

# Managing Gastrointestinal Parasites in Small Ruminant Herds

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# Objectives

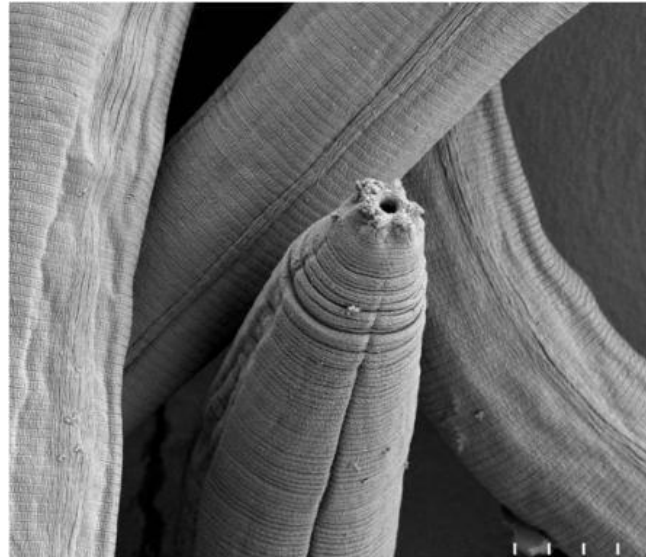
- Learn about the most important **parasite** that affects sheep and goats in Florida and the Southeastern US.
- Define parasite **resistance**.
- Discuss the **options to control GI worms** in sheep and goat operations.
- Promote a **hole-farm approach** and less reliance on dewormers.
- Discuss the process of **Smart Drenching**.
- Define how **FAMACHA** works.



# Gastrointestinal parasites

- Number one cause of death in sheep and goat herds/flocks in the Southern United States.

***Haemonchus contortus*** – most common endoparasite in Florida and the humid tropics.



# Gastrointestinal parasite problems

- More frequent under these conditions:
- Immune compromised.
  - 4 month olds
  - Older animals
  - Stressed animals (Lactating, sick, etc..)
- High stocking rate situations.
- Overgrazed/ inappropriately pastures.





# *Haemonchus contortus* (Barber Pole Worm)

- Literally a blood sucking worm
- Very prolific – one adult female can produce **5,000 eggs per day**.
  - 500 worms = 2.5 million eggs/day/animal.
  - 50 goats = 1 billion eggs per week.
- Short life cycle – about 3 weeks from time of infection until eggs are produced.
  - Preys on the weak, young, pregnant, or lactating animal.
- Developing resistance to all classes of dewormers



# “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.





# Dewormer Resistance History of the Problem

- Age of modern dewormers.
  - Effective, broad-spectrum, cheap, safe.
- **Over-reliance on dewormers**
  - Addiction to drugs, improper use of dewormers.
  - Loss of common sense approaches.
  - Belief there will always be a new drug.
- No new drug classes introduced since 1981.
  - We have what we have !!!!

\*\*\*New anthelmintic announced by Novartis in 2007 – **Zolvix®** (monepantel). Not available in the US.



# Where Do Resistant Worms Come From ??



Resistance is an **inevitable consequence** of using any particular drug to kill worms.

- “Resistant” worms – worms that can survive drug treatment, actually 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 (Animals shipped from state to state or country to country carry their worm infections with them).



