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Farm Advisory Service

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Planned worm control for the beef herd

Summary

- ***Ostertagia ostertagi* and *Cooperia oncophora* are the most common gut worms that cause parasitic gastroenteritis (PGE) in beef cattle in Scotland.**
- ***Dictyocaulus viviparus* is the cause of lungworm also known as parasitic bronchitis, husk or hoose.**
- **Co-infections are common.**
- **Grazing may be classed as high, moderate, or low parasite risk and this should be taken into account when selecting which class of stock should graze which fields. This risk assessment should be regularly reviewed throughout the grazing season.**
- **Anthelmintic resistance is an emerging issue in cattle, therefore the use of targeted selective treatment with anthelmintics and lungworm vaccination should be used where possible.**

Introduction

Gut worms and lungworm have an adverse effect on production parameters of beef cattle. Estimates suggest that in the UK internal cattle parasites cost the industry £77.8 million due to production losses (2/3rd of costs) and treatment costs (1/3rd). However, in many herds worm treatments are also given when they are not required, wasting time and resources while increasing the risk of anthelmintic resistance developing. The way to prevent losses and ensure that cost effective worm control is achieved is to plan the whole season's worm control before turnout.

There are four key elements to consider:

- The parasites present – roundworms, lungworm, liver fluke
- Different classes of cattle on farm
- The availability of and grazing history of pasture
- The treatment or prevention programme

This technical note will take you through each element and what you need to know.

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The parasites present

When grazing, cattle may be infected with several species of roundworms and lungworm. Co-infection with more than one parasite at a time is common.

- *Ostertagia ostertagi* and *Cooperia oncophora* are the most common gut worms that cause parasitic gastroenteritis (PGE) in beef cattle in Scotland while
- *Dictyocaulus viviparus* (lungworm) is the cause of parasitic bronchitis also known as husk or hoose.
- Liver fluke (*Fasciola hepatica*) is covered in a separate Technical Note: TN677.

Ostertagia ostertagi

Ostertagiosis is caused by the brown abomasal worm, *Ostergatia ostertagi* and comes in two forms – Type I and Type II.

Type I

This form of ostertagiosis tends to affect first grazing season cattle, particularly autumn-born calves turned out in spring. Ostertagia ostertagi begin to emerge from the gastric glands from 18 days post infection and clinical signs are noted soon afterwards. Affected animals have a persistent profuse watery diarrhoea which can be bright green in colour, which can be noted from 4 to 6 weeks post-turn out following the ingestion of overwintered larvae. Therefore, cases are typically seen from mid-July onwards. Significant loss of body weight (approximately 20%) may be noted within 7 to 10 days of clinical signs. Whilst morbidity can be very high (over 75%), mortality from type I ostertagiosis is rare.

Type II

Infective larvae ingested by cattle at the end of the grazing season in late autumn can arrest their development and inhibit as L4 larvae in the gastric glands of the abomasum. Later in the winter/spring, following an unknown trigger, the L4 larvae resume activity and the mass emergence at the same time causes significant damage to the abomasum. Affected animals may have intermittent diarrhoea, thirst, submandibular oedema (bottle jaw), and inappetence. Type II ostertagiosis can be fatal unless affected animals are treated with a product licenced for developing and arrested larvae. However, the prevalence of type II ostertagiosis is low which is thought to be due to the regular use of macrocyclic lactone wormers at housing. The risk of type II ostertagiosis may be higher in years where L3 larvae are retained in faecal pats during dry summers and are released following rainfall in late autumn.

Cooperia oncophora

The small intestinal worm, *Cooperia oncophora* is less pathogenic than *Ostertagia*, but can still result in reduced feed intakes, poor weight gain, and intermittent diarrhoea in affected cattle. Adult cattle act as carriers to maintain egg production at low levels despite showing limited clinical signs. When cattle have a concurrent burden of *Cooperia* and *Ostertagia* the associated clinical signs are worse than if they were infected with just one worm type.

Lifecycle

Ostertagia ostertagi and *Cooperia oncophora* have a direct lifecycle, completing all stages within cattle without the need for an intermediate host. Cattle become infected after ingestion of infective larvae from pasture, which then develop into adults in the gastrointestinal tract, before eggs are passed in the faeces. It can take approximately three weeks after ingestion of larvae for eggs to be produced. Climate factors, especially temperature and moisture levels, influence the development and survival of larvae on pasture. Larvae can however survive adverse conditions e.g. hot, dry spells within cow pats and in the soil and reemerge when conditions are more favourable.

Other gastrointestinal parasites

Other gastrointestinal parasites including *Nematodirus spp*, *Trichostrongylus spp*, and *Haemonchus spp* may be important locally.

