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

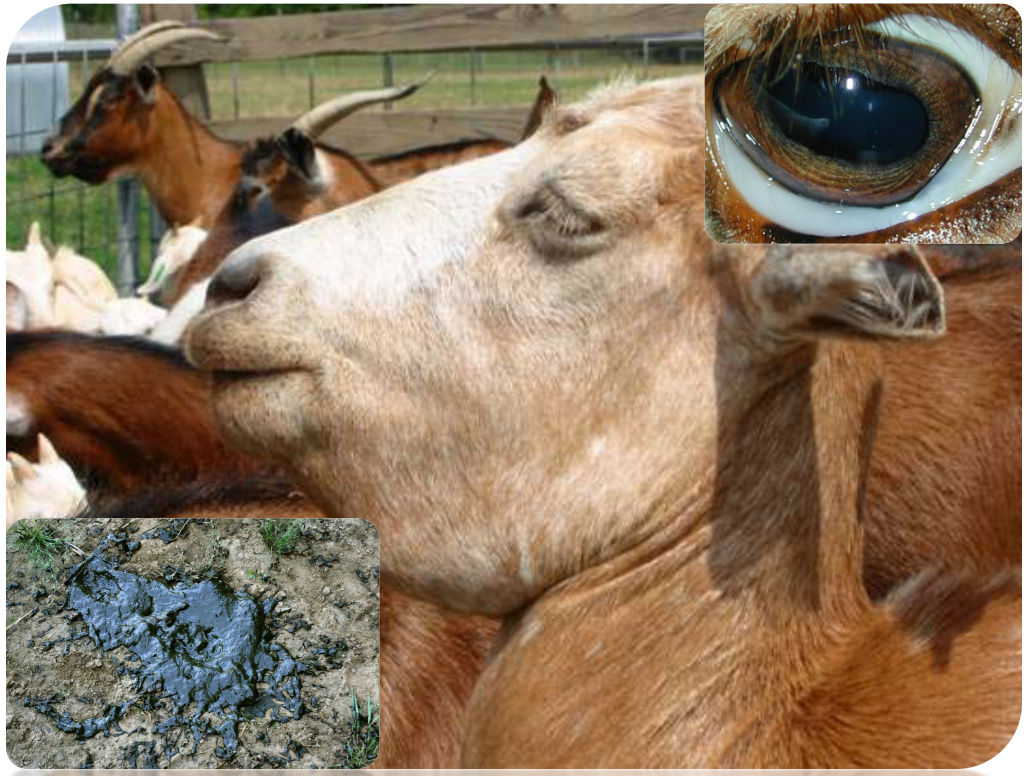
WORMS OF CONCERN

- 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

