What will we talk about?

- Introduction to Parasites
- Previous recommendations
- Herbal Products, Garlic, Diatomaceous Earth
- 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**

- ~ 5,000 eggs per day
  - 300 worms → 1.5 million epd/animal
  - 30 sheep → 1 billion eggs over 3 wks

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**H. contortus Fecundity**

- Egg Fecundity
  - Eggs hatch and larvae migrate in 24-48 hrs to end and intestines

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**Anemia**

**Bottle Jaw**
**Why is H. contortus such a problem?**

- Evolved in tropics
  - thrives in warm/wet climates
- Long transmission season - southern US
- Short life cycle -- less than 3 weeks
- Immunity is slow to develop in sheep
  - Immunity wanes around the time of lambing (Peri-parturient rise)

**Previous recommendations**

- Parasitologists recommended strategies that maximized benefits of treatment, but ignored resistance issues
- Over-use of anthelmintics
  - Therapeutic vs. prophylactic
  - Loss of common sense approaches
- Many have no effective anthelmintics to use

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**Why is Dewormer Resistance?**

- The ability of certain worms in a population to survive drug treatments that are generally effective against the same worm species and stage of infection
  - Caused by changes in levels of “resistance” genes carried by worms in a population
  - Result of drug treatment that produces genetic selection of resistant worms in a population of worms

**Where Do Resistant Worms Come From?**

- Resistance is an inevitable consequence of using any particular drug to kill worms
  - “Resistant” worms – exist prior to the first use of a drug
  - Treatment eliminates worms whose genes render them susceptible to the drug
  - Parasites that are resistant survive and pass on their “resistant” genes to their offspring
    - Over time with continued treatment, more and more resistant worms build up in the population
    - High level of animal movement spreads resistant worms

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**What Causes Resistance To Dewormers?**

- Lack of Refugia
  - Refugia = the proportion of the worm population that is not selected by drug treatment
    - Worms in untreated animals
    - Eggs and larvae on pasture
- Provides pool of sensitive genes
  - Dilutes resistant genes
- Considered the most important factor in the development of drug resistance

**Slowing Down Resistance**

- Reduce genetic selection pressure by maintaining a pool of sensitive genes - REFUGIA
- Treat individuals, not the flock
- Known as Smart Drenching or maximizing the effectiveness of treatments
Use Proper Technique

- Ensure proper dose is delivered
- Proper technique when drenching sheep and goats is very important
  - Drench should be delivered over the back of the tongue
  - Critical that full dose lodges in the rumen
    - Drench delivered to the mouth may stimulate esophageal groove to close
      - If significant drench bypasses the rumen, efficacy is reduced

Images courtesy of premier1supplies.com

Myth Busters

- Treat entire flock
- Deworm according to the calendar or treat every three weeks
- Rotate dewormers regularly
- Unknowingly purchase resistant worms

Myth Busters

- One Pasture - may be only option
- If multiple pastures, deworm at move to new pasture
- Over crowd/graze
- Continuous graze

Herbal Dewormers

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

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!
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

If current approved drugs not effective against *H. contortus*, what can producers do?

- Good management, including grazing and good nutrition,
- Genetic selection,
- Alternative approaches (tomorrow).

Summary

- Frequent application of dewormers is not a viable approach due to resistance
- Some veterinarians across the U.S. still recommend frequent deworming
- Effective dewormers must be thought of as an extremely valuable and limited resource

Summary

- Use caution with undocumented approaches
- Come back tomorrow to learn about some sustainable approaches to control gastrointestinal worms.

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Acknowledgments