EVERYTHING YOU NEED TO KNOW ABOUT WORMS IN 25 MINUTES

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TODAY’S TOPICS

- Worms of concern
- Drugs (dewormers)
- Dewormer resistance
- Can we eliminate worms?
- Sustainable integrated parasite management
WORMS OF CONCERN

- **External Parasites**
  - Organisms that live outside an animal
  - Examples include ticks, lice, flies, mites etc.,

- **Internal Parasite**
  - Organisms that live within an animal
  - Helminths (nematodes, cestodes and trematodes)
  - Protozoa (coccidia)

An organism that lives in or on another organism (its host) and benefits by deriving nutrients at the host's expense. (Oxford dictionary)
**WORMS OF CONCERN**

- *Haemonchus contortus* (Barber pole worm)
  - A blood-sucking parasite
  - Short life cycle and prolific egg producer
  - Symptoms: anemia, edema, weight loss, sudden death

- *Teladorsagia* (Ostertagia; medium or brown stomach worm and *Trichostrongylus* (hair or bankrupt worm))
  - Additive effect in mixed parasite infections
  - Symptoms: scouring, weight loss, rough hair coat, ill thrift, poor appetite
WORMS OF CONCERN

- **Tapeworms**
  - Indirect life cycle with mite acting as an intermediate host

- **Coccidia**
  - Single-cell protozoa that damages the lining of the small intestines

- **Meningeal worm**
  - Parasite of White Tail Deer
  - Parasite has indirect life cycle – snails and slugs needed for infection
LIFE CYCLE OF STOMACH WORMS

Eggs require warmth (60°F) and humidity to hatch to first stage larvae.

Haemonchus enters arrested development during winter in sheep and goats during cold climates to survive over the winter and re-infect pastures the next spring.
## DRUGS (DEWORMERS)

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug name</th>
<th>Tradenames</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzimidazoles</td>
<td>Fenbendazole, albendazole, oxydendazole</td>
<td>SafeGuard®, Valb zen®, Panac ur®, Synanthic®</td>
</tr>
<tr>
<td>Nicotinic Agonists</td>
<td>Levamisol, morantel, pyrantel</td>
<td>Prohibit®, Strongid®, Positive Pellet®, Rum ate®, Leva-Med™</td>
</tr>
<tr>
<td>Macrocyclic lactones</td>
<td>Ivermectin, doramectin, eprinomectrin, moxidectin</td>
<td>Ivomec®, Cy dectin®, Quest®, Dectomax®, Eprinex®</td>
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</tbody>
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*Source: Adapted from Susan Schoenian, [https://www.sheepandgoat.com/underanthel](https://www.sheepandgoat.com/underanthel)*

***First new classes since 1980s – Amino-acetonitrile derivative (Monepantel - Zolvix®) and Spiroindole (Derquantel and Abamectin - Startect®)*
DEWORMER RESISTANCE


- **Benzimidazoles**
  - Mid-Atlantic (33)
  - South (46)

- **Ivermectin**
  - Mid-Atlantic (47)
  - South (24)

- **Cydectin**
  - Mid-Atlantic (24)
  - South (54)

- **Levamisol**
  - Mid-Atlantic (100)
  - South (98)

Dewormer resistance on sheep farms in MD, VA, and GA (2016-2017; ASI funded)

- **Benzimidazoles**
  - MD (100)
  - VA (100)
  - GA (100)

- **Ivermectin**
  - MD (80)
  - VA (100)
  - GA (90)

- **Cydectin**
  - MD (60)
  - VA (100)
  - GA (70)

- **Levamisol**
  - MD (10)
  - VA (70)
  - GA (70)

**Barber pole worm predominant worm in all studies**
DEWORMER RESISTANCE

There are two tests available for determining drug resistance:

1. Fecal egg count reduction test (FECRT)
   - FEC done prior to treatment and 10 – 14 days later
   - This test is suitable for on-farm testing and can be conducted by trained producers, veterinarians or extension personnel

2. Larval Development Assay (LDA; DrenchRite®; $450)
   - Pooled sample from at least 10 animals with FAMACHA scores > 3 required
   - All 3 classes of drugs tested

**Resistance testing should be done every 2-3 yrs.**
CAN WE ELIMINATE WORMS?

- Zero grazing
  - No access to pasture
  - Kept in a bedded barn, dirt lot, or facility with slatted floors

- Clean pastures
  - Not been grazed by sheep or goats for the past 6 to 12 months
  - Have been grazed by horses or cattle
  - Hay or silage crop has been removed

Overall goal is to have a management system that promotes minimal effects of worms on animal performance.
CAN WE ELIMINATE WORMS?

