

Equine Fecal Egg Count

(McMaster's Method)

The McMaster's technique is a quantitative analysis that allows you to count parasite eggs (strongyles or ascarids) in your horse's manure. Fecal egg counts are not recommended for detection of tapeworms.

This technique is easy to use and is often used by veterinarians or farm managers, but it is not as sensitive as other methods that use a centrifuge. The sensitivity of this technique is 25 eggs per gram, which means that very light infections may go undetected by this technique. The technique works because while parasite eggs will sink in plain water, they will float in chemical solutions that are denser than water. There are several different flotation solutions that you can either make or purchase.

Materials Needed:

- Permanent marker
- Sealable plastic baggie
- Barn refrigerator or designated cooler with ice packs (unless you will be processing the sample immediately without transporting it)
- Microscope
- McMaster's microscope slide (has two chambers with gridlines)
- Manure from target horse
- Latex, nitrile, or vinyl gloves (optional)
- Disposable 10 mL pipet or small syringe
- Graduated cylinder or syringe with measurements in mL
- Popsicle stick
- Manure measuring device
 - Sensitive scale that can measure in grams and a small container OR
 - Make a manure measuring device
 - Find a small container that is somewhat tall with a small diameter (for example, an old pill bottle or a very small cup)
 - Use a syringe to measure out 26 ml (this would be the same as 26 cc)
 - Put water into the small container and use a marker to draw a line at the water mark
 - Add an additional 4 mL of water
 - Draw a second line at the new water mark at 30 mL
- Paper and pencil/pen
- 26 mL of flotation solution (see last page of protocol for options)

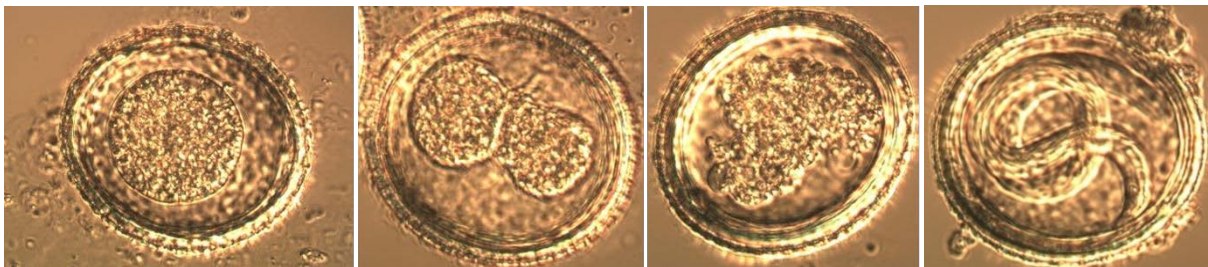
Sample Collection Procedure:

1. Prepare a designated sampling cooler with ice packs.
2. Select a horse to sample.
3. On outside of a plastic baggie, use permanent marker to write horse's name and the date.
4. Wait for horse to pass manure. Alternatively, manure piles less than 12 hours old can be used if you know which horse the pile came from.
5. Once manure is passed...
 - a. Turn the baggie inside-out.
 - b. Put your hand in the baggie and use it to collect manure from multiple locations in the pile (do not take pieces that are touching the ground). Take the equivalent of at least 2 manure balls (it is better to take too much sample than too little).
 - c. Invert the baggie so that manure is on the inside.
 - d. Remove as much of the air as possible before sealing the baggie.
6. Place baggie in designated cooler with ice packs or a barn refrigerator if available. Keep manure cold until you are ready to test it. If you are going to process the sample immediately without transporting it, you can skip this step.

