Bryony Sands, UVM Extension, September 2025.

Fecal Egg Counting: Test don't guess!

Fecal Egg Counts (FEC) are used to measure the number of internal parasite eggs in fecal samples of livestock. They are most commonly used to determine the number of gastrointestinal nematodes (GIN) but will also show coccidia, tapeworms, and fluke. The results of FEC tests should be interpreted with caution because limitations exist. For example, the output of eggs is not perfectly correlated with the actual worm burden in the animal, worm eggs are often clumped in fecal samples so if they are not thoroughly mixed the results can be variable, and FEC indicates the number of egg-laying **adult** worms in the gut, so infections with immature larvae will not be picked up. Nevertheless, FEC is a very useful tool for several purposes:

- Early detection and monitoring of healthy animals, giving the opportunity to make timely interventions that minimize production losses.
- Diagnosing disease in animals with clinical signs.
- Monitoring pasture contamination to understand the risk associated with different areas of a farm.
- Assessing treatment efficacy and detecting resistance to treatments (using the Fecal Egg Count Reduction Test FECRT).
- Ensuring the responsible use of treatments to minimize negative environmental impacts – i.e. only treating when it is necessary.

Fecal egg counting is a way that we can ensure we are using treatments responsibly – *as much as necessary but as little as possible*.

You can get FEC done with your veterinarian or a commercial laboratory service. You can also do them at home yourself using various approaches such as the McMaster system or mini-FLOTAC. Different techniques have different levels of precision, so you can decide which is most appropriate for your needs.

Taking a fecal sample

You can take fecal samples from individual animals, or you can pool samples from the whole herd to assess the infection level of a group that are grazing together. Fresh dung is essential; however you do not need to collect it directly from the rectum unless you need samples from individual animals. The dung is ideally less than one hour old, so you can collect animals into a corner and hold them there for a few minutes, picking up fresh dung when they move away. You can also watch animals when they get up from lying down because they will often drop fresh dung then.

Taking pooled samples:

- Collect 10 – 15 samples to give sufficient representation from the group.

- Collect the same amount from each animal to avoid bias – each sample should be at least 3g (around the size of a heaped teaspoon). Samples for individual tests should be larger – around 5g.
- Select samples at random, do not pick out particular dung types or consistencies.
- Mix induvial samples thoroughly before combining them together. Eggs can be clumped within each sample so the more mixing the better.

Sample storage:

- Aim to perform FEC as soon as possible after collecting samples.
- If there is a delay, keep samples refrigerated or in a cool box. This helps to slow the development of eggs.
- If samples are stored for too long, eggs will start to hatch and the results of the FEC will be inaccurate.
- Do not perform FEC on samples that have been stored (in the refrigerator) for more than 3 days. Collect new samples.
- Do not perform FEC on samples that have been stored at room temperature for more than 12 hours.

Performing the FEC – McMasters method

McMaster is the most commonly used, easiest, and cheapest method of FEC. It is not very sensitive to egg counts under 100 eggs per gram of feces (EPG), but this is usually acceptable for general monitoring and making treatment decisions on farms. A kit can be purchased from FEC Source (https://www.fecsource.com/our-products).

Equipment:

- McMasters slide
- Microscope with mechanical stage
- Two 50 mL beakers
- Pipettes
- Tweezers
- Flotation solution (can be bought ready-made, or you can make your own saturated salt solution: add salt (350g) to hot water (1000mL) while stirring vigorously until no more salt will dissolve. Leave overnight to cool and ensure it is saturated – you may be able to add more salt! You want there to be some salt left at the bottom to show it is saturated. **Do not use warm solution for FEC – leave to cool**).
- Scales accurate to 0.1g
- Fresh fecal sample
- Gloves
- Tea strainer or fabric strainer

Methods:

Note: different McMasters kits may use different ratios of flotation solution to dung. This method will use 4g dung and 26mL solution. Other methods may use 2g dung and 28mL solution. The ratio will affect the **multiplication factor** used at the end to work out the total fecal egg count so be sure to follow the specific instructions for whichever kit you get.