Lungworm

Lungworm, also known as husk, is caused by *Dictyocaulus viviparus*. Cases of lungworm are reported to be increasing across Scotland and first season grazing cattle are most at risk between July and October, but increasingly infections are seen during the winter.

Affected animals suffer from a parasitic bronchitis characterised by coughing, especially after exertion, nasal discharge, increased breathing rates and effort, and loss of body condition. These signs can be seen from day 8 to 25 post infection, but deaths may be seen from day 15 onwards during the pre-patent period where larvae are not found in the faeces. Severely affected animals can be seen mouth breathing with their head and neck extended and sudden death may occur within 24 to 48 hours. During the patent phase (days 26 to 60 post infection when larvae can be found in faeces) lungworms may be seen in frothy, white mucus in the nostrils of affected animals. Most cases will recover following treatment, but lungworm can be fatal in the post-patent phase (days 61 to 90 post infection) due to a severe allergic reaction within the bronchi to dead or dying lungworms, which may also be accompanied with bacterial pneumonia and fever.

Lungworm is endemic on some farms and cattle on these farms develop a strong immunity to lungworm. Immunity to lungworm can be short-lived however, lasting only 6 – 12 months, unless low level challenge is maintained. In addition, cattle with partial immunity to lungworm may suffer from “reinfection syndrome” This is when a mass die off of larvae triggers a hypersensitivity reaction resulting in coughing, laboured breathing and sometimes death.

Different classes of cattle on farm

Youngstock are most susceptible to the effects of a worm challenge, especially during their first and second season of grazing. Ideally cattle develop strong immunity that ensures that by the time spring-born calves are 24 months old and autumn-born calves are 30 months old, worms will cause them little or no adverse effects. To achieve this a minimum period of 8 months on pasture over two grazing seasons is needed, therefore on systems with extended housing periods immunity may be slower to develop. Whilst this immunity means cattle are resilient to parasitism, it is incomplete so they can still carry worms at a low level and produce limited numbers of worm eggs without demonstrating clinical signs. These subclinical PGE infections can impact growth rates, carcase yield and quality, calf weaning weight, fertility (from body condition loss) and milk yield.

Spring born suckler calves in their first grazing season do not generally require treatment as they have low levels of exposure from limited grazing until most of the overwintered L3 larvae have died off. Monitoring the parasite burden in second season grazing youngstock should be used to determine the need for treatment. Autumn or winter-born calves may be at a higher risk in the grazing season after weaning, especially if they were housed. Adult cattle do not generally require worming despite their role in contaminating pasture with eggs. However, any age of cattle could develop clinical disease and production impacts if they did not receive adequate exposure as youngstock and low-level exposure has not been maintained in subsequent grazing seasons. Host factors including age, sex, nutrition, and genetics may also influence the rate of immunity development.

The availability and grazing history of pasture

The infective stages of the parasites, third stage larvae (L3), levels vary over the course of the year and are influenced by temperature and moisture levels. Over winter there is limited and slow development of eggs and larvae on pasture, but some worms survive in the host. Following turn-out eggs are shed from worms overwintering in cattle meaning larvae can infect calves in the spring. Pasture larvae levels peak in late summer. Some infective larvae can survive on pasture for five to twelve months. Therefore, the grazing history of each field in the previous 12 months must be known when planning a worm control programme. With lungworm, asymptomatic carrier animals may have small number of inhibited larvae which could recommence development and lead to pasture contamination in the following grazing season. In addition, small numbers of infective lungworm can persist on pasture over winter and lungworm larvae may be carried up to 3 m from the faecal pat by the *Philobolus spp.* fungi into neighbouring fields.

All pasture fields should be mapped and have a risk value assigned to it so that the grazing platform can be utilised most appropriately by the correct class of stock to reduce the risk of a heavy parasite burden year-on-year.

The risk profile of pasture can fluctuate throughout the season in response to climatic conditions and the parasite risk assessment should be reviewed regularly.

Risk profile	Type of pasture
High	Grazed by young stock in previous 12 months
Medium	Grazed by adult cattle
Low	New leys following cereal or root crops. Fields not grazed early in the season and cut for hay/ silage. Fields grazed by sheep only

The roundworm and lungworm species affecting cattle are different to those affecting sheep, therefore pasture grazed by sheep can be considered clean. Co-grazing or leader-follower rotational systems for cattle and sheep can also have simultaneous benefits on the parasite burden of both species. However, an exception to this is liver fluke caused by Fasciola hepatica which can infect both sheep and cattle.