Sample Processing Procedure:

1. Measure out 26 ml of flotation solution using graduated cylinder, syringe, or pre-marked jar.
2. Put 26 ml of flotation solution in your container or manure measuring device (see Materials section for how to make).
3. Use scale OR pre-marked container to measure manure.
 - Use scale to measure.
 - i. Put container on scale and tare it so scale is at 0.
 - ii. Add 4 g of manure from baggie to container.
 - OR
 - Use pre-marked manure measuring device.
 - iii. Add manure to the 26 ml solution until solution reaches the 30 mL line.
4. Return manure to cooler or refrigerator (in case a mistake is made during the FEC and you need to redo the test).
5. Use a popsicle stick to mix the solution for 1-2 minutes. If your container has a lid you can also shake it.
6. **Immediately** after mixing, use pipet or syringe to draw out solution (if you let the solution sit, eggs will not be evenly distributed in solution). Try to avoid taking up large particles.
7. Pipet solution into first chamber on McMaster's slide. If you get an air bubble, pipet the liquid back out and try again.
8. Mix solution and **immediately** pipet out another subsample.
9. Fill second chamber on McMaster's slide.
10. Allow the slide to stand 20-30 minutes before reading.
11. Put slide under microscope.
12. Focus microscope on one of the outer corners of the grid of the first chamber.
13. Move platform smoothly across the slide, counting the eggs only on the inside of the gridlines.

14. Record each egg by putting a tally mark on your paper. If you have both ascarid and strongyle eggs, count them separately.
15. When you get to the other end of the grid, pick a reference point on the slide and move the slide into the next gridline, so that you can count the eggs in the next column without overlapping or missing any.
16. Add the total number of eggs in each chamber.
17. Multiply this number by 25 to get your eggs per gram (EPG).
18. Thoroughly clean your McMaster's slide, jar, and other equipment with water and soap. This won't kill the eggs but should help to rinse them out so they aren't present during the next use.
19. Determine if your horse's EPG merits a deworming treatment (see page 5 for assistance). You may want to consult with your veterinarian on appropriate deworming strategies.
20. Choose an appropriate dewormer based on which deworming drugs work on your farm and which parasites you are trying to remove.

Examples of strongyle eggs in different stages of development:**Examples of ascarid eggs in different stages of development:**

Strongyle eggs are slightly smaller and more oval shaped. Ascarid eggs are rounder and typically only seen in horses <1-2 years of age.

Sources and Solutions

SLIDES

McMaster's slides can be obtained from companies that supply veterinary clinics and testing laboratories. Here is one US company that sells them directly:

Chalex Corporation

P.O. Box 187, Wallowa, OR. 97885, USA Fax 541-886-3300

Email: chalexcorp@att.net

<http://www.vetslides.com/index.html>

There are two types of grids to choose from. The etched white grid will not flake off but many find these difficult to read. The green silkscreened grid is easier to read but will eventually start to flake off. Prices range from \$15-20/slide, with different prices for larger purchases or kits. Slides can be reused many times. Be sure to use mild soap and water and rinse thoroughly.

FLOTATION SOLUTIONS

Fecasol solution (sodium nitrate)

This premade flotation solution can be obtained from many veterinary supply catalogs. The specific gravity of this solution is 1.2 and it generally costs about \$21-25 per gallon, plus shipping.

Making your own flotation solution is not difficult and is much less expensive than buying a premade solution. Here are two that you can make with items you can purchase at the grocery store, and both have slightly higher specific gravity than Fecasol, which enhances egg detection.

Magnesium sulfate (Epsom salt solution, specific gravity 1.24)