1. Thoroughly homogenize dung sample. You can do this by crushing it and kneading it inside the bag or even inside the glove if you took a rectal sample. It is very important that the dung is properly homogenized, especially if it is a pooled sample.
2. Tare one beaker on the scale.
3. Weigh out 4g dung.
4. Pour 26 mL flotation solution into the beaker and leave to soak for 5 minutes.
5. Using the tweezers, crush and mix the sample thoroughly so that no clumps remain.
6. Place the tea or fabric strainer over the second beaker and pour the mixture through.
7. Immediately transfer the solution into the McMaster slide, filling both chambers, using a pipette. **Never** pipette after the sample has been sitting for any amount of time because parasite eggs will float to the surface and you will not get an accurate reading. The method relies on the solution being thoroughly mixed so that eggs are evenly distributed through it. If you do let the solution sit, thoroughly mix it in an X shaped motion before using the pipette to transfer it to the slide.
8. Let the McMaster slide sit for 10 minutes to allow parasite eggs to float to the surface of the slide.
9. Place McMaster slide on to the microscope stage and read adjust to the 10X magnification setting.
10. Count all eggs inside the grid lines for both of the chambers, always starting at the same place on the slide so that you don't forget which direction you are scrolling!
11. You can count strongylid type eggs, Nematodirus, Strongyloides, tapeworm, and Coccidia separately (see pictures below). It is not possible to differentiate between different types of strongylid eggs, for example it is not possible to get a count of *Haemonchus contortus* (barberpole worm) alone. A special procedure is required for this and you will need to talk to your veterinarian.
12. You can calculate different types of eggs separately but the most meaningful group is the stronygylid type eggs. Total the number of strongylid eggs in both chambers of the slide and then calculate the number of Eggs Per Gram of feces (EPG):

Eggs per gram feces (EPG) = (chamber 1 + chamber 2)*25

The multiplication factor of 25 is specific to the ratio of 4g feces to 26mL flotation solution. If you change the ratio, you must change the multiplication factor!

In this method, with a multiplication factor of 25, each egg on the slide represents 25 EPG so the procedure will not detect readings lower than 25 EPG, and only in increments of 25 EPG. This is adequate for most purposes, but a more sensitive method is the mini-FLOTAC technique outlined below.

Performing the FEC – mini-FLOTAC method

The mini-FLOTAC method is a more sensitive technique that can detect parasite egg counts down to 5 EPG. This can be useful for research purposes or investigating impacts of subclinical levels of infection when more precision is needed. The equipment required was developed by Professor Giuseppe Cringoli at the University of Naples, Italy, and can be purchased directly from their lab (www.parassitologia.unina.it). You will need both the mini-FLOTAC and fill-FLOTAC equipment.

Equipment:

- Gloves
- Scales (accurate to 0.1g)
- Mini-FLOTAC kit
- Fill-FLOTAC kit
- Microscope
- Flotation solution (see McMaster method above for details)
- Fresh fecal samples

Methods:

1. Thoroughly homogenize fecal sample (see McMasters method above).
2. Pour 45mL flotation solution into the mini-FLOTAC beaker.
3. Weigh out 5g dung on scales.
4. Place 5g dung into the beaker with the solution and screw the lid on.
5. Homogenize the dung and solution by pumping the conical mixer up and down while turning it left and right. The sample must be thoroughly mixed with no clumps of dung left. Make sure all fecal material is suspended in the solution.
6. Place the pipette tip that came with the kit onto the lateral hole. Invert the beaker 5 times to ensure the suspension is thoroughly mixed, and then **immediately** fill the flotation chambers of the mini-FLOTAC disc. **Never** fill the chambers after letting the solution sit for any amount of time because parasite eggs will have floated to the top and the results will not be accurate. If you do let it sit, mix and invert the beaker 5 times again before pipetting.
7. Invert the beaker 5 times in between filling each of the two chambers, hold the mini-FLOTAC disc at an angle of 45˚ when filling to prevent the formation of air bubbles, and slowly fill the chambers through the filling holes until a meniscus is formed.
8. Let the disc sit for 10 minutes to allow parasite eggs to float to the surface.