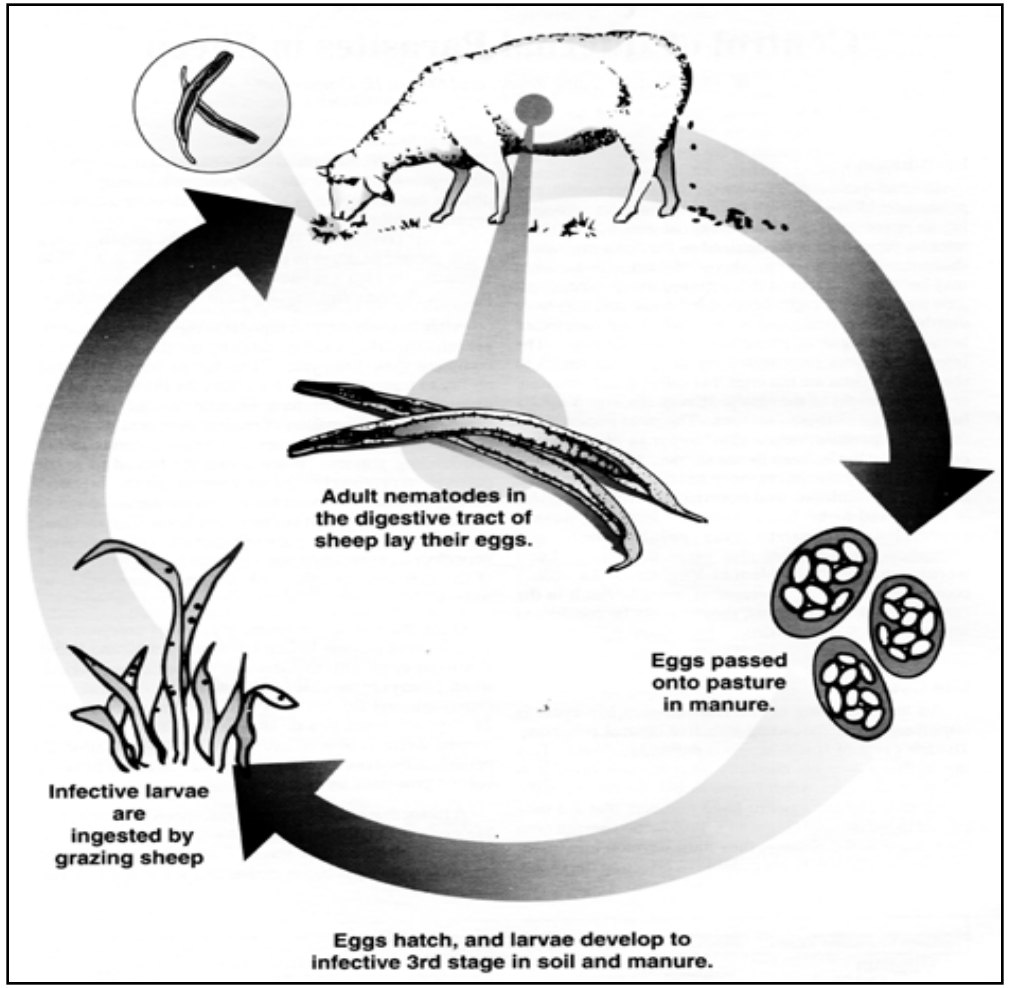


WORMS OF CONCERN

- 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

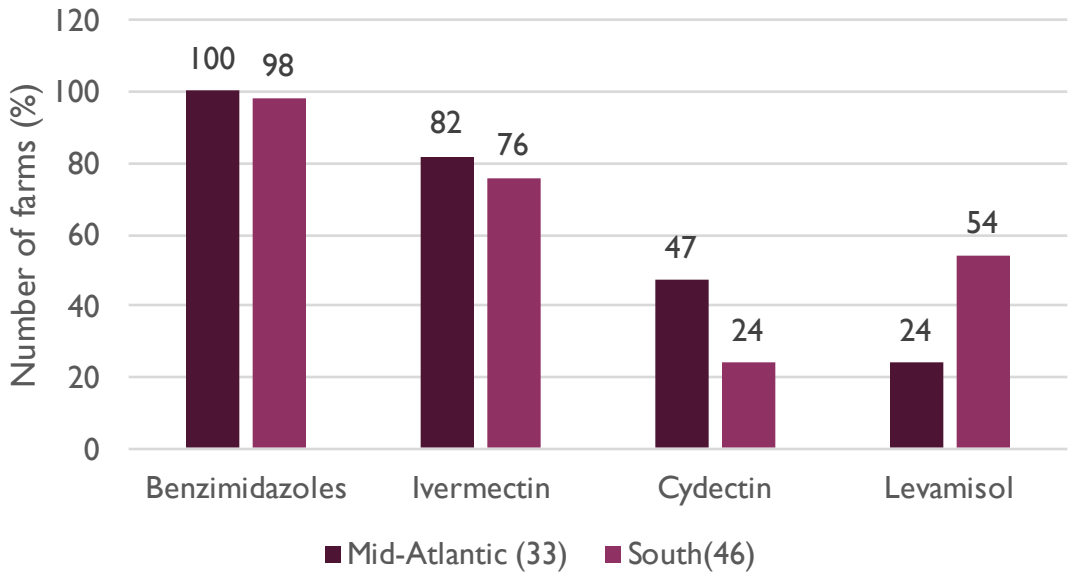
DRUGS (DEWORMERS)

