MANAGING THE WORMS IN YOUR SHEEP
(OR—IS THERE LIFE AFTER DRUGS?)

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THE BIGGEST HEALTH PROBLEM FACED BY SMALL RUMINANT PRODUCERS IN THE MIDATLANTIC AND SOUTHEAST U.S. IS WORMS.

We have all become accustomed to having several highly effective drugs to select from for the treatment of worms, but as the level of parasite drug resistance increases, these drugs are not the easy solution they once were. Drug resistant worms are spreading and drug companies are not developing new products. Control programs based on drug treatment alone are not the answer.

What are the most important worms?
The most important worm parasites live in the stomach and intestine. They are nematodes and belong to a family called trichostrongyles. Throughout the U.S., but especially for us in the mid Atlantic and southern states, the really important member of this family is the barber pole worm (*Haemonchus contortus*) -- it causes many deaths every year. This is a bloodsucking parasite that causes anemia and bottle jaw but usually not scouring.

Some near relatives of the barber pole worm can cause scouring in large numbers and contribute to the general debilitation caused by barber pole worm disease, but in this region they usually do not cause severe production losses or death by themselves. Examples of some of these worms that you will see on dewormer labels are *Trichostrongylus, Ostertagia, Cooperia*

In order to control parasites most effectively there are some facts about the life cycle hat are important to understand.

1. Adult female worms produce eggs that are passed in manure. Larvae hatch out and go through several stages of development in the environment before they can infect the next host.

2. During the warm months of the year enormous numbers of larvae can build up on your pasture.
3. Virtually all these worms need pasture for successful development; they do not do well on dirt lots or in the barn. The success of larvae outside the host depends on the climate. Moisture and warmth are necessary for development and survival. Barber pole worm does not survive cold winters well, but in eastern Virginia with its mild winters larvae will probably survive better over the winter. Dry weather is very hard on these larvae once they are out on the grass.

4. *Haemonchus* (and its relations) larvae can also undergo a process called ARRESTED DEVELOPMENT where they sit quietly in the stomach following infection and don’t become adults until several months later. This is an important adaptation for keeping the worm around through cold winters when eggs and larvae don’t survive well on pasture. The worms that became arrested in the fall resume development in the spring and reproduce.

This information can be used in several ways to target parasite control for times of the year when it will have the greatest impact.
CONTROLLING BARBER POLE WORM AND ITS RELATIONS

Worm parasites are a part of the natural sheep world. We can't eradicate them as long as sheep are on pasture. The goal is to maintain the parasites at a level that will not produce any illness or economic loss.

What is the Current Status of Drug Resistance?

Drug resistant *Haemonchus* is widespread throughout the world in sheep and goats and the problem is increasing in the U.S. There are 3 basic categories of dewormers now is use: Benzimidazoles, Macrolides (also called macrocyclic lactones) and a third group we'll call nicotinic agents that includes levamisole and pyrantel.

![Drug Resistance Diagram]

What Is Drug Resistance?

Inherited ability of worms to resist the action of a drug—passed from generation to generation. The more a population of worms sees a drug, the faster resistance will develop.
What Does Drug Resistance Look Like?

As the proportion of resistant worms increases generation after generation, a drug will become less and less effective. However, you may not see any obvious effect on your sheep until a drug is hardly working at all and significant losses in production or even deaths occur.

Drug Failure May Not Be Drug Resistance!

Other factors may cause a drug to be ineffective that are NOT related to resistance in the parasites.

1. Not giving enough (inaccurate estimation of weight, always dose for the heaviest animal in an age or sex group, not the average

2. Out of date or inadequately stored drug.

3. Inappropriate administration (example, not mixing the Safeguard well)

4. Too many worms! Sheep are treated but immediately pick up the same number of parasites again when they return to pasture.

How Do You Know If You Have Resistant Worms?

A Fecal Egg Count Reduction Test can be performed. Fecal samples are collected from about 10 sheep, they are dewormed and then a second set of fecal samples is collected from the same sheep 7 to 10 days later. Some untreated sheep should also be sampled at the same times. The number of parasite eggs is counted in each set of samples and the percentage reduction after treatment is determined. This test has to be done by a laboratory that counts eggs. The state labs currently do not count eggs. We can perform the tests in the parasitology lab at the veterinary school. If you are interested do this procedure, contact me for additional information.