9. Use the key to turn the reading disk clockwise until it stops and remove the key.
10. Place the disc under the microscope at a magnification of 10X and count the number of parasite eggs in both chambers (see McMasters method above).
11. Always read the chambers/grids in the same direction so that you don't loose track of what you have counted when scrolling!
12. Total the number of eggs in both chambers and calculate the numbers of parasite eggs per gram of feces:

Eggs per gram feces (EPG) = (chamber 1 + chamber 2)*5

Fecal egg count reduction test (FECRT) method

One of the most useful applications of the FEC test is to find out how well worming treatments have worked and if there are resistant worms in the group of animals. It calculates the percentage of parasites that survive treatment after any given medication.

- FEC is carried out **before** and **after** treatment.
- If the treatment is effective there should be a ≥95% reduction is FEC.
- The timing of the post-treatment FEC depends on the drug that is administered but is mostly 10-14 days after treatment (except levamisole which should be tested 7 days after treatment).
- To calculate the percent reduction in parasite eggs, use the following formula:

% Fecal Egg Count Reduction = (1 – (post-treatment FEC / pre-treatment FEC))*100

Example: I test my group of lambs and they have a FEC of 700 EPG. I treat them with ivermectin. I wait 14 days, and then test the group again. They now have a FEC of 200 EPG. The FECRT calculation is:

% FECRT = (1-(200/700))*100

→ 71%

This indicates that there are ivermectin resistant worms in the group because the percentage reduction in parasite eggs is lower than 95%. The treatments will become less and less effective over time because resistant worms will survive on pastures and re-infect the animals. Action should be taken to slow the development of resistance and find effective wormers.

Interpreting FEC results

It is important to discuss goals with your veterinarian. Each farm is different and there may be different levels of parasites that are acceptable. However, as a general rule of thumb the following parameters may be used:

Sheep:

Worm egg count	Comment	Action
50 – 350 EPG	Light infestation	Treatment not necessary
400 – 600 EPG	Moderate infestation	Treatment may be beneficial
650 – 1000+ EPG	Heavy infestation	Treatment is necessary

Cattle:

Worm egg count	Comment	Action
50 – 100 EPG	Light infestation	Treatment not necessary
200 – 700 EPG	Moderate infestation	Treatment may be beneficial
700 – 1000+ EPG	Heavy infestation	Treatment is necessary

It is important to note that if you detect a moderate or high FEC in a group of animals using pooled samples, you may not need or want to treat the whole group. You can investigate further using individual FECs and observing clinical signs to decide which animals to treat.

Best practice – Test don't guess!
Treat as much as necessary but as little as possible.

Identifying parasite eggs in FEC

Slides usually contain very small air bubbles, plant debris, and sometimes pollen. Once you have done a few egg counts you will quickly get used to what is an egg and what is not! It is possible to identify a few different egg types:

- Strongylid type eggs
- Trichuris
- Nematodirus
- Monezia (tapeworm)
- Strongyloides
- Coccidia

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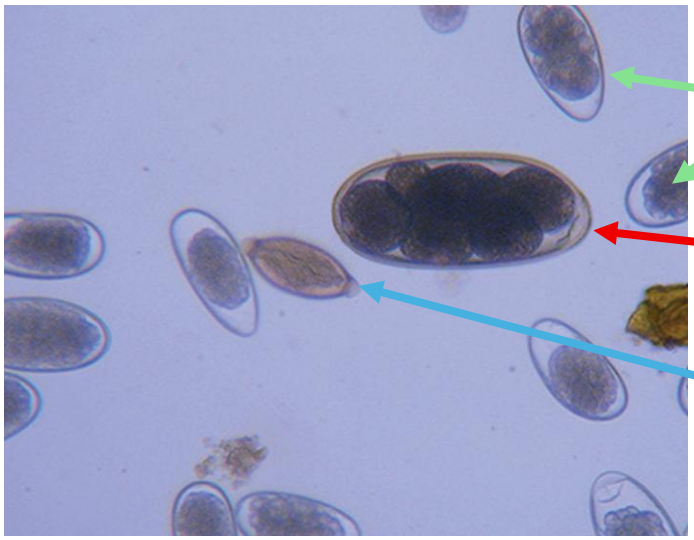