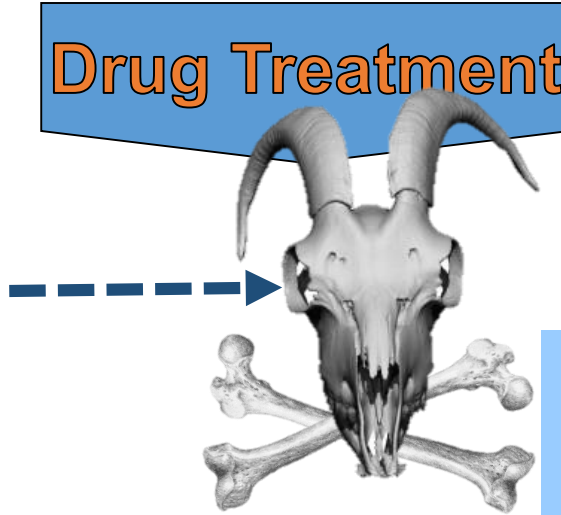
Parents

# Selection for Drug Resistance

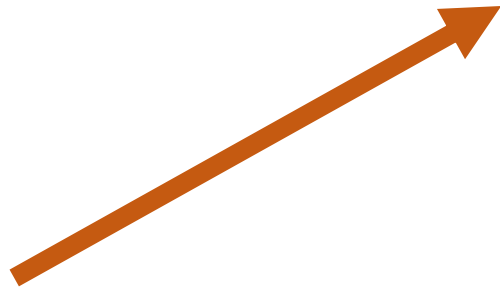
Susceptible



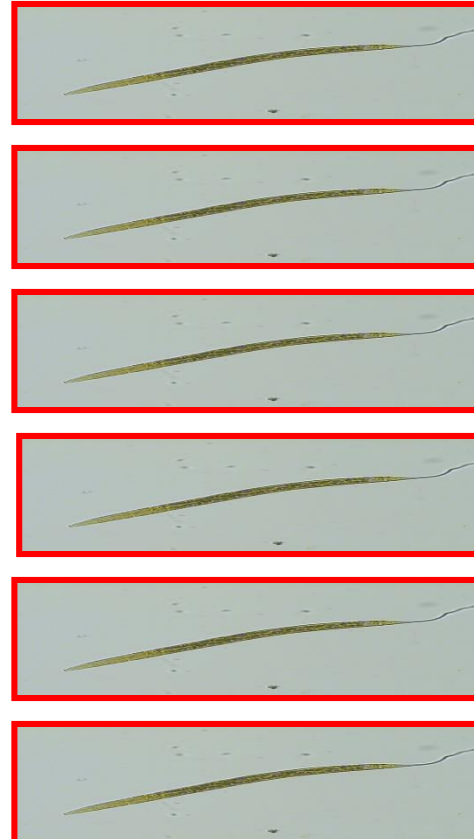
Drug Treatment



