Parasite Control leaflet series

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

Anthelmintic resistance in cattle roundworms

PARASITE CONTROL LEAFLET SERIES ANTHELRESISTINCATTLE 04.12.2019

PARASITE CONTROL PROGRAMME

Parasite Control
Animal Health Ireland.ie

Animal Health Ireland, 4-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27

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

ahi Animal Health Ireland

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

Animal Health Ireland, 4-5 The Archways, Carrick-on-Shannon, Co. Leitrim, N41 WN27
Phone 071 9671928 Email nmorgan@animalhealthireland.ie

Anthelmintic Resistance and Cattle Stomach/Gut Roundworms

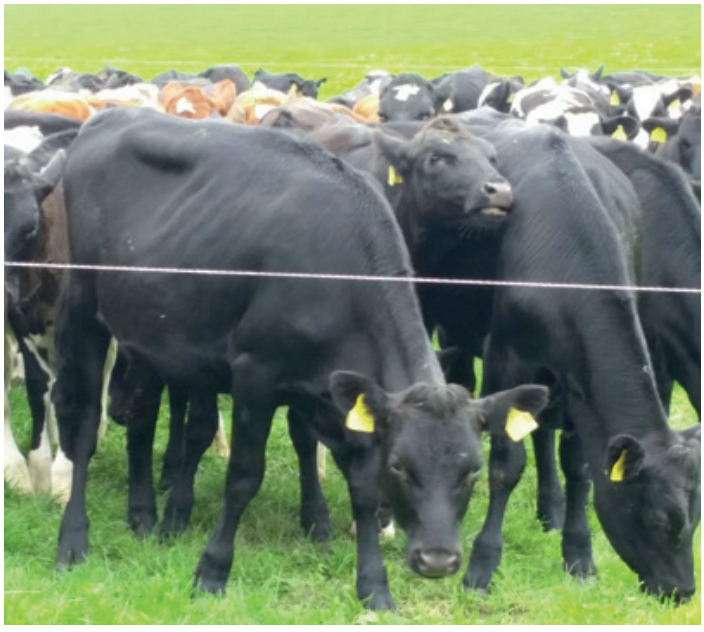
Cattle at pasture are faced with challenge from gastrointestinal nematodes (stomach/gut roundworms). Anthelmintics (wormers) are used to manage stomach/gut roundworms. These should be used strategically and in conjunction with other methods e.g. pasture management (see AHI Parasite Control series leaflets: 'Parasite control at turnout', 'Parasite control at grazing' **click here**). There are many different brands of wormers with a broad spectrum of activity on the market for cattle. These wormers can essentially be grouped into one of three classes or families as summarised in **Table 1.** Wormers within a family all have the same method of killing stomach/gut roundworms (either by starvation or paralysis), ultimately leading to worms being expelled from the host. Importantly, wormers from different families have different methods of killing worms.

Common name (wormer)	Drug family		Examples	Method of killing the worms
White	1-BZ	Benzimidazoles	Albendazole, fenbendazole	Starvation
Yellow	2-LV	Imidazothiazoles	Levamisole	Paralysis due to muscle spasm
Clear	3-ML	Macrocyclic lactones	Ivermectin, moxidectin, doramectin	Paralysis due to loss of muscle tone

Table 1. Description of Wormer Families.

Anthelmintic Resistance

The future effectiveness of wormers for the control of stomach/gut roundworm infections is threatened by parasites developing resistance to them. Anthelmintic resistance is present when worms survive a dose of a wormer that would normally be expected to kill them. A variable proportion of the roundworms in the stomach or gut of an animal or on pasture will have a natural (genetic) resistance to certain wormer families. Each time a wormer treatment is given to an animal, roundworms resistant to that family of wormers survive the treatment and only susceptible roundworms are killed. This increases the proportion of the roundworms in that population that are resistant to that particular wormer family. The more frequently worming treatments are carried out, the greater the risk of increasing anthelmintic resistance developing in a worm population.



As anthelmintic resistance is a heritable trait controlled by the genes of the roundworm, the ability to survive treatment is passed on to the next generation of roundworms. Any practice which favours the survival of resistant parasites will speed up the rate at which resistance increases in their population.

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.

