Development of an online tool to aid farmer understanding of roundworm faecal egg counts

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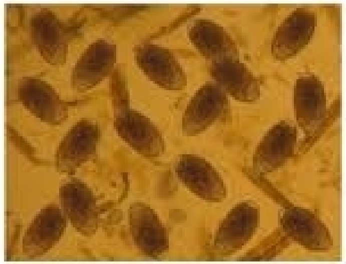
Gastrointestinal nematodes

- High welfare and economic concern for sheep industry worldwide
  - Costs meat sheep sector >£39.7million/year in UK
- Anthelmintic resistance an increasing challenge
- Diagnostics can be used to target treatments to slow resistance

Charlier et al, 2020. Preventative Veterinary Medicine, 182; 105103.

Faecal egg counts (FECs) are very useful for farmers…

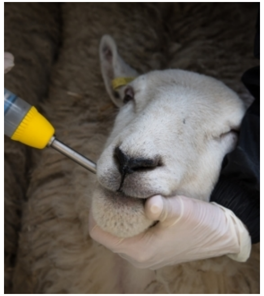
- Simple & cheap technique (~£12/sample)
- Routinely performed by: vets, private labs, independent providers & on-farm



Monitor burden

Estimate pasture contamination

Determine who & when to treat



Determine whether the treatment worked

...but results interpretation is challenging

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- Current interpretation offered with results is very variable & dependent on:
  - FEC provider
  - Previous history known?
  - Time/labour constraints

Ensuring **effective** and **accurate** interpretation is **critical** for **responsible anthelmintic use**

Making results visual & informative

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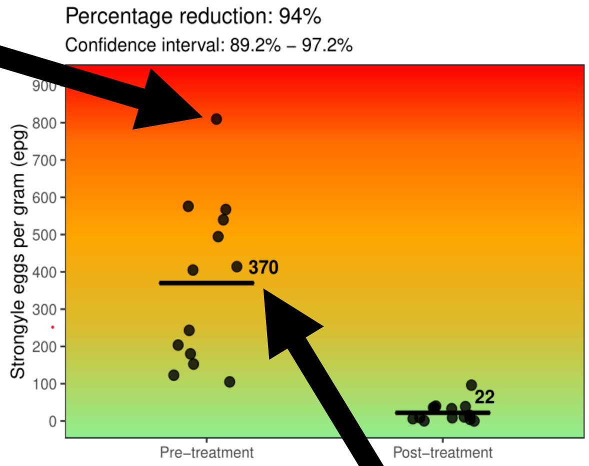
From a table...

Sample	Pre-treatment	Post-treatment
1	261	0
2	207	0
3	162	9
4	207	3
5	72	0
6	369	46
7	189	0
8	99	42
9	909	0
10	405	5
11	117	9
12	105	0
13	720	8
14	54	1
15	48	7
Average	262	9

... to a simple visual

Individual sample result



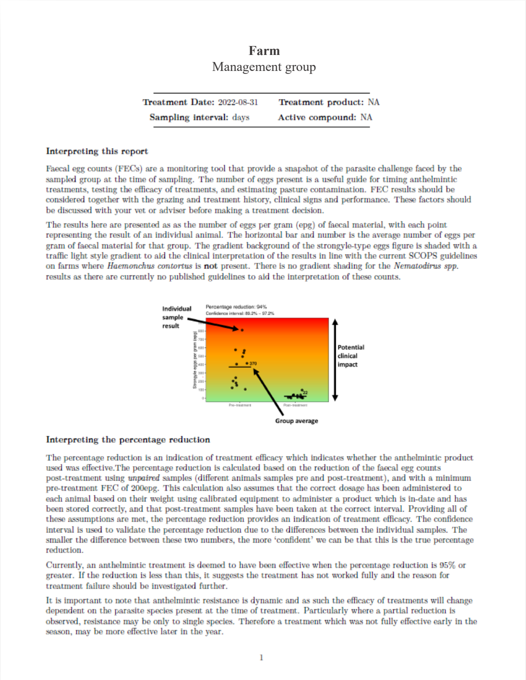
Potential clinical impact

Group average

FEC reporting – from the lab to the field

- Semi-automated PDF reporting in **R Markdown**
  - From lab to report in <2 minutes
- Report template trialled with 9 farmers for >1 year

Can we scale this up to make it a useful tool for the wider industry?