- Rotated with field crops
- Recently established or renovated by tillage
- Good sanitation is a must
  - Do not feed off ground
  - Provide clean water
  - Keep waterers and feed troughs clean
SUSTAINABLE INTEGRATED PARASITE MANAGEMENT (SIPM)

- Chemical
  - Targeted Selective Treatment (TST; FAMACHA®, Five Point Check®)

- Non-Chemical
  - Pasture and grazing management
  - Genetic Selection
  - Nutrition
  - Herbal dewormers (garlic, ginger, pumpkin seeds etc.)
  - Copper Oxide Wire Particle (COWP)
  - Condensed tannins (sericea lespedeza)
  - Others
- Deworming only those animals that require treatment
  - It helps in identifying animals that are susceptible (or not) to worm infections
  - Helps to manage drug resistance and decrease deworming frequency
  - This technique slows down resistance by increasing “refugia” (number of worms left in refuge from the drug)

Two tools developed: FAMACHA© system and The Five Point Check©
Can fecal egg counts be used to determine need to treat?

- In most cases, no

Best Uses for FEC’s

1. Monitoring rate of pasture contamination
2. Determining Drug Resistance
3. Culling animals
SIPM: TARGETED SELECTIVE TREATMENT (TST)

- Increasing drug efficacy
  - Give the correct dose (weigh before treatment)
  - Drenching correctly (over the tongue towards the back of the mouth) with a dosing syringe that has a long metal nozzle
  - Restrict feed for 24-hrs (most effective with benzimidazoles and ivermectin drugs)
  - Repeat dosing 12 hrs. apart (benzimidazole drugs benefit the most; wait 24 hrs with levamisole)
  - Give dewormers in combination (additive effect)
  - Combining an alternative treatment, such as copper oxide wire particles (COWP) with a deworming drug for increased efficacy
Good pasture management practices for worm control include:

- Rotational grazing
- Managing grazing heights
- Maintaining low stocking rates
- Multi-species grazing
- Provide access to browse and bioactive forages (such as sericea lespedeza)
- Use of annuals
- Harvesting hay
- Increasing forage quality
SIPM: GENETIC SELECTION

- The ability to regulate worms is under genetic control and it is a moderately heritable characteristic (20-40%)
- Resistance is the ability of the animal to limit infection
  - Consistently demonstrate low FEC (assessed by FEC)
- Resilience - ability of animal to withstand infection
  - Tend to be wormy (high FEC) yet demonstrate few if any signs of parasitism (good FAMACHA scores etc.)
  - Assessed by FAMACHA scores and hematocrits
Some breeds are ‘more resistant’ than others
- Individual animals should always be monitored for their own merit
- Resistant dams and sires will most likely produce resistant offspring
  - The sire/male contributes 50% of the flock genetics
- 80/20 rule
  - 20% of flock shed 80% of the worm eggs in a flock/herd
  - Focusing deworming on susceptible animals will significantly reduce pasture contamination
Nutritional status impacts the ability to fight worm infections

- Time of lambing/kidding
  - Increasing the protein intake during the last six weeks of pregnancy is effective in reducing the peri-parturient rise in FEC

- Growing animals
  - Lambs supplemented with protein have increased immunity and resistance to worm infection

Ensuring that animals are receiving good nutrition and are fed a balanced ration with proper mineral supplementation will aid in parasite control
SIPM: HERBAL DEWORMERS

- Number of herbal dewormers have been studied ([https://projects.sare.org/sare_project/lne08-269/](https://projects.sare.org/sare_project/lne08-269/))
  - Garlic
  - Papaya
  - Pumpkin
  - Ginger
  - Others, such as wormwood and fennel
  - Molly’s Herbals Worm Formula ([www.fiascofarm.com](http://www.fiascofarm.com))
  - Hoeggar’s Herbal Wormer ([www.hoeggerfarmyard.com](http://www.hoeggerfarmyard.com))

There is anecdotal evidence that herbal dewormers work:
- Lack of scientific support
- Inconsistent data when support is available
Copper is important for immune function

COWP are available commercially to alleviate copper deficiency in ruminant livestock

A low dose of COWP (0.5 - 1 g) in kids/lambs and a higher dose (1 – 2 g) in ewes/does is effective in controlling the barber pole worm in sheep and goats.

Can be used in TST

Possible toxicity issues on sheep
Sericea lespedeza

- The presence of condensed tannins has been shown to reduce indicators of worm infection in sheep and goats
- Reduces FEC when grazed and also when fed as a hay or pellets in many studies
- Effective against the barber pole worm and coccidia eggs
SIPM: OTHERS

- Nematode trapping fungi (*Duddingtonia flagrans*)
  - Survives passage through the digestive tract of livestock, when fed
  - Germinates and spreads on fresh feces producing specialized nematode trapping structures that restrict the development of parasite larvae

- Studies have proven its efficacy and it might be available in the near future for use by US producers

[https://www.duddingtonia.com/](https://www.duddingtonia.com/)
Barber pole worm is thriving in more areas than the southeastern U.S.

Dewormer resistance has reached critical levels throughout the entire Eastern United States.

Sustainable integrated parasite management (SIPM) practices must become the new standard.

- Not relying on drugs alone
- Holistic approach of responsible drug usage if possible combined with SIPM tools
