited information about their survival in haylage and in hay. One study from 1927, suggested that metacercariae can survive for eight months in hay harvested in rainy weather, with a relative humidity of >90% and stored at low temperatures.

Another study showed that metacercariae will survive in hay produced under normal farm conditions.

Section 5: Diagnosis

Diagnosis is important to establish if liver fluke is the cause of clinical disease and/or production loss.

Abattoir reports are useful (where available) in establishing if fluke are present on the farm. Other herd tests, such as bulk tank tests and composite fluke egg sedimentation tests, should be regarded as the first step in investigating the presence of fluke. They are also useful monitoring tools if it is necessary to implement a control programme.

For individual cattle three diagnostic tests are used widely:

1. Fluke egg sedimentation of faeces. This method lacks sensitivity, particularly in cattle and can only detect infection once the parasites are adults in the bile ducts from ten weeks post-infection. Diagnostic sensitivity ranges from 30–70%, depending on the amount of faeces sampled. Increasing the amount of faeces analysed to more than 30g per animal, can increase sensitivity to 90%. It is important to note that the techniques used to detect liver fluke eggs are different to those used for gut roundworms.
2. An enzyme-linked immunosorbent assay (ELISA) that detects antibody in serum and milk samples can detect early, (pre-patent) infection, from two to four weeks post infection. However, serum antibodies are known to persist for four to ten weeks after treatment, so a positive ELISA result does not prove that an infection is actually present – rather that the animal has been exposed to the parasite. The sensitivity of most antibody-detection ELISAs is high – ranging from 86–100%, with specificities ranging from 83–96%
3. A copro-antigen detection ELISA is commercially available in the UK. In sheep this test is useful for detecting infection slightly earlier, before eggs are detected in faeces

Diagnostic tests

- Checking dung samples using fluke egg sedimentation
- Antibody detection via blood or milk samples
- Copro-antigen ELISA

In individual animals, liver enzymes, gamma-glutamyl transferase (ϒ-GT) and glutamate dehydrogenase (GLDH), may be raised if infected. However, such tests are not definitive proof of liver fluke infection.

Dairy herds

Bulk tank ELISAs are used routinely to establish the presence of infection within a herd. They indicate high, moderate, low or no infection and can be done three or four times a year to monitor levels of infection and efficacy of control programmes. Several laboratories and milk recording services have the capacity to test routinely for liver fluke.

Dairy and beef herds

Composite fluke egg sedimentation tests can be informative. Normally at least 5g of dung are required from each of ten animals and a single sedimentation assay carried out. This reduces the cost of diagnosis but can only provide information about whether the parasite is present within the herd and to prompt further investigation (Figure 5).

All the caveats about individual fluke egg sedimentation tests also apply to composite fluke egg sedimentation counts. Bear in mind that fluke egg shedding can be intermittent and the absence of eggs does not necessarily mean that animals are fluke-free. They may be harbouring immature liver fluke, which are too young to lay eggs.

First season grazing calves

Testing first season grazing calves at, or shortly after housing, using a serum antibody ELISA is a good way to identify if there has been exposure to liver fluke in the current grazing season, since presence of antibodies in these 'sentinel' animals can only have come from this period.

Figure 5: Taking dung samples from a group of cattle.



Farm Advisory Service

Other factors should be considered when diagnosing infection including herd history, time of year and weather conditions over the summer months.

Section 6: Control

Control of fasciolosis depends on the type of farm and the history of the herd and should involve both management and chemical treatment options.

Infection pressure will depend on prevailing weather conditions and varies year to year.

The National Animal Disease Information Service (NADIS) provides a useful summer and autumn fluke forecast across the UK based on local monthly rainfall and evapotranspiration values. However, it is important to recognise that this risk will vary between individual farms within an area. This is because the farm environment and management practices employed over these periods will be as, if not more, important than the weather, in determining whether animals are truly at risk from infection and/or disease.

