

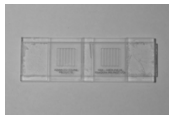


## Sheep Fecal Egg Counts

- What is a fecal egg count?
- What are they good for?
- What are they not good for?
- Should you do your own fecal egg counts?
- What's needed to do them?

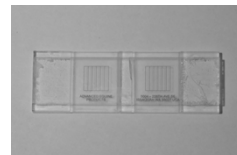
## Fecal Egg Counts

- Most common way and the best way to get fecal egg counts for sheep, goats and horses is McMaster test
- Uses special slide with a grid to make counting easier
  - Measure manure and flotation fluid so know exactly the quantity of manure in the test
  - Count eggs, then can calculate back to yield eggs/gram manure



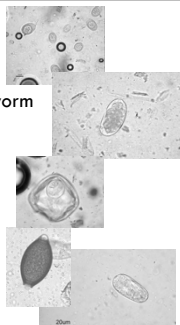
## Why Count Egg Numbers in Fecal Exams?

- In pets (or people) we don't want any parasites at all so positive/negative test is desirable
- In grazing animals we accept the presence of some level of parasites so positive/negative test less helpful



## Which Parasites Do You See in Fecal Test?

- Coccidia
- Strongylids (GI worms including *Haemonchus contortus*—barberpole worm
  - May also be called trichostrongyles or strongyles
  - Several species produce identical eggs
- Tapeworm (*Moniezia*)
- Whipworm (*Trichuris*)
- Threadworm (*Strongyloides*)



## Other parasites?

- Lungworms
  - A different test is better for lungworms
- Deer (meningeal) worm
  - Not in manure because worms never become adult

## Parasites in a Fecal Egg Count

- Example: results from 4 month old lambs
- Whipworms, threadworms not considered important except under unusual circumstances
- Number of tapeworm eggs meaningless because eggs passed in segments
- ns=none seen

Sheep	Strongylids	Coccidia	Tapeworm	Whipworm	Threadworm
1	3000	500	ns	150	400
2	600	10,000	150	ns	ns
5	150	2000	8000	50	200
6	1500	200	ns	ns	100
7	500	900	15,000	ns	ns
8	400	ns	ns	100	750



## Parasites in a Fecal Egg Count

- As an example, results from 4 month old lambs
- Recognize that if one sheep infected with parasites below, they are all exposed
  - ns doesn't mean they are not infected

Sheep	Strongylids	Coccidia	Tapeworm	Whipworm	Threadworm
1	3000	500	ns	150	400
2	600	10,000	150	ns	ns
5	150	2000	8000	50	200
6	1500	200	ns	ns	100
7	500	900	15,000	ns	ns
8	400	ns	ns	100	750

## Why Do Fecal Egg Counts (FEC)?

- To see if drugs still work
- Indicate relative susceptibility of individual animals to parasite
- Use in conjunction with other information to design and evaluate parasite control programs
- However
  - Fecal exams are not a reliable way to diagnose parasitic disease in **individual** animals

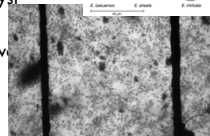
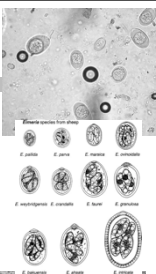
## What To Do With FEC Results?

- Most natural reaction is –this will tell me who to treat
- FEC provide an estimate only, eggs not uniformly distributed
  - Not a highly accurate test, especially at low numbers
- Numbers not absolute, have meaning in context
  - Time of year (winter, summer, early/late grazing season, etc)
  - Treatment history (dewormed last week, last month, last year, etc)
  - Animal condition: age, clinical signs, etc.
- FEC never intended to be sole determinant of disease status of an animal

Sheep	Strongylids	Coccidia
1	3000	500
2	600	10,000
5	150	2000
6	1500	200
7	500	900
8	400	ns

## FEC and Disease

- Many assume that over a certain number of coccidia in a fecal sample means it's coccidiosis
- Not as straightforward as it seems
  - Diarrhea may precede high oocyst shedding
  - Clinically normal animals can have high oocyst counts
  - What species is it?