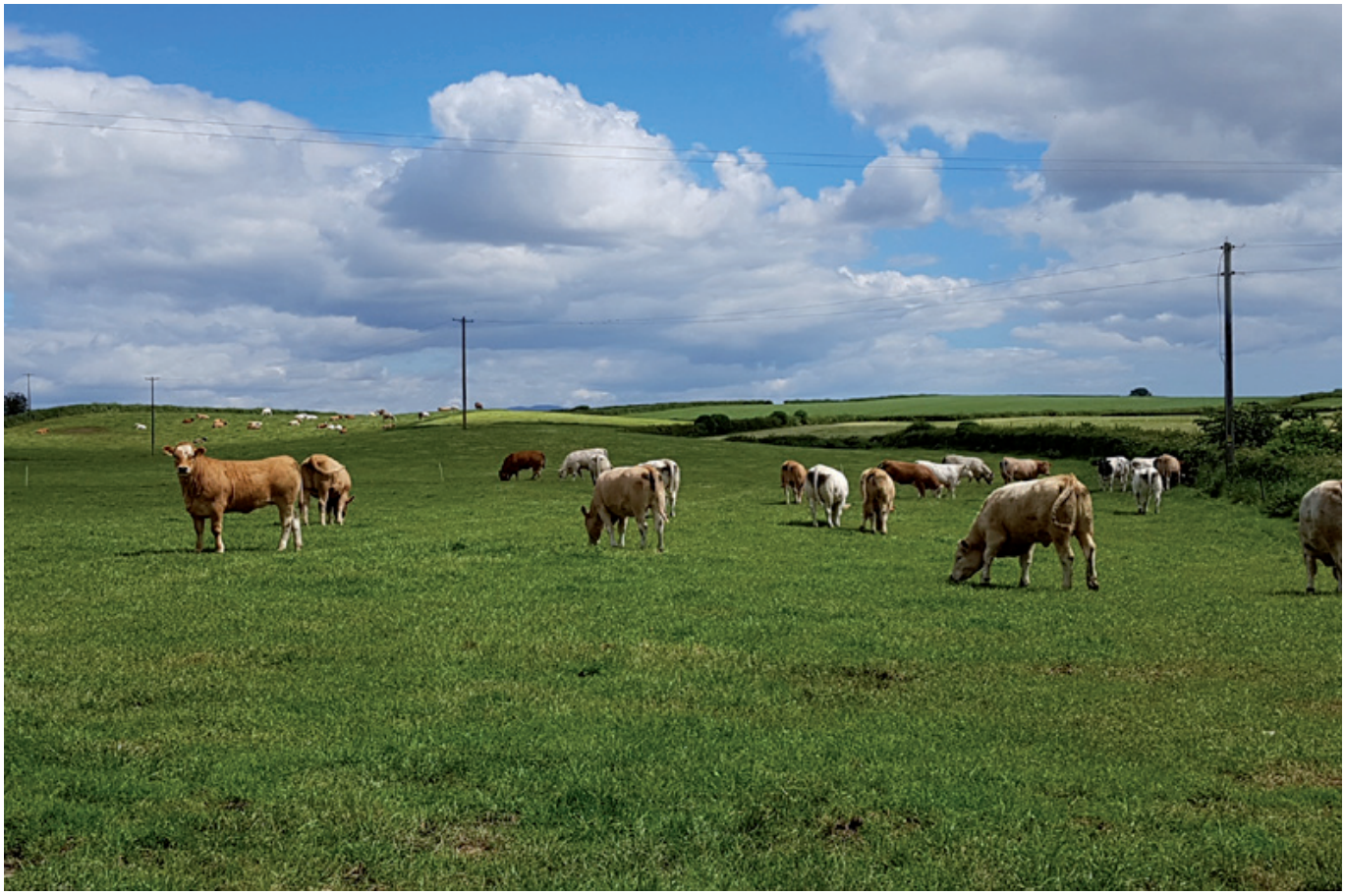
Evidence for resistance globally

The emergence of resistance to wormers by stomach/gut roundworms infecting ruminants (cattle, sheep etc.) has been reported worldwide. The first cases were observed in roundworms associated with goats and sheep, but more recently an increasing number of cases have also been reported in cattle.

In the last decade or so, there have been many reports demonstrating resistance by the gut roundworm *Cooperia* to macrocyclic lactones (3-ML). Reports of resistance by the more significant *Ostertagia* family of stomach roundworms to the macrocyclic lactones are less common. Benzimidazole (1-BZ) resistance in *Cooperia* and *Ostertagia ostertagi* roundworms has now been reported on most continents and levamisole (2-LV) resistance has been reported in Europe and South America but is less frequent.

Evidence for resistance in Ireland

Two recently published studies report stomach/gut roundworm resistance in Irish cattle herds. In the first report in 2014, in which wormer efficacy on two beef farms was tested, treatment with ivermectin (3-ML) failed to sufficiently clear the parasite infection and the predominant resistant parasite observed post treatment was *Cooperia*. Of even more concern, given the greater pathogenic effects associated with *Ostertagia* challenge, is the recent detection of *Ostertagia* resistant to ivermectin (3-ML) in a study of four dairy farms. An additional study in dairy-to-beef farms showed that benzimidazole (1-BZ) resistance was present on 60% of farms tested, levamisole (2-LV) resistance on 18% of farms, moxidectin (3-ML) resistance on 71% of farms and ivermectin (3-ML) resistance on 100% of farms tested. Macrocyclic lactone resistance is therefore likely to be extremely common in Ireland, with resistance to the other groups also present in cattle stomach/gut roundworms and points to the need for Irish farmers to re-evaluate their worming practices.



