Deworming: Relationships, Resistance, Refugia

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2015 UW-Extension Cow Calf Meetings

Parasite Control Requires an Integrated Approach

- Clean Pastures
- Fecal Egg Counts (FEC)
- Strategic Deworming
- Proper Anthelmintic Use
- Genetic Selection
- Good Nutrition
Relationship: Host, Parasite, Environment

Ingest L3

Eggs

L4
L5
Adult

L3
L2
L1

Grass

www.petalia.com.au
Stocking density
Grass height > 4”
Residual biomass

Risks for Helminths

• Young cattle: stockers
• Pastured or grazing cattle
  • Moist spring-summer
  • Intensively rotated
  • High stocking rates

Lower Risk for Parasitism
• Cattle in their second grazing season
• Hot dry summer
  • Short over-grazed cool-season grasses
• Appropriate stocking rate
• Cows and nursing calves or yearlings in continuous grazing management
  • Well-formed manure pats
• Mob grazing
Signs of Parasite Infection

- Diarrhea
- Rough hair coat
- Distended abdomen
- Lower than expected weight gains
- Bottle jaw/edema under mandibles
- Higher incidence of other diseases
- Delayed conception rates

Subclinical Infections

Are these animals infected?

Fecal Egg Counts (FEC)
FEC Sampling

WVDL Submission Guidelines

- 2-5 gm, refrigerate do not freeze
- $11 lab charge per sample with a $10 accession fee per submission
- Individual fresh grab sample which is identified to a specific animal

How many to sample?

- 20% of population sheds 80% of the eggs
- 20% of the cattle population or at least 20 head—this number may equal the whole herd

Do I have resistant parasites?

- Establish a surveillance program
- Fecal egg count reduction test (FECRT)
  - Test 20% of your herd (or 20 animals)
  - Treat the entire group
  - In 14 days, retest same animals
  - Should get a decrease in egg counts by 90-95%
Which cattle should be treated?

- Weanlings
- Stockers
- Young cattle < 2nd grazing season
- Cows prior to calving

When to treat?

- Symptoms/ FEC
- In the fall- FEC then deworm after a good freeze before winter
- In the spring- 4-6 weeks after the pasture is green, FEC then deworm if necessary
Parasite Control Begins with Good Management and Common Sense

- Good sanitation
- Clean water, free from fecal matter
- No overstocking of pens and pastures
- Isolation and de-worming of new animals
- Treatment: **TEST Before & After!!**

Classes of Dewormer Medications

<table>
<thead>
<tr>
<th>Benzimidazoles</th>
<th>Imidazothiazoles</th>
<th>Macrocyclic Lactones</th>
<th>Tetrahydropyrimidines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albendazole</td>
<td>Levamisole</td>
<td>Doramectin</td>
<td>Morantel</td>
</tr>
<tr>
<td>Fenbendazole</td>
<td></td>
<td>Eprinomectin</td>
<td></td>
</tr>
<tr>
<td>Oxfendazole</td>
<td></td>
<td>Ivermectin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moxidectin</td>
</tr>
</tbody>
</table>
Anthelmintic Response

Two Main Mechanisms Causing Death:
- Interruption of energy uptake
- Muscle paralysis

Benzimidazoles

- Example: Fenbendazole - white paste dewormer
- Kill larval and adults stages
- Can increase the dose and duration to increase efficacy against larvae
- Safe and non-toxic
- Short duration of activity (< 24 h), no residual activity
- Administered orally - not preferred by producers
Imidazothiazole

- Example: Levamisole
- Kills adult stages of worms (+/- larvae)
- Short-acting effects of the drug
- Available as an oral, injectable and pour-on product
- Can have toxic side effects as it depolarizes the membrane!

Macrocyclic Lactones

- Examples: Ivermectin, eprinomectin and moxidectin
  - clear dewormer
- Effective against worms and external parasites
- Kill both adults and larval stages
- Have residual effects (long-lasting)
- Available as injectable and pour-ons
Alternative Dewormers

- Diatomaceous earth (DE)
  - Finely ground fossilized remains of tiny sea organisms found on the sea floor
  - Remains have microscopic cutting edges—pierce outer protective layers of parasitic worms and insects
  - No scientific research it is effective
- Other herbs that harm helminths and boost the immune system

Do I have the correct product?

