

Managing Internal Parasites in Small Ruminants



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September 14, 2018



Overview

- What are the major parasites that can infect small ruminants in California?
- Symptoms of infection
- An ounce of prevention...
- A pound of cure...
- Detecting parasites and reducing resistance



Photo: Prairie View A&M University



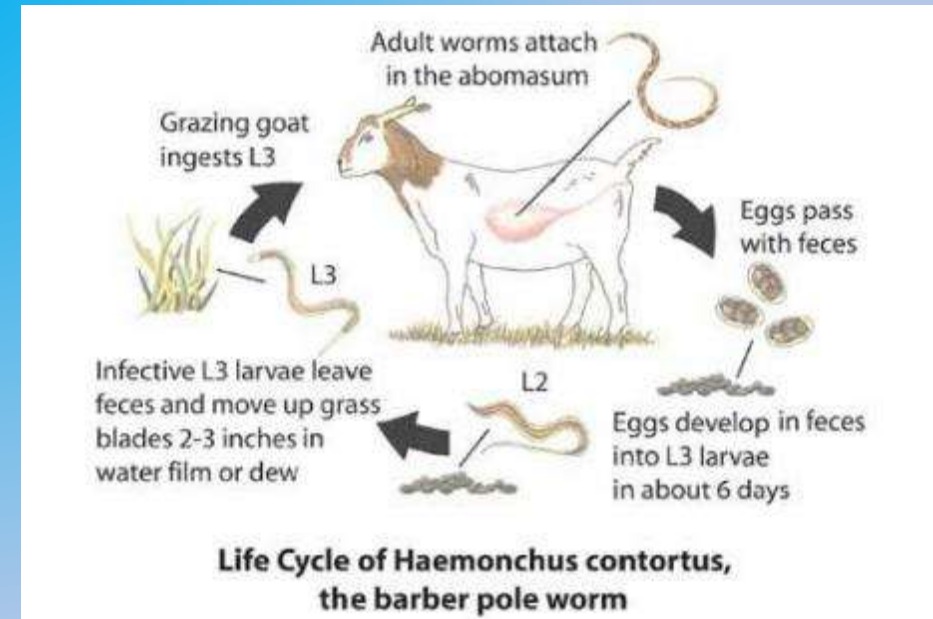
Photo: Spanish Ministry of Agriculture

Internal Parasites

- Gastro-Intestinal Worms (roundworms, nematodes, stomach worms)
 - *Haemonchus Contortus* (barber pole worm)
 - *Trichostrongylus* ssp.
 - *Teladorsagia* (brown stomach worm)
 - *Ostertagia Curumcinta* (small brown stomach worm)
- Tapeworms (*Moniezia* ssp.)
- Lungworms (*Dictyocaulus filarial*, *Muellerius capillaris*)
- Liver Flukes (*Fasciola hepatica*)
- Coccidia (*Eimeria* ssp.)

Gastro-Intestinal Worms

- Barber pole worm is largest and most deadly stomach worm
 - Symptoms
 - Anemia (characterized by pale mucous membranes, especially in the lower eyelid)
 - Bottle jaw
 - Rarely causes diarrhea
 - Larvae favor warm, moist conditions
 - Normal peak population in mid-summer
- Small brown stomach worm
 - Symptoms
 - Weight loss and diarrhea
 - Anecdotally, may continue to be a problem through winter months.



Tapeworms

- Typically not a significant problem in sheep or goats.
- In extreme cases, infestations can cause diarrhea, weight loss, or gut blockages.
- Some evidence that tapeworms can affect growth rates in lambs when present in large numbers.