Resistant



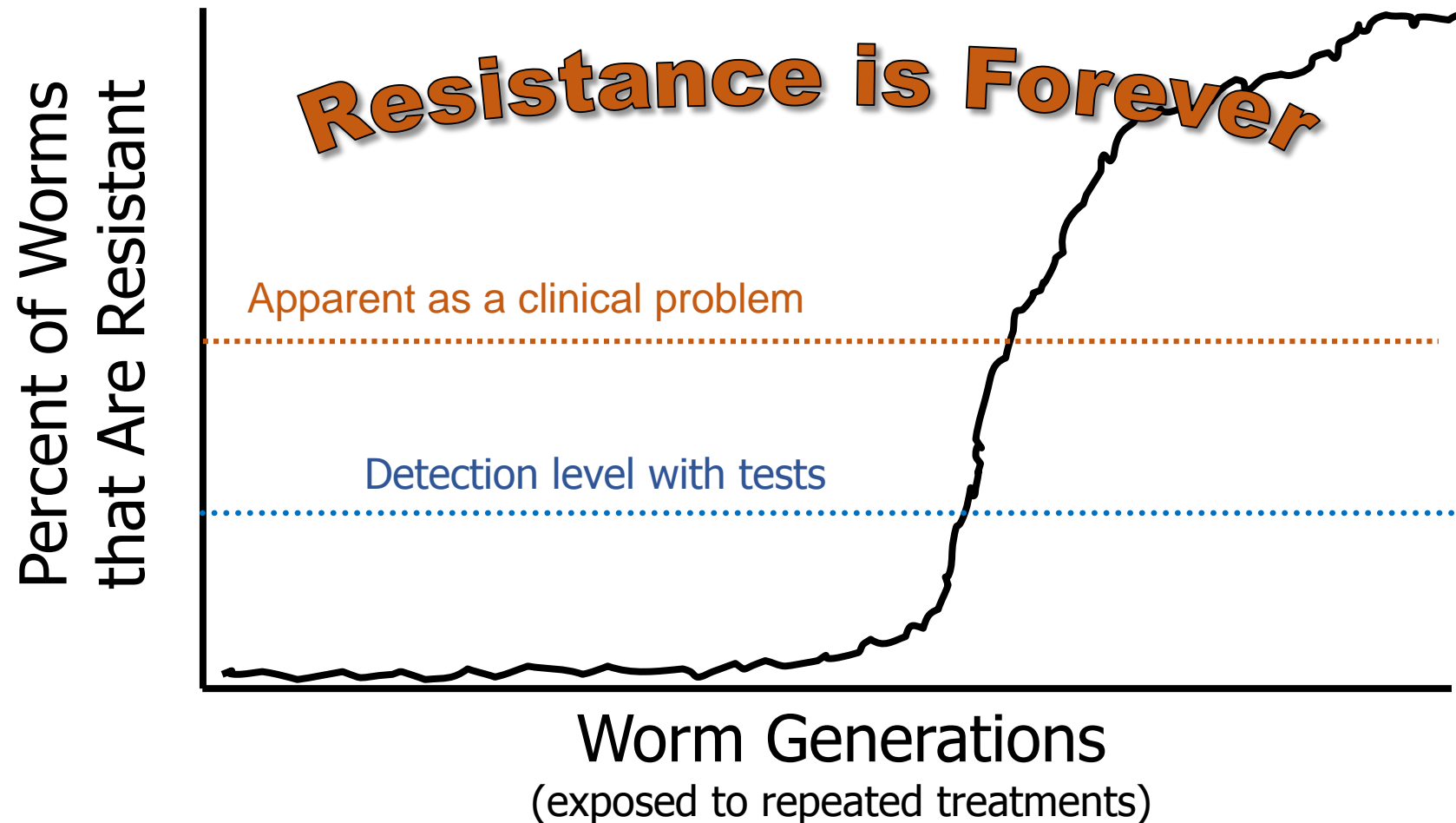
Next Generation



Resistant

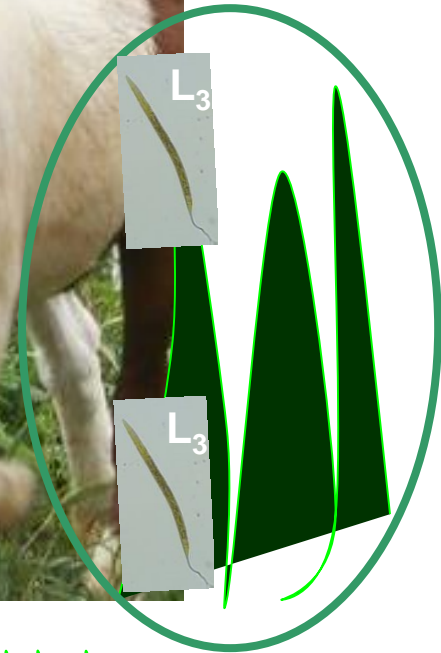
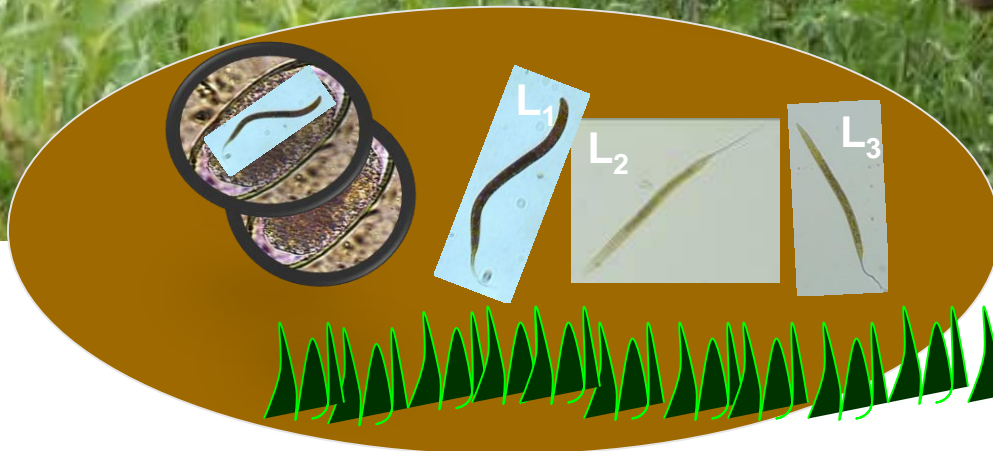
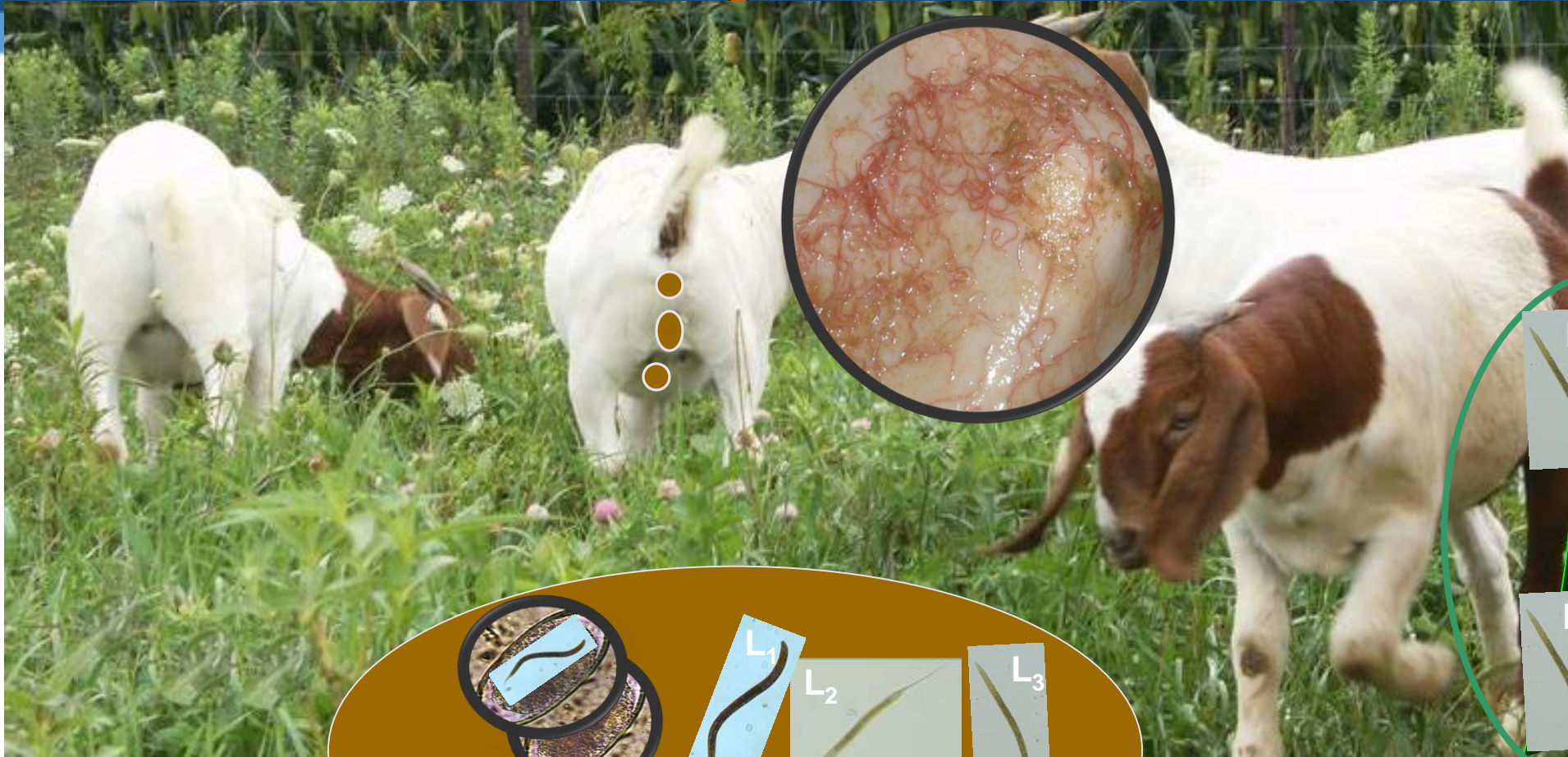


