

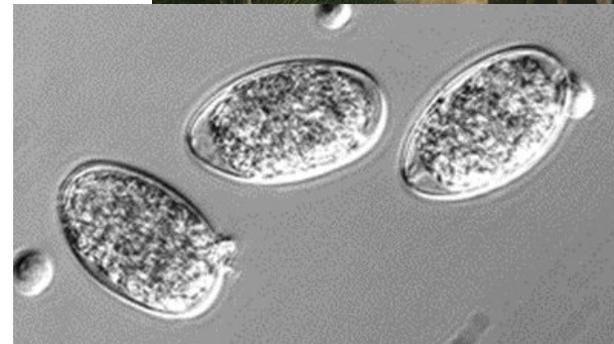
# A Roadmap to Integrated Parasite Management

**2026 ASI Convention-  
Production, Education, and Research  
Council Meeting**

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# Parasite Challenges

- Superfamily Trichostrongyloidea (Strongylid nematodes- “worms”)  **Extracellular**

- *Haemonchus contortus*
- *Teladorsagia circumcincta* (*Ostertagia*)
- *Trichostrongylus* species
- *Cooperia*
- *Nematodirus*

- Protozoan parasites

- *Eimeria* (coccidia) 

**Intracellular**

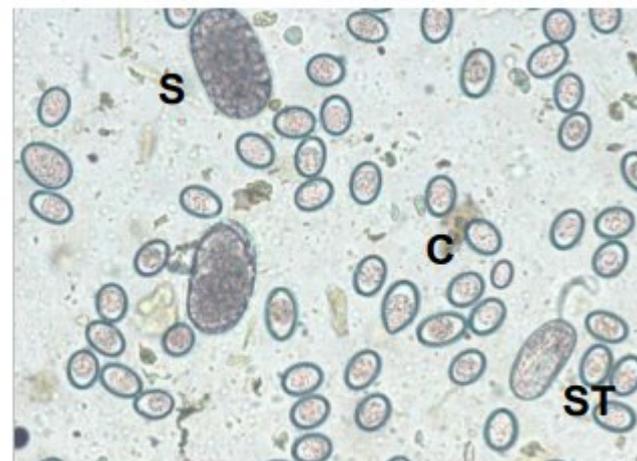


Figure 7. Strongylid (S) eggs and *Strongyloides* (ST) egg and coccidia (C) oocysts. Note size difference between eggs. *Strongyloides* eggs are larvated in fresh feces, strongylid eggs are not.

# The Worm of Concern

*Haemonchus contortus*

(Barber Pole Worm)

- Blood feeder
- Anemia, decreased performance and death of infected individuals
- Highly prolific
- Millions of dollars in economic losses annually (Sackett et al., 2006)