- 4 cups water
- 1 ½ pounds Epsom salts

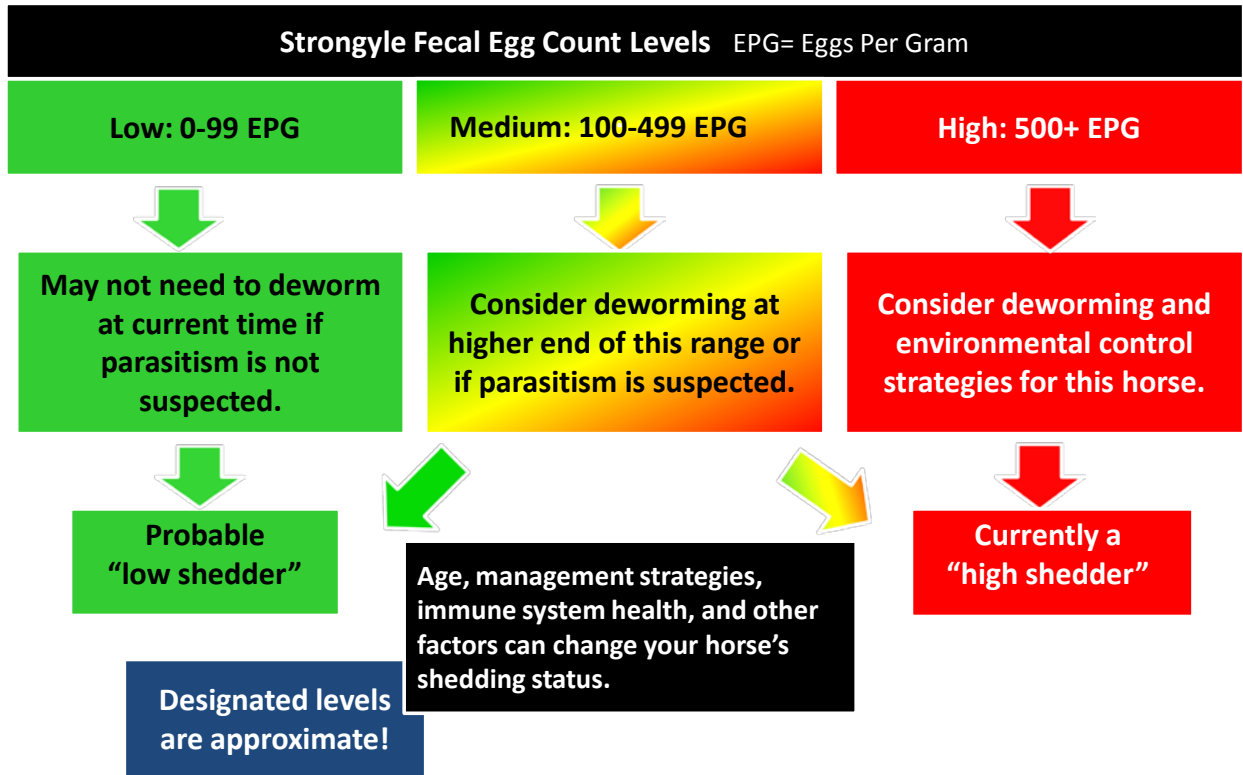
Directions: Add about half of the Epsom salts to the water and shake or stir until the crystals dissolve. Add about half of the remaining Epsom salts and mix again. Add the last of the Epsom salts and mix until all of the crystals are dissolved.

Sheather's solution (Sugar solution, specific gravity 1.27)

- 1 lb table sugar
- 12 oz hot water

Directions: Dissolve sugar by gradually adding it to the water, stirring over low heat, or indirect heat (such as the top of a double boiler). Mix until all of the crystals are dissolved. Allow to cool to room temperature before using. This solution will grow mold within about 1 week of being made, but if the mold is removed from the top, the solution is still usable.

Levels designed using data from Nielsen et al. 2010, Dopfer et al. 2004, Becher et al. 2010., and Nielsen et al. 2006.



This is **not** meant to substitute for the advice of your veterinarian. Work with your veterinarian to determine an ideal treatment plan. Horses with low FEC results could still be harboring a large load of immature strongyles or other parasites like tapeworms or bots.