Rotational grazing strategies may be used to manage parasite risk, but consideration needs to be given to the stocking density, grazing and rest periods, and weather, to reduce worm infection pressure. Although, such strategies may have limited to no effect on lungworm risk management due to the unpredictable nature of outbreaks.

There is currently limited evidence on the effects of herbal leys or multi-species swards containing condensed tannin rich plants e.g. sainfoin, chicory, and birdsfoot trefoil on parasitism in cattle.

The treatment prevention programme

A successful worm control plan includes methods to monitor the parasite burden, effective quarantine of bought-in cattle, and targeted treatment to reduce the reliance on anthelmintics and minimise the risk of resistance developing.

Monitoring parasite burden

Monitoring the parasite burden can determine the level of challenge cattle are exposed to for tailoring pasture risk assessments and determine the need for treatment.

FEC

Starting 3 to 4 weeks post turn-out monthly faecal egg testing of each group of first and second season grazing cattle can build a picture of the parasite risk cattle are exposed to. Fresh faeces (20 to 40 g and still warm) should be taken from 10 individual animals per group and placed in air-tight pots before sending to the lab. Obtaining samples from representative members of the group is key as not all individuals will carry the same worm burden. If transport to the lab for analysis is to be delayed, samples should be kept in the fridge.

The results of FEC tests are reported as eggs per gram (e.p.g.). Treatment is usually required if high levels (over 200 e.p.g.) are detected. However, low levels do not necessarily mean there are no, or low numbers of worms present in the gut as FEC may be influenced by faecal consistency, nutritional status of cattle, stocking density, season, and worm species present. For example, *Ostertagia ostertagi* is more pathogenic than *Cooperia oncophora* but are less prolific producing 200 – 350 eggs per day compared to 1100 – 4400 eggs per day by *Cooperia*, but this will vary by time of year. FEC is of limited value in adult cattle as the number of eggs can be diluted in the large quantities of dung produced and this can also be skewed by immunity. Consideration also needs to be given to the time to year when assessing FEC results as during winter no eggs may be detected, but cattle may be carrying high levels of arrested larvae within their abomasum.

In addition to worms, FEC can be used to identify coccidial oocysts and liver fluke eggs, which may result in similar symptoms (diarrhoea and weight loss) and occur at the same time as roundworm infections.

It is generally not possible to differentiate between the eggs of *Cooperia* and *Ostertagia* using FEC, but specialist testing can be done to determine which species dominates in some circumstances.

Faecal samples can also be used to monitor for lungworm using the Baermann test. A minimum of 50 g of faeces per animal, ideally taken directly from the rectum, from 10 to 15 individuals in a group is required. Samples should be submitted in lidded containers, but not filled to the top as a little air is needed and kept at cool temperatures (12 - 14°C; not in the fridge). The Baermann test identifies lungworm larvae rather than eggs. Samples can be positive 23 – 28 days post infection but clinical signs may be seen within two weeks. In patent cases 50 to 1000 lungworm larvae per gram of faeces may be found.

Growth rates

Cattle affected by PGE can have a 10% reduction in body weight due to reduced feed intake. Consequently, weaning weights, and carcase yields and quality, are negatively affected with the knock-on effect on greenhouse gas emissions. Providing adequate nutrition and the absence of other disease, grazing beef cattle should achieve daily liveweight gains of at least 0.7 kg. Therefore regular weighing of cattle can be used to determine the need for treatment.

Other tests

Blood samples can be taken from cattle during their first grazing season to measure levels of pepsinogen, an enzyme released following damage to the abomasum as the L4 larvae emerge from the gastric glands. This test is less reliable in older cattle and there is little correlation between high pepsinogen levels and the worm burden.

For the diagnosis of lungworm an ELISA test on blood and bronchoalveolar lavage (BAL) can be used too.

Postmortem examination including total worm counts can also be useful in identifying worm issues in any animals that die or are euthanised due to poor body condition.

Anthelmintics

Anthelmintics from three wormer classes are available to cattle keepers for the treatment of roundworms and lungworms.

- Group 1 Benzimidazoles (1-BZ, white wormers) e.g. albendazole, oxfendazole, fenbendazole
- Group 2 Levamisole (2-LV, yellow wormers)
- Group 3 Macrocyclic Lactones (3-ML, clear wormers) i.e. ivermectin, doramectin, eprinomectin, moxidectin

These anthelmintics come in a variety of preparations including injectables, oral drenches, pour ons, and pulse release rumen boluses and some have persistent activity. Some products are also licensed for other parasites including liver fluke, mites, warbles, lice, hornflies, and eyeworm.