Farm
Management group

Treatment Date: 2022-08-31 **Treatment product:** NA
Sampling interval: days **Active compound:** NA

Interpreting this report

Faecal egg counts (FECs) are a monitoring tool that provide a snapshot of the parasite challenge faced by the sampled group at the time of sampling. The number of eggs present is a useful guide for timing anthelmintic treatments, testing the efficacy of treatments, and estimating pasture contamination. FEC results should be considered together with the grazing and treatment history, clinical signs and performance. These factors should be discussed with your vet or adviser before making a treatment decision.

The results here are presented as as the number of eggs per gram (epg) of faecal material, with each point representing the result of an individual animal. The horizontal bar and number is the average number of eggs per gram of faecal material for that group. The gradient background of the strongyle-type eggs figure is shaded with a traffic light style gradient to aid the clinical interpretation of the results in line with the current SCOPS guidelines on farms where *Haemonchus contortus* is **not** present. There is no gradient shading for the *Nematodirus spp.* results as there are currently no published guidelines to aid the interpretation of these counts.

Interpreting the percentage reduction

The percentage reduction is an indication of treatment efficacy which indicates whether the anthelmintic product used was effective.The percentage reduction is calculated based on the reduction of the faecal egg counts post-treatment using *unpaired* samples (different animals samples pre and post-treatment), and with a minimum pre-treatment FEC of 200epg. This calculation also assumes that the correct dosage has been administered to each animal based on their weight using calibrated equipment to administer a product which is in-date and has been stored correctly, and that post-treatment samples have been taken at the correct interval. Providing all of these assumptions are met, the percentage reduction provides an indication of treatment efficacy. The confidence interval is used to validate the percentage reduction due to the differences between the individual samples. The smaller the difference between these two numbers, the more 'confident' we can be that this is the true percentage reduction.

Currently, an anthelmintic treatment is deemed to have been effective when the percentage reduction is 95% or greater. If the reduction is less than this, it suggests the treatment has not worked fully and the reason for treatment failure should be investigated further.

It is important to note that anthelmintic resistance is dynamic and as such the efficacy of treatments will change dependent on the parasite species present at the time of treatment. Particularly where a partial reduction is observed, resistance may be only to single species. Therefore a treatment which was not fully effective early in the season, may be more effective later in the year.

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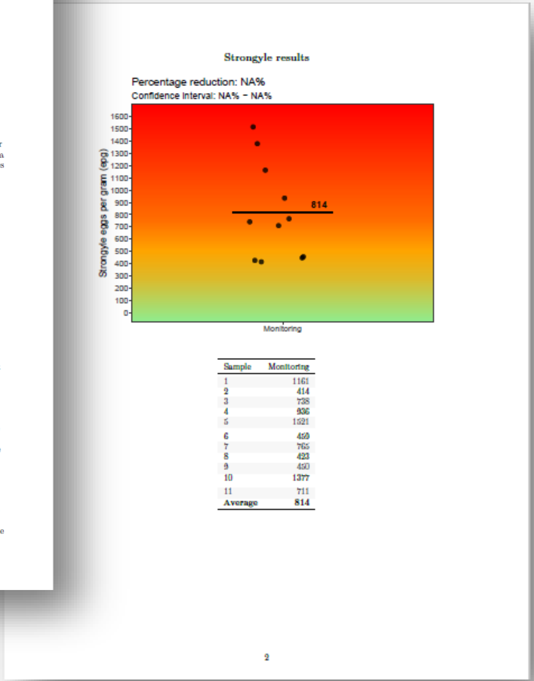


