

Faecal Egg Counts

WHAT IS A FAECAL EGG COUNT?

A Faecal Egg Count (FEC) is a method of determining how many internal parasite eggs are present in a particular dung sample. It may also be possible to determine the different types of worms or other parasites present. This information can be used to determine whether or not an anti-parasitic treatment is needed.

If an animal has internal parasites the eggs produced by the adult parasites are often passed out in the dung. If eggs are found in a fresh dung sample it shows that worms are present in the animal. The number of eggs found can provide a useful indication of the level of parasite infection. However, as you will see below, there are various factors that can affect the correlation between egg count and actual parasite burden.

In addition to helping with decisions about whether or not to treat animals, the FEC can be used to check if resistance to particular anthelmintic treatments is developing. A test before and after treatment can help to identify whether a particular anti-parasite product was effective.

The FEC technique was originally developed for use in sheep but can be used for cattle, horses, pigs, poultry, and other species. The number and type of eggs found that should trigger treatment are different for each species.

WHAT IS INVOLVED?

First you need to collect a fresh dung sample - an older sample could have been affected by the weather or contaminated with nematodes that live in the soil. If you walk quietly through a field of resting animals you should be able to encourage individual animals to stand up, at which point they will often defecate, providing you with a fresh sample. Alternatively, you might bring a group of animals into a clean yard or pen, hold them for 10–15 minutes, and collect the samples they have left.

If you collect samples it is important to exclude as much air as possible. If the air has contact with the dung the eggs may start to develop into larvae – as they would do if the dung was left on the pasture – and this will affect the result of the count. So if you use an air-tight pot try to fill it right to the top before sealing with the lid. If you collect in a bag tie it tightly to keep the air out. Once you have your sample, label it as a reminder of which animal or animals it came from and when it was collected, and keep it cool. The sample should ideally be examined within 48 hours of collection.

You may have the equipment on farm to carry out a count yourself, or you can send off your sample for analysis. Carrying out your own tests gives instant results and the flexibility to carry out more tests. You might therefore

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test more often, or choose to test particular groups of animals – for example, you might test animals in different age groups or animals with different body condition to see if some groups are carrying a higher worm burden than others.

The cost of the test – whether this is buying the equipment or sending samples to be tested – is likely to be recouped fairly quickly through improved monitoring and management of parasites facilitated by the test results.

HOW IS THE TEST CARRIED OUT?

A measured amount of the dung sample is added to a measured amount of a solution (a flotation fluid) that allows the parasite eggs to float to the surface. The mix needs to be carefully measured so the results can be translated into a final 'eggs per gram' (or epg). The dung and the solution are mixed well and then strained through a sieve or cheesecloth to get rid of as much debris as possible.

The filtered solution is then stirred again and a small sample drawn off with a syringe or pipette for examination right away (eggs will start to float to the top as soon as the mix is left undisturbed). The sample is placed into a counting slide which normally has two chambers, each with a grid etched onto the top surface. One chamber is filled, the solution is stirred again and then the second chamber is filled. The sample is then allowed to stand for a short while – normally a few minutes – to allow the eggs to float to the surface where it is easier to see them under a microscope.

Eggs that can be seen under the etched grid are then counted and identified, as necessary. The quantities of dung and flotation fluid that are mixed together determine the multiplication factor that is applied to the egg count result to give a final 'eggs per gram'.

WHAT DOES THE RESULT TELL YOU?

As mentioned above, the result of FEC gives a guide to the parasite burden that the animal or animals are carrying but it is not exact. In other words, a low count may not necessarily mean there are a low number of worms in the animal and vice versa.

Other factors affecting the numbers of parasitic worms found in a dung sample:

- Eggs are only produced by fertile adult female worms, so if the animal is carrying large numbers of immature worms the egg count will be low
- The number of eggs each adult female worm produces varies with factors affecting the host animal, such as stress or producing milk to raise offspring (which will increase the number of eggs produced) or immunity (which will decrease the number of eggs)
- The age of the animals can also affect the result. Older animals tend to have greater resistance to internal parasites, so the correlation between

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number of parasites and worm egg count is not always as clear as with younger animals

- The forage or feed the animals are eating can have an effect. High tannin forages such as bird's foot trefoil can reduce egg counts
- If animals have recently been wormed the levels of worm eggs should be lower. Other veterinary treatments can also have an effect – for example, corticosteroids may increase egg counts
- The concentration of eggs in the dung will be influenced by the daily volume of faeces produced by the host, the rate of passage of the food through the gut, and the distribution of eggs throughout the dung
- Some types of parasite egg are heavier than others and may not float as well – and could therefore be missed in the count
- If animals are starved or do not eat for 24 hours, the count may be increased. Scouring can depress the egg count
- Some species of worms produce more eggs per individual worm than others, and therefore a significant egg count for one species does not necessarily relate to another. This is particularly so for the barber's pole worm (*Haemonchus contortus*) which becoming more of a problem in the UK. Some worm species may also produce eggs intermittently.

HOW CAN YOU TELL WHAT WORMS ARE PRESENT?