# Changes in “Resistance” Genes in Response to Drug Selection





# Life Cycle of GI Worms



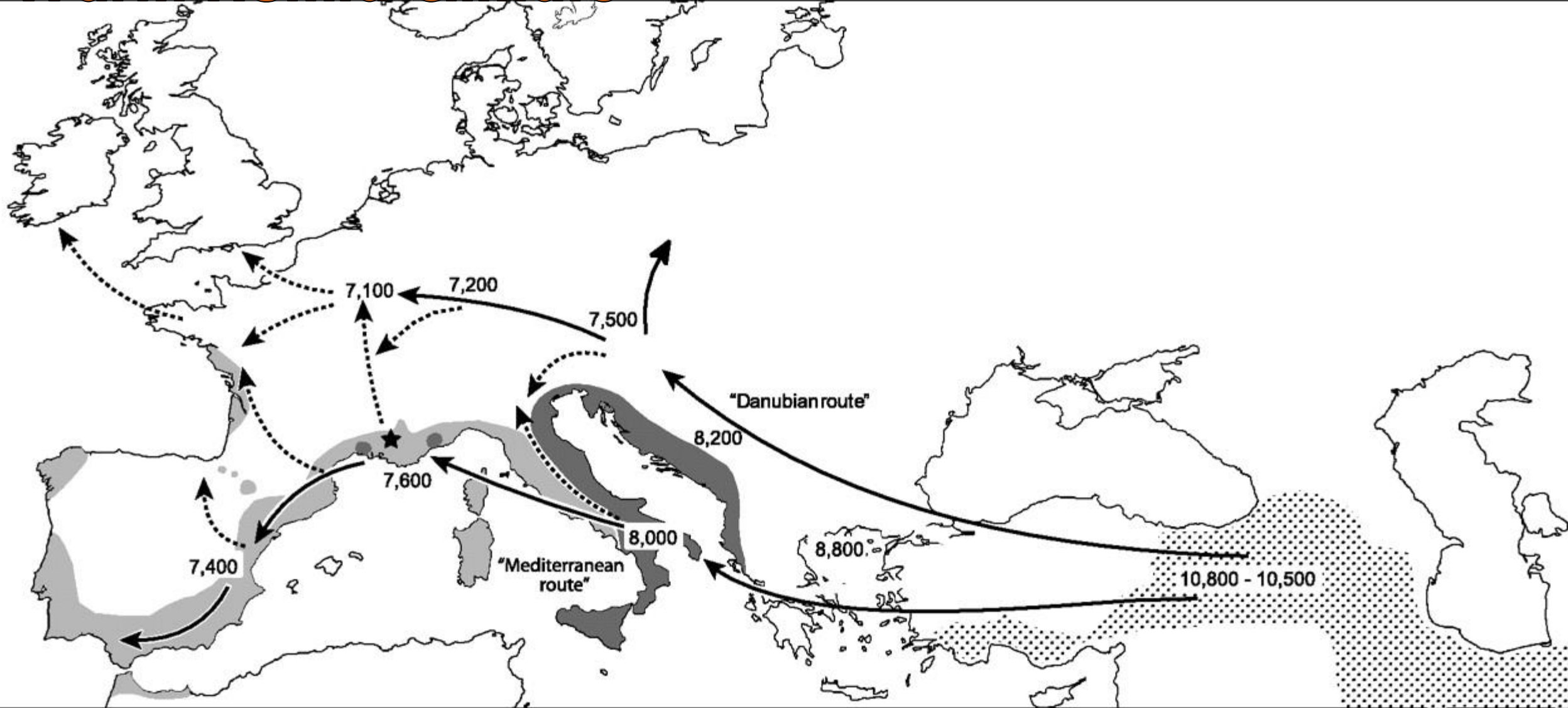
# Why is *H. contortus* Such a Problem ???