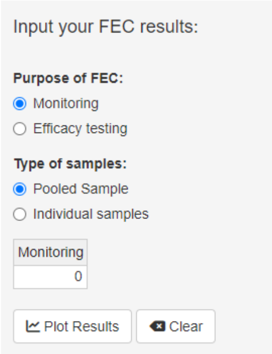
Strongyle results

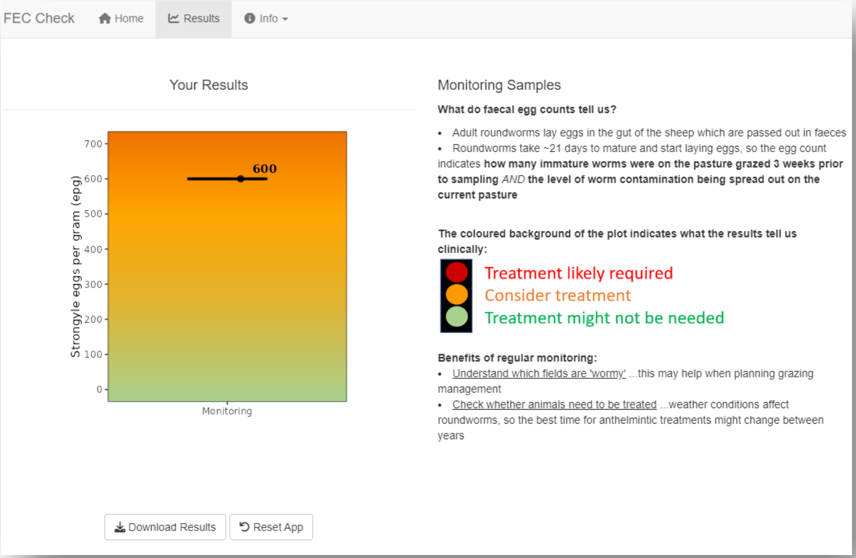
Sample	Monitoring
1	1161
2	414
3	738
4	936
5	1521
6	459
7	765
8	423
9	450
10	1377
11	711
Average	**814**

2

Creating an online app for FEC results

- Prototype designed in R Shiny
- Farmers input results – receive **easy visual** accompanied by **relevant advice and resources**





Co-developed with farmers, vets and advisors

- 4 focus groups held with 37 stakeholders
- Positive response to tool
- Identified need for greater accessibility + mobile compatibility

"If I have the app, I am more likely to do FEC more often if I can build a bigger history which will provide me with a better understanding"

"Great tool for people doing FEC at home"

"App finetunes it all"

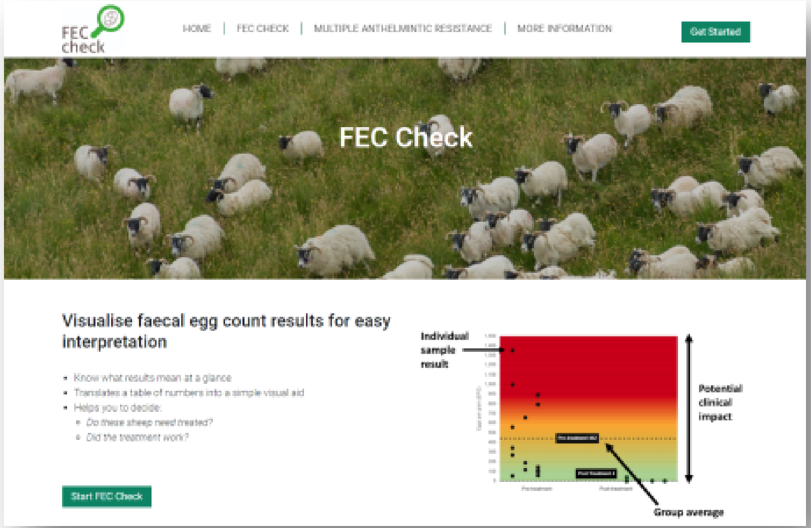
The result: FEC Check

SEFARI Gateway
Veterinary Medicines Directorate
SRUC
Moredun

- Tool integrated into Moredun website (established source of knowledge in UK with > 13 000 members)

- Improved useability and new features
  - Post-drench check
  - Inclusion of gradient-free option for visualising *Nematodirus* FEC results
  - Improved resources

- Includes decision tree for managing multiple anthelmintic resistance
- Currently only for sheep



https://app.moredun.org.uk/fec

Try FEC CHECK

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Dissemination

- Launched in May 2023
- **> 150 users per month**
- Received Royal Highland Show’s Technical Innovation Award

https://app.moredun.org.uk/fec

Try FEC CHECK

FEC Check: Standardised FEC results

Veterinary Medicines Directorate
SRUC
Moredun
SEFARI Gateway

- FEC Check offers standardised approach to FEC results interpretation

- Provides farmers with information and resources to make their own **evidence-based decisions**

- In future, addition of longitudinal data and in-app storage could promote long-term monitoring

> *"We as farmers need the ability to turn data, into information, into knowledge and that is what an app should be able to do."*

Try FEC CHECK

https://app.moredun.org.uk/fec

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FEC check

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