Parasite Control & Being a Good Steward: Tips to Implementing New Research Findings (Crystal Ball Stuff)

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WORMS
- Flukes (Trematodes)
- Tapes (Cestodes)
- Roundworms (Nematodes)

GERMS (Protozoans)
- Crypto (Cryptosporidium)
- Coccidia (Eimeria)

BUGS
- Flies (adult Dipterans)
- Grubs (larval Dipterans)
- Lice (Sucking and Biting)
- Mites

CATTLE PARASITES

Liver Fluke
Lungworm
Stomach Worms
Hookworm, Small Intestinal Worms
Nodular Worm
Large Mouthed Bowel Worm
Tapeworm, Thread Neck Intestinal Worm
Avermectin Resistant Long-nose Cattle Lice in a South Dakota Charolais Herd

Treated:
• An avermectin pour-on mid November
• Avermectin pour-on and injectable mid December
Approaches to Treating Lice on Cattle
Entirely Dependent on Pesticides

Types of Applications:
- **Sprays & Dusts (& Fogs?)** – (Insecticides)
  - Permethrin -
  - Malathion ?? -
- **Pour-ons** –
  - Macrocyclic Latones – systemic: sucking & biting lice
    - Avermectins – Ivermectin, Dormamectin, etc.
    - Milbemycins – Moxidectin
  - Permethrin – non-systemic
  - Insect Growth Regulators (IGR) – combined with permethrin - sucking & biting lice
- **Injectables (endectocides)** – better on sucking lice
  - Macrocyclic Lactones
    - Avermectins – Ivermectin, Dormamectin, etc.
    - Milbemycins - Moxidectin
Combining Insecticide Classes

Rotating insecticide & Anthelmintic Classes is “out”; Combinations are “in”

- Studies on controlling pesticide resistance take years to get results
- Computer models are commonly used
- Models can’t show any delay in resistance from rotating classes of pesticides
- Models show advantages with combination

Combining Insecticide Classes

<table>
<thead>
<tr>
<th>ACTIVE INGREDIENTS:</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diflubenzuron</td>
<td>3.0%</td>
</tr>
<tr>
<td>Permethrin</td>
<td>5.0%</td>
</tr>
<tr>
<td>OTHER INGREDIENTS*</td>
<td>92.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Haematobia irritans irritans (Horn Fly)

Guide to Estimating Fly Numbers

Level 1:
A single small patch of flies = 25-50 flies located in area A, B or C

Level 2:
A single patch of flies that covers areas A and B or B and C = 100-125 flies

Level 3:
The patch of flies extends through all 3 areas = 200-350

Level 4:
The patch of flies covers all areas extensively
“Control” of Horn Flies
Mostly Dependent on Insecticides

• Sprays
  • High Pressure
  • Low Pressure
• Insecticide Impregnated Ear Tags
  • Organophosphates
  • Pyrethroids
  • Organochlorines
  • Macrocyclic Lactones
• Bags and Rubs
• Mineral Blocks and Feed Additives (Larvacides)
• Traps

Bruce Walk-in Horn Fly Trap
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- Tapeworm, Thread Neck Intestinal Worm
In only 1 fecal sample, it is possible to detect trichostrongyle nematodes in virtually all ruminants with access to grass anywhere in the world.

• You can’t eliminate them, but you can manage them.

PREVALENCE OF INTESTINAL PARASITES IN COWS & CALVES FROM THE NORTHERN PLAINS

<table>
<thead>
<tr>
<th>Parasite</th>
<th>Mean EPG</th>
<th>Percent Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coccid.</td>
<td>94</td>
<td>92.1</td>
</tr>
<tr>
<td>Strong.</td>
<td>69.1</td>
<td>69.1</td>
</tr>
<tr>
<td>Ndirus</td>
<td>34</td>
<td>78.4</td>
</tr>
<tr>
<td>Moniezia</td>
<td>1.6</td>
<td>35.4</td>
</tr>
<tr>
<td>Trichurs</td>
<td>6.5</td>
<td>19.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.42</td>
</tr>
</tbody>
</table>

Calves - Yellow, Cows - Turquoise.
Goats:
• Extremely Susceptible
• Control measures needed in all areas of South Dakota

Sheep:
• Very Susceptible
• Control measures needed in most areas of the Northern Plains

Bison:
• Moderately Susceptible

Cattle:
• Moderately Susceptible
• Control measures for economic gains only

Relative Susceptibility of Different Livestock to Trichostrongyles
Aggregation of nematodes in a herd population creates the opportunity to use parasitism as a culling determinant.