Drug Class	Drug name	Tradenames
Benzimidazoles	Fenbendazole, albendazole, oxydendazole	*SafeGuard®*, *Valbazen®* Panacur®, Synanthic®
Nicotinic Agonists	Levamisol, morantel, pyrantel	*Prohibit®*, Strongid®, *Positive Pellet®*, *Rumatel®* Leva-Med™
Macrocyclic lactones	Ivermectin, doramectin, eprinomectrin, moxidectin	*Ivomec®*, *Cydectin®*, Quest®, Dectomax®, Eprinex®

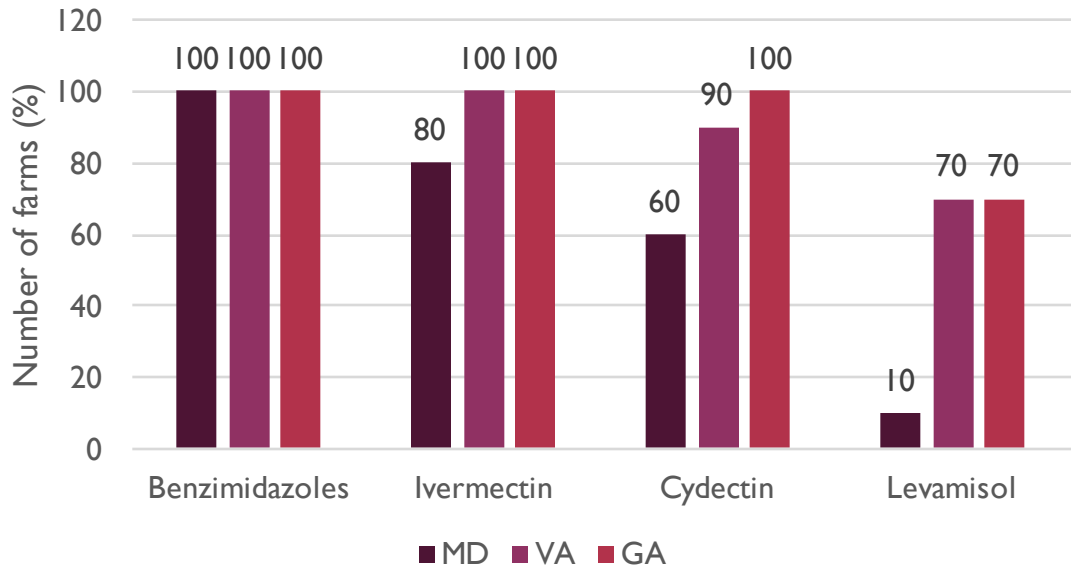
Source: Adapted from Susan Schoenian, https://www.sheepandgoat.com/underanthel
***First new classes since 1980s – Amino-acetonitrile derivative (Monepantel - Zolvix®) and Spiroindole (Derquantel and Abamectin - Startect®)

DEWORMER RESISTANCE

Dewormer resistance (DR) in U.S. (2007 – 2009)



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

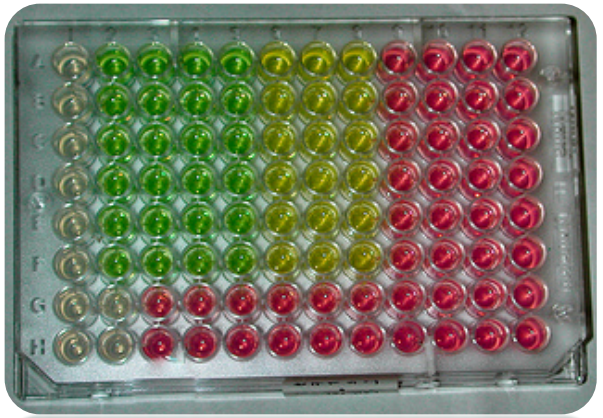


***Barber pole worm predominant worm in all studies*

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?

Overall goal is to have a management system that promotes minimal effects of worms on animal performance

- 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

CAN WE ELIMINATE WORMS?