## Diagnosing Disease with Fecal Egg Counts

- What's the disease cutoff for coccidiosis?
  - All over the place, see 5,000 up to 50,000 opg
- Same with worms, egg count may not tell you if they have disease
- What to do with these lamb results?
- Nothing without further information
  - Are there signs of disease?
    - Anemia, diarrhea
  - Treatment history, time of year

Sheep	Strongylids	Coccidia
1	3000	500
2	600	10,000
5	150	2000
6	1500	200
7	500	900
8	400	ns

## Strongylid worms

- Number of eggs in manure will vary seasonally
- Population of adult worms in gut lower in winter months
  - Many larvae in the host in a dormant state (arrested or hypobiotic)
    - No disease, no eggs in feces



## What are Fecal Egg Counts Good For: Testing Drug Efficacy

- Modern available dewormers fall into 3 groups

Benzimidazoles	Macrolides A-avermectin M-milbemycin	Nicotinics
fenbendazole (Safeguard)	ivermectin-A (Ivomec etc.)	levamisole (Prohibit)
albendazole (Valbazen)	eprinomectin-A (Eprinex)	Pyrantel(Strongid)
Oxfendazole (Synanthic)	doramectin-A (Dectomax_)	morantel (Rumatel, Goat Care, Positive Pellet)
Oxibendazole (Anthelcide)	moxidectin-M (Cydectin)	

## What are FEC Good For: Testing Drug Efficacy

- Fecal Egg Count Reduction Test (FECRT) for sheep and goats
  - Usually done by comparing pre and post treatment samples from a group of animals (should have 10-15)
  - Need 2 fecal samples from each animal—at the time of treatment and 10-14 days later (not after that)
    - Most scientific is to have a treated group and an untreated group because egg counts might change for other reasons, but this isn't always practical
  - Calculate the % reduction in fecal egg counts (FECR)

## What are FEC Good For: Testing Drug Efficacy

- Fecal egg count reduction test-sheep and goats
  - Animals must have minimum of 150-200 egp before treatment, even higher is preferred
    - Lower counts inaccurate
  - If testing fewer than 10 animals the you will get a rough idea only
  - Give the right amount of drug—weigh animals preferably
    - If not weighing, dose for heaviest animal
  - Use oral form of drug
  - Collect follow-up sample 10-14 days
  - Easiest to calculate egg count reduction for each animal and then average

## FECRT example 1

Animal #	Pretreatment	After Treatment	Reduction
1	1000	100	90%
2	600	50	92%
3	200	0	100%
4	3000	250	92%
5	150	50	67%
6	1500	0	100%
7	500	100	80%
8	400	0	100%
Average	919	69	90%

CALCULATE FECR 100 (1-{Post/After}) for each animal, calculate mean

One sheep is not enough; what if you picked #5?

## What are FEC Good For: Testing Drug Efficacy

- In general, for sheep and goat dewormers look for efficacy greater than 90%
- If efficacy less may indicate presence of resistant worms
  - Numbers in mid range—70-90% harder to interpret—watch closely
    - <70% strong concern
- Always consider confounding factors:
  - Were animals given the right dose?
  - Was the drug expired?
  - Might egg counts change on their own?
  - Did you have enough animals
- The lower the fecal egg count reduction, the higher the proportion of resistant worms in the population—but not a direct relationship (so 60% FECR doesn't mean you killed 60% and 40% of the worms are resistant)

## Why Do Fecal Egg Counts (FEC)?

- To see if drugs still work
- Indicate relative susceptibility of individual animals to parasite
- Use in conjunction with other information to design and evaluate parasite control programs
- However
  - Fecal exams are not a reliable way to diagnose parasitic disease in **individual** animals

## Individuals Vary in Susceptibility to Worms



- Normal immunity controls parasites, doesn't eliminate them
  - Immune animals will have eggs in manure
  - Immunity in place at maturity
  - Variation in level of immunity in individuals
- Where do worm problems appear?
  - Sheep before immunity fully developed
  - Sheep with temporary reduction in immunity
    - Ewes at time of lambing especially susceptible
    - Poor health or nutrition
- Animals with INHERITED high susceptibility to parasite

## Immunity of the Host

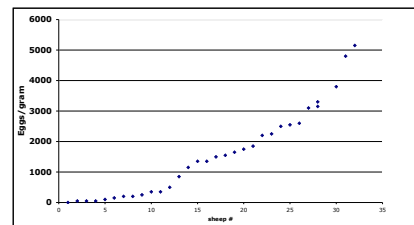


- Under normal conditions, most animals control their parasites
- A few are highly susceptible
- Much of an individual animal's susceptibility is inherited so that can be selected for in a breeding program
- Population rule: All other things equal, **~30% of the animals contribute ~80% of the parasite eggs to pasture**
- But if you have only 10 sheep, you may not see exactly that breakdown