Lungworms

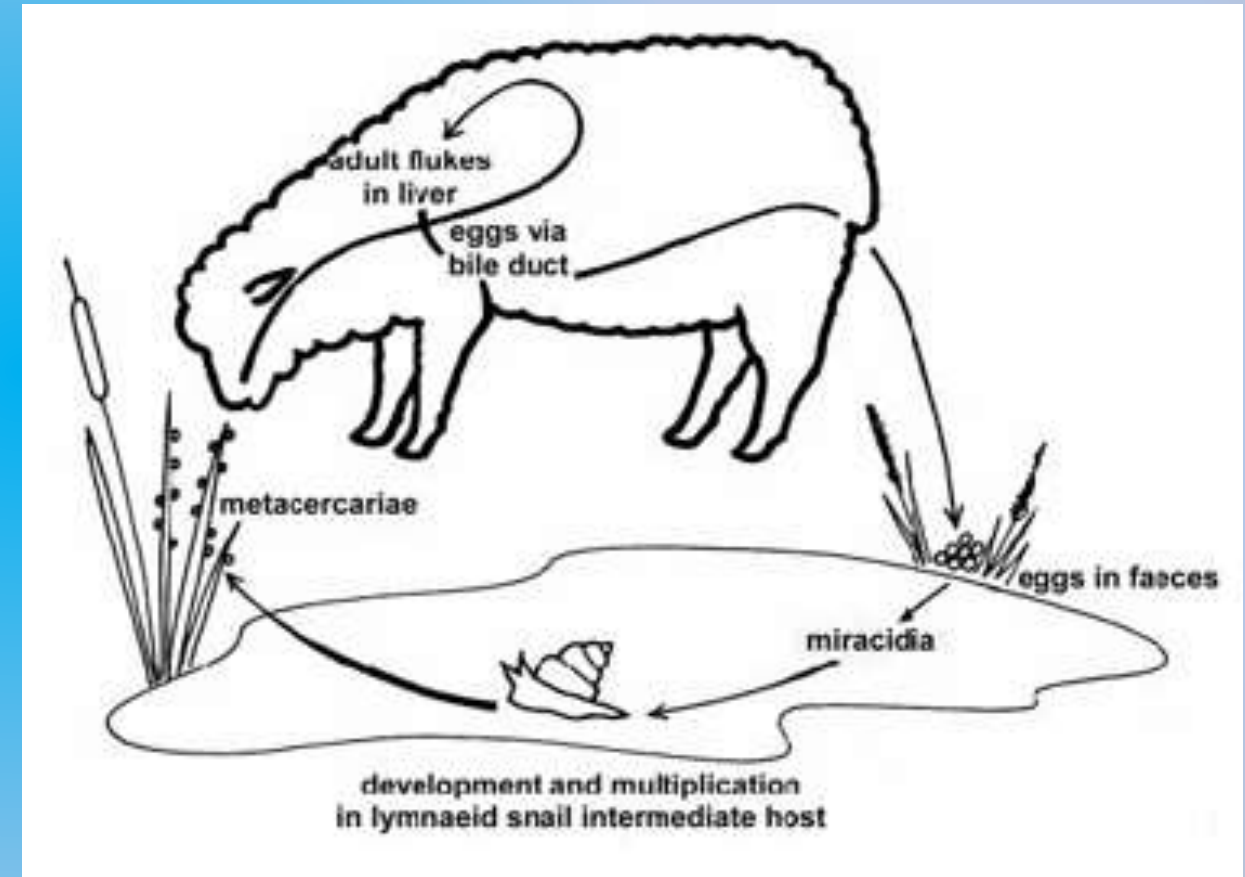
- Wet, low-lying pastures + cool, damp weather favor development of lungworms
- Eggs passed in feces. After eggs hatch and are consumed by livestock, the larvae travel to the lungs where they can cause respiratory problems in severe cases.
- Normally, no clinical signs of infection.
- Control programs for stomach worms usually control lungworms as well.