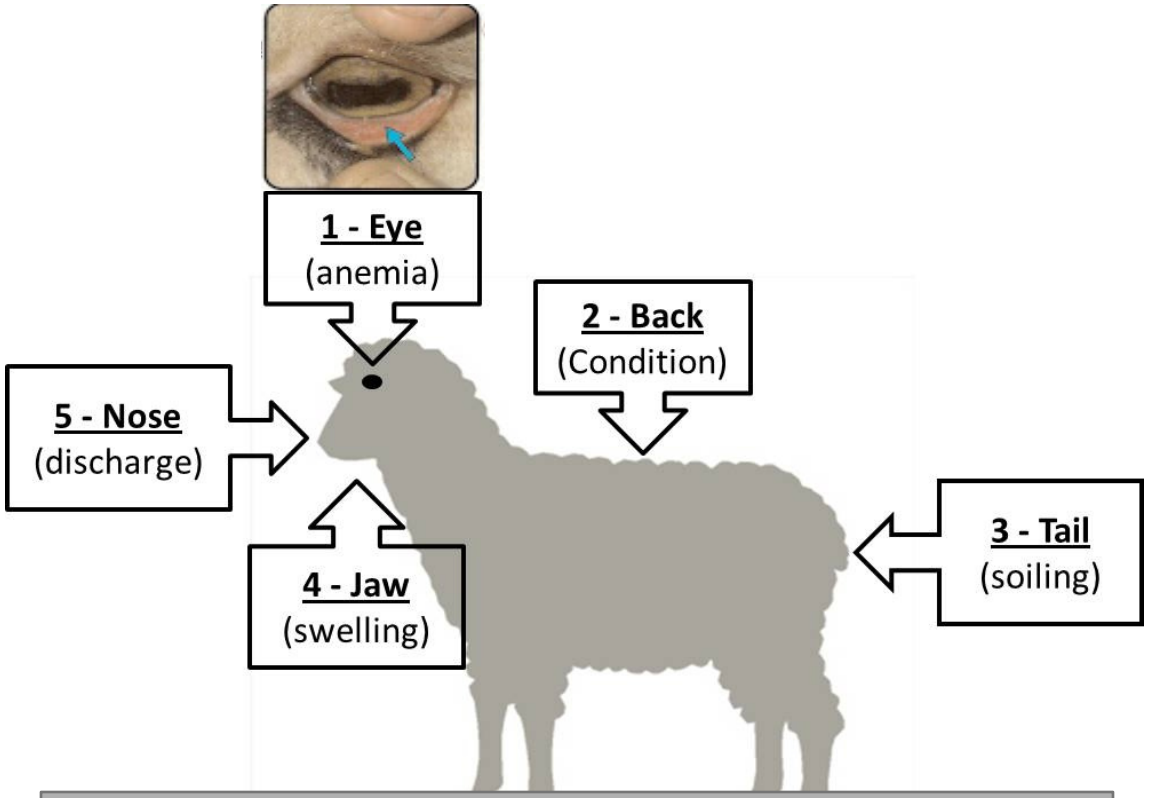
- Rotated with field crops
- Recently established or renovated by tillage
- Good sanitation is a must
  - Do not feed off ground
  - Provide clean water
  - Keep waterers and feed troughs clean

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

SIPM: TARGETED SELECTIVE TREATMENT (TST)

