



Fecal Egg Counts is one of a range Animal Welfare Approved technical papers designed to provide practical advice and support to farmers. For more information, visit our website.

SHORT DESCRIPTION OF TECHNICAL PAPER CONTENT

About this technical paper

This technical paper provides farmers who are participating in the Animal Welfare Approved program with information fecal egg counts. Key topics include what is involved in fecal egg counts, interpreting the results, how to set up on-farm testing facilities and which laboratories will carry out the test on behalf of farmers.

KEYWORDS

Fecal egg count, worms, eggs per gram, treatment, laboratories

About Animal Welfare Approved

Acknowledged by Consumer Reports as the only “highly meaningful” food label for farm animal welfare, outdoor access and sustainability, Animal Welfare Approved (AWA) is an independent, nonprofit farm certification program. We audit, certify, and promote independent family farmers across the U.S. and Canada. AWA is the only farm certification that guarantees animals are raised outdoors on pasture or range for their entire lives on an independent family farm using truly sustainable agriculture methods, and one of only two farm certifiers to require audited, high-welfare transport and slaughter practices. All AWA standards, policies and procedures are available on the AWA website, making it one of the most transparent certifications available.

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Fecal Egg Counts

Animal Welfare Approved standards require farmers to take fecal samples to monitor the internal parasite burdens of their animals at least once a year. This paper reviews what this involves and how the results can be used, as well as providing links to public and private laboratories that can carry out these tests for you.

Fecal sampling—also known as a Fecal Egg Count (FEC)—is a technique that farmers can use to monitor internal parasite levels and assist in decisions of when and which animals to treat. This tool can help farmers to better target wormers, avoid unnecessary treatments (and save costs), and ultimately reduce reliance on wormers in the longer term. FECs can also play a key role in potential breeding strategies to select natural parasite resistance in your flock or herd.

What Does It Involve?

Taking a FEC involves collecting a fresh sample of dung from either an individual or a group of animals. A measured amount of this sample is mixed with a solution that allows worm eggs to float to the surface. The solution is filtered to remove as much debris as possible and a small quantity is examined under a microscope to count the number of eggs. This gives a result measured in eggs per gram (epg) of dung.

Many vets will carry out this service and a number of public and private laboratories can also carry out the test. Kits are also available that allow farmers to take FECs themselves; most include a microscope and special chambered slides with an etched counting grid (see end of factsheet for details of laboratories and kit suppliers).

What Do the Results Tell You?

The results of a FEC provide a good guide to the parasite burden that the animal (or group of animals) is carrying. However, it is not an exact science, and a number of factors can affect the levels of parasitic worm eggs found in a dung sample. In other words, a low count may not necessarily mean there are low numbers of worms in the animal, and vice versa.

Eggs are only produced by fertile adult female worms, so in the early stage of worm infection (when the animal is carrying large numbers of immature worms) the egg count will be low. The number of eggs that each adult female worm will produce also varies according to the state of the host animal. For example, the number of eggs produced will increase if the host animal is stressed, if it is lactating, or if it has not eaten. Conversely, the number of eggs will decrease if the animal has some immunity to worms, if it is eating high tannin forages such as *Lotus*, or if it has recently been wormed. If the animal is scouring the egg count may also be depressed.

Some FEC tests provide the total eggs per gram of dung, while others can give you some indication of the different *types* of worm that are present. The latter is useful because some species of worms produce more eggs per adult female than others. So a high count from some species, such as barber’s pole worm in sheep, may not be quite as significant as a high count of another worm type, such as nematodirus. Table 1 provides guidelines for when you might take action based on your FEC results—and the worm species involved.

