Improving the diagnosis and treatment of gastrointestinal roundworms in cattle

Initial project report May 2020

Key Objectives

- Improving detection of roundworms
- Improved targeting of wormer treatments.
- Determine resistance status (or efficacy)
- Determine species of worm present
- Reducing reliance on wormers
- Improving performance
- Reduce environmental impact

Internal parasite control has long been considered an important factor in managing cattle. The industry has however largely relied on routine and regular treatments with anthelmintics (wormers) to combat this. We have learned from the sheep sector that this policy can lead to widespread resistance issues and the use of tools like FEC and efficacy testing is more commonplace in modern sheep farming than for cattle. The project is a response to concerns from three dairy farmers in Ceredigion that parasite burdens in youngstock may be affecting their growth rates and performance and the policy of routine treatments may need to be reviewed.

Background

The seeding of this project was set in 2018 when Eurion Thomas of Techion (the company behind FECPAK^{G2}) approached one of the farmers about doing a small pilot study of worm burdens in dairy heifers for a student placement. This unearthed a surprisingly high faecal egg count (FEC) in a group of calves given a moxidectin pour-on wormer 5 weeks previously (the long acting activity of moxidectin should still be effective at that point). The calves were then wormed with an oral levamisole wormer and subsequently recorded a substantial lift in growth rates. Care needs to be taken when interpreting this as it wasn't a controlled trial and the timing did coincide with the breaking of the 2018 drought. However, it was enough to get the farmer thinking about worms and their impact on performance and he was keen to investigate more. He spoke to 2 other farmers operating similar systems who were interested in being involved. Farm 1 had already started doing some FEC testing through their vet and found the results useful but wanted to do more. The other farmer also has a keen interest in parasite control having had previous problems with another parasite group – coccidia.

These conversations have formed the basis behind this project with aims to assess the extent to which using a combination of FEC data, speciation testing and predictive models can improve the management of roundworms in dairy youngstock (<24mths). The operational group is made up of the three farmers and Eurion Thomas of Techion, with technical input from Steffan Vets, Tysul Vets and Prof. Diana Williams of Liverpool University who is a leading parasitologist and advisor to the COWS group (Control of Worms Sustainably)

Farm system background

- 3 farms run similar systems
- Spring calving dairy herds
- Rely heavily on grass for production – extended grazing seasons
- Minimal supplementary feeding
- Same applies for youngstock – both R1 (1st season grazers) and R2 (2nd season grazers)
- Already monitor grass growth and daily liveweight gains in R1 and R2
- Set targets for DLWG, bulling weights and bulling dates
- Some groups of youngstock outwintered

Progress to date –

The project has been running for 9 months having started in August 2019. The farmers have been encouraged to regularly collect pooled faecal samples from both R1 and R2 groups of cattle and send them to Steffan Vets who process them using the FECPAK^{G2} system. This has started off well with a total of 32 samples tested to date. The results showed plenty of variation between farms and the group are learning how we interpret the data and use the results. We were able to complete some resistance testing using full Faecal Egg Count Reduction Tests (FECRT) on 2 of the farms with farm 1 testing 2 different wormers and farm 2 testing 4 wormers.

Results from 1st set of resistance / efficacy testing

The table shows the summary of average results. 15 individual samples were collected and analysed pre and post treatment for each treatment group and the farms vet carried out the treatment and sampling under tight protocols. The definition of resistance is if FECRT results drop below 95% e.g. if the wormer is fully effective, we

expect egg counts to drop by 95% or more. Percentages show in red text highlight tests where we are concerned with efficacy of that treatment.