Lung worm larva



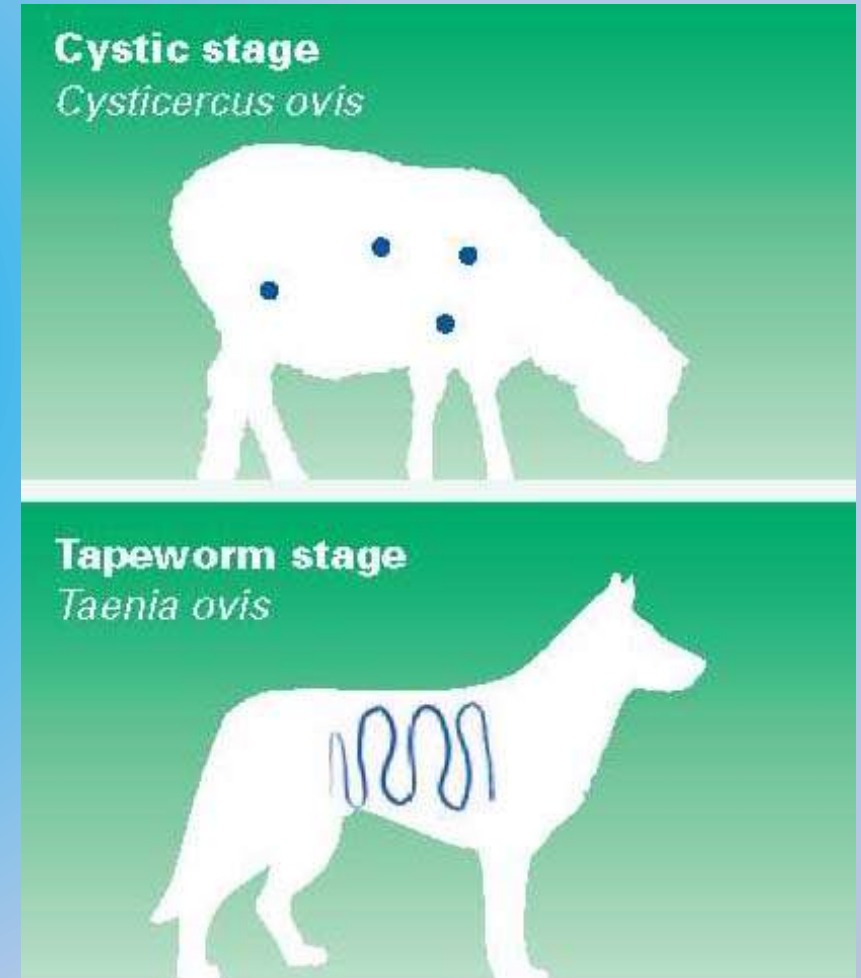
Liver Flukes

- Liver flukes can cause death or liver damage (in sub-acute cases) in sheep and goats
- Primarily a concern in CA, Pacific NW and Gulf States
- Require snails as intermediate host



Canine Tapeworms and Sheep Measles

- Sheep measles is the common name to lesions in sheep and goats caused by an intermediate stage of a tapeworm parasite (*Taenia ovis*) which infects dogs.
- Typically causes hard, white cysts on the surface or within muscle tissue of sheep and goats (resulting in carcass condemnation).
- Parasite relies on 2 hosts (canine and ovine/caprine).
- No human health risk.
- Prevent by treating dogs for tapeworm.
- If feeding sheep/goat meat to dogs, freeze or cook before feeding.



Coccidia

- Single-cell protozoa that damage lining of small intestines
 - Species-specific
 - Very common in sheep, especially growing lambs
 - Older sheep generally immune, but can serve as sources of infection
 - Transmission favored by warm, wet environmental conditions
 - Stress (weaning, shipping, etc.) often induces outbreaks
- Clinical signs include:
 - Diarrhea (sometimes containing blood or mucous)
 - Dehydration
 - Fever
 - Loss of appetite
 - Anemia
 - Death



External Parasites

- External parasites can impact wool/hair quality, milk production, and overall animal health
- Sheep Scab or Scabies
 - Thought to be eradicated in US
 - Reportable condition
- Sheep Lice
- Ticks and Keds (Sheep Ticks)
- Nasal Bots
- Cydectin (moxidectin) and Ivomec Drench (ivermectin) provide control of nasal bots, lice and ticks.



An ounce of prevention... Integrated Parasite Management

- Good management

- Feed in troughs/mangers that cannot be easily contaminated with feces
- Don't overstock pastures
- Isolate new animals for at least 30 days



- Rotational grazing

- Moving animals every 1-3 days can reduce likelihood of reinfection
- The majority of infective larvae are found within the bottom 3 inches of forage plants - moving animals before pastures are grazed to/below this level can reduce infection
- CHALLENGE: longer rest periods may be necessary to disrupt parasite life cycles.
 - Forage quality may decline if rest period is too long.