A very clean sample showing:

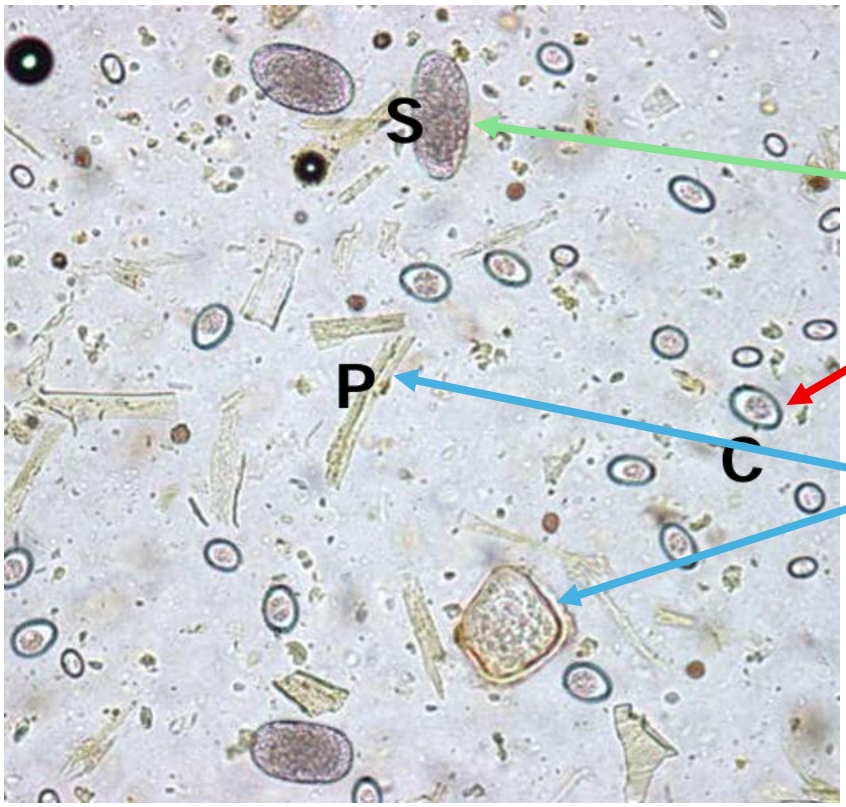
Strongylid type eggs

Nematodirus

Trichuris

Nematodirus is much larger than strongylid type eggs and contains large distinct blastomeres.

https://www.scops.org.uk/workspace/pdfs/vet-times-article-on-maximising-fecs-october-2024.pdf



A mixed infection with some plant debris present (common):

Strongylid type eggs

Coccidia

Plant debris

Coccidia are much smaller than strongylid eggs and can look ovoid or circular.

https://web.uri.edu/wp-content/uploads/sites/241/McMaster-Test_Final3.pdf

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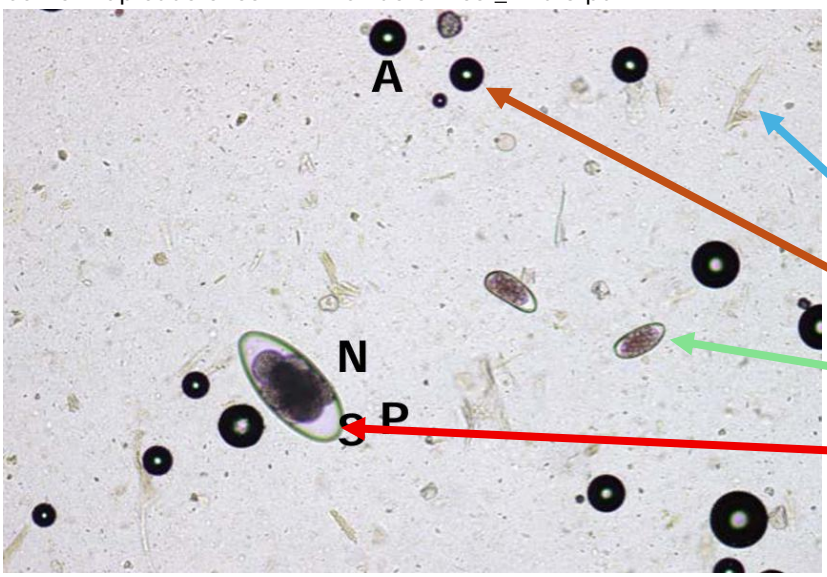
Photos on this page from: https://web.uri.edu/wp-content/uploads/sites/241/McMaster-Test_Final3.pdf



