

# Roundworms in Sheep



PARASITE CONTROL LEAFLET SERIES SHEEP ROUNDWORMS 11.02.2020

PARASITE CONTROL PROGRAMME



**Parasite Control**  
Animal Health Ireland.ie

Animal Health Ireland, 2-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27

AHI gratefully acknowledges the financial and other contributions of our stakeholders.



Contributing to a profitable and sustainable farming and agri-food sector through improved animal health

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## Introduction

There are over 16 species of roundworms (stomach/gut worms) capable of infecting the gastrointestinal tract of sheep in Ireland. These worms cause the condition known as parasitic gastroenteritis (PGE) which is common in sheep, particularly those under 1 year of age, and can result in scouring, lack of thrive and considerable economic loss. The most economically important species of roundworms affecting lambs and hoggets in Ireland are *Nematodirus battus*, *Teladorsagia* species and *Trichostrongylus* species. **Table 1** highlights the main differences between these three types of roundworms, detailing the age groups of animals most at risk of PGE and the recommended treatment.

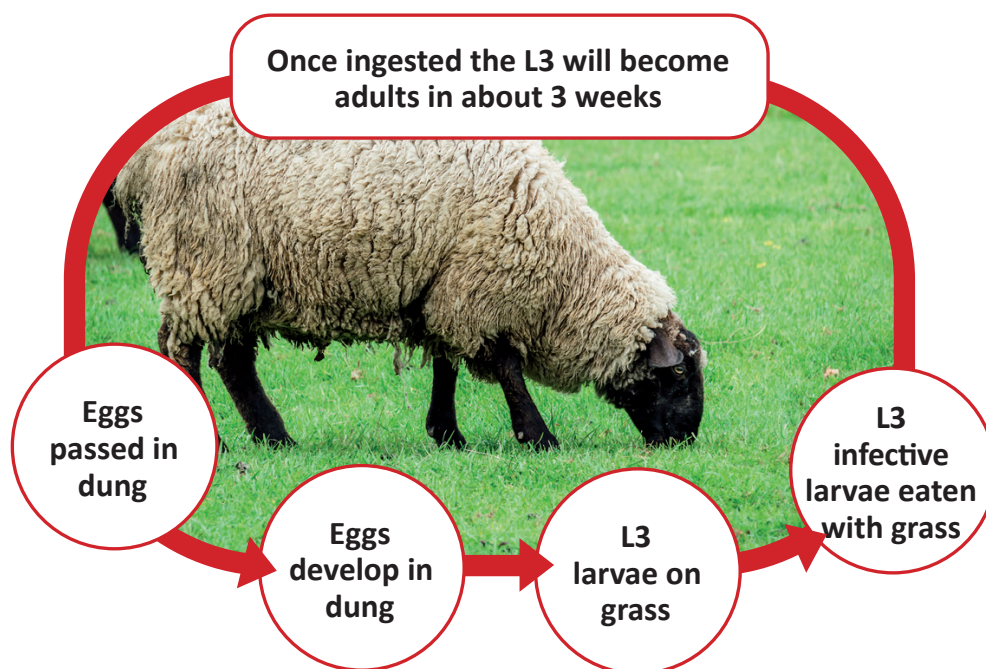
	<i>Nematodirus battus</i>	<i>Teladorsagia</i> spp.	<i>Trichostrongylus</i> spp.
<b>Common name</b>	Thread/thin-necked worm	Brown stomach worm	Black scour worm
<b>Mature Size</b>	11-25 mm	6-10 mm	4-8 mm (hair-like)
<b>Location in the gut</b>	Small intestine	Abomasum (4th stomach)	Small intestine
<b>Age at which sheep are most susceptible</b>	5-12 weeks of age† †Lambs born to ewes of poor milking ability are likely to be at risk first.	Older than 10 weeks of age	
<b>Main risk period on pasture</b>	April/May	June onwards	August onwards
<b>Symptoms/ Clinical signs</b>	Scour (may be confused with coccidiosis), hunched appearance, dehydration, mortality	Scour, inappetence, lack of thrive	Black scour, inappetence, lack of thrive
<b>Immunity</b>	Lambs generally develop good immunity by 12-14 weeks of age	Sheep, with the exception of ewes in the peri-lambing period, are considered immune by 1 year of age	
<b>Faecal egg count (FEC)</b>	FEC are not a reliable indicator of the level of exposure/infection	Can lead to high FEC (e.g. >750 eggs per gram (epg) of faeces)	
<b>Pasture management</b>	Avoid grazing lambs on pasture grazed by lambs/calves in the previous spring	Provision of 'safe' pasture e.g. aftergrass, creep grazing, mixed grazing with cattle	
<b>Prevention/Treatment</b>	If uncontaminated pasture is unavailable, dose with white drench at 5 to 6 weeks of age or at times recommended by the <i>Nematodirus</i> forecast issued by the DAFM in the spring	Dose on the basis of FEC* Low: ≤250 epg Medium: 250-750 epg High: >750 epg *on farms where <i>Haemonchus</i> (Barber pole worm) is not present Contact your veterinary practitioner or advisor regarding interpretation of FEC results.	
<b>Resistance issues</b>		Check for resistance to anthelmintics	