Integrated Parasite Management

- Managing grazing heights of forage species (NOTE: this is only 1 consideration in pasture management)
 - Cool season forages (tall fescue, orchard grass, perennial ryegrass, etc.) – can be grazed to 3-4” stubble height
 - Warm season forages can be grazed to 6-8” stubble height.
- Utilizing browse
 - Allowing sheep or goats to browse on brush species encourages them to eat higher in the canopy where there is less chance of picking up parasites.
- Condensed tannins
 - Some plants containing high levels of condensed tannins (like birdsfoot trefoil and chicory) can reduce fecal egg counts.

Integrated Parasite Management

- Multi-species grazing
 - Generally, cattle and horses do not share the same internal parasites as small ruminants.
 - Cattle or horses can “clean” a pasture by consuming forage with infective larvae.
 - These larvae cannot complete their life cycle in the foreign host.
- Genetics
 - Some breeds may have greater parasite resistance
 - New genetic selection tools (EBVs) include parasite resistance for Katahdin sheep – may be developed for additional breeds
 - Cull females that are persistently affected
 - Evaluate through FAMACHA© or fecal egg counts
 - Requires recordkeeping system

...or a pound of cure! Treating Parasite Infections



Photo: Premier 1 Supplies

- Anthelmintics (dewormers) must be used properly to ensure effectiveness and slow drug resistance.
 - Provide proper dose based on weight (under-dosing creates resistance).
 - Holding animals off feed (NOT water) for up to 24 hours may improve efficacy (by slowing absorption)
- **New recommendation:** deworm newly purchased animals with drugs at least two of the three anthelmintic families.

Families of Dewormers

Drug Class		Ingredient	Trade Names
BZD	Benzimidazole	Fenbendazole Albendazole Oxtendazole	SafeGuard [®] , Valbazen [®]
IMID	Nicotinic agonist Imidazothiazoles Tetrahydropyrimidines	Levamisole Morentel Pyrantel	Prohibit [®] , LevaMed [®]
ML	Macrocyclic lactone Avermectins Milbemycins	Ivermectin Epinomectrin Doramectin Moxidectin	Ivomec [®] , Cydectin [®]

Note: only Valbazen drench, Ivomec drench, Prohibit drench, LevaMed drench, and Cydectin drench are FDA-approved for use in sheep in the U.S. Only SafeGuard is FDA-approved for use in goats.

Anthelmintics (dewormers)

	Prohibit (Levamisole)	Cydectin Drench (Moxidectin)	Valbazen Drench (Albendazole)	Ivomec Drench (Ivermectin)	Safe-Guard Drench (Fenbendazole)
Cost (100 lb sheep)	\$0.18	\$0.60-0.69	\$0.23-0.25	\$0.75-1.09	
Cost (100 lb goat)			\$0.30-0.34	\$0.33-0.40	
Barber pole worm	Sheep	Sheep	Sheep	Sheep	Goats
Brown stomach worm		Sheep			
Liver flukes			Sheep		
Lung worms	Sheep		Sheep	Sheep	
Nasal bots				Sheep	
Roundworm	Sheep	Sheep			Goats
Tapeworm			Sheep		

Remember: the manufacturer's label supersedes all information contained in this chart. Read labels carefully for all indications, dosages and uses. Off-label use of any anthelmintic requires a valid veterinary-client-patient relationship.

Treating Coccidiosis

- Infection is usually treated with sulfa drugs (which require a veterinarian's prescription in California) or with amprolium (Corid[®]).
- Several feed additives can prevent coccidiosis – these require a veterinary feed directive (VFD).



Natural Options?



- Significant interest in “natural” substances (e.g., herbal dewormers, diatomaceous earth, etc.).
- No research indicating these products have a substantial effect on internal parasites.
- Possible exception: copper oxide wire particles (administered as a bolus) – may reduce barber pole worm infections.
- Know the copper status of your sheep before using!

Anthelmintic Resistance

- Resistance to deworming products is a growing problem
- Experts recommend that producers test for resistance every 2-3 years:
 - Fecal Egg Count Reduction Test (FECRT): compares pre- and post-treatment fecal egg counts.
 - An effective treatment should reduce fecal egg counts by $\geq 95\%$.
 - Low level resistance: 90-95% reduction
 - High resistance: $\leq 60\%$
 - DrenchRite[®] assay: single test to determine resistance to all drug classes. Only available from UG College of Veterinary Medicine.