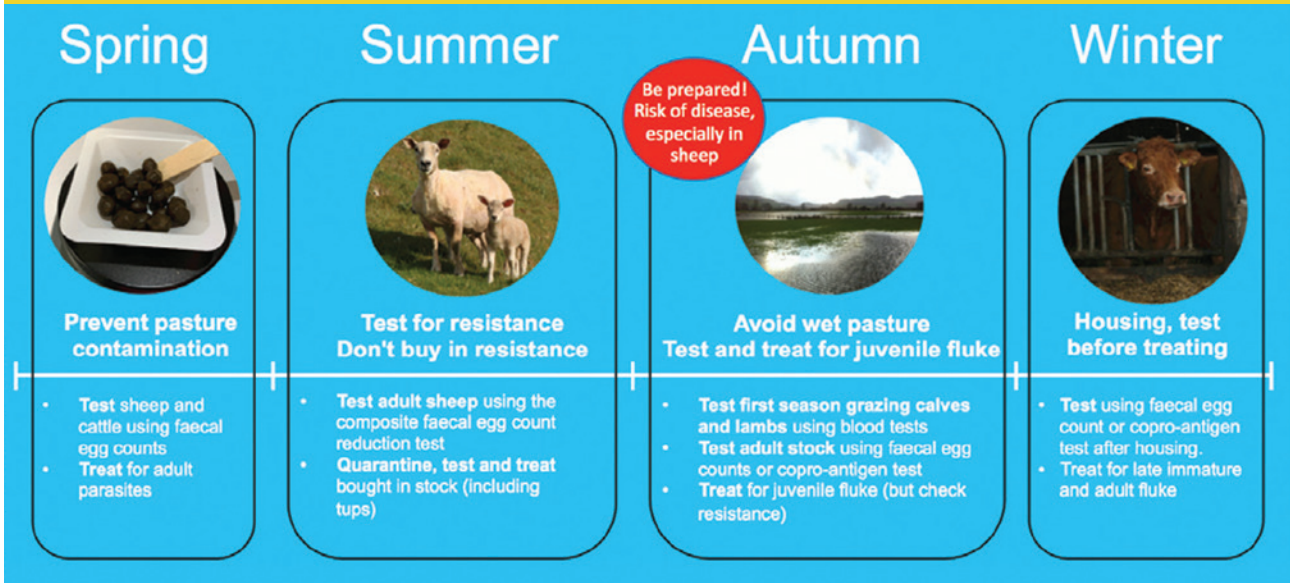
Parasite and fluke control programmes should be tailored to each farm, formulating grazing and treatment plans for the whole year. Ideally these should be carried out in consultation with a vet or animal health advisor.

It is important to:

- Establish if fluke infection is present
- Identify 'flukey' areas of the farm, ie those with ideal mud snail habitat
- Design a programme for the whole farm, taking into consideration all stock, regardless of age and species

Most programmes will require the use of diagnostics to identify if stock has been exposed to infection and flukicides to prevent disease and reduce

Figure 6: The Liverpool Four Point Fluke Plan
Note: Seasonal periods are a guideline only. Consider current conditions on farm when making treatment decisions



contamination of pasture with eggs. Also grazing strategies will be needed to avoid moving cattle onto heavily contaminated pasture, particularly in key risk periods.

There is a range of flukicidal medicines available for use in cattle. Care must be taken to select an appropriate product for the specific purpose required, to dose animals accurately, at the most suitable time according to the life cycle of the parasite. Also to observe meat and milk withdrawal periods as indicated by the product information leaflet.

Triclabendazole is the only product effective against very early immature fluke that are two weeks and older through to adults. It is used extensively to control liver fluke in sheep and a result, triclabendazole resistance has been reported in many parts of the UK. It is important to remember that the same parasite affects cattle and sheep. Triclabendazole resistance in liver fluke has been reported in cattle in the UK.

Wherever possible, the efficacy of triclabendazole should be established on farms where it is used, especially if sheep are also present. A faecal egg count reduction test (FECRT) can be used for this purpose. Where efficacy is demonstrated, triclabendazole products can be included in the control programme with confidence, although this status should be reviewed periodically.

Diagnosing infection and, if necessary, dosing around housing in autumn is a useful control option for beef cattle. The choice of product will depend on the triclabendazole resistance status, the infection pressure of the year and the meat withdrawal times.

Control of fluke in dairy cows is more difficult with few treatment options available for lactating animals. Significant changes in bulk tank milk ELISAs can indicate where significant levels of exposure have occurred, whilst testing of individual animals at drying off by doing fluke egg sedimentation tests, allows the identification and treatment of chronic, patent infections.

Flukicide medicines have no persistent activity so turning cattle onto fluke-infected pasture after treatment re-exposes them immediately to risk of re-infection. If cattle are turned back out after treatment, use tactics such as placing them in lower-risk pastures. If cattle remain on highly contaminated pasture, monitoring for infection is essential, as further treatments may be needed.

Many flukicidal medicines are sold in combination with medicines used to treat roundworms as well as fluke. Such products should only be used where treatment of both types of parasite is required. Combination products that target all stages of liver fluke, ie contain triclabendazole, and the hyperbiotic/arrested stages of gut roundworms, may be beneficial, provided diagnostic information is available to show that cattle have been exposed to liver fluke.

Once cattle are housed there is virtually no risk of them picking up a new infection until they are turned out to pasture again. Where risk in the latter

part of the previous season was low, but treatment is still indicated, it may be possible to delay treatment to a point several weeks after housing. By then, the existing fluke burdens will have matured sufficiently to be treated effectively with a product other than triclabendazole (Table 1).

The COWS group strongly advises farmers to discuss product choice with their vet, RAMA or SQP as part of their Herd Health Plan. (Figure 6: The Liverpool Fluke Plan).

The choice of drug will be influenced not only by the risk of infection, but also by its meat/milk withdrawal period, the risks posed by other parasites and the ease of administration.

Table 1 summarises the flukicide active ingredients available in the UK and licensed for use in cattle.