**Table 1.** Main species of roundworms affecting sheep in their first grazing season



## Roundworm Life Cycle

From a practical point of view, the lifecycle of many roundworms is very similar (**Figure 1**). The adult female worm in the intestine produces eggs that are passed in the faeces of the sheep onto the pasture. Once in the pasture environment, the larvae undergo development involving several moults (from larval stage 1 (L1) to larval stage 3 (L3)). The L3 may survive and overwinter on pasture. Lambs become infected when they ingest L3 on pasture. Once ingested the larvae migrate to their preferred sites along the gastrointestinal tract (abomasum or small intestine) where they mature to the adult stage in roughly 3 weeks.



**Figure 1.** Roundworm life cycle

On pasture *Teladorsagia* and *Trichostrongylus* L1 hatch from the egg and develop to L2 and then L3 in the dung. In contrast, *Nematodirus* larvae develop to L3 inside the egg and will only hatch after the eggs have been exposed to low temperatures or frost for several weeks followed by a temperature increase to at least 10 °C. Mass hatching of *Nematodirus* L3 can coincide with a time when the lambs are beginning to feed on considerable amounts of grass (from around 5 weeks of age) so the disease can progress quickly. The DAFM *Nematodirus* forecast issued in spring each year can advise when this mass hatching is likely to take place.

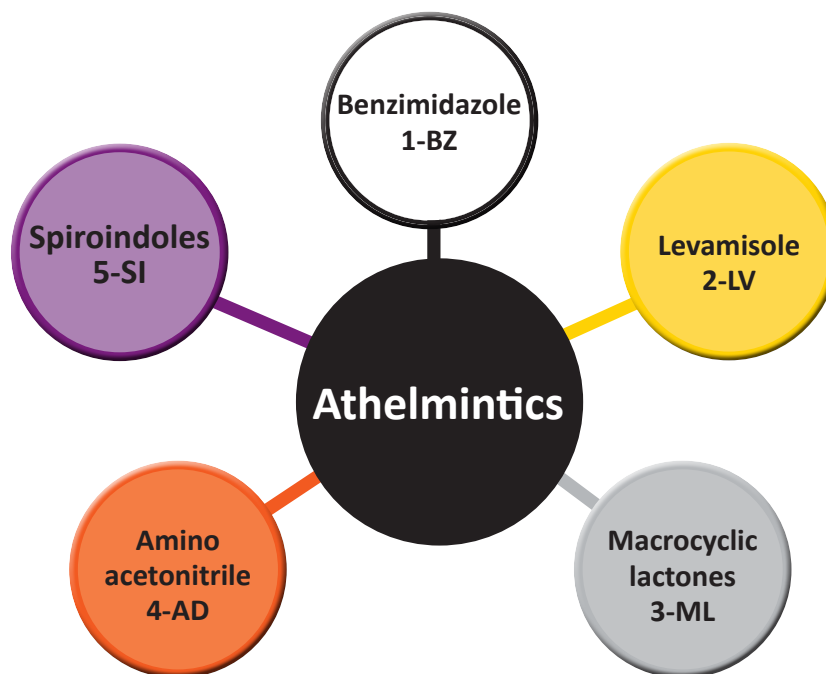
## Diagnosis

Faecal egg counts (FEC) are the most widely used test to diagnose roundworms in sheep. The best sample for diagnosis of roundworms is fresh faeces, which must be taken from a representative number of sheep in the flock (10-12 animals per management group) and submitted (preferably on the day of collection) to a veterinary laboratory in screw-cap containers. Containers with push-on caps are not suitable because gas production in the sample may cause the cap to become dislodged leading to spillage. Eggs from the main roundworm species (including both *Teladorsagia* and *Trichostrongylus* species; usually collectively referred to as 'strongyles' or 'trichostrongyles') are counted and reported as a single value representing the number of eggs per gram of faeces (epg). *Nematodirus* spp. eggs and *Strongyloides papillosus* eggs are counted separately. Veterinary advice should be sought when interpreting these results in the context of season, age, grazing and treatment history.