Worm eggs are usually quite easy to recognize. They are much larger than other items that might be seen under the microscope, such as coccidial oocysts or grains of pollen. The main types of worm eggs that you might see for sheep and cattle include nematodirus and strongyles, such as ostertagia. Eggs from the nematodirus group are particularly distinct as they are dark in colour, typically red/brown with dark discs inside a double-layered outer shell. The other trichostrongylus species are less eye catching as they are a transparent grey in colour and not as big. Some eggs from different species are indistinguishable (particularly trichostrongylids and strongylids). This complicates clinical interpretation as some species such as haemonchus produce many more eggs per day than others, such as ostertagia. If full identification is necessary the faecal sample must be cultured to allow the larvae to develop for further examination. This would have to be carried out by your vet or whichever agency carried out the count and would take a further 10–14 days.

The appearance of the dung can also give an indication of the possible worm species that are present. Pelleted faecal samples with moderate to high FEC are generally indicative of barber's pole worm infections, while dark, foul-smelling diarrhoeic faeces are suggestive of trichostrongylus infections (see reference to the 'SCOPS' booklet below).

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WHEN SHOULD I TREAT SHEEP?

Eggs per gram overall	Implications of the result
0–200	A good result. The only time you might contemplate drenching is if nematodirus is present in a sample from young lambs.
200–500	<p>Productivity losses and scouring may be occurring, especially if the counts are dominated by scour worms rather than barber's pole worm (which tends to constipate). Depending on prevailing weather conditions and other factors, you may consider drenching or repeating a faecal egg count in about four weeks. A stable FEC level during mid season may show that the host animal is dealing adequately with the parasite challenge.</p> <p>However, if conditions favour increasing numbers of larvae on pasture, or there are signs consistent with parasitism – including scouring, anaemia or ill-thrift – the treatment may be required. Likewise if stocking rate is high, weather conditions are conducive to epidemics (warmth, rain, humidity) then treatment may be necessary.</p>
500–1000	This range of counts is entering the 'high' range. Production losses could become significant – particularly in young lambs with no immunity (around 3–4 months of age). Scour worm burdens could be quite significant, and the stage may be set for a rapid escalation in numbers of barber's pole worm if conditions are warm and moist. In any case, treatment with an effective drench could well be required.
1000–1500	These counts are into the high range. Production losses could be quite significant and clinical signs – especially related to scour worms – may be quite obvious. Treatment is likely to be required.
1500+	Production losses are likely to be severe. Treating with a highly effective drench and then later moving to a low risk paddock is clearly a priority.
Nematodirus eggs	Numbers are often low (<100 epg) but can be a cause of significant ill health in young lambs, occasionally with few or no eggs in the faeces. Counts >200 epg should be investigated promptly. The egg laying capacity of nematodirus is poor and severe clinical signs may be seen before appreciable numbers of eggs are present in the faeces.
Liver fluke egg counts	Any egg count can be significant. Counts in sheep >50 epg are considered high

Infections with one parasite only are rarely seen and the additional effects of mixed infections will require assessment. The potential risk from immature stages of the parasite that won't be picked up by egg counts should always be considered. This is of particular significance with nematodirus,

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ostertagia, and *Fasciola hepatica*.

WHEN SHOULD I TREAT CATTLE?

Faecal egg counts are usually much lower in cattle than in sheep. As a rough guide, a count above 150–200 epg would probably indicate a need to treat – particularly in younger cattle.

If the eggs found in the FEC are divided into their particular types the following results would potentially have an effect on the health and welfare of cattle aged up to around 18 months.

Type of worm	Epg that could indicate a need to treat
Barber's pole worm <i>Haemonchus</i>	200
Black scour worm <i>Trichostrongylus</i>	50
Brown stomach worm <i>Ostertagia</i>	150
Nodule worm <i>Oesophagostomum</i>	100
Intestinal worm <i>Cooperia</i>	500
Liver fluke <i>Fasciola</i>	>5

WHAT ABOUT LIVER FLUKE?

As can be seen from the tables above, the relationship between fluke found in faecal egg counts and numbers of adult flukes the animal is infected with is poor. Even low egg numbers indicate that the animals have been exposed to infection – and that control and treatment programs are needed.

It is worth noting that flukes do not produce eggs until 12–16 weeks after infection. By this time, immature flukes could have caused considerable damage. If you suspect liver fluke, a blood test can detect antibodies produced in response to fluke infections from as early as two weeks after infection.

WHAT ABOUT COCCIDIOSIS?

Coccidial oocysts can be counted as part of a faecal egg count. They are much smaller than worm eggs. However, the numbers of oocysts that might trigger a need to treat is far higher than the numbers of worm eggs shown above. There could be hundreds of thousands of coccidial oocysts without any sign of clinical infection. You probably need to get a result showing

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around a million oocysts per gram of faeces before you need to worry about treatment – but of course you should look at the condition of the animals and take advice from your vet too.

WHEN SHOULD I TREAT PIGS?

As noted above, there are a lot of factors that can affect the accuracy of FEC. In pigs, the relationship between egg counts and actual worm burden seems even less clear than for cattle and sheep. There are several research papers that show false positive results can be quite common, particularly for the ascarid worm. The ascarid worm is the most common found in pigs and is often detected from the presence of white scarring on the liver found at the abattoir, known as 'milk spot'.