## Reduce Parasite Exposure on Pasture Immunity of the Host Drugs



### My Sheep



## Selection for Resistance to Parasites

- Easiest to identify the most susceptible sheep with FAMACHA (anemia) scores
  - Tells you who not to use for breeding,
- Since most animals should not develop disease, FAMACHA not so good for identifying the sheep with the best immunity
  - This is where fecal egg counts come in

## Interpreting Fecal Egg Counts

Lamb #	Eggs/g	
101	ns	More resistant
110	6000	More susceptible
192	400	
64	1150	
105	750	
120	1650	
89	1050	
95	4050	More susceptible
116	850	
100	1900	
75	100	More resistant
88	1050	
108	900	

- Fecal egg counts 4-5 month old lambs in August
- McMaster not highly accurate especially when numbers low
  - Small differences not very meaningful
- When looking for resistant/susceptible animals do tests when egg counts highest
- May not tell you the BEST one, but can narrow it down

## Interpreting Fecal Egg Counts

Lamb #	Eggs/g
64	1150
105	750
120	1650
89	1050
116	850
88	2000
108	900

- Fecal egg counts 4-5 month old lambs in August
- The larger the group of sheep, the more likely you are to see meaningful differences
- In this group there are no differences

## Should You Do Your Own FEC?

- Commercial labs vary in charge
  - Try and find one that does bulk rate
- Worth doing your own if you will be doing lots
  - Active selection program, drug testing
  - Strong interest
- If only doing a small number every year may not be worth investment and may not be easy to do them well

## Performing Fecal Egg Counts

- Whether or not you do your own, need good sample collection
  - Know who the sample came from
    - Allows identification of highly susceptible/resistant animals
  - Need fresh samples
    - Samples that sit on the ground invaded by free living nematodes
    - Eggs may hatch
- Use samples that you have seen hit the ground or rectal fecal samples

## Performing fecal exam

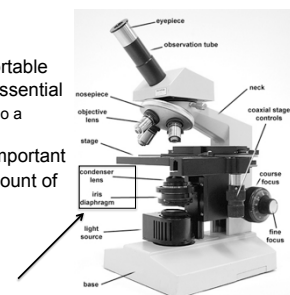
- Collection of fecal samples
  - Rectal fecal samples
  - Wear glove, use water, spit or KY jelly to lubricate finger
  - Insert 1 or 2 fingers into rectum, animal often stimulated to push feces out or you can cup fingers and pull out
  - Turn glove inside out and label
    - Don't try on babies!
  - Samples can be stored in the refrigerator for up to a week before examination
    - Put in plastic bag, press out excess air so eggs don't develop

## Performing the fecal exam

- Greatest amount of information comes from sampling individual animals
  - Representative sample from each category: ewes, lambs, rams, etc.
- Composite sample (samples mixed together)
  - More convenient, quicker
  - Can be misleading depending on which animals are included
  - If doing composites
    - Separate by category (ewes, lambs, etc)
    - Use the same amount of feces from each animal

## Equipment

- Compound Microscope
  - Binocular more comfortable than monocular, not essential
    - Can also use attached to a compute
  - Internal light source important
  - Means to regulate amount of light reaching slide
  - Moveable stage



## Performing the Fecal Exam Equipment

- Way to measure feces
  - By weight or by volume
    - Recommend using weight
      - Can get inexpensive balances in 0.1 increments
- Way to measure flotation solution
  - Syringe, graduated cylinder, small measuring cup



## Supplies

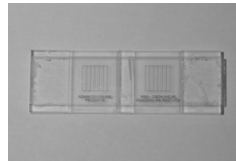
- Other supplies
  - Paper/plastic cups
  - Something for mixing--spoon, tongue blades, etc.)
  - Something for straining--tea strainer, cheesecloth squares, unfolded guaze pads
  - Something for transferring material to slide--pipette or 1 cc syringe
  - Nice to have some slides and coverslips on hand for unusual things

## Methods of fecal analysis

- McMaster test based on flotation--parasite eggs float because they are less dense than the fluid they're in
- Flotation solutions
  - Saturated salt solutions
    - Table salt (NaCl) or Epsom Salts (MgSO4)
    - Add to warmish tap water until some stays undissolved, let sit overnight
  - Commerical solution--Fecasol (Sodium nitrate) can also be used
  - Sugar solution very viscous and sticky

## McMaster Test Equipment

- McMaster's Slide



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## Doing Your Own Fecals

- Can also buy complete set-ups like this website sells, also claim to provide on-line help