N=75     Mean EPG=28.45
2,134 total eggs

60% of eggs in 7 calves
Trichostrongyle Genera in Beef Calves from Eastern South Dakota

HOTC Complex

• *Haemonchus placei* (Cattle) or *H. contortus* (Sheep)
  - Parasitizes the abomasum (stomach)
  - Most deadly trichostrongyle also production losses
  - More common to wet and warm climates

• *Ostertagia ostertagi*
  - Can raise pH of the stomach and clinical problems
  - Causes production losses
  - Commonly found in South Dakota cattle

• *Trichostrongylus spp.*
  - Parasitizes stomach or intestine
  - Rare in South Dakota cattle; very common in sheep
  - Causes production losses

• *Cooperia spp.*
  - Commonly found in South Dakota cattle
  - Causes production losses, but not clinical problems
• **Ostertagia & Cooperia** 3rd stage juveniles can survive adverse environmental conditions in the soil.  
• They can easily survive S.D. winters.  
• **Haemonchus** cannot survive S.D. winters and struggle more during dry summers.  
• All trichostrongyle 4th stage juveniles can survive in the wall of the gut.
Problems caused by Trichostrongylus Infections
Vary depending on species and intensity

CLINICAL PARASITISM
- Sudden Death
- Anemia
- Diarrhea / Loose stools

SUBCLINICAL PARASITISM
- Reduced Appetite
- Reduced weaning wt.
- Reduced reproductive performance
- Reduced milk production
- Reduced growth rate
- Increased susceptibility to disease

Haemonchus
Rare in South Dakota
- Weakness
- Bottle jaw

Ostertagia and Cooperia

Mesenteric lymph nodes

14 Days Post Infection
> 20 fold increase in size

Housing Costs
Ostertagia (Brown Stomach Worm)

Juveniles live in the gastric glands of the stomach, damaging them and raising stomach pH.
**Haemonchus**

- Historically, a tropical worm
- Becoming more common in Northern Plains

In Sheep - *Haemonchus contortus*
- Can cause lethal anemia
- Often resistant to anthelmintics

In Cattle – *H. placei* & *H. contortus*
- Doesn’t seem to be as lethal, but
- Affects weight
- *H. contortus* often resistant
Results of Trials from 1999-2001

28.5 eggs/gram
23 lb difference

10-15 lbs/calf for every 100 days

Worms in stocker cattle cost South Dakota producers ~ 10-15 pounds per calf every 100 days on pasture

- Even with low egg output (≤ 35 EPG)
- Other effects of worms
  - Conception rates
  - Carcass quality
  - Immunity

Most years it’s worth the costs to treat and prevent these losses IF cattle can be protected during the key time period!
Macrocyclic Lactone Class
- Ivermectin
- Doramectin
- Eprinomectin

Macrocyclic Lactone Class
- Milbemycin Subclass
  - Moxidectin

Benzimidazoles Class
- Albendazole
- Oxbendazole
- Fenbendazole

Imidazothiazoles Class
- Levamisole
  Older anthelmintic that was discontinued for a while

Older anthelmintic that was discontinued for a while
Title: Overwintering Strategies of a Population of Anthelmintic-resistant *Haemonchus contortus* within a Sheep Flock from the United States Northern Great Plains

Authors: D.D. Grosz, A.A. Eljaki, L.D. Holler, D.J. Petersen, S.W.Holler, M.B. Hildreth

<table>
<thead>
<tr>
<th>Drug</th>
<th>Collection Dates</th>
<th>Mean Eggs/Gram (Stand. Deviation)</th>
<th>Percent Reduction (Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doramectin [23 lambs]</td>
<td>preT: 7/2/07</td>
<td>1419 (918)</td>
<td>69% (44-83%)</td>
</tr>
<tr>
<td></td>
<td>postT: 7/30/07</td>
<td>444 (215)</td>
<td></td>
</tr>
<tr>
<td>Albendazole [29 lambs]</td>
<td>preT: 10/13/09</td>
<td>1092 (906)</td>
<td>90% (81-95%)</td>
</tr>
<tr>
<td></td>
<td>postT: 10/23/09</td>
<td>106 (172)</td>
<td></td>
</tr>
<tr>
<td>Moxidectin [27 ewes]</td>
<td>preT: 10/12/10</td>
<td>317 (322)</td>
<td>100%</td>
</tr>
</tbody>
</table>
TRIPLE TREATMENT METHODS

- **Animals**
  - Commercial 250 ewe flock in east-central South Dakota
  - History of *H. contortus* problems
  - Rotationally grazed ewes through 116 acre pasture divided into 8 paddocks.