- Evolved in tropics.
  - Thrives in warm/wet climates.
- Long transmission season in southern states.
- Short life cycle.
- Goats acquire only **partial immunity**.
- Immunity is slow to develop in sheep
  - Kids and Lambs are highly susceptible.
  - Immunity wanes around time of kidding/lambing.





# Goats Were Never Intended to Live (and Graze) in a Warm Humid Climate





# Goats Were Never Intended to Live (and Graze) in a Warm Humid Climate



High Humidity  
Standing water

No rocks

Long growing season

+ Warm nights

**Hell for a goat**





# Overview of Anthelmintics

- Only 3 actual classes or families of anthelmintics exist.
  - ✓ Drugs within a class (or family) are very similar in properties and activity.
- Sold under many different trade names.
- Can be very confusing.





# Classes of Anthelmintics (Dewormers)

## 1. Benzimidazoles (BZ)

- fenbendazole (FBZ; Panacur, Safeguard)
- albendazole (ABZ; Valbazen)

## 2. Avermectins (Milbemycins)

- ivermectin (IVM; Ivomec)
- moxidectin (MOX; Cydectin)

## 3. Imidazothiazoles (Tetrahydropyrimidines)

- levamisole (LEV; Tramisole, Levasole), morantel (MOR; Rumatel, Golden Blend, others)



# Alternative treatments

## 1. Diatomaceous Earth

## 2. Herbal Dewormers

\*\*\*No scientific evidence that these have any benefit for worm control.\*\*\*

## 3. Copper oxide capsules – has proven to reduce worm loads in sheep and cattle.





# The Traditional Approach to Parasite Management

- Treated entire herd.
- Dewormed by the calendar.
- Rotated wormers regularly.
- One Pasture – may be only option.
- Over crowding/overstocking.
- If multiple pastures, dewormed at move to new pasture.
- Unknowingly purchased resistant worms.

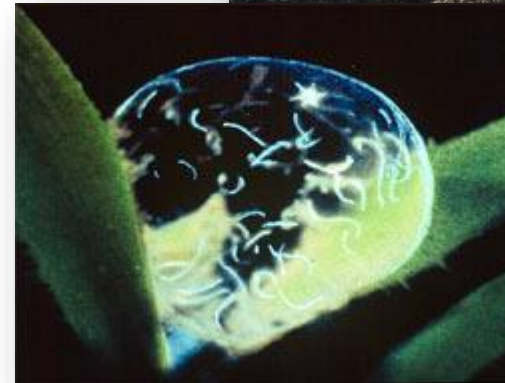




# What Causes Resistance To Dewormers ???

- **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.**



# What Causes Resistance To Dewormers ???

1. Treatment strategies that ↓  
refugia.
  - Examples:
  - Treating and moving to clean pasture.
  - Treating when few larvae are on the pasture (drought).
  - Treating all animals at same time.
2. Frequent Treatments.
  - More than 3 treatments per year.
3. Under-dosing.