Common Dewormers

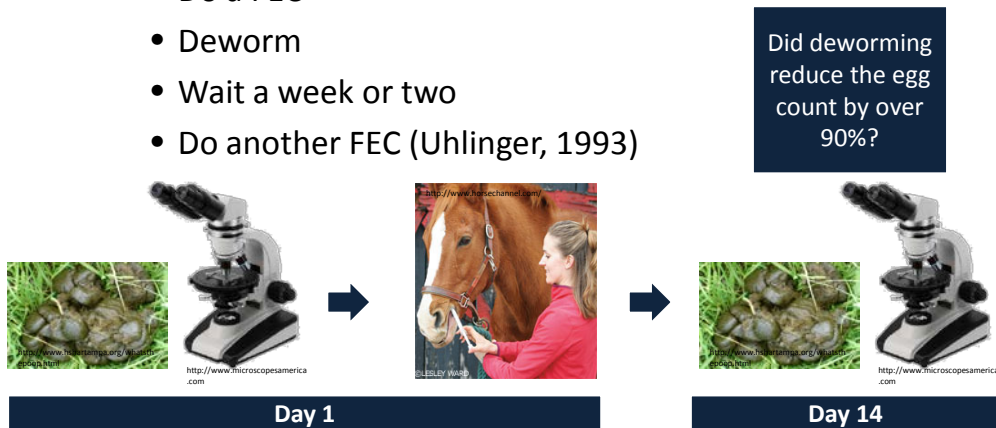
Drug Name	Brand Names
Ivermectin	Zimectrin, Equimax, Rotectin 1.87%
Moxidectin	Quest
Fenbendazole	Safe Guard, Panacur
Oxibendazole	Anthelcide
Pyrantel Pamoate	Strongid, Rotectin P
Pyrantel Tartrate	Strongid C
Iver. + Praziquantel	Equimax, Zimectrin Gold
Mox. + Praziquantel	Quest Plus

Equine Fecal Egg Count Reduction Test

If you are not sure if the deworming drugs you are using are effective on your farm, you can do a FECR test to find out. Wait at least 8-12 weeks after deworming (to allow effects of the previous drug to be wiped out), then follow the steps in the slide below. Make sure that when you deworm, your horse gets the full amount of the drug for his or her weight.

Determining Drug Efficacy

- To check for drug-resistant parasites
 - The Fecal Egg Count Reduction test (FECR)
 - Do a FEC
 - Deworm
 - Wait a week or two
 - Do another FEC (Uhlinger, 1993)



If you do not find a 90% reduction in eggs during the second fecal egg count, (or if you find even higher numbers of eggs), you have a resistance problem. It may be a good idea to do the FECR test with multiple horses to see if the same effect is noted in each horse.

Developing a Strategic Deworming Plan

Remember to consult with your veterinarian when developing a parasite control plan

Minimum Treatment for All Adult Horses

Deworm ALL adult horses regardless of shedding status *at least* 1-2 times per year with ivermectin + praziquantel or moxidectin + praziquantel (Zimectrin Gold, Quest Plus, etc.).

If deworming only once/year, do it in the FALL.

If deworming twice/year, do it in the FALL and early SPRING.

Consult your veterinarian to determine frequency needed for your horses and area. Deworming with these drugs will target tapeworm and bot infections, along with strongyles. *If your horse is a high shedder, he/she will need additional treatments (see the next section to learn how to determine the shedding status of your horse).*

Treatment of Low and High Shedders

When initially trying to determine if your horse is a high or low shedder, perform a fecal egg count 8 weeks after deworming. Repeat this step several times over the year until you can say with certainty that your horse is either a high or low shedder. Look at the chart on page 5 for help in interpreting results.

Low Shedders: If your horse is identified as a low shedder, you may have to check fecal egg counts less frequently in the future (2-3 times per year, in late spring, early fall, and/or winter) unless you or your veterinarian suspects an increased level of parasite infection. Unless they have a sporadic high egg count, low shedders may only require 1-2 dewormings each year.

High Shedders: Horses that are identified as high shedders are often immunocompromised, very young (<3), or old (>23). Sometimes horses that do not fit into any of the previously mentioned categories are just more biologically prone to parasite infection. Horses that are known to be high shedders, or that fit into these categories, should be checked with fecal egg counts more frequently. High shedders will require more frequent deworming. For these additional dewormings, choose a deworming drug that parasites on your farm are not resistant to. See the FECR test on page 6 to identify appropriate deworming drugs.

Cost of Strategic Deworming

The cost of developing a strategic deworming plan will be the most expensive during the first year. Costs can be lowered by doing your own fecal egg counts and making your own flotation solution. Check with local schools, universities, or laboratories to see if anyone has an old microscope that could be donated to your program. Since horse parasites are not infective to humans, this could even be a scientific learning experience for appropriate clients and volunteers. Once you have identified low shedders (the majority of horses fall into this category) and any ineffective drugs, your deworming program will be less costly and labor-intensive.