Table 1: A Guide to Fecal Egg Count Results for Sheep

Eggs per gram overall	Implications of the result
0-200	A good result. The only time you might contemplate treating is if nematodirus is present in a sample from young lambs. Nematodirus can cause significant ill health in young lambs—sometimes with few or no eggs present in the feces (see below).
200-500	Expect some productivity losses and scouring, especially if counts are dominated by scour worms (barber’s pole worm tends to constipate). Depending on prevailing weather conditions and other factors, consider treating or repeating a FEC in about four weeks. A stable FEC level during mid-season may show that host animals are dealing adequately with the parasite challenge.
500-1,000	This count is entering the high range. Production losses could become significant—particularly in young lambs with no immunity (around 3–4 months old). Scour worm burdens could be quite significant and a rapid escalation in numbers of barber’s pole worm may occur if conditions are warm and moist. In any case, treatment with an effective wormer could be necessary
1,000-1,500	These counts are in the high range. Production losses could be quite significant and clinical signs—especially related to scour worms—are likely to be obvious. Treatment is probably necessary.
1,500+	Severe production losses and welfare issues are now highly likely. Treatment with a highly effective wormer and later moving the animal(s) to a low-risk paddock is a priority.
Nematodirus eggs	The egg laying capacity of nematodirus is poor and severe clinical signs may appear in young lambs before appreciable numbers of eggs are present in the feces (more than 100 epg). Investigate counts of more than 200 epg promptly.
Liver fluke egg counts	Any egg count can be significant. Counts in sheep of more than 50 epg are considered high.

A Guide to Fecal Egg Counts Results for Goats

Type of goat	EPG result that would necessitate worming for barber pole worm
Bucks and dry does	≥ 2000 epg
Lactating dairy does	≥ 750 epg
All other goats	≥ 1000 epg

What About Coccidiosis?

Coccidial oocysts can also be counted as part of a FEC. Coccidial oocysts are much smaller than worm eggs, but the numbers of oocysts that might trigger a need to treat is far higher than the numbers of worm eggs shown above. A sample might reveal hundreds of thousands of coccidial oocysts without any sign of clinical infection, and a result showing around a million oocysts per gram of faeces would probably be necessary before considering any treatment. Nevertheless, you should look at the condition of the animals and take advice from your vet if you are concerned.

When is it Important to Carry Out FEC?

In an ideal world, farmers would carry out regular FEC samples to build a picture of the worm burden carried by particular groups of animals or fields on your farm. However, this is not always possible or practical, so the best approach is to target the most important times to take samples.

For sheep, we know that the worm egg count will rise around lambing time when the ewes are under stress. Testing at this time provides an indication of the level of increase of worm eggs and will help determine the parasite burden likely to be present in the lambing fields.

Cattle over 18 months of age will usually have developed resistance to worms. However, spring born suckled calves should have a FEC carried out in the autumn to identify the level of infection they have ingested from summer grazing, and to ensure calves are not going into the winter with a high level of worms that could affect their health and welfare. Table 2 below provides guidelines for cattle.

Why Perform Group Egg Counts?

In most instances it is more appropriate to take dung samples from a number of animals and make a decision on treatment based on the average results. Individual animals grazing together under the same management regime can have significant variation in their epg results, so only collecting samples from one or two animals could give a result that does not represent the worm burden in the group.

Ideally, samples should be taken from at least 10 animals. This can be mixed together to form a bulk sample for one test to be carried out. A more expensive option would involve assessing each of the 10 samples individually and then taking an average. The advantage of the latter is that it will provide the highs and lows from the individual counts and give you an idea of the range of infection, as well as having an average result.

The group worm count approach will tell you the level of worms within a particular group of animals and therefore whether or not they should be treated. However, testing different groups of animals from particular fields can also provide a picture of the potential worm infection from different areas of your farm. Some fields may carry a higher worm burden than others and knowing these areas 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 'other benefits' below).

When Should I Treat Cattle?

FECs are usually much lower in cattle than sheep. As a rough guide, a count above 150 to 200 epg would probably indicate a need to treat—particularly in younger cattle. Fluke eggs of higher than 5 epg require urgent investigation.

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, and could indicate a need for treatment.

Table 2: A Guide to Fecal Egg Count Results for Cattle up to 18 months of age:

Type of worm	Possible Treatment Required (epg)
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

When Should I Treat Pigs?

The guidelines for treatment in other species are less straightforward than for sheep and cattle. The key worm species for pigs is the ascarid worm, which is often detected from the presence of white scarring on the liver known as 'milk spot' found at the slaughterplant.

In young pigs (up to 4-5 months of age) 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, and body condition, growth rate, and other symptoms like coughing (ascarid worms migrate through the lungs as part of their life cycle and can increase coughing) should also be considered.

When Should I Treat Poultry?