Table 1: Summary of different flukicidal products licensed for use in cattle*

Active Ingredient	Administration Route	Stage of liver fluke killed
Triclabendazole	Oral	2 weeks onwards
Closantel	Pour-on	7 weeks onwards
Clorsulon	S/c injection	Adults only
Oxyclozanide	Oral	Adults only
Albendazole	Oral	Adults only

*Note: This information was correct when this document was updated (November 2026). Current data sheets must always be checked before treatment.

Quarantine treatments

Bringing in cattle or sheep from markets, other farms or common grazing can potentially introduce liver fluke, including those that are resistant to triclabendazole.

If there is no suitable snail habitat on the farm, the life cycle of the liver fluke cannot be completed and there is no risk. Where there is uncertainty, it is better to assume that a farm does have suitable snail habitat, particularly where agro-environment schemes such as putting in scrapes and other wetland management practices, may inadvertently create such habitats.

The aim of quarantine treatments is to minimise the risk of introducing liver fluke and resistance onto the farm and importantly, to avoid contamination of pastures.

Quarantine measures should be applied to all incoming livestock. This includes those purchased or hired from other herds and flocks, including bulls and rams, and cattle and sheep that have been grazing on other farms or common grazing, including tack sheep.

Step 1 – House

Keep newly arrived cattle inside, yarded or on snail-free pasture away from other livestock, until quarantine treatments have been completed, the animals have been tested and results show they are free of infection. This will reduce the risk of introducing resistant fluke onto the farm.

Step 2 – Treat

It is safest to assume that brought-in animals are infected with resistant liver fluke. Where new animals can be housed or kept on snail-free pastures, treatment can be delayed until the fluke are sufficiently mature to be killed by the chosen product. If cattle are treated immediately, they may need a second treatment to kill any fluke that were too young to be killed by the first treatment.

Step 3 – Test

Do not turn animals out onto pasture that might have suitable snail habitat until they are free from infection. This means checking dung for fluke eggs post-treatment to check all fluke have been killed.

Alternatively, the copro-antigen test offered by a number of different diagnostic labs can indicate if treatment has been successful. It is recommended that dung samples are checked six weeks after treatment to ensure no fluke have survived. If cattle are positive, it could indicate the need for re-treatment to remove parasites that have matured since the first treatment.

Information on individual products is available in the NOAH Compendium of Data Sheets for Animal Medicines at www.noahcompendium.co.uk or from the product manufacturer.

Always check the latest product data sheet and/or product label before advising on or administering products.

Section 7: Rumen fluke

Rumen fluke (*Calicophoron daubneyi*) is another type of trematode flatworm found on the surface of the rumen and reticulum. They are 0.5–1cm long and resemble pink, fleshy maggots (Figure 7).

Rumen fluke is very common in British and Irish livestock and prevalence has increased dramatically over the past ten years.

Diagnosis

Rumen fluke are commonly diagnosed through the presence of rumen fluke eggs in dung samples or rumen fluke parasites in the intestine or rumen at post-mortem.

Dung samples are processed in exactly the same way as for liver fluke diagnosis ie, by sedimentation.

Their eggs also look similar, although rumen eggs are more variable in shape and appear colourless as opposed to the golden colour of liver fluke eggs.

Disease

Data suggests that in most cases, rumen fluke infections are entirely benign.

Very occasionally, the presence of immatire rumen fluke has been associated with outbreaks of severe disease in youngstock. These occurred under very specific and exceptional circumstances that resulted in overwhelming infections, with vast numbers of immature rumen fluke causing intestinal injury and severe enteritis characterised by ill-thrift and profuse, fetid diarrhoea. In severe cases, acute disease due to immature rumen fluke has proved fatal in cattle and sheep.

Treatment

Differentiation of liver fluke and rumen fluke eggs is important. Liver fluke is a pathogenic parasite and when liver fluke eggs are detected in cattle, treatment should be considered.

A number of studies have concluded that adult rumen fluke have no apparent impact on health, welfare or productivity if cattle. Therefore, the reasons and benefits of treating for rumen fluke infections, in the absence of confirmed clinical signs, are questionable.

Figure 7: Adult rumen fluke on the surface of a bovine rumen.



Only one flukicide, oxyclozanide has activity against rumen fluke. However, no commercial flukicides containing oxyclozanide have a specific label claim for rumen fluke.

SQPs/RAMAs cannot prescribe oxyclozanide for rumen fluke. Where there is concern, farmers should seek veterinary advice.

Epidemiology

For decades it was assumed that the principal rumen fluke species infecting British and Irish livestock is *Paramphistomum cervi*, which has a wildlife reservoir in deer and is known to favour aquatic snails as their intermediate host.

However, DNA analysis of rumen fluke specimens from homebred sheep and cattle, has shown the major species now affecting both species in the UK is *Calicophoron daubneyi*. This species uses *Galba truncatula* as its intermediate host, the same mud snail used by liver fluke.

There are many open questions surrounding the epidemiology of rumen fluke. The speed of spread of the parasite and its high prevalence suggest it is adapting to UK environmental conditions and intermediate snail host species very rapidly.

More information is needed about the circumstances in which rumen fluke can lead to clinical outbreaks, particularly in calves and heifers.