Methods to detect Anthelmintic Resistance

The most commonly used efficacy test for detecting anthelmintic resistance is the **faecal egg count reduction test (FECRT).**

The **FECRT** test 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 2)**. The reduction in the average FEC observed between these samples provides an indication of the efficacy of the wormer used. Ideally, this response should be compared against a control group of untreated animals. Roughly 15 cattle should be allocated to each treatment group (benzimidazole, levamisole or macrocyclic lactones) or control group. Fresh faecal samples should be collected, with the same cattle sampled both times. Faecal samples are sent to the laboratory for analysis where the number of eggs per gram of faeces (i.e. the FEC) is determined individually for each animal pre- and post-treatment. Anthelmintic resistance is suspected if a reduction of less than 95% in FEC post-treatment is seen.

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 2. Sampling interval post-treatment by drug family for efficacy tests.

Requirements for FECRT

- Test animals should not have been dosed in the previous 8-12 weeks. On farms with suspected resistance, this can be done by testing calves before their first wormer treatment.
- Initially 15 animals should be used with a minimum individual FEC of 100 eggs per gram of faeces before treatment. Animals with a lower FEC on the pre-treatment sample should be excluded.
- Adhere to the recommended sampling interval post treatment for each drug family **(Table 2)**. Due to the variability in persistence in some of the macrocyclic lactones, additional sampling at later times may also be required. Consult your laboratory/private veterinary practitioner for advice.

A list of parasitology laboratories is available on the AHI website **click here**.

A basic indication of efficacy can be done by testing only the FEC post-treatment, after a suitable interval, either individually or pooled. These are often referred to as **drench tests**. 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 rate or dosage technique and a more structured FECRT may be needed to support a diagnosis of resistance. In contrast, a low FEC cannot confirm the wormer is working correctly, unless a pre-treatment sample was taken to confirm a sufficiently high initial FEC for comparison. Pooling samples will also reduce the sensitivity of the test, for example by diluting the effect of shedding individuals and this should be considered when interpreting the result.

Recommendations to slow the progression of Anthelmintic Resistance

- Develop a roundworm control strategy as part of a herd health plan
- Ensure optimal wormer administration by:
  - Choosing the most **appropriate wormer**. For example, do not use a combination roundworm/fluke product if only liver fluke treatment is needed.
  - Measuring and using the **correct dosage** rate based on the heaviest animal in a group of similarly aged animals and using calibrated dosing equipment.
  - **Correct timing** of treatment for optimum effect. For example, later in the grazing season when worm burdens are higher.
  - Ensure **good technique** as per the manufacturers instructions. For example, with oral wormers the dosing gun should be placed over the back of the animal's tongue to ensure the full dose is swallowed.
- Reduce the likelihood of inadvertently introducing resistant worms in purchased or reintroduced animals by treating with two classes of wormers and quarantining for at least 48 hours. After this time, new animals should be grazed on roundworm contaminated pastures to dilute the proportion of potentially resistant worms in the animal.
- Reduce dependence on wormers by using other management strategies e.g. silage/ hay aftermath, reseeding and mixed grazing while adopting strategies that preserve susceptible worms on the farm.
- Adopt strategies which preserve the presence of susceptible worms 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.
  - **After dosing cattle, do not immediately move animals on to 'clean' pasture.** (e.g. silage/hay aftermath). Cattle remaining on the contaminated pasture for a short period will allow for a small amount of re-infection to dilute any potentially resistant worm populations that survived the treatment. It is of no benefit to use this method if the wormer has a long persistent activity (consult your veterinary practitioner on this).
  - **Adopt a targeted selective treatment approach to treatment.** This approach involves monitoring FEC, weight gain and body condition in calves to identify which individual animals to treat.

Any farm that follows a selective treatment approach to stomach/gut roundworms would need to have daily monitoring in place for clinical signs of lungworm.

- Monitor the efficacy of anthelmintics used on your farm by conducting a drench test or a faecal egg count reduction test (FECRT).

Both stomach and gut worms will continue to present a major challenge in cattle production. As wormers have a critical role to play in controlling these parasites, practices to prolong their efficacy are needed.

TECHNICAL WORKING GROUP

James O'Shaughnessy (Chairman) - DAFM, Veterinary Laboratory Services, **Charles Chavasse** - Zoetis, **Bosco Cowley** - MSD Animal Health, **Martin Danaher** - Teagasc Food Research Centre Ashtown, **Theo de Waal** - UCD School of Veterinary Medicine, **John Gilmore** - Veterinary Practitioner, **Barbara Good** - Teagasc, Athenry, **Fintan Graham** - Veterinary Practitioner, **Ian Hogan** - DAFM, Veterinary Laboratory Services, **Orla Keane,**- Teagasc, Grange, **Mark McGee** - Teagasc, Grange, **Grace Mulcahy**- UCD School of Veterinary Medicine, **Mark Robinson -** Queen's University, Belfast, **Maresa Sheehan** - DAFM, Veterinary Laboratory Services.

TECHNICAL WORKING GROUP RAPPORTEUR

Natascha Meunier - Animal Health Ireland

4-5 The Archways, Carrick-on-Shannon, Co Leitrim N41 WN27.
Phone 071 9671928
Email nmorgan@animalhealthireland.ie
Web www.animalhealthireland.ie