

# What's Killing Your Goats?



## What You Can Do About It

# Integrated Parasite Management/FAMACHA Training

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# Contributors

**American Consortium for Small Ruminant  
Parasite Control**

for the most up to date information available  
for goat producers


**Wormx.info**



# What is Integrated Parasite Management?



Management of small  
ruminants for parasite  
control using a  
combination of the most  
current management  
practices available.





# What is FAMACHA?


FAMACHA is a method of determining the health of an animal by assessing the color of the mucous membranes of the eyes. This is used as an aid to determine if an animal should be wormed or not.




# What's Killing My Goats?



# Worms (Intestinal Parasites)

- ▶ Worms are normal
  - ▶ Mother Nature's population control
  - ▶ Excessive worm burdens cause significant health problems
  - ▶ Or Death
  - ▶ Almost all goat deaths are worm related
  - ▶ Most of the goat deaths in the southeast are caused by one worm
- 

# Importance

- ▶ Internal parasites are the number one health problem of goats and sheep in the Southern U.S.
  - ▶ Warm, moist, weather in the Spring and Summer offer a “parasite paradise”
  - ▶ Hot, dry weather is not conducive to parasite proliferation
  - ▶ Resistance to currently available dewormers is widespread
  - ▶ It's estimated that parasites cost goat and sheep producers worldwide over 2 billion dollars annually
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# Small Intestinal Worms

## ▶ Trichostrongylus colubriformis

- bankrupt worm
- throughout U.S. but thrives in cool moist climates
- second most common worm
- feeds on nutrients in mucous
- chronic poor doers resulting in diarrhea

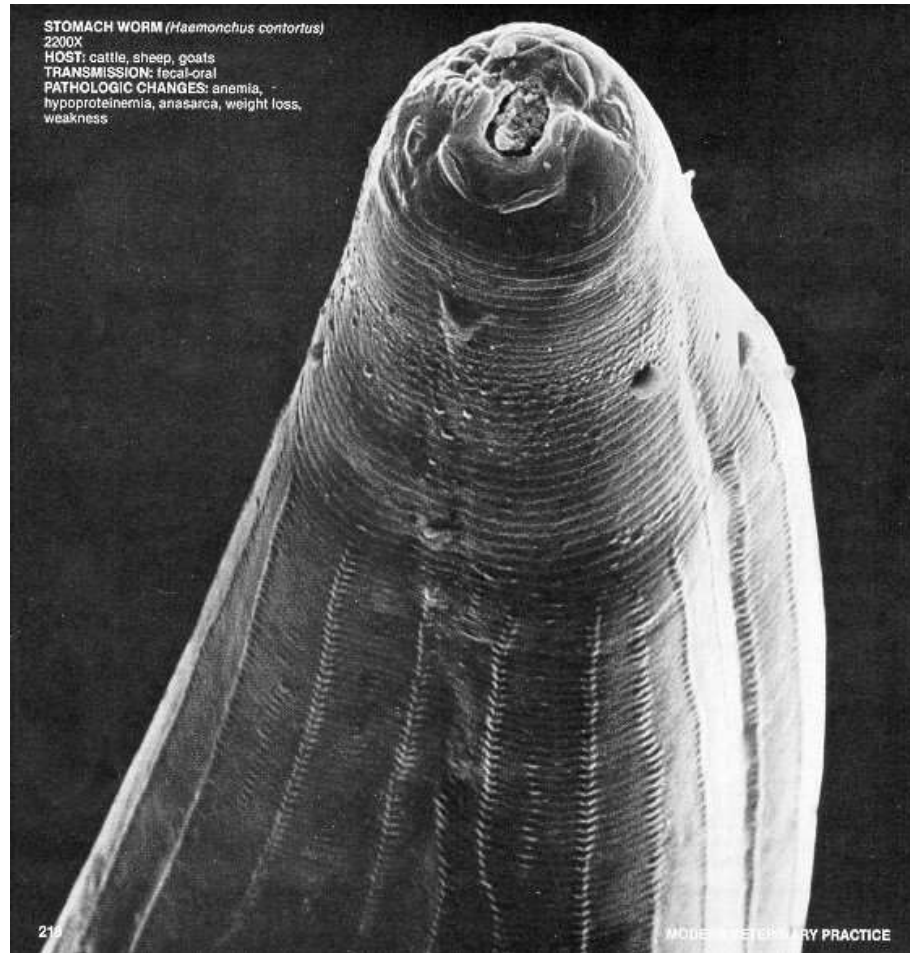
## ▶ Nematodirus spp.

- less of a problem
- symptoms similar to bankrupt worm

# Abomasal (Stomach) Worms

- ▶ Teladorsagia (Ostertagia) circumcincta
  - Brown stomach worm
  - Feeds on mucous
  - Leads to poor growth and diarrhea
- ▶ Haemonchus contortus\*\*\*
  - barber pole worm
  - most common, found throughout the world
  - voracious blood feeder
  - females – prolific egg layers
  - lead to anemia, poor performance and death
  - adults can live 3–6 months

# Barberpole Worm





# Microscopic view of the mouth of barber pole worm



# Barber Pole Worms



# Barberpole Worm



Females can lay up to 10,000 eggs per day

# Super Worm




The Enemy