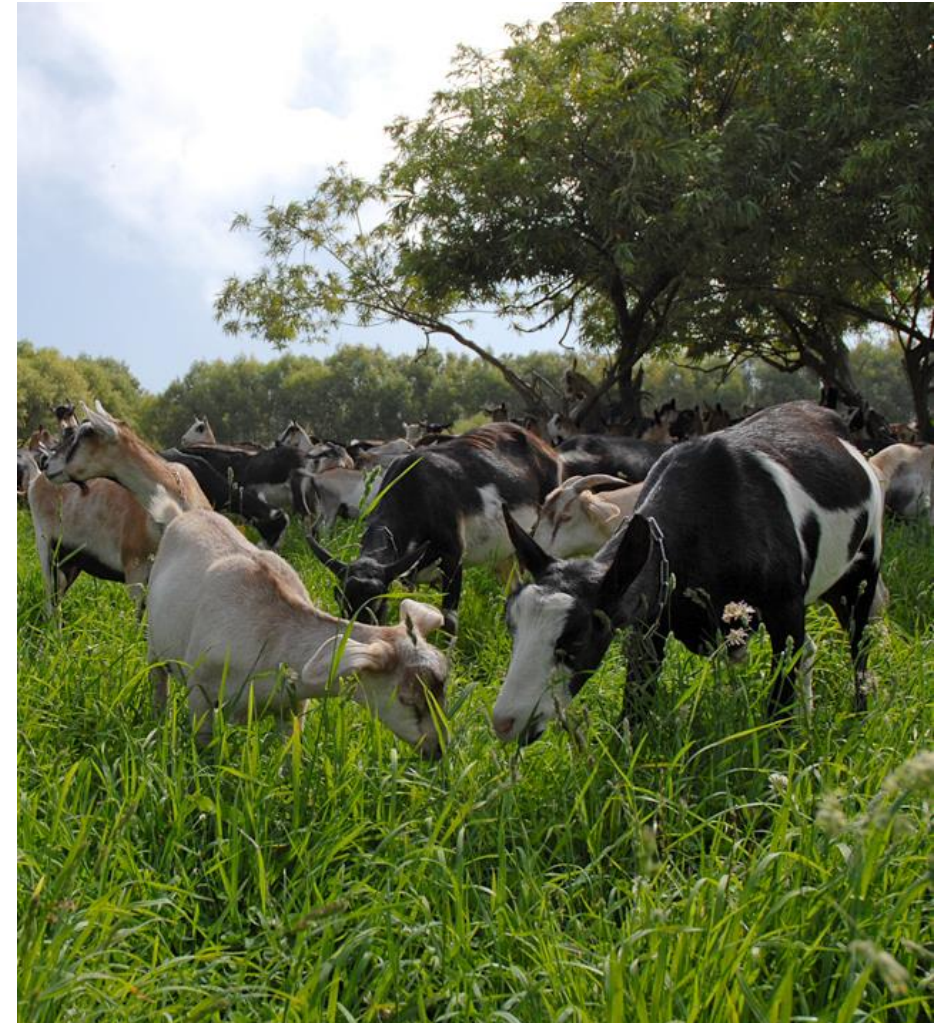




# What Does This Mean For The Small Ruminant Industry ???

Dewormers can no longer be thought of as a cheap input to maximize productivity.

- **Extremely valuable and limited resources.**
- Requires a medically-based approach to treatment.
- Control of *Haemonchus* must be practiced with an eye to the future.
  - **Reality** = long-term control of *Haemonchus* will only be possible if dewormers are used intelligently with **prevention of resistance as a goal.**
  - Reduced-chemical and non-chemical approaches are needed.





# Slowing down “Resistance”

- Given that “resistance” is inevitable and “resistance” is forever, how do we slow it down?
  - Reduce genetic selection pressure.
  - Maintaining a pool of sensitive genes (REFUGIA).
  - Treat individuals, not herds.
- Concept known as...



# Slowing down “Resistance”

- **Smart Drenching** - Using what we have learned to develop deworming strategies that maximize the effectiveness of treatments while at the same time decreasing the rate at which we create drug resistance.





# Components of a Smart Drenching Program

1. Know the resistance status of the herd/flock.
2. Sound pasture management.
3. Keep resistant worms off the farm.
4. Administer the proper dose.
5. Utilize host physiology.
6. Selective treatment → **FAMACHA.**





# Know the Resistance Status of the Flock/Herd

- Perform FECRT or DrenchRite®.
- Repeat every 2 years.
- When resistance is recognized in early stages.
  - Drug can still be used.
  - Must be managed appropriately.



# Recommendations For Pasture Management

- Use appropriate stocking rates.
- Build fences – provide safe pastures.
- Use multispecies grazing.
  - mix 2 or more species on same pasture (sheep with cattle or horses).
  - rotate pastures between different species.





# Smart Pasture Management



- Avoid overstocking.
- Limit to the minimum recommended stocking rate for your area (4-6 animals/acre).
- Less is better.

# Do Not Buy Resistant Worms

- All new additions should be quarantined and aggressively dewormed upon arrival.
- Deworm with 3 anthelmintics from different drug classes:
  - moxidectin, levamisole, and albendazole upon arrival.
- Should remain in quarantine for 10 - 14 days
  - Perform FEC to confirm that no eggs are shed.





# Dewormer Savvy Give the *Right* Dose



- Goats: **2X sheep dose**
  - exceptions
    - Levamisole (1.5X)
    - Moxidectin injectable (1X)

# Dose According to Weight

- Weigh scales (1<sup>st</sup> choice).



- Weight tapes.
  - Only accurate for dairy goats.