## Prevention and Control of Roundworms

Alongside pasture management (described in **Table 1**), anthelmintics (wormers) play a critical role in the prevention and treatment of PGE. Although there is a large range of different brands of broad-spectrum anthelmintics on the Irish market, it is important to note that in fact there are just 5 families/classes of compounds with specific modes of anti-parasitic action.

- 1-BZ:** **Benzimidazole** and probenzimidazoles (which include albendazole, fenbendazole, oxfendazole, mebendazole) also known as the ‘white drenches’
- 2-LV:** **Levamisole** also known as the ‘yellow drenches’
- 3-ML:** **Macrocyclic lactones** (which include abamectin, doramectin, ivermectin, moxidectin) also known as the ‘clear drenches’
- 4-AD:** **Amino acetonitrile** derivatives (monepantel) also known as the ‘orange drenches’
- 5-SI:** **Spiroindoles** contain derquantel plus abamectin also known as the ‘purple drenches’



**Figure 2.** Anthelmintic (wormer) classes licensed for the control of roundworms in Ireland

The treatment options for roundworms applicable to most Irish farms are presented in **Table 2**. Choose an appropriate anthelmintic to target the correct roundworm and only use a combination product (flukicide + wormer) if necessary. For example, combination products containing an adult flukicide should be used when both adult flukes and roundworms would likely be present in animals. The withdrawal times for the product used must be noted and adhered to, particularly for lambs approaching slaughter weight.

PARASITE	RECOMMENDED OPTIONS FOR TREATMENT OF ROUNDWORMS*				
	1-BZ	2-LV	3-ML	4-AD <sup>†</sup>	5-SI <sup>†</sup>
	BENZIMIDAZOLE GROUP (WHITE)	LEVAMISOLE (YELLOW)	MACROCYCLIC LACTONE (CLEAR)	AMINO ACETONITRILE (ORANGE)	SPIROINDOLES (PURPLE)
<i>Nematodirus battus</i> (thread/thin-necked worms)	✓	✓			
<i>Teladorsagia</i> spp. (medium brown worm)		✓	✓	✓	✓
<i>Trichostrongylus</i> spp. (black scour worm)					

\*Recommendations based on reports of anthelmintic resistance in roundworms on Irish farms.

<sup>†</sup>POM = Prescription only medicine; available from your veterinary practitioner, pharmacist or a licensed merchant on presentation of a prescription issued by a private veterinary practitioner who has the animals in question under his/her care.

Products containing benzimidazole ('white drench') are the preferred treatment option for *Nematodirus* as there is no confirmed evidence for *Nematodirus* resistance to these products. For other types of roundworms, products containing benzimidazoles should be excluded as a treatment option for roundworms from mid-season onwards, given the extensive evidence for resistance to benzimidazole observed in Irish sheep farms.

Current advice on the use of the prescription only medicine (POM) anthelmintics ('orange drench', 4-AD or 'purple drench', 5-SI) is that one of these compounds should be used in the following circumstances:

- (1) As a quarantine treatment for bought-in sheep. All incoming stock should be:
  - a) treated with an orange (4-AD) or purple (5-SI) class of anthelmintic product according to dosing guidelines in combination with another class of anthelmintic and,
  - b) kept indoors or on concrete for up to 48 hours before turning out to contaminated pasture in order to dilute any possible resistant roundworms present in the animal.
- (2) In order to delay the development of anthelmintic resistance to the other anthelmintic classes, these POM products can also be used once as a 'knock out dose' during the grazing season when the worm population is at its peak (generally the end of July to the middle of August).

## Anthelmintic Resistance

Worldwide, there is evidence that on many farms roundworms have become resistant to at least one class of anthelmintic. Anthelmintics from different classes have different modes of action. However, within the same class all products have a similar mode of action and so when resistance develops to one product within a class, generally other products in the same class are also less effective. **Studies carried out in Ireland have reported roundworm resistance to benzimidazoles ('white drenches') on 88% of investigated sheep farms; resistance to levamisole ('yellow drench') on 39% of farms, and resistance to macrocyclic lactones ('clear drench') on 11% of investigated sheep farms.** Resistance to all 3 commonly used anthelmintic classes was also found in Northern Ireland.