- **Anthelmintics**
  - Starting in April 2014, 3 different anthelmintics were given orally:
    - *moxidectin* (Cydectin®; dosage of 0.2mg/kg),
    - *albendazole* (Valbazen®; dosage of 7.5mg/kg),
    - *levamisole* (Prohibit®; dosage of 7.5mg/kg).
  - Ewes were treated a 2nd time if FECs were greater than 1.
  - All ewes were treated again in spring of 2015 with levamisole

- **Fecal Egg Counts (FECs)**
  - Pre-treatment (N=250)
  - Post-treatment (N=250; after at least 9 days)
  - Only ewes with FECs less than 1 EPG went onto the pastures.
  - Pasture samples picked up every-other week (N=30)
  - Following Years during spring and fall (N=30)

- **Grazing Rotation**
  - Prior to August 10, rotated through first 4 paddocks (17.62 ha) before returning to a paddock; 3 total rotations through these.
  - Other 3 paddocks were grazed only once, later in the season.
Rotational grazing can provide relief depending on the rotational scheme.
Successfully being used in a flock of 400 ewes infected with anthelmintic-resistant *Haemonchus*
Timing is a critical factor; the longer the period between returning to a plot, the better.

Table 1. Rotational grazing time-table for 2014

<table>
<thead>
<tr>
<th>Pad. No.</th>
<th>Area Hectares</th>
<th>1st Rotation</th>
<th>Days *</th>
<th>Weeks After**</th>
<th>2nd Rotation</th>
<th>Days *</th>
<th>Weeks After**</th>
<th>3rd Rotation</th>
<th>Days *</th>
<th>Weeks After**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.56</td>
<td>6/30 7/7</td>
<td>7</td>
<td>1</td>
<td>8/10 8/18</td>
<td>8</td>
<td>7</td>
<td>10/15 10/23</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>1.36</td>
<td>7/7 7/10</td>
<td>3</td>
<td>2</td>
<td>8/18 8/21</td>
<td>3</td>
<td>8</td>
<td>10/10 10/15</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>3.63</td>
<td>7/10 7/17</td>
<td>7</td>
<td>3</td>
<td>8/21 8/26</td>
<td>5</td>
<td>8</td>
<td>10/23 10/28</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>8.07</td>
<td>7/17 8/1</td>
<td>15</td>
<td>4 &amp; 5</td>
<td>9/2 9/11</td>
<td>9</td>
<td>10-11</td>
<td>10/28 11/4</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>5.8</td>
<td>8/1 8/10</td>
<td>9</td>
<td>6</td>
<td>9/29 10/10</td>
<td>8</td>
<td>14</td>
<td></td>
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<tr>
<td>6</td>
<td>8.88</td>
<td>8/26 9/2</td>
<td>7</td>
<td>9</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>7</td>
<td>5.06</td>
<td>9/11 9/19</td>
<td>8</td>
<td>11-12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fecal Egg Counts from Ewes Treated with 3 Classes of Anthelmintics

- Mean pre-treatment FEC was 3606.8 EPG, ranging from 0 to 49400 EPG.
- The first triple treatment showed a 99.99% FEC reduction to 0.16 EPG.
- 68% of the post-treatment samples showed no eggs; 27.6% contained less than 1 EPG, and 4.4% contained between 1 and 2 EPG.
- FEC at turnout was 0.12 eggs per gram.
- Ewes with more than 1 EPG were kept in a feedlot.
- After 18 weeks rotating through the different paddocks, FEC was already 30.7 EPG.
- Next Spring, egg counts were still pretty low.
- Spring of 2016 and 2017, FEC was about one/third of the original because of culling and rotations.
PARASITE MANAGEMENT

• **Parasite Treatment** *(Fall Deworming)*
  - Targets 10% of the Parasite Population
  - Doesn’t require product with persistence
  - Avermectins also control lice, especially as pour-ons

• **Parasite Management/Prevention** *(Strategic or Spring Deworming)*
  - Targets 90% of Parasite Population
  - Requires persistence or multiple treatments