# “Resistant” Breeds



# The FAMACHA<sup>®</sup> System



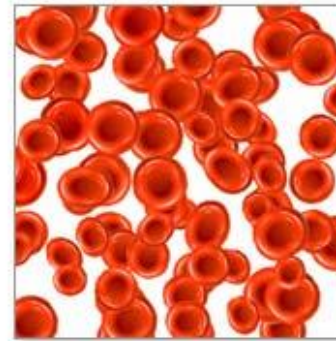
- Eye color chart with five color categories
- Compare chart with color of mucous membranes of sheep or goat
- Classification into one of five color categories:
  - ✓ **1** – not anemic
  - ✓ **5** – severely anemic



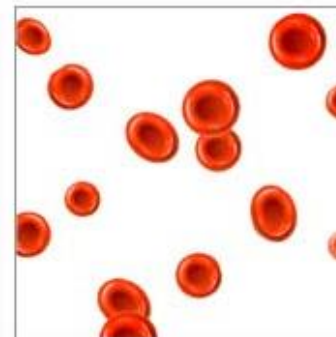
# How Does FAMACHA Work ??

- Since the primary impact of *H. contortus* is **anemia**, one can indirectly measure parasite burden (and need for treatment) by measuring anemia
- **Only useful where *H. contortus* is the primary parasite species**

Normal amount of  
red blood cells



Anemic amount of  
red blood cells



# Haemonchus contortus

- Heavy burden can result in the loss of  $\frac{1}{2}$  cup or more of blood per day
- The total blood volume of a goat makes up approximately  $\frac{1}{12}$ <sup>th</sup> its total body weight.
  - A 120 pound goat  $\rightarrow$  10 pounds of blood  $\rightarrow$  4.5 kg of blood  $\rightarrow$  4.5 liters or 4,500 ml of blood volume. 120 ml in  $\frac{1}{2}$  cup  $\rightarrow$  50% blood loss in 37 days