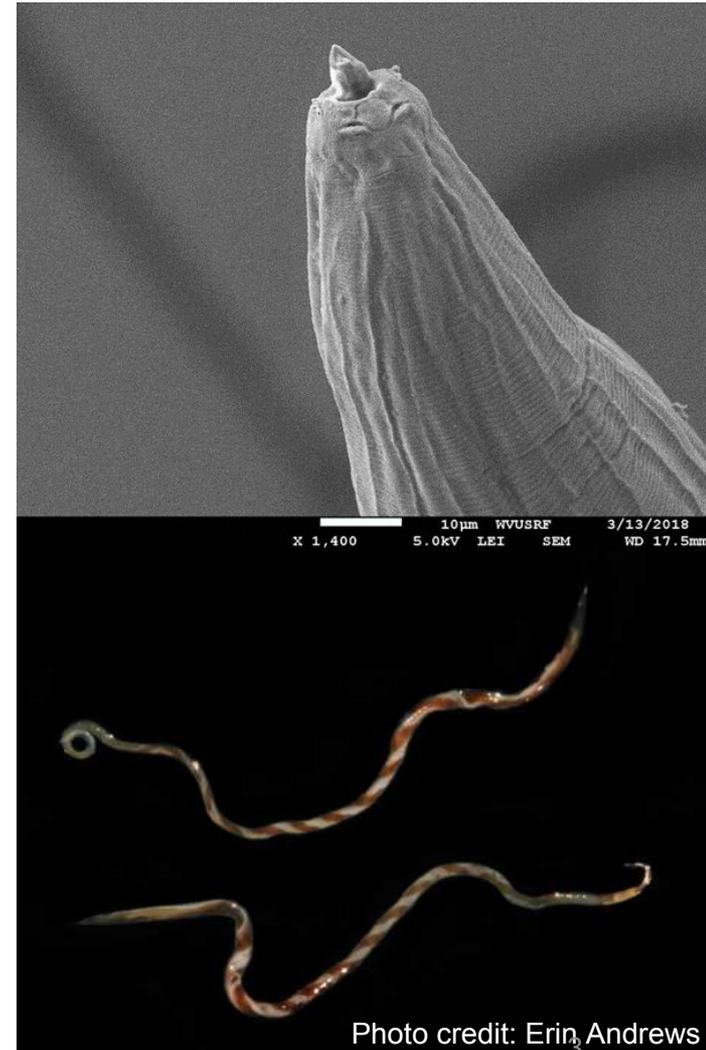
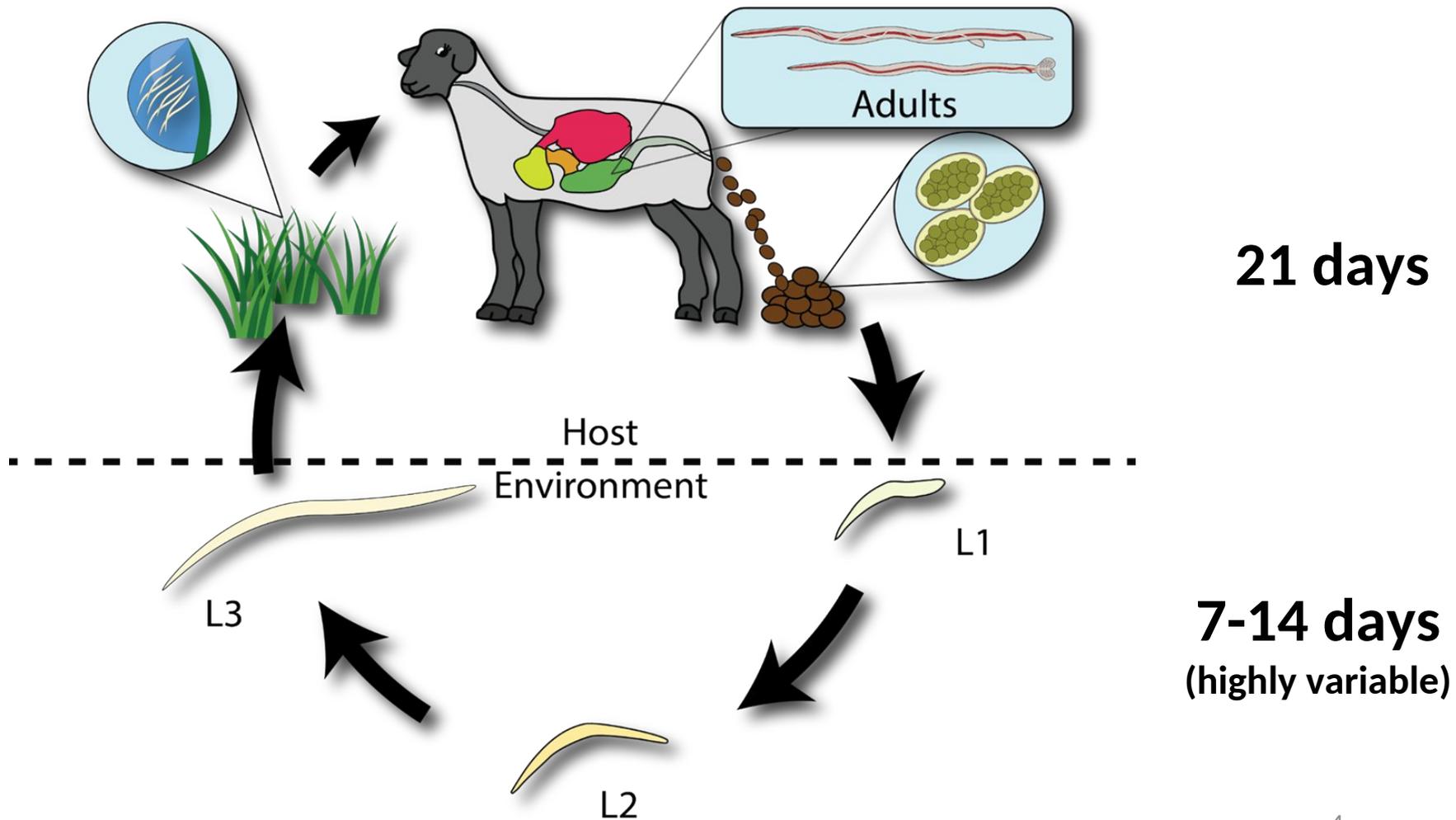


