Managing Internal Parasites in Small Ruminants

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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
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.

![Life Cycle of Haemonchus contortus, the barber pole worm](image-url)
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.
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

- 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

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Ingredient</th>
<th>Trade Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>BZD</td>
<td>Benzimidazole</td>
<td>Fenbendazole, Albendazole, Oxfendazole</td>
</tr>
<tr>
<td>IMID</td>
<td>Nicotinic agonist, Imidazothiaoles, Tetrahydropyrimidines</td>
<td>Levamisole, Morentel, Pyrantel</td>
</tr>
<tr>
<td>ML</td>
<td>Macrocylic lactone, Avermectins, Milbemycins</td>
<td>Ivermectin, Epinomectrin, Doramectin, Moxidectin</td>
</tr>
</tbody>
</table>

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)

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

*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 ≥95%.
    - Low level resistance: 90-95% reduction
    - High resistance: ≤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
- 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

<table>
<thead>
<tr>
<th>Clinical Category</th>
<th>Eye Color</th>
<th>Packed Cell Volume (PCV)</th>
<th>Treatment Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
<td>≥28</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Pinkish-Red</td>
<td>23-27</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Pink</td>
<td>18-22</td>
<td>Maybe</td>
</tr>
<tr>
<td>4</td>
<td>Pinkish-White</td>
<td>13-17</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>White</td>
<td>≤12</td>
<td>Yes</td>
</tr>
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</table>
## Five Point Check©

<table>
<thead>
<tr>
<th>Point</th>
<th>What to check</th>
<th>Which parasites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eye</td>
<td>Paling of ocular membranes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FAMACHA© score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barber pole worm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Liver fluke</td>
</tr>
<tr>
<td>2</td>
<td>Back</td>
<td>Body condition score</td>
</tr>
<tr>
<td>3</td>
<td>Rear</td>
<td>Dag score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fecal soiling</td>
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<tr>
<td></td>
<td></td>
<td>Evidence of scours</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Jaw</td>
<td>Bottle jaw</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Nose</td>
<td>Nasal discharge</td>
</tr>
</tbody>
</table>

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)