Parasite Resistance vs. Resilience

- Resistance is the ability to prevent infection
 - Quantified by fecal egg counts (which estimate the number of worms in the animal's gut)
- Resistance is more important in rams/bucks than in ewes/does
 - Males influence the genetics of more offspring – and resistance is heritable
- Resilience is the ability to tolerate parasitic infection
 - Quantified by FAMACHA© scores, which are an estimate of packed cell volume (PVC – a measure of red blood cells).
 - The Five Point Check© also measures resilience
- Resilience is also important genetically

Refugia



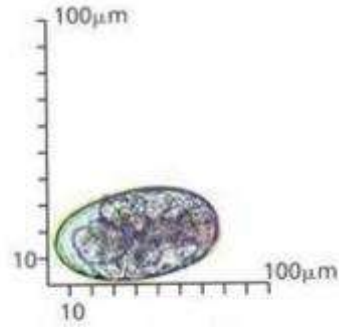
- Worms in “refugia” have not been exposed to treatment.
- Refugia are essential to maintaining anthelmintic effectiveness and slowing the development of resistance.
- To increase refugia, a portion of the flock should not be dewormed.
- Tools like fecal egg counts and FAMACHA© can identify animals that do not need to be treated.

Fecal Egg Counts

- Fecal Egg Counts can help determine how contaminated your pastures are.
- Can also be used to help select culls or replacements
- Critical tool for evaluating drug resistance
- Equipment and Supplies:
 - Microscope (100x power)
 - Flotation solution
 - Mixing vials
 - Strainer
 - Stirring rod
 - Slides (McMaster slides work great)
 - Cover slips
- Worming recommendations can be made based on quantity of strongyle eggs

Guide to Internal Parasites of Ruminants

Sponsored by Intervet—providers of Panacur®/Safe-Guard® to the livestock industry.



Ostertagia
(brown stomach worm)



Cooperia
(small intestinal worm)



Moniezia
(tapeworm - sheep)



Moniezia
(tapeworm - cattle)



Bunostomum
(hookworm)



Haemonchus
(barberpole worm)



Nematodirus
(threadneck worm)



Trichostrongylus
(bankrupt worm)



Oesophagostomum
(nodular worm)



Trichuris
(whipworm)



Strongyloides
(threadworm)



Coccidia
(a protozoan that causes coccidiosis)



Dictyocaulus
(lungworm)



Mite Egg - 1/4 actual size
(contaminant - often mistaken for worm eggs)

FAMACHA®

- Developed in South Africa due to emergence of drug-resistant worms
- Utilizes eye anemia guide to evaluate eyelid color to determine severity of infection
- Only effective for detecting barber poll and other blood-feeding parasites. Should not be used in isolation.
- Use as part of an integrated approach:
 - Pasture management, nutrition, multi-species grazing, etc.
- Online training now available: <https://web.uri.edu/sheepngoat/famacha/>



FAMACHA[®] System

Clinical Category	Eye Color	Packed Cell Volume (PCV)	Treatment Guideline
1	Red	≥28	No
2	Pinkish-Red	23-27	No
3	Pink	18-22	Maybe
4	Pinkish-White	13-17	Yes
5	White	≤12	Yes



Five Point Check©

Point		What to check	Which parasites
1	Eye	Paling of ocular membranes FAMACHA© score	Barber pole worm Liver fluke
2	Back	Body condition score	All
3	Rear	Dag score Fecal soiling Evidence of scours	Brown stomach worm Hair worm Threadworm Nodule worm Coccidia
4	Jaw	Bottle jaw	Barber pole worm Liver fluke
5	Nose	Nasal discharge	Nasal bots

Developed by the same South African researchers who developed the FAMACHA© system. The Five Point Check© incorporates other check points that encompass the symptoms and deworming need for other internal parasites. It is also useful for making deworming decisions for animals with FAMACHA© scores of 3.

More information

- www.wormx.info (American Consortium for Small Ruminant Parasite Control)
- www.sheepandgoat.com (Maryland Small Ruminant Page)
- <https://www.premier1supplies.com/sheep-guide/2012/07/integrated-parasite-management-ipm-in-small-ruminants/> (Premier 1 Sheep Guide)