The choice of anthelmintic used should be discussed with your vet, or RAMA/SQP and based on likely parasites, time of year, class of stock, and grazing history.

Three worming strategies exist – strategic use, therapeutic use and targeted selective use which are described in more detail in the table below.

	Pros	Cons
Strategic Use • Traditional strategy • Wormer administered early in season and at set intervals to reduce larval burden mid-season	Overwintered larvae gradually die off as season progresses and no new infection is added to it.	May not develop immunity, especially to lungworm. May increase risk of anthelmintic resistance developing. May be less reliable with climate change.
Therapeutic Use • Wait until clinical signs seen to treat.	Only use anthelmintics when necessary. Best in low-risk systems.	Performance will be impacted by the time clinical signs are seen. Not all individuals within a group/herd are equally affected by worms. Deaths may be seen from lungworm before clinical signs are displayed.
Targeted Selective Use • FEC, liveweight gain/ body condition score, and serum pepsinogen levels or a combination of these tests are used to determine need for worming	Only individuals with significant worm burdens treated. Maintain a population of worms that are not exposed to wormers (in *refugia*). Minimise selection for anthelmintic resistance and reduce anthelmintic use in herds that were previously high users.	Not suitable for lungworm control.

Previously, dose and move strategies were advocated but these have now been proven to be highly selective for anthelmintic resistance. Should movement be required after dosing, this should be delayed until individuals have been re-infected, and care should be taken with products with persistent activity.

There is also growing concern on the long-term effects of wormers on the environment and biodiversity, particularly dung beetle populations.

Best practice when using anthelmintics in cattle.

- Select the right **product** for the right **parasite** at the right **time** of year in the right **animal.**
- Dose according to individual liveweight using scales or a weigh band.
- Calibrate dosing equipment before use to ensure the correct does is given. Clean and disinfect between use to avoid spreading disease.
- Administer the product according to the manufacturer's instructions. This also includes storage before use and expiry dates.
- Adhere to withdrawal periods for meat (and milk). Note that the withdrawal period is different from the duration of activity of a product.

Anthelmintic resistance

Anthelmintic resistance (AR) occurs when worms survive a treatment that would be expected to kill them and is increasingly being observed in cattle parasites. In the UK cases of 3-ML resistance in Cooperia and 1-BZ resistance in Ostertagia have been diagnosed, although in Ireland resistance to all three classes for both species has been reported. A recent study has also demonstrated high suspicion of 3-ML resistance in lungworm in the UK.

AR in gut worms can be detected using a faecal egg count reduction test (FECRT) or a drench test. These tests use FEC pre- and post-treatment to determine the reduction in worm egg counts. The post-treatment interval for sampling is 7 to 14 days depending on the product used and repeat testing may be required if long-acting preparations are used. AR is suspected if a reduction of less than 95% in FEC post-treatment is seen.

There are currently no guidelines for diagnosing resistance in lungworm. However, if AR in lungworm is suspected, post-dose efficacy testing 14 days after treatment can be undertaken.

Any suspicions of resistance should be reported to the Veterinary Medicines Directorate (VMD) or manufacturing authorisation holder (MAH).

Housing

During the housing period cattle are not exposed to new worm infections from pasture and the survival of larvae in hay and silage is poor. Therefore treatment of cattle with anthelmintics at housing can both remove the worm burden which has built up over the season within the cattle and reduce the risk of pasture contamination in the next grazing season. This also ensures that worms do not depress the animal's ability to make the most of their food in the housing period. Treating with a product licensed for arrested stage larvae at housing will prevent Type 2 ostertagiosis. Anthelmintics from the 3-ML class and some 1-BZs are suitable for this purpose.

Vaccination

Currently there are no vaccines available to prevent PGE in cattle. However, a vaccine exists for the prevention of lungworm in cattle over 8 weeks of age. This two-dose oral vaccine containing irradiated lungworm larvae (L3) should be administered at least two weeks prior to turn-out to ensure the development of immunity occurs before exposure to lungworm. Administration of the vaccine should be avoided during the period of activity of long acting anthelmintics and endectocides or sustained release bolus preparations, and anthelmintic use should be avoided during the two weeks after the second dose. Vaccinated youngstock should be turned out onto low-level infected pasture (i.e. not clean grazing) to boost natural immunity. Single dose boosters may be required prior to turnout in the second grazing season in high-risk areas or if natural exposure has not occurred. It is important that all calves on a farm are vaccinated at the same time and that this is maintained annually for each calf crop as pasture contamination can still occur albeit at a low level.

For further information on the sustainable control of cattle parasites see Control of Worms Sustainably (C.O.W.S) https://www.cattleparasites.org.uk/

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