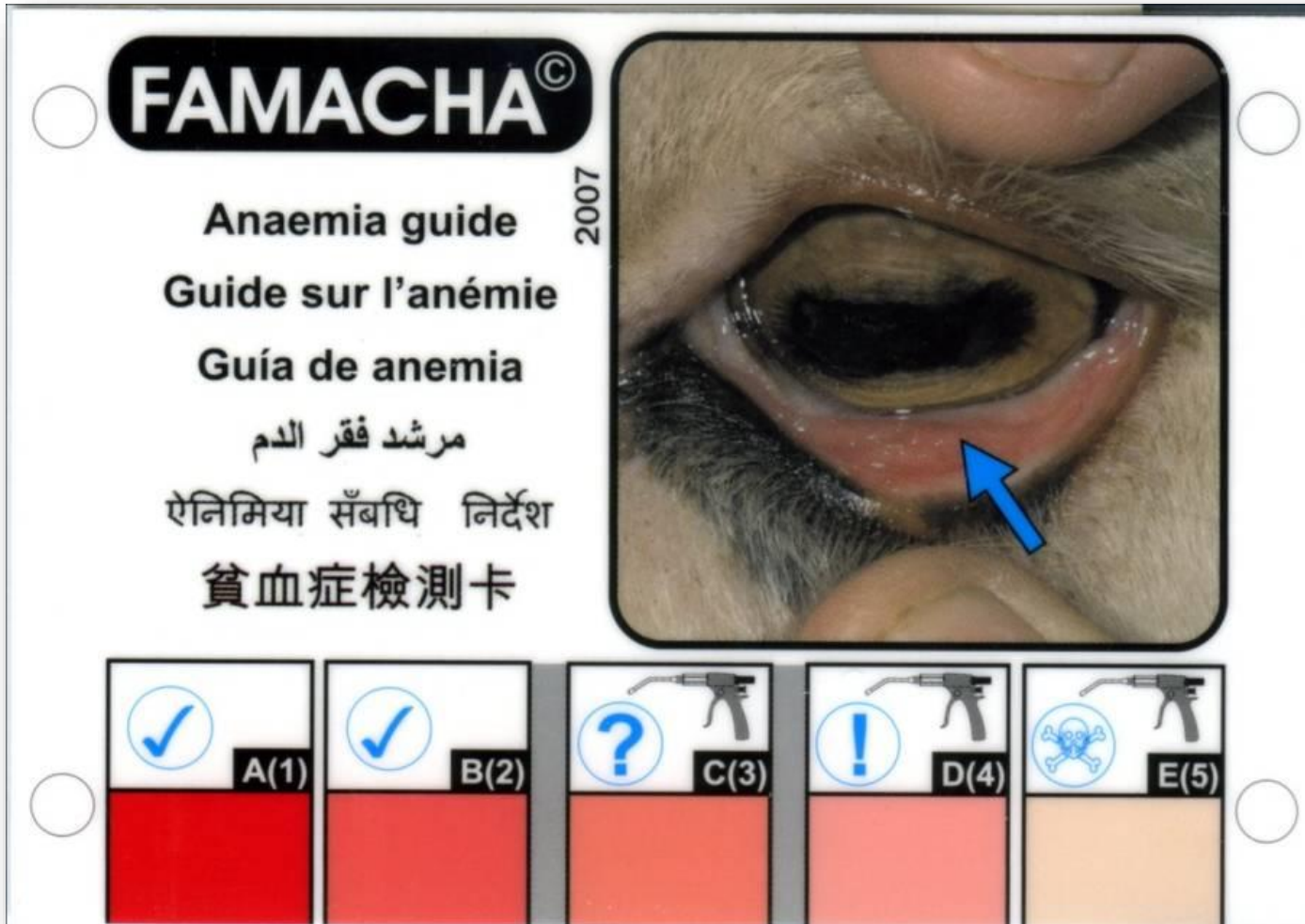


**Anemia**  
**Bottle Jaw**





# Conjunctiva color relationship to Anemia



Clinical Category	Color Classification	Hematocrit Range (%)
1	Red	$\geq 28$
2	Red-pink	23 - 27
3	Pink	18 - 22
4	Pink-white	13 - 17
5	White	$\leq 12$

# Conjunctiva color relationship to Anemia

- 1) Place gentle downward pressure on eye with upper thumb
- 2) Pull down lower eyelid with other thumb
- 3) Read color of eye on mucous membranes of lower eyelid





# FAMACHA® System “rules”

- Score using the chart
- Evaluate in bright light (sunlight)
- Be quick
- Score both eyes (of the animal)
- Use higher score if eyes differ



# What Do I Do With The Results?

- *Always* treat goats and sheep in categories 4 and 5
- Don't treat 1's and 2's
- When should you treat the 3's?





# Animals in Category 3

## Treat when

- >10% of herd scores in categories 4 or 5
  - Young animals
  - Ewes/does (pregnant or lactating)
  - Animals in poor body condition
  - If any concern about animals general health and well being
- 
- Consider using less effective drugs



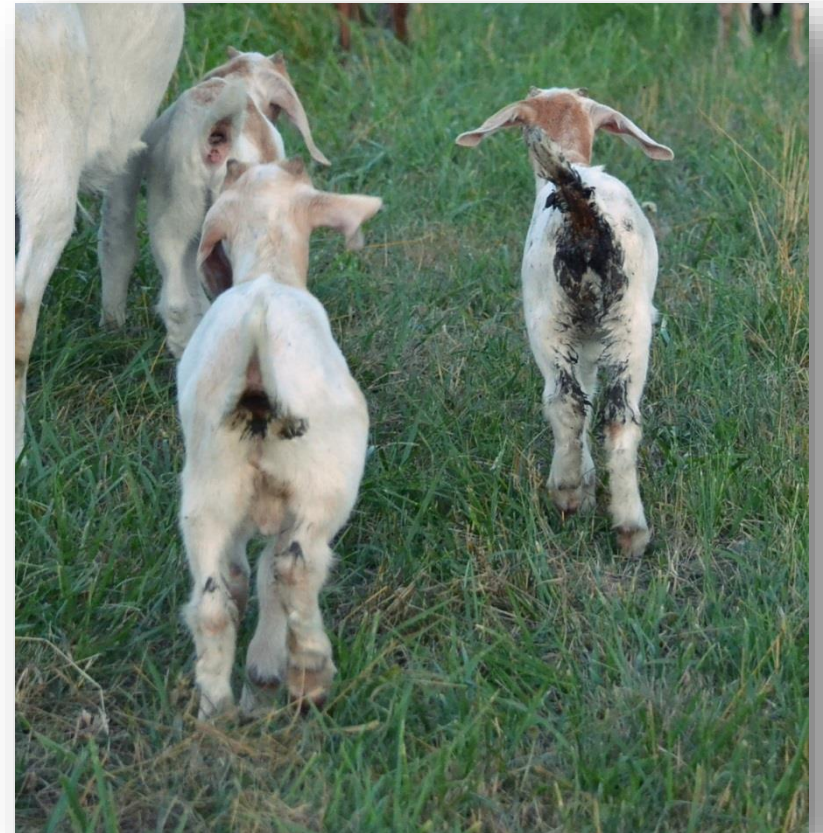
# How often...

If more than 10% of flock/herd scores in categories **4** and **5**:

- Recheck weekly
- **Treat the 3's**
- Rotate paddocks (if possible).

Introduce animals to clean pastures a week after they have been dewormed, not right away.

**\*\*CULL PROBLEM ANIMALS\*\***





# Culling

- Select animals that are easy keepers. Decide if its worth keeping problem animals.

1. FEC
2. Age
3. Body condition
4. Production level
5. Conformation



# Summary

- Do not expect anything different if you are not changing your parasite management strategies.
- Always read and follow the label.
- Only treat animals that need to be treated.
- Consider different pasture management strategies.
- Cull problem animals.
- **Consult with your Extension Agent!**





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