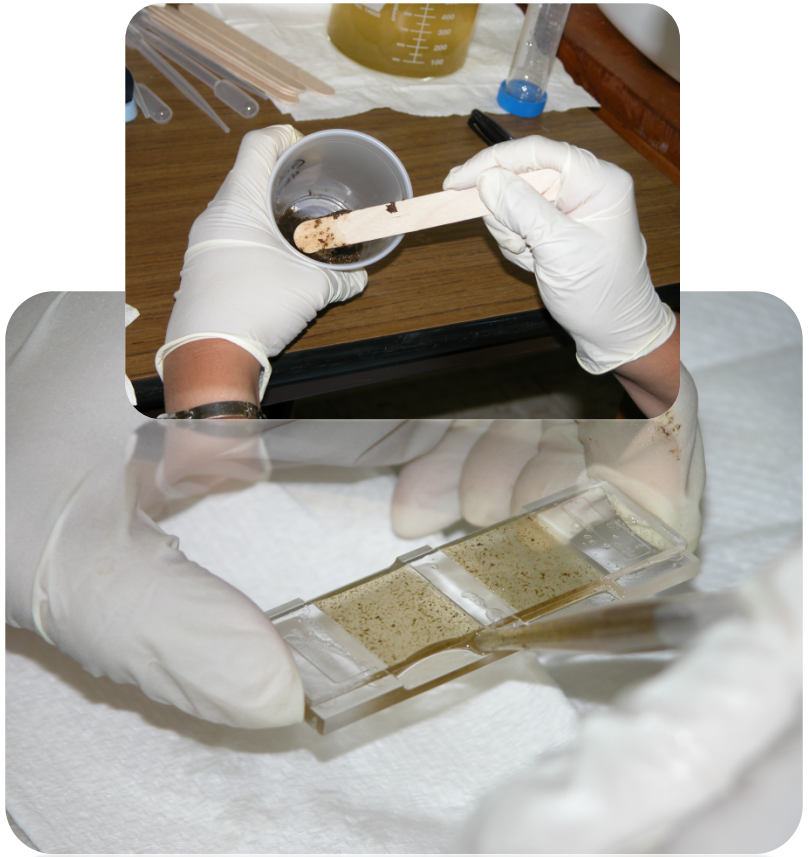
- Deworming only those animals that require treatment
  - It helps in identifying animals that are susceptible (or not) to worm infections
  - Helps to manage drug resistance and decrease deworming frequency
  - This technique slows down resistance by increasing "refugia" (number of worms left in refuge from the drug)



Two tools developed: FAMACHA© system and The Five Point Check©

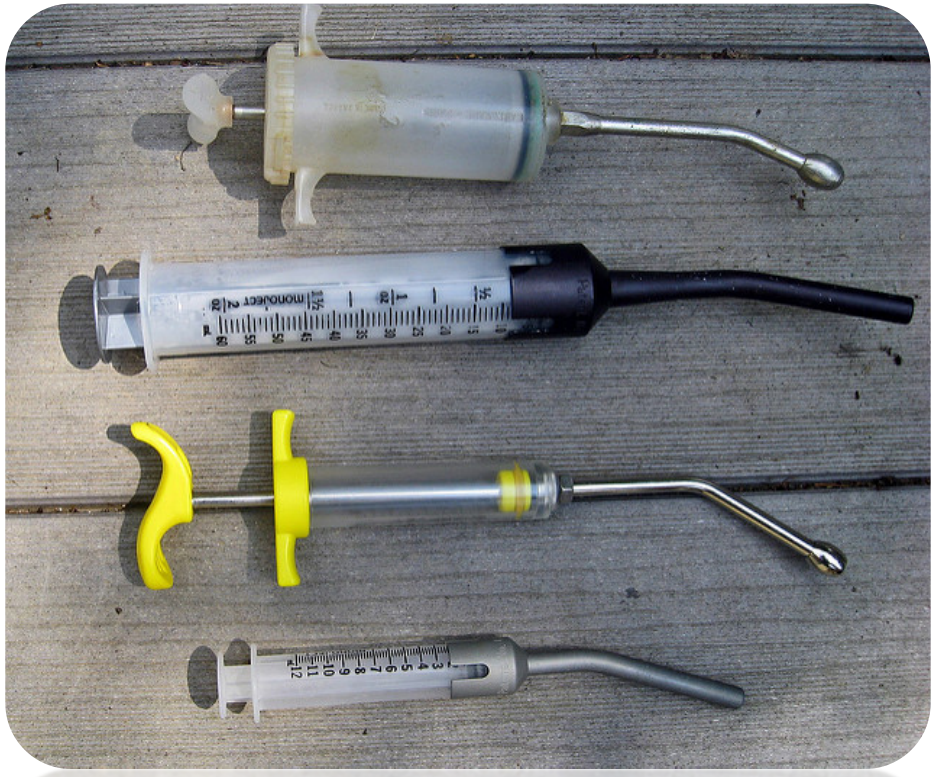
SIPM: TARGETED SELECTIVE TREATMENT (TST)