How Can You Slow Down The Development Of Resistance?

1. Reduce the number of treatments you give (see below).

2. Use the correct dose (no underdosing!). Divide sheep into age or weight categories, dose for the heaviest animal in each category.
All of the available “modern” dewormers fall into 3 major groups of drugs. You need to recognize which ones are in each group because once worms become resistant to one member of the group, they will be resistant to the other members of the group.

Some of the drugs listed here are not FDA approved for use in sheep and, as such, can only be used following consultation with your veterinarian with appropriate consideration of withdrawal times.

<table>
<thead>
<tr>
<th>Chemical Name and Family</th>
<th>Approved for Sheep</th>
<th>Trade Name (example)</th>
<th>Dose (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fenbendazole BZD</td>
<td>No</td>
<td>Safeguard</td>
<td>5</td>
</tr>
<tr>
<td>Albendazole BZD</td>
<td>Yes</td>
<td>Valba zen</td>
<td>7.5 not for first 30 days of pregnancy</td>
</tr>
<tr>
<td>Levamisole Nicotinic</td>
<td>Yes</td>
<td>Tramisol</td>
<td>8</td>
</tr>
<tr>
<td>Pyrantel Nicotinic</td>
<td>No</td>
<td>Strongid T</td>
<td>25</td>
</tr>
<tr>
<td>Ivermectin Macrolide</td>
<td>Yes</td>
<td>Ivomec</td>
<td>0.2</td>
</tr>
<tr>
<td>Doramectin Macrolide</td>
<td>No</td>
<td>Dectomax</td>
<td>0.2</td>
</tr>
<tr>
<td>Moxidectin Macrolide</td>
<td>No</td>
<td>Cydectin</td>
<td>0.2</td>
</tr>
</tbody>
</table>

3. Use product that is fully effective (not expired, etc.)

4. When giving a product orally, make sure you put it in the back of the mouth. If you deposit it in the front of the mouth it is more likely to stimulate the closure of the esophageal groove. This groove is important in lambs because it allows the milk to go directly from the esophagus to the stomach and bypass the rumen, but with dewormers it is much better if they go into the rumen because they will be more slowly absorbed and stay in the body longer.

5. When giving a benzimidazole or ivermectin orally it is better to hold the sheep off feed for 12 to 24 hours before treatment (don’t remove water, just food). The drugs will not pass so quickly through the GI tract and active levels will be maintained in the body longer.

6. Rotate Dewormers
   To reduce the selection for resistance it is best not to use any single drug group for too long. For small ruminants the general recommendation is to change your dewormer groups annually.

7. Don’t Bring Resistance To Your Farm
   If you get new sheep, don’t let them bring in worms with drug resistance. Always quarantine new animals and immediately deworm them with at least 2 drug classes.
Keep them separated, preferably away from any pasture, for a week until no further eggs would be passed in the manure from imported drug resistant parasites.

**What Can You Do If You Have Resistant Parasites**

1. **Reduce the number of treatments that you give (see below)**

2. Change the drug group you are using

3. Dose twice

For BZD resistant worms give 2 doses of the drug separated by 12 hours. This protocol will be especially important at the point where you start noticing that the drug isn’t working so well. It will only be a temporary fix since the population of worms will become increasingly resistant.

With ivermectin, give 2 doses 18 hours apart. Just increasing the amount of drug in a single treatment will not work as well as the separated doses.

4. **Drug Combinations**
   If you find that you do have worms resistant to more than one drug group, you can maintain the activity of the drugs for a while by giving them in combination. This is another temporary fix.

5. Use the recommendations above for minimizing development of resistance.

**HOW CAN YOU REDUCE THE NUMBER OF DEWORMING TREATMENTS?**

The goal here is to reduce the number of worms that are exposed to the drug and reduce the selection for resistance.

1. **Monitor eye color**
   With some parasites, like coccidia, signs of scouring will alert you to a problem. With barber pole worm there is no scouring but there is anemia with pale mucous membranes. You can check the color of the membranes around the eye—this is the easiest place to see changes.