**These reports clearly indicate that it is essential to test your flock for the resistance status of roundworms to anthelmintics and to take actions to prevent and/or delay the development of resistance to anthelmintics on your farm. Discuss with your veterinary practitioner or advisor how to test for the presence of anthelmintic resistance.**

### TECHNICAL BOX – METHODS TO DETECT ANTHELMINTIC RESISTANCE

**Faecal egg count reduction testing (FECRT)** involves comparing the response to wormer treatment in a group of animals by determining the faecal egg count (FEC) on dung samples pre-treatment and post-treatment after a suitable interval (**Table 3**). The reduction in the average FEC observed between these samples provides an indication of the efficacy of the wormer used. Roughly 10-15 sheep are randomly allocated to a treatment group (e.g. benzimidazole, levamisole or macrocyclic lactones) and ideally, an untreated control group. Faecal samples are collected pre- and post-treatment from the same animals and sent to the laboratory where the numbers of eggs per gram of faeces (i.e. the FEC) is determined individually for each animal. Anthelmintic resistance is suspected if a reduction of less than 95% in FEC post-treatment is seen.

A basic indication of the efficacy of a wormer can be tested by sampling animals post-treatment and determining a FEC. This is often referred to as a **drench test**. Samples should be taken from 10-15 animals at a suitable interval after treatment depending on the wormer used (see **Table 3**). A high FEC post-treatment is suggestive of a treatment failure and warrants further investigation. Treatment failure may be due to several factors such as incorrect dose or dosage technique and a more structured FECRT may be needed to support a diagnosis of resistance. A low FEC post-treatment cannot confirm that the wormer is working correctly unless a pre-treatment sample is taken to establish if a sufficiently high initial FEC was present for comparison.

Common name	Drug family	Sampling interval post-treatment
Yellow (e.g. levamisole)	2-LV	7 days
White (e.g. fenbendazole)	1-BZ	10-14 days
Clear (e.g. ivermectin)	3-ML	14-16 days

**Table 3.** Sampling interval post-treatment by drug family for efficacy tests

## Guidelines on Dosing

The following guidelines are recommended:

- (1) Establish whether the management group requires dosing. This will depend on a number of factors including animal age, time of year, grazing history, faecal egg counts and previous dosing history. Scouring (watery faeces) is not always a reliable indicator of worm burden and may be due to other parasites, such as coccidia, or due to non-parasite factors such as viruses or bacteria.
- (2) Select a suitable anthelmintic (see **Table 2** above). Test the efficacy of each anthelmintic group used on farm, for example, by doing a drench test.
- (3) Calibrate the dosing equipment. Set the dosing gun to the calculated dose volume and run a number of doses through it into a measuring jug or calibrated measuring cylinder to check for accuracy e.g. if the calculated dose is 5 ml, squirt 6 doses into the calibrated measuring cylinder and check that 30 ml of product has been delivered.
- (4) Weigh the animals and calculate the dose volume to be used based on the **heaviest** animal in the group. If there is a large range in animal weights, split the group into a heavy and a light group.
- (5) Ensure animals are adequately restrained and carefully dose over the back of the tongue. If the nozzle of the gun is rough or damaged, replace it before it causes injury to the lambs' mouths.

In order to delay anthelmintic resistance, follow the dosing guidelines above and adopt strategies which preserve the presence of susceptible worms (in *refugia*) on the farm:

- Leave a proportion in the group untreated if moving to 'clean' pasture. For example, leaving the heaviest 10% of animals untreated. If resistant worms are present, the treated animals are likely to predominantly pass eggs from resistant worms, while the untreated animals will pass eggs from both susceptible and resistant worms, thereby ensuring that any resistant worm population is diluted by susceptible worms. Animals with reduced growth rates, poor condition, or scouring should be targeted for treatment.
- After dosing, do not immediately move animals on to 'clean pasture' (e.g. silage/hay aftermath). This allows for a small amount of re-infection in the flock by worms on the contaminated pasture before moving which will dilute any potential resistant worm populations that survived the treatment. It is of no benefit to use this method if the wormer has a long persistent activity.
- Use grazing management to minimise reliance on anthelmintic use. Heavily contaminated pastures should be avoided to reduce the risk of clinical disease.

### TECHNICAL BOX

**Refugia** is a concept relating to a population of worms that have not been exposed to anthelmintics. These parasites in *refugia* can be in the environment, such as contaminated pastures, or in untreated animals. Worms that are not exposed to anthelmintics are less likely to undergo selection pressure for resistance genes. This susceptible population is then available as a reservoir to dilute resistant worm populations on a farm.



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