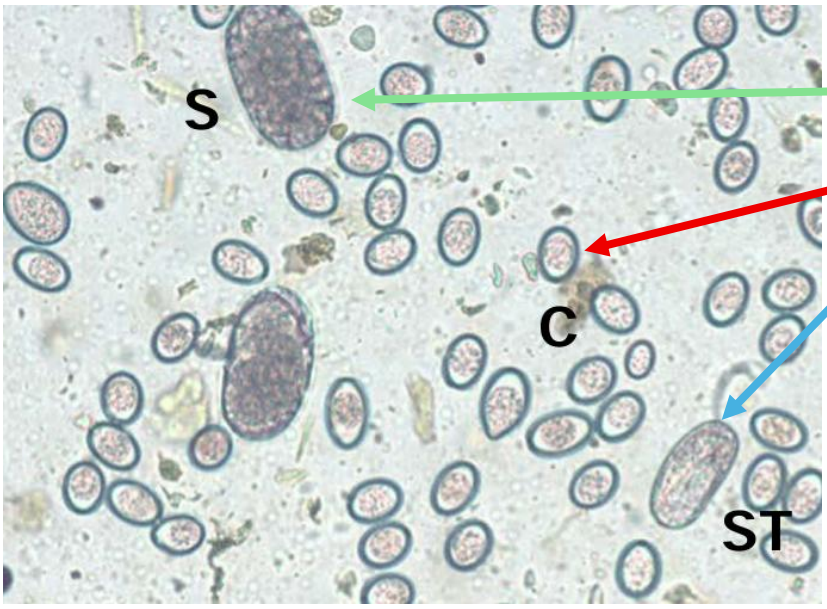
A mixed infection with plant debris and air bubbles present in the slide (common):

Plant debris

Air bubble

Strongylid type eggs

Nematodirus



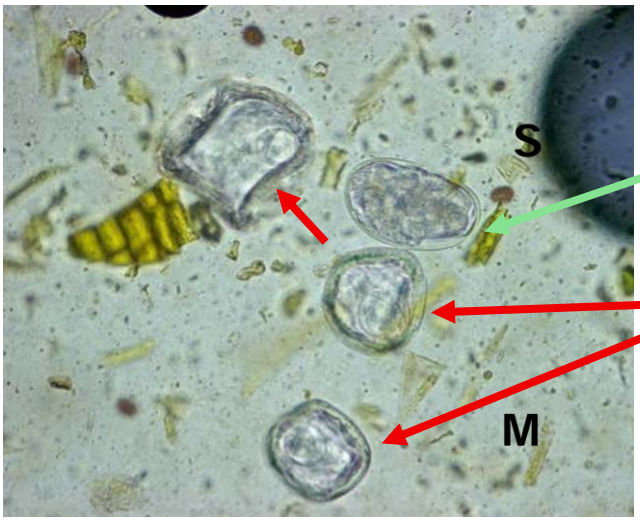
Mixed infection containing:

Strongylid type eggs

Coccidia

Strongyloides

Strongyloides can be distinguished from other eggs because it contains a living larva which can often be seen moving inside the egg!



A mixed infection containing plant debris:

Strongylid type egg

Monezia (tapeworm)

Monezia are a similar size to strongylid eggs but they are irregularly shaped and triangular or quadrangular.