Outline

- Introduction to Parasites
- Biology of the worm
- How did we arrive where we are?
- Dewormer resistance
- What should we do?

Gastrointestinal Nematodes (Worms) of Sheep

Most Important Species:
- *Haemonchus contortus*** or barberpole worm
- *Teladorsagia (Ostertagia) circumcincta* or Brown stomach worm
- *Trichostrongylus colubriformis* or bankrupt or black scour worm
- Lesser importance: *Cooperia, Nematodirus, Trichuris, Oesophagostomum spp.*
**Haemonchus contortus**  
(Barber Pole Worm)

- Sheep, goats, deer, exotic ruminants
- Blood-sucking worm
  - highly pathogenic
  - anemia
  - hypoproteinemia -- “bottle jaw”
- Most important worm parasite in sheep raised in warm/wet environments

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**Life Cycle of H. contortus**

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**FEC reduction of goats entered into Western MD Pasture-based Meat Goat Performance Test**
Nutrition

Effect of supplement on PCV

Forage Systems

- Organic forage systems rely on diverse forages, reduce impact of worms
- Animal performance increases with increased protein in pasture
- Rotational grazing

Condensed tannin-rich forages

- Sericea lespedeza reduces FEC and need for deworming
- Birdsfoot trefoil
- *Desmodium* or tickseed trefoil
- Condensed tannins react with worm cuticle; leads to more protein absorption in intestine

Adult *H. contortus* affected by sericea lespedeza

Use of dried sericea lespedeza to control internal parasites in animals
Effect of sericea lespedeza on coccidiosis

Effect of season of birth on GI infection

Copper Oxide Wire Particles (COWP)
- A nonchemical approach to control *H. contortus*.

Mode of action
- Lodges in abomasum and has direct effect on worm.
- Acts like an anthelmintic in that it has a short term effect, even though COWP can be found in abomasum for more than 30 days.
- Can be administered by capsule or in feed.

COWP
- COWP available in the U.S. as Copasure (Animax) for cattle and goats and Ultracruz (Santa Cruz Animal Health) for goats.
**Efficacy against GIN**

- COWP effective in reducing fecal egg counts of *H. contortus*.
- Not effective by itself against other GIN.
- Not effective if expelled.
- COWP may not be effective when digestive tract not functioning normally (too fast, pH too high).
- Doses: 0.5 g – 2 g (less is better).

**Copper Oxide Wire Particles**

- When used in combination with levamisole or albendazole, effective against other worms (by itself, only barber pole worm).
- Increased efficacy by ~30%.

**Safety Concerns**

- Important for both sheep and goat producers to understand about risks of COWP before consideration as an anthelmintic.
- Sheep (and maybe goats) are susceptible to copper toxicity. If exposed to other forms of copper (mineral, poultry litter spread on pasture, soils/forages), COWP should NOT be used.
- Also, Copasure and Ultracruz labeled as a supplement for copper deficiency, not an anthelmintic.

**More is NOT better**

- Whether a sheep or a goat, when using COWP to control *H. contortus*, use smallest effective dose (0.5 – 1 g if < 12 months of age; 1 – 2 g > 12 months of age).
- COWP increased copper in dairy goat milk and muscle tissue.
We developed a publication for producers: www.wormx.org or www.attra.org

Copper Sulfate
- Recommended by a popular, non-science based book (Australia)
- We examined CS in feed or in mineral in goats
- No differences in FEC or PCV
- Can be toxic!

Future Control Method
- *Duddingtonia flagrans* or nematode trapping fungus

Herbal Dewormers
- Molly’s and Hoeggers examined according to manufacturer recommendations
- No reduction in barber pole or mixed worm population in goats

Other Methods
- Garlic – no effect (ARS, LSU)
- Papaya – no effect (ARS, Heifer Ranch)
- Diatomaceous earth – no effect
- Ginger – No good evidence
- If it sounds to good to be true, do not count on it

Management and Breeding
- Good management, including grazing and good nutrition
- Condensed tannin forages (sericea lespedeza, birdsfoot trefoil)
- Genetic selection
Using genetics for individual selection

- An animal’s ability to resist parasites is heritable (≈0.2 – 0.5)
- USDA, ARS progeny of sires have been evaluated since 2004 for parasite resistance (FEC) and tolerance (PCV and FAMACHA), growth, and maternal traits.

### Summary

- Rely on Systems Approach
- Management/nutrition
- Forages/condensed tannins
- Copper oxide wire particles
- Genetics

### Resources

- American Consortium for Small Ruminant Parasite Control: [www.wormx.info](http://www.wormx.info)
- University of Maryland: [www.sheepandgoat.com](http://www.sheepandgoat.com)
- ATTRA publications: [https://attra.ncat.org/](https://attra.ncat.org/)

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