- Factors to consider:
  - Internal parasites in your animals
  - Type of production system
  - Pasture and grazing management
  - Time of year and geographic location
  - Animals being treated
  - What about resistance??
### Comparison of FECRT Efficacy for ML Pour-Ons 2008 (AABP) vs. 2013 (January 3)

<table>
<thead>
<tr>
<th>Products</th>
<th>No. of Trials 2008</th>
<th>Efficacy</th>
<th>No. of Trials 2009-13</th>
<th>Efficacy</th>
<th>Efficacy Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivomec®</td>
<td>8</td>
<td>72.3%</td>
<td>3</td>
<td>27%</td>
<td>-45.3%</td>
</tr>
<tr>
<td>Ivermectin</td>
<td>35</td>
<td>59.7%</td>
<td>26</td>
<td>45.8%</td>
<td>-23.9%</td>
</tr>
<tr>
<td>Dectomax®</td>
<td>8</td>
<td>78.9%</td>
<td>10</td>
<td>66.1%</td>
<td>-13.8%</td>
</tr>
<tr>
<td>Cydectin®</td>
<td>9</td>
<td>67.2%</td>
<td>11</td>
<td>72.5%</td>
<td>+5.3%</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>60</td>
<td>66.1%</td>
<td>53</td>
<td>51.2%</td>
<td>-14.9%</td>
</tr>
</tbody>
</table>

### FECRT Efficacy Summary for All Products

<table>
<thead>
<tr>
<th>Products</th>
<th>Samples</th>
<th>Pre Rx*</th>
<th>Post Rx*</th>
<th>Efficacy</th>
<th>Number of Passing Trials**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injectable Endecticide</td>
<td>4,880</td>
<td>73.3%</td>
<td>29.9%</td>
<td>59.2%</td>
<td>19/119</td>
</tr>
<tr>
<td>Pour-On Endecticide</td>
<td>6,193</td>
<td>61.5%</td>
<td>25.96%</td>
<td>57.8%</td>
<td>36/146</td>
</tr>
<tr>
<td>Safe-Guard® or Panacur®</td>
<td>7,807</td>
<td>57.6%</td>
<td>0.8%</td>
<td>98.7%</td>
<td>179/182</td>
</tr>
<tr>
<td>Fenbendazole Endecticide</td>
<td>2,838</td>
<td>77.3%</td>
<td>0.5%</td>
<td>99.4%</td>
<td>63/64</td>
</tr>
</tbody>
</table>

**90% EFFICACY REQUIRED FOR SUCCESSFUL DEWORMING**

**THRU 12-1-14**

90% EFFICACY REQUIRED FOR SUCCESSFUL DEWORMING
# FECRT Efficacy for Injectable Endectocide Products

<table>
<thead>
<tr>
<th>Product Formulation/Active Ingredient</th>
<th>Trials</th>
<th>Samples</th>
<th>Pre Rx*</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivomec® / Ivermectin</td>
<td>24</td>
<td>1,312</td>
<td>71.8%</td>
<td>47.2%</td>
</tr>
<tr>
<td>Ivomec® Plus/ Ivermectin/Clorsulon</td>
<td>17</td>
<td>707</td>
<td>102.6%</td>
<td>45.7%</td>
</tr>
<tr>
<td>Dectomax® / Doramectin</td>
<td>34</td>
<td>1,400</td>
<td>69.9%</td>
<td>79.1%</td>
</tr>
<tr>
<td>Cydectin® / Moxidectin</td>
<td>9</td>
<td>394</td>
<td>32.1%</td>
<td>83.8%</td>
</tr>
<tr>
<td>LongRange® / Eprinomectin</td>
<td>11</td>
<td>437</td>
<td>45%</td>
<td>72.9%</td>
</tr>
<tr>
<td>Ivermectin / Avermectin</td>
<td>13</td>
<td>630</td>
<td>90.0%</td>
<td>48.3%</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td><strong>119</strong></td>
<td><strong>4,880</strong></td>
<td><strong>73.3%</strong></td>
<td><strong>59.2%</strong></td>
</tr>
</tbody>
</table>

THRU 12-1-14

90% EFFICACY REQUIRED FOR SUCCESSFUL DEWORMING

# FECRT Efficacy for Pour-on Endectocide Products

<table>
<thead>
<tr>
<th>Product Formulation/Active Ingredient</th>
<th>Trials</th>
<th>Samples</th>
<th>Pre Rx*</th>
<th>Post Rx*</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivomec® / Ivermectin</td>
<td>21</td>
<td>823</td>
<td>61.8%</td>
<td>27%</td>
<td>56.3%</td>
</tr>
<tr>
<td>Ivermectin / Ivermectin</td>
<td>80</td>
<td>3,327</td>
<td>63.1%</td>
<td>29.6%</td>
<td>53.1%</td>
</tr>
<tr>
<td>Dectomax® / Doramectin</td>
<td>23</td>
<td>941</td>
<td>67.9%</td>
<td>23.7%</td>
<td>65.1%</td>
</tr>
<tr>
<td>Cydectin® / Moxidectin</td>
<td>21</td>
<td>878</td>
<td>55.7%</td>
<td>14.5%</td>
<td>74.0%</td>
</tr>
<tr>
<td>Eprinex® / Eprinomectin</td>
<td>5</td>
<td>224</td>
<td>38.1%</td>
<td>25.7%</td>
<td>32.5%</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td><strong>150</strong></td>
<td><strong>6,193</strong></td>
<td><strong>61.5%</strong></td>
<td><strong>25.96%</strong></td>
<td><strong>57.8%</strong></td>
</tr>
</tbody>
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THRU 12-1-14