As with pigs, there is less information available for poultry than for sheep and cattle. However, research has shown that there is a close correlation between the number of eggs per gram found in the FEC and the worm burden the bird is carrying. With poultry it may be more useful to carry out at least two tests a few weeks apart to see if the results differ and if epg levels are rising, as there is not a clear level at which worming is definitely required. Again, body condition and other symptoms should be considered.

Other Benefits

FEC can give you more information than simply the number or type of worms present. By carrying out FEC before and after worming, you can find out if there is any resistance to the particular wormer you used.

If the level of reduction after treatment is less than 95 per cent you may have potential resistance problems and you should consider an alternative treatment. With increasing numbers of farms discovering they have benzimidazole (a type of wormer also known as “white drench”) resistance it is worth checking that you are not wasting time and money—or risking welfare problems—on ineffective treatments.

FEC can also help in breeding programs to select natural parasite resistance in your flock or herd. Some estimates suggest that just 10 per cent of animals can contribute 50 per cent of worm output. By carrying out individual rather than group tests it is possible to identify and remove the ‘worst offenders’—and breed from animals with the most resistance. Over time, this strategy will help minimize pasture contamination and reduce future reliance on wormers.

What about FAMACHA?

While anemia can have other causes, the most common cause is infestation with barber pole worm. FAMACHA is a technique that involves matching the color of the mucous membranes of the sheep or goat’s eye to anemia levels using a colored chart or card in order to determine if an animal requires treatment. AWA recommends that sheep and goat farmers use FAMACHA to monitor anemia in their sheep and goats, although farmers must be trained before receiving a FAMACHA card.

For more information about FAMACHA—and the benefits of this technique, visit http://web.uri.edu/sheepngoat/files/FAMACHA-Scoring_Final.pdf.

For contact details of qualified FAMACHA instructors, visit <http://www.wormx.info/#!/instructors/c21dc>.

Summary

FEC and FAMACHA can provide very useful information on the levels of parasites that are infecting your animals. These methods can help you maintain the health of your animals, as well as enabling you to better target your wormer treatments and avoid unnecessary (and costly) treatments—or even identify resistance problems.

Guidance on Setting Up On-Farm FEC

The main suppliers of FEC kits and materials are listed below. Some sell microscopes as part of the kit and some do not. You will need a microscope with a magnification power of a 10X eyepiece with 10X objective, total 100X power. If you look on Amazon or eBay you can find these, sometimes at lower cost than buying them as part of a kit – but make sure the microscope you buy is the right specification for fecal egg counts.

Chalex Corporation [slides and microscopes]

E: chalex@vetslides.com

T: -503-208 3831

W: www.vetslides.com

Eggzamin [slides, kits for preparing the sample, and microscopes]

E: info@eggzamin.com

T: 503-312 2657

W: <http://eggzamin.com/purchase/>

FEC Source [supply McMasters counting slides and kits for preparing the sample]

E: info@fecsource.com

T: 844-838-7543

W: <http://fecsource.com/shop/>

Other Useful Links

The American Consortium for Small Ruminant Parasite Control offers a wealth of information relevant to all farmers interested in learning more about fecal egg counting, including links on how to set up and carry out on-farm testing, as well as information on wormers and management to avoid parasite build up in pastures. Visit <http://www.wormx.info/#!fecal-egg-counting/c24s2>

The RVC/FAO Guide to Veterinary Diagnostic Parasitology website provides useful guidance on the identification of different egg types for ruminants, poultry and pigs. Visit <http://www.rvc.ac.uk/review/Parasitology/EggID/EggID.htm>

Private and Public Laboratories That Carry Out Fecal Samples:

Prices correct at time of writing (August 2015)