A South African researcher has produced an eye color chart, called the FAMACHA system, in which sheep are checked on a regular basis and the color of the mucous membranes is checked against a chart that then directs which sheep should be treated. This system is beginning to be used in the U.S. Producers who wish to use this chart must be trained in the system. We are planning to offer some training sessions here in Virginia. However, you can begin monitoring your animals without the chart. Develop an idea of what normal is and you will be able to appreciate the sheep that are very anemic because of a heavy load of barber pole worm.
2. Reduce Your Stocking Density
Sheep and their parasites have evolved over a long period of time and under more primitive conditions the level of parasitism in animals would probably be limited by their tendency to roam over greater areas. Now, we often collect up the animals and restrict them to small pastures where the numbers of parasite larvae can build up to dramatic numbers leading to frequent drug treatments. The intensive deworming programs used for parasite control rapidly lead to drug resistance.

3. Don't Pinch Pennies On Diet
Many experiments over the years have shown that animals on a high nutritional plane are more resistant to the adverse effects of parasites than those on marginal diets. Protein and minerals, as well as energy, are important in resisting the effects of barber pole worm because new red blood cells must be generated to replace those lost to the parasites. Nutrients are also needed to develop an immune response to the parasites.

4. Use the Sheep’s Normal Immune Responses To Parasites
Sheep develop some immunity against worm parasites levels of resistance vary with age and reproductive condition.

Increasing immunity

Lambs (require a full grazing season to develop immunity)
Lambing and ewes in early lactation
Rams
Dry ewes and wethers

Concentrate your worm control efforts on the sheep that need it the most. The pasture with the lowest number of parasite larvae should be used for ewes and lambs, not for rams or dry ewes. Remember that immunity will be overcome if sheep are exposed to high numbers of worm larvae.

5. Consider Resistance To Parasites In Your Selection Program.
There is definitely a genetic component in resistance to parasites that is most likely related to the immune response. In any breed there will be some highly resistant sheep and some very susceptible sheep. You should eliminate the highly susceptible ones from your flock. In other words, the sheep that always develops bottle jaw before the others should be culled. Similarly, keep the ones that never seem to get anemic. There are other ways to select for resistance based on fecal egg counts, but they work best with large flocks.

Some sheep breeds, especially the West Indian hair sheep breeds, appear to have a high level of resistance to gastrointestinal nematodes.
6. Maximize Pasture Use To Reduce Parasite Numbers.
Some ways to reduce parasite numbers on your pasture to safe levels include:

   a. Let pasture sit ungrazed for long enough for most parasite larvae to die. The
      length of time required will vary with the time of year and conditions, but will be at least
      several months.

   b. Take a cutting of hay from the pasture—this dries out lots of worms and by
      the time the pasture is regrown there will be very few larvae left.

   c. Have an early lambing season so that kids are weaned and sold before
      pasture larvae levels become really high

   d. When you have safe pasture, always put the most vulnerable animals on it
      first—in most cases that would be the lambs

   e. Graze the pasture with a different animal (horses or cattle, not goats or young
      calves, because they also get barber pole worm) or use mixed grazing. Most of the
      worms in the stomach and intestines are pretty specific to their hosts and won’t infect
      other animal species. The exception is a stomach parasite that infects ruminants and
      horses, but usually does not cause any problems.

7. Restrict Access to Pasture
This is obviously a more radical solution, but worms will not be a problem if sheep aren’t
grazing.

WHAT ABOUT ORGANIC DEWORMERS?

There are some “natural” products sold as alternatives to standard commercial
dewormers. This category includes herbal dewormers and diatomaceous earth. There
are no studies that I know of that suggest that these products have any substantial
effect on barber pole worm or other internal parasites. In the case of diatomaceous
earth there have been several studies done by parasitologists in different parts of the
country that have found no beneficial effect to feeding it or offering it as mineral.

Specific brands of herbal dewormers have not been rigorously tested so it is difficult to
make recommendations about them. There are certainly a number of plants that
contain compounds that can be shown to have anthelmintic activity but how that
translates into efficacy of these products isn’t clear. There is also not much information
about their safety. These products do not go through the same rigorous testing for
safety that drugs do and just because they are plant derived does not mean that they
can’t be harmful. Herbal dewormers and diatomaceous earth may have a place in
parasite control but until there are some controlled tests to support them, it is not
possible to recommend their use.