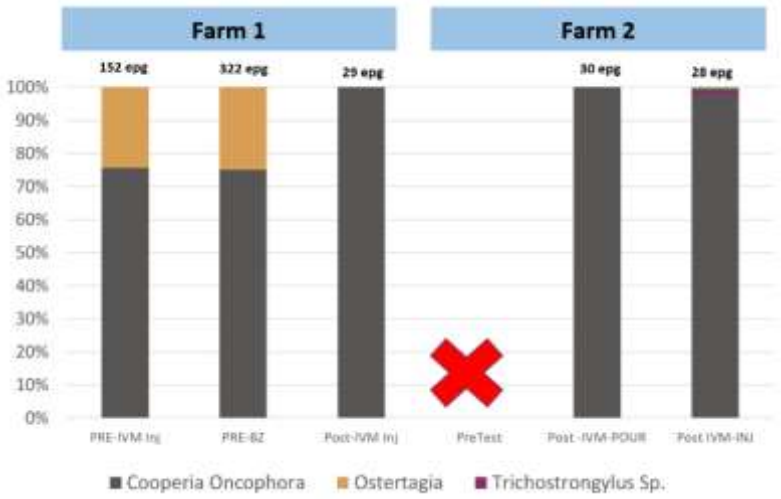
Farm	Wormer (group)	Average Start FEC	Average End FEC	% Reduction	Confidence
Farm 1	BENZIMIDAZOLE (1 BZ)	323	1	100%	High
Farm 1	IVERMECTIN Injectable (3ML)	153	29	81%	High
Farm 2	LEVAMISOLE Oral (2 LV)	43	1	98%	Low
Farm 2	IVERMECTIN Injectable (3ML)	50	28	44%	Medium
Farm 2	IVERMECTIN Pour-On (3ML)	33	30	8%	Medium
Farm 2	MOXIDECTIN Injectable (3ML)	29	4	86%	Low

Interpretation

- **Results confidence** – statistical analysis was applied, and as seen we have a high confidence in farm 1 results but lower for farm 2. This is largely due to the FEC levels at day of treatment (Start FEC) and the higher the FEC levels the more confidence we have in results.
- The good news is that Benzimidazole (white) and Levamisole (yellow) wormers appear fully effective for farm 1 and farm 2 respectively.
- More concerns lie with the 3ML group of wormers. Despite our low confidence in farm 2 results (the actual % figure) –we are confident in saying both ivermectin treatments have failed.
- For farm 2 Moxidectin Injectable - we have very low confidence that it is a failure despite the reduction % only being 86%. This was due to very low pre and post treatment FEC. At this stage this result should not concern us – but would be good to test again.

So what species of worms survived treatment?

- Additional samples were taken pre and post treatment and sent away to determine species by using Nemabiome sequencing.
- The results are represented in the graph
- The pre-test sample for farm 2 failed. But for farm 1 they show a mix of *Ostertagia ostertagi* and *Cooperia oncophora*.
- These are the 2 most common worm species and *Ostertagia* is deemed the most pathogenic and therefore performance limiting. *Cooperia* on the other hand is deemed to be of less concern, however the extent of disease impact is relatively unknown. It is also the dose limiting species of worm for the 3ML group of wormers (e.g. we could find some worms surviving a 3ML wormer and it's not down to resistance).



- In both farms the parasite species present post treatment with 3ML were *Cooperia oncophora*
- The good news here is there is no evidence of the most pathogenic worm (*Ostertagia*) surviving treatment (but we don't know for sure that it was present at time of treatment at farm 2).
- The presence of *Cooperia* after treatment does raise several questions –
  - Is the presence down to true Ivermectin resistance or just its expected lack of full efficacy?
  - The Pour-on treatment at farm 2 showed much poorer efficacy than injectable. Again, is this down to the mode of administration of the wormer rather than true resistance?
  - Does the level of *Cooperia* surviving matter in terms of stock performance?
- It's important therefore that we look at these results as being a failure in **treatment efficacy** as we can't conclude at this stage it is down to true wormer resistance.
- No significant difference has been seen in performance of different treatment groups at this stage which is not surprising considering the low levels of burdens post treatments.

Future Work –

Over the remaining two years of the project, regular FEC monitoring will continue and will be interesting to see

results over a full grazing season. More efficacy testing will be carried out and we hope to shed more light on some of the questions that have been raised already. The project will also investigate the use of contamination mapping and disease modelling.