Name	Contact details	Cost
Auburn University, College of Veterinary Medicine, Alabama	Department of Pathobiology 166 Greene Hall Auburn University, AL 36849 T: 334-844 4539 W: http://www.vetmed.auburn.edu/about/dept-of-pathobiology/diagnostic-services/	\$12/sample
Horseman's Laboratory (offers fecal egg counts for other species) Illinois	Horseman's Laboratory 907 Westbrook Drive Mahomet, IL 61853 T: (Lab) 800-544-0599 E: hlab@horsemanslab.com W: http://www.horsemenslab.com	One sampling kit (incl. test and result): \$22 2-5 kits: \$19 ea. 6+ kits: \$17 ea.
Myers Parasitology Services, Kentucky	3289 Mount Sherman Road Magnolia, KY 42757 T: 270-324-3811 E: gmyersph@scrtc.com W: http://www.manta.com/c/mm58vyw/gil-myers-phd-inc	<i>Not known</i>
Louisiana Animal Disease Diagnostic Laboratory	School of Veterinary Medicine Skip Bertman Drive Baton Rouge, LA 70803 T: 225-578-9500 W: http://www.lsu.edu/vetmed/laddl/index.php	\$22/sample

Name	Contact details	Cost
Maryland Department of Agriculture	Frederick Animal Health Lab 1840 Rosemont Ave Frederick, MD 21702 T: 301-600-1548 E: AHFrederick.mda@maryland.gov <i>OR</i> Salisbury Animal Health Lab 27722 Nanticoke Rd. Salisbury, MD 21801 T: 410-543-6610 E: AHSalisbury.mda@maryland.gov W: http://mda.maryland.gov/AnimalHealth/Pages/laboratory.aspx	\$10-\$15/sample (in state) \$15-\$22.50/sample (out of state)
Cornell University College of Veterinary Medicine, New York	College of Veterinary Medicine Ithaca, NY 14853-6401 T: 607-253-3000 W: https://ahdc.vet.cornell.edu	\$25/sample
North Carolina Department of Agriculture and Consumer Services	Rollins Laboratory 2101 Blue Ridge Road Raleigh, NC 27607 T: 919-733-3986 W: http://www.ncagr.gov/vet/ncvdl/	\$10/sample
Oklahoma Animal Disease Diagnostic Hospital	P.O. Box 7001 Stillwater, OK 74076-7001 T: 405-744-6623 W: https://cvhs.okstate.edu/oaddl	Starts at \$14

Name	Contact details	Cost
College of Veterinary Medicine at Oregon State University	College of Veterinary Medicine Oregon State University 700 SW 30th Street Corvallis, OR 97331-4801 T: 541-737-2141 W: http://vetmed.oregonstate.edu/diagnostic/fecal-parasites-flotation	\$15/sample
Pennsylvania Department of Agriculture	Penn State University Animal Diagnostic Laboratory Wiley Lane University Park, PA 1680 T: (814) 863 0837 E: adlhelp@psu.edu W: http://www.padls.org	\$15/sample
University of Tennessee Veterinary Medical Center	University of Tennessee Knoxville, TN 37996 W: https://vetmed.tennessee.edu/vmc/dls/Pages/default.aspx	\$12-\$30
Texas A&M University Helminthology Lab	Agency Headquarters: 1 Sippel Road College Station, TX 77843 T: 979-845-3414 W: http://tvmdl.tamu.edu	\$12/sample (in state) \$14.40/sample (out of state)
Virginia Department of Agriculture and Consumer Services	Virginia Department of Agriculture and Consumer Services 102 Governor Street Richmond, VA 23219 T: 804-692-0601 W: http://www.vdacs.virginia.gov/animals/index.shtml	\$15 per sample

Virginia Tech Animal Laboratory Services	VITALS 285 Duck Pond Drive Blacksburg, VA 24061 T: 540-231-4320 W: https://www.vetmed.vt.edu/lab-services/	\$14 to \$28 per samples
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Farmer to Farmer Support

If you are a farmer and you can offer a similar service to others in your area please let AWA know and we'll add you to this list.

Name	Contact details	Cost
Julia Shewchuk, Florida	Serenity Acres Farm Pinetta, FL 32350 T: 850-464-2115 Please note: Serenity Acres Farm offers you the opportunity to take a sample to the farm and learn how to prepare and carry out your own FEC test. They cannot accept mailed samples.	\$5/sample
Cherrie Nolden, Wisconsin	1dr Acres Farm 5686 Griffiths Rd. Dodgeville, WI 53533 T: 608-477-1981 E: wonderacres@yahoo.com Cherrie will teach any interested farmer about how to conduct their own fecal counts and how to draw blood for flock/herd disease testing. She can accept mailed fecal samples that have been packaged fresh (not frozen) on ice in a cooler mailer.	\$7/sample