The good news is that the correlation between FEC results and actual worm infection seems to be much higher in outdoor pig systems than in indoor systems. It is not totally clear why this can be a problem but the fact that pigs indoors can root around and ingest faeces in the pen may account for some of the anomaly.

In young pigs up to around four months old any result over about 50 epg may mean that treatment is needed as young pigs can carry quite high worm burdens without many eggs being shed. For older pigs a result of less than 100 epg is unlikely to be significant. However, because of the potential lack of correlation between egg count and infection you should not rely on FEC as the sole reason for treating pigs. The body condition, the growth rate and other symptoms like coughing should all be assessed as well – note that ascarid worms migrate through the lungs as part of their life cycle and can increase coughing.

GROUP VERSUS INDIVIDUAL EGG COUNTS

Group egg counts

In most instances you will take dung samples from a number of animals and make a decision on treatment based on the average results from these. There can be a great deal of variation in epg results from individual animals grazing together under the same management regime, so only collecting samples from one or two animals could give a result that does not represent the worm burden in the group.

Ideally, you should aim to take samples from at least 10 animals. This can be mixed together to form a bulk sample for one test to be carried out. Alternatively, a more expensive option would be to test the 10 samples individually and then determine an average from these. The advantage of the latter is that you will be able to see the highs and lows from the individual counts and get an idea of the range of infection, as well as having an average result.

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The group worm count will tell you the level of worms within the group and therefore whether or not they should be treated. But if you test groups of animals from particular fields you may also be able to build up a picture of the potential worm infection from different areas of your farm. Some fields may carry a higher worm burden than others and being able to identify these can help with management decisions, such as where to put the most susceptible animals without putting them at risk. For example, freshly weaned lambs should go onto your cleanest pastures. A group worm count can also be used to see if you have any potential problems with wormer resistance (see section below).

Individual egg counts

Despite the drawbacks of individual testing noted above, some breeders are carrying out individual faecal egg counts to aid in breeding decisions. Certain breeds, such as the Lleyn sheep, seem to have a higher resistance to internal parasites than others. But whatever the breed there will be some animals that have greater or lesser resistance to internal parasites.

Resistance to internal parasites – the ability of an animal to suppress the establishment or development of a worm infection and so shed fewer eggs – can be inherited. So, if you can identify individual animals that shed far fewer worms than the average of the group, they are likely to be most useful to keep if you are trying to breed for worm resistance. Conversely, identifying those animals that are shedding the most worms – and in some populations 80% of the worm eggs will be produced by 20% of the individuals – may aid in culling decisions.

WHEN IS IT IMPORTANT TO CARRY OUT FEC?

For sheep, there are some key times when FEC can be particularly useful. We know that the worm egg count will rise around lambing time when the ewes are under stress. Testing at this time gives an idea of the level of increase of worm eggs and will help determine the parasite burden that will therefore be present in the lambing field.

Lambs will not show significant infection from pasture until around five or six weeks of age – in fact, some advice suggests that FEC is not worthwhile until lambs are at least 10 weeks of age. Ideally, FEC samples should be taken every four to six weeks after this time to monitor any increase in epg and give warning of any potential worm infection. If epg shows a big jump from one sample to the next, but lambs still look OK, you may want to take another test at a shorter interval to find out what is happening. Be aware that stress – such as torrential rain for a day after several weeks of good weather – can affect the FEC result giving an artificially high epg.

Suckled calves should have a FEC carried out in the autumn to find out what level of infection has come from summer grazing and to ensure calves are not going into the winter with a high level of worms that could affect health and welfare.

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USING FAECAL EGG COUNTS TO CHECK FOR RESISTANCE

FEC can be used to check the efficacy of a wormer and to determine whether there is any resistance to particular wormer groups used. The simplest way of doing this is to collect dung samples from 10 sheep in the group that you are going to treat on the day that you give them their dose of wormer. You then need to take another 10 samples several days after treatment to check whether the wormer was effective.

The type of wormer used will determine the number of days after treatment that the second sample should be taken. For benzimidazole (white drench) wormers the second sample should be taken 7–10 days after treatment; for levamisoles (yellow drench) seven days; and for avermectins and moxidectins 14–16 days. The difference between the two test results shows the level of reduction that has been achieved. If the level of reduction is less than 95% – that is if more than 5% of the worms have survived – there is a potential resistance problem and you should take advice from your vet as to your next steps.

REFERENCES

Soil Association (2006) Managing internal parasites in organic cattle and sheep.

Sustainable Control of Parasites in Sheep (SCOPS):

www.defra.gov.uk/foodfarm/farmanimal/diseases/control/documents/scops-technical-manual-0903.pdf

The RVC/FAO Guide to Veterinary Diagnostic Parasitology provides visual advice on the different worm eggs from different species:

www.rvc.ac.uk/review/Parasitology/RuminantEggs/Common.htm

www.rvc.ac.uk/review/Parasitology/poultrEggs/Common.htm

www.rvc.ac.uk/review/Parasitology/pigEggs/Common.htm