Photo credit: Erin Andrews

# Life Cycle





***H. contortus* does not bind to epithelial surface of the abomasum! Must swim to maintain position!**

# The Protozoan of Concern

- *Eimeria* species (coccidia)
  - Intracellular, protozoan parasite
  - Infects intestinal tract
- Can cause infection at young age and many infections are subclinical
- *Eimeria* infections are host species specific
  - Sheep and goats infected by different *Eimeria* species
- More common problem in dry lot environments than *Haemonchus contortus*

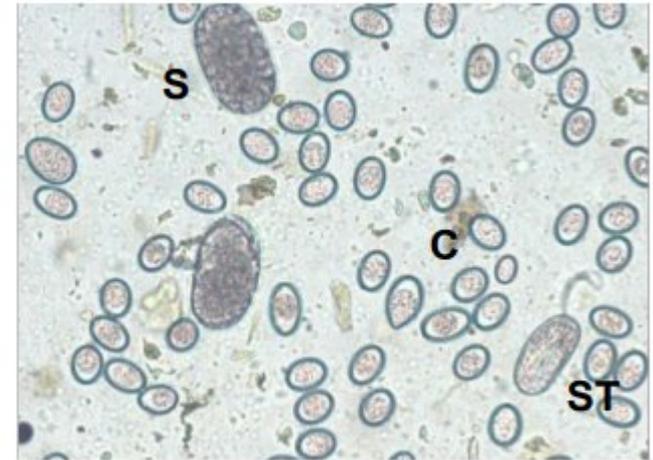


Figure 7. Strongylid (S) eggs and *Strongyloides* (ST) egg and coccidia (C) oocysts. Note size difference between eggs. *Strongyloides* eggs are larvated in fresh feces, strongylid eggs are not.

URI



# Identifying the Problem

*“You can’t select (or improve) something that you do not measure”*

- **Make data-driven decisions**
- **What traits can we measure to determine parasitism?**

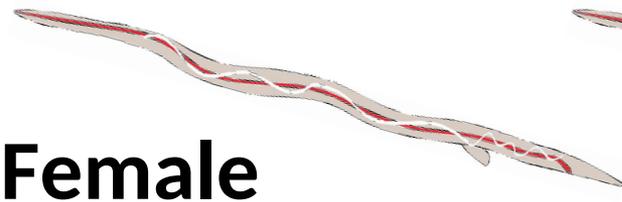
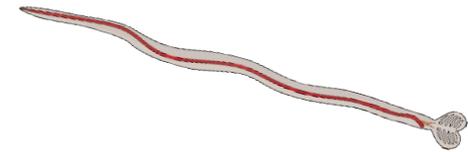
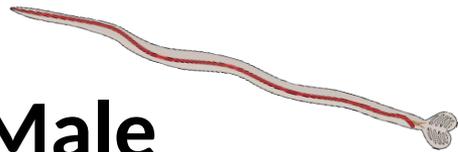


# So why not just use a dewormer?

**Resistant**

**Susceptible**

**Resistant**



*“What doesn’t kill you makes you stronger”*

# So why not just use a dewormer?

- Only three chemical classes of dewormers
- Resistance has developed to ALL three classes  
(Howell et al., 2008)
- Don't count on chemical treatment

Benzimidazoles	Macrocyclic Lactones	Nicotinics
Fenbendazole (Safeguard, Panacur)	Ivermectin (Ivomec)	Levamisole (Prohibit)
Albendazole (Valbazen)	Moxidectin (Cydectin)	Pyrantel

Once resistance has developed to one dewormer in a class, generally all dewormers in that class will be ineffective

# Determine Corrective Actions

## ➤ INTEGRATED PARASITE MANAGEMENT



*A combination of multiple tools and methods is the best solution to managing parasitism*

# Integrated Parasite Management

## Environment

- Grazing Management
  - Forage height/rotation
  - Stocking rate
  - Tannin-containing forages
  - Multi-species grazing
- Supplementation Rate