90% EFFICACY REQUIRED FOR SUCCESSFUL DEWORMING
Comparison of FECRT Efficacy for ML Injectables 2008 (AABP) vs. 2011 (January 12)

<table>
<thead>
<tr>
<th>Product / Active Ingredient</th>
<th># of Trials in 2008</th>
<th>Percent Efficacy</th>
<th># of Trials in 2011</th>
<th>Percent Efficacy</th>
<th>Efficacy Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivomec® / Ivermectin</td>
<td>6</td>
<td>76.2%</td>
<td>14</td>
<td>53.8%</td>
<td>-22.4%</td>
</tr>
<tr>
<td>Ivomec® Plus / Ivermectin/ Clorsulon</td>
<td>6</td>
<td>42.6%</td>
<td>12</td>
<td>43.1%</td>
<td>+0.5%</td>
</tr>
<tr>
<td>Ivermectin or Ivermectin Plus</td>
<td>1</td>
<td>50.0%</td>
<td>11</td>
<td>52.5%</td>
<td>+2.5%</td>
</tr>
<tr>
<td>Dectomax® / Doramectin</td>
<td>11</td>
<td>90.5%</td>
<td>25</td>
<td>77.2%</td>
<td>-13.3%</td>
</tr>
<tr>
<td>Cydectin® / Moxidectin</td>
<td>2</td>
<td>98.1%</td>
<td>8</td>
<td>85.1%</td>
<td>-13.0%</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td><strong>26</strong></td>
<td><strong>72.5%</strong></td>
<td><strong>70</strong></td>
<td><strong>59.4%</strong></td>
<td><strong>-13.1%</strong></td>
</tr>
</tbody>
</table>

90% EFFICACY REQUIRED FOR SUCCESSFUL DEWORMING

Resistance

The ability of helminths to survive:

- the normal effective dose of the anthelmintic
- which would normally kill that same species and stage
- and pass this genetic ability to their offspring
Some larvae carry resistance genes

How & why does resistance occur?

- Under-dosing!
- Over use
- Treat for the right reason!

Allowing some worms to live and breed with their resistant genes

Resistant eggs can be shed in manure

What if I have resistance?

- DO NOT de-worm right away with the same product
- May have to develop a combination treatment protocol for your farm
- Identify “shedders” in the herd and cull (80/20 rule)
- Develop a strategic de-worming protocol
- Develop pasture management and grazing strategies
Tactical Program

- Treat or administer medicine when it is convenient for the producer
- **Helps increase the development of resistance**
- **Does nothing to minimize pasture contamination**

Concept of Refugia

- **Proportion of helminths still susceptible to chemical treatment**
  - Helminths in untreated host animals
  - Eggs, L2 and L3 on pasture
- **Diluting the gene pool with drug susceptible genes**
- **Allow them 1-2 days after treatment before putting onto new pasture**
### Treat to Meet Production Goals and Refugia

<table>
<thead>
<tr>
<th>Production Type</th>
<th>Operation Type</th>
<th>Helminth Impact</th>
<th>Production Needs</th>
<th>Target for Control</th>
<th>Probability Anthelmintic Resistance</th>
<th>Ability to Manage Refugia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>Conventional</td>
<td>Low</td>
<td>High</td>
<td>Replacement Heifers</td>
<td>Low</td>
<td>Easy</td>
</tr>
<tr>
<td></td>
<td>Grazing</td>
<td>Moderate</td>
<td>Mod - High</td>
<td>Replacement Heifers</td>
<td>Low - Mod</td>
<td>Moderate</td>
</tr>
<tr>
<td>Beef</td>
<td>Cow-calf</td>
<td>Mod - high</td>
<td>Mod - high</td>
<td>Calves Yearlings</td>
<td>Mod - High</td>
<td>Mod - Difficult</td>
</tr>
<tr>
<td></td>
<td>Stocker</td>
<td>Very high</td>
<td>Very High</td>
<td>All</td>
<td>Very High</td>
<td>V. Difficult</td>
</tr>
<tr>
<td></td>
<td>Feeder</td>
<td>High</td>
<td>Maximal</td>
<td>All</td>
<td>Very Low</td>
<td>Not an issue</td>
</tr>
</tbody>
</table>

L. Gasbarre, Vet Parasitology 204 (2014) pg 8

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**Our Presentation was Adapted from Presentations Provided by:**

- Sherrie G. Clark, DVM, MS, PhD, University of Illinois—Anti-helmintic Resistance and Alternative Strategies
- Teresa Steckler, PhD, Extension Educator, Commercial Ag, Dixon Springs Agricultural Center University of Illinois—Herd Health Considerations: Parasites
- Guy Ellis DVM, Beef Tech Services, Merck Animal Health FECRT Database Update MONITORING PERFORMANCE Results thru December 1, 2014

**Thank-You!!**
Any Questions?

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