- 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



SIPM: PASTURE MANAGEMENT

- 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

SIPM: GENETIC SELECTION

- 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

SIPM: NUTRITION

- 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 dewormwers have been studied (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)
  - Hoeggar's Herbal Wormer (www.hoeggerfarmyard.com)

There is anecdotal evidence that herbal dewormers work
Lack of scientific support
Inconsistent data when support is available

SIPM: COPPER OXIDE WIRE PARTICLES (COWP)

- 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

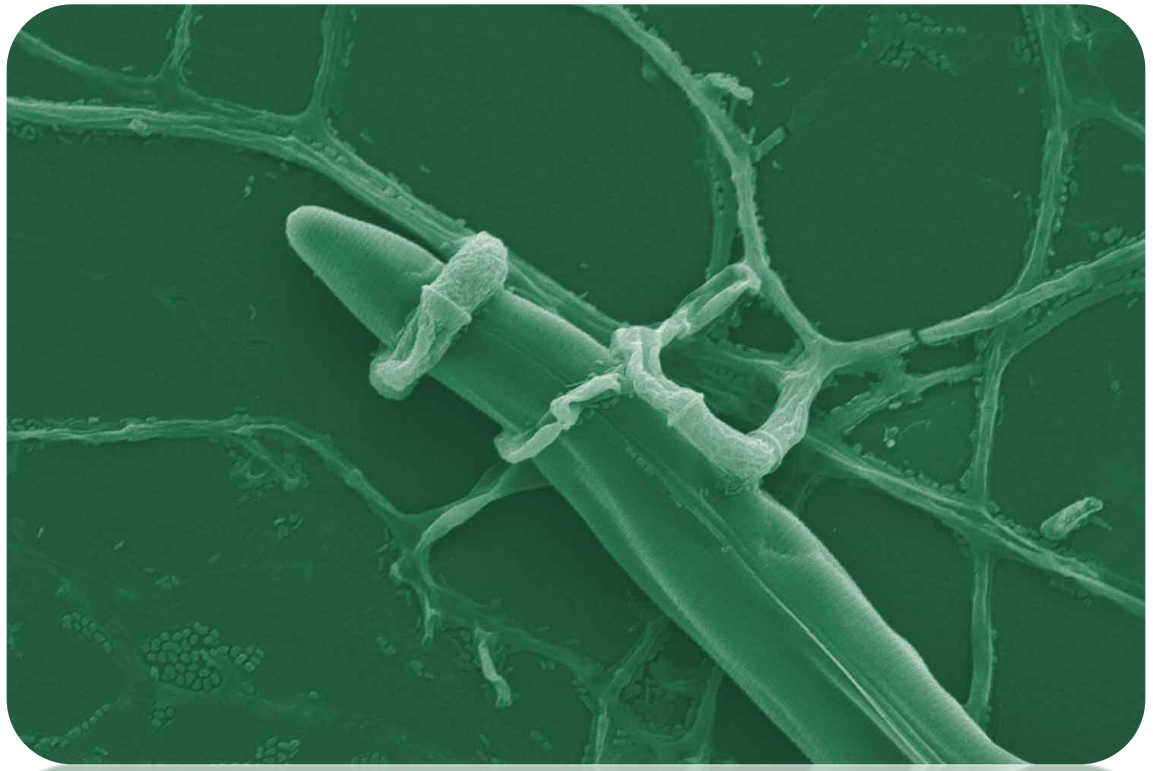
Copper oxide wire particles – Linda Coffey @ https://docs.wixstatic.com/ugd/6ef604_10cb6517fbab453b8ac787c538ed92f0.pdf

SIPM: CONDENSED TANNINS

- 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/

FINAL THOUGHTS

- ✓ 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

https://www.wormx.info/, https://attra.ncat.org/, www.sheepandgoat.com