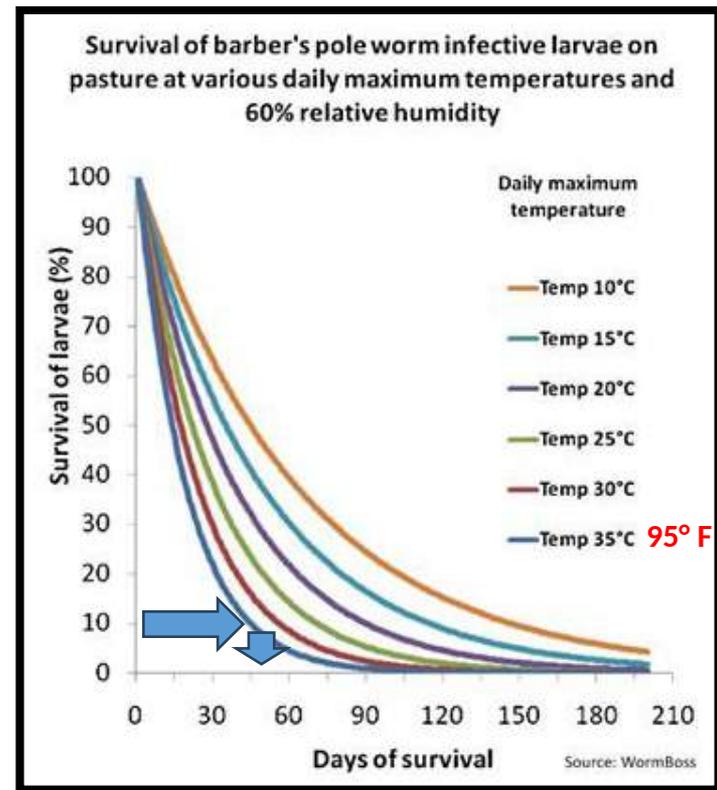
## Animal

- Targeted treatment
- Combination treatments
- Copper oxide wire particles
- Genetic selection

***Select several tools for your parasite management toolbox***

# Grazing Management

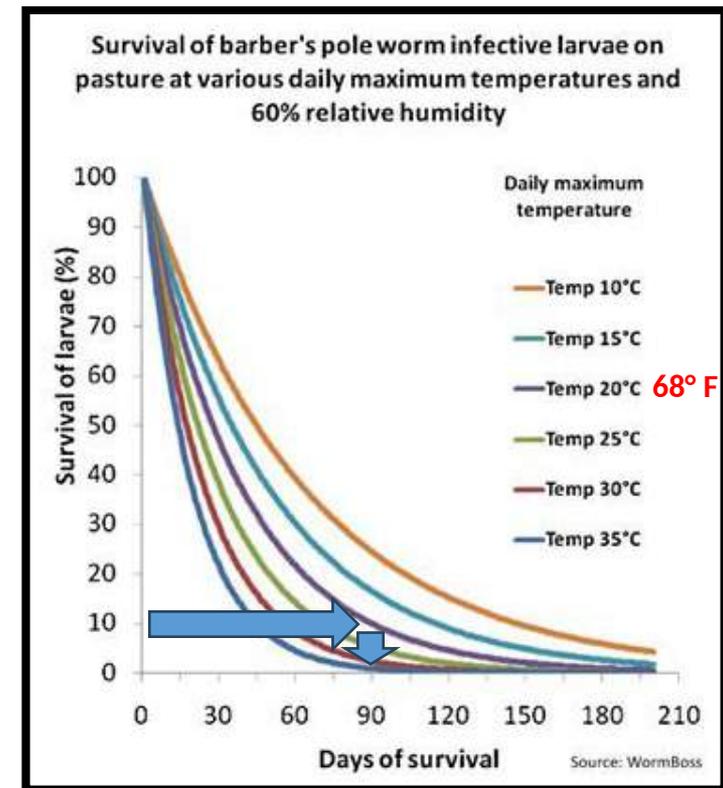
- Avoid overgrazing
  - 90% L3 in the first 4" forage  
(Santos et al., 2012; Amaradasa et al., 2010)
- Rotate animals to new pasture regularly
  - Every 3-5 days
- Adequate Rest Period
  - The longer the better (45+ days)
  - As length of rest period increases, forages may become mature and nutritive quality decreases
  - Use pasture for hay production



**45 days rest at 95° F  
...kills 90% of infective larvae**

# Grazing Management

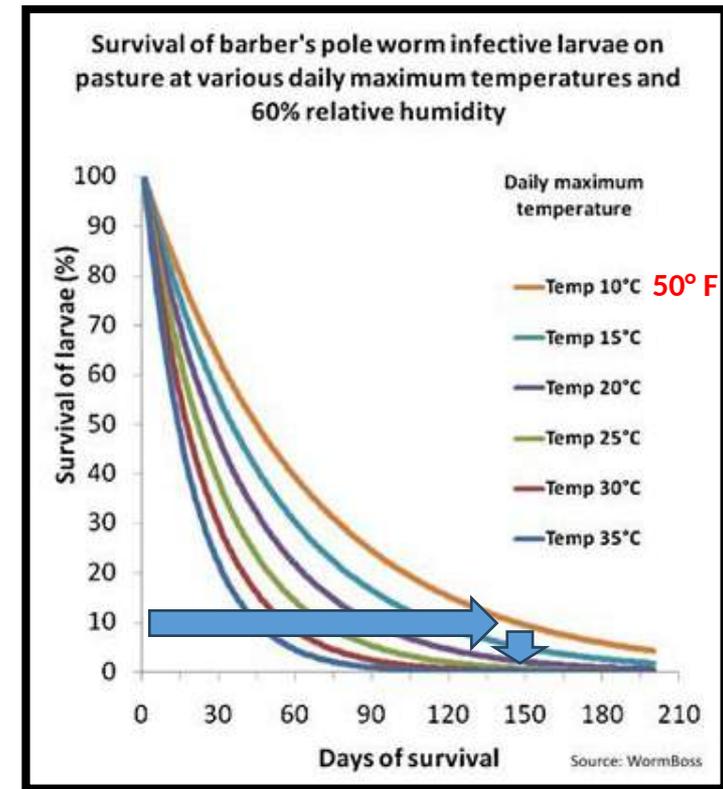
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- Adequate Rest Period
  - The longer the better (45+ days)
  - As length of rest period increases, forages may become mature and nutritive quality decreases
  - Use pasture for hay production



**90 days rest at 68° F  
...kills 90% of infective larvae**

# Grazing Management

- Avoid overgrazing
  - 90% L3 in the first 4" forage  
(Santos et al., 2012; Amaradasa et al., 2010)
- Rotate animals to new pasture regularly
  - Every 3-5 days
- Adequate Rest Period
  - The longer the better (45+ days)
  - As length of rest period increases, forages may become mature and nutritive quality decreases
  - Use pasture for hay production
- Utilize tannin-containing forages
  - Tannins improve protein availability for the animal

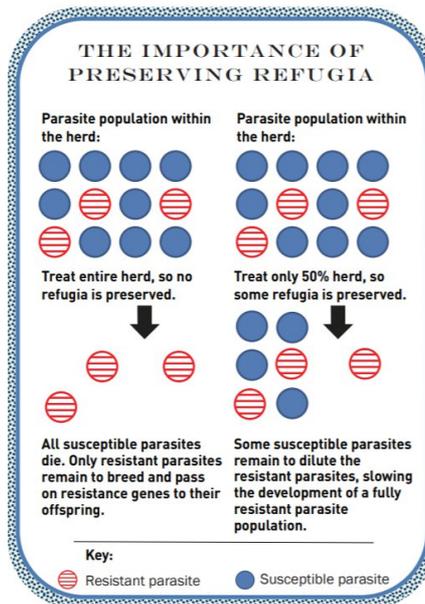


**150 days rest at 50° F  
...kills 90% of infective larvae**

# Targeted Selective Treatment

No.	Point	Indicator	Which parasite(s)?
1	Eye	Paling	Barber pole worm, liver fluke, coccidia <b>(FAMACHA Scoring)</b>
2	Back	Body condition score	All
3	Rear	Dag score/fecal soiling	Brown stomach worm, hair worm, thread worm, nodule worm, coccidia
4	Jaw	Bottle jaw	Barber pole worm, liver fluke
5	Nose	Nasal discharge	Nasal bots

Burke and Miller, 2015



# Proper Drenching

- Provide full dosage using appropriate drench gun
- Read the label!
- Goats generally require higher dosages than sheep
- Use a scale to determine accurate weight

## Charts

[Dewormer chart for camelids](#); Lisa Williamson, DVM, University of Georgia and Michael Pesato, Mississippi State University [October 2021].

[Dewormer chart for goats](#); Ray Kaplan, DVM, PhD, University of Georgia and Michael Pesato, Mississippi State University [October 2021].

[Dewormer chart for sheep](#); Ray Kaplan, DVM, PhD, Lisa Williamson, DVM, MS. University of Georgia and Michael Pesato, Mississippi State University [October 2021].

<https://www.wormx.info/dewormers>

# Combination Dewormer Use

- Choose one dewormer from each class
- Drench with each dewormer at labeled dosage in sequence => Do **NOT** mix dewormers together
- Consult veterinarian due to extra-label use
- Use in a targeted selective treatment approach

Benzimidazoles	Macrocyclic Lactones	Nicotinics
Fenbendazole (Safeguard, Panacur)	Ivermectin (Ivomec)	Levamisole (Prohibit)
Albendazole (Valbazen)	Moxidectin (Cydectin)	Pyrantel

# Copper Oxide Wire Particles

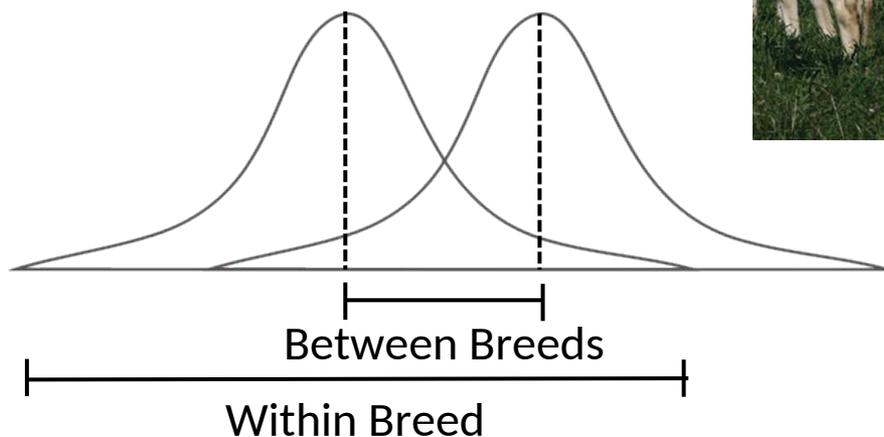
- Copper in small doses can be given to sheep
- Particles are packaged in gelatin capsules
  - 0.5-1 g per lamb
  - 1-2 g per ewe
- Negative impacts on adult *Haemonchus* survival
- Effective treatment method
  - Only use on FAMACHA > 3

[www.wormx.info/copper-oxide-wire-particles](http://www.wormx.info/copper-oxide-wire-particles)



# Genetic Variation in Parasitism

- Between breeds
  - Parasite Resistant
  - Parasite Susceptible
- Within breed



# Selection Tools

- Phenotypic Selection
  - FAMACHA Records
  - Deworming Records
    - Identify repeat offenders
  - **Fecal Egg Counts**
    - Identify those that **actually have the worms!**
- Implement good culling practices
  - Identify the 30% that carry 70% of the worms



**Table 1. Selection traits for resistance and resilience to parasites**

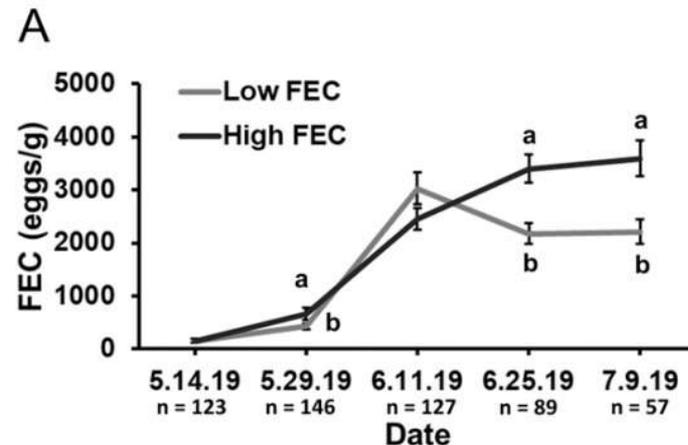
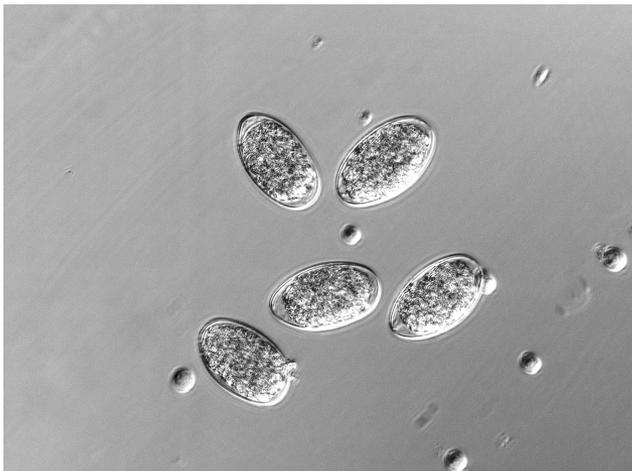
	Range of values	Advantages	Disadvantages
<b>Deworming history</b>	Yes-No	Easy	Marginal impact Selects more for resilience
<b>Bottle jaw</b>	Yes-No	Easy	Marginal impact Selects more for resilience
<b>Body condition score (BCS)</b>	1-5	Easy to perform	Not specific for identifying worm resistance or resilience since other factors can reduce BCS Need to be careful not to select against highly productive females which may have reduced BCS.
<b>FAMACHA® eye anemia score</b>	1-5	Easy to perform More accurate than above criteria Better correlation with FEC	Also selects for resilience Animals with low FAMACHA® may still be shedding a lot of eggs. Training required
<b>Fecal egg count (FEC)</b>	0 to 25,000+	Greater variability in data enables more accurate selection Selects for resistance rather than resilience. Best way to identify resistant (or susceptible) animals.	Labor intensive Most expensive

Adapted from Kathy Bielek, Blueprint for selecting resistant sheep: a shepherd's perspective (2017)

# Fecal Egg Count

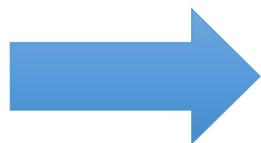
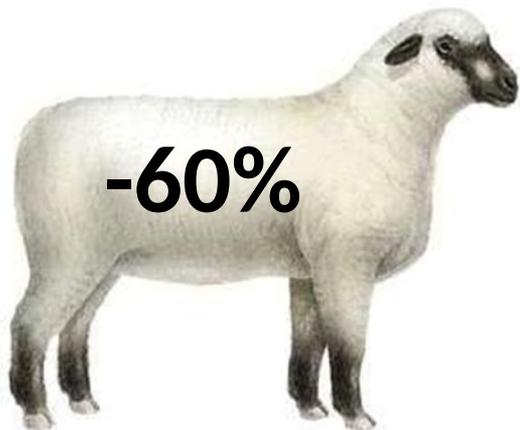
## Estimated Breeding Value

- Developed at Virginia Tech in the early 2000's
- FEC heritability: 20-25% (moderate)
- Reported as a **PERCENT CHANGE**
- Negative values are GOOD
  - Indicates the genetic potential to reduce FEC



# Fecal Egg Count

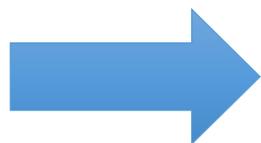
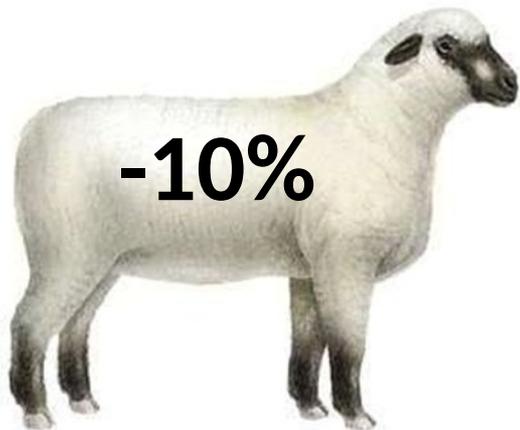
## Estimated Breeding Value



**-30%**

$$EPD = \left(\frac{1}{2}\right)EBV$$

**Expected FEC difference  
between lambs sired by  
these rams is 25%**



**-5%**

# Create a Plan and Evaluate Results

- What is practical?
- What can be implemented on your farm?
- Use a **combination** of different methods
- Continue to monitor parasites
  - 5-point check
  - FAMACHA Scoring
  - Deworming Records
  - Fecal Egg Counts
- Use **DATA** to make decisions
  - Are metrics improving?



# *What does this look like in* **REAL LIFE???**

- Dr. Brittany Diehl, DVM, University of Florida
- Dr. Reid Redden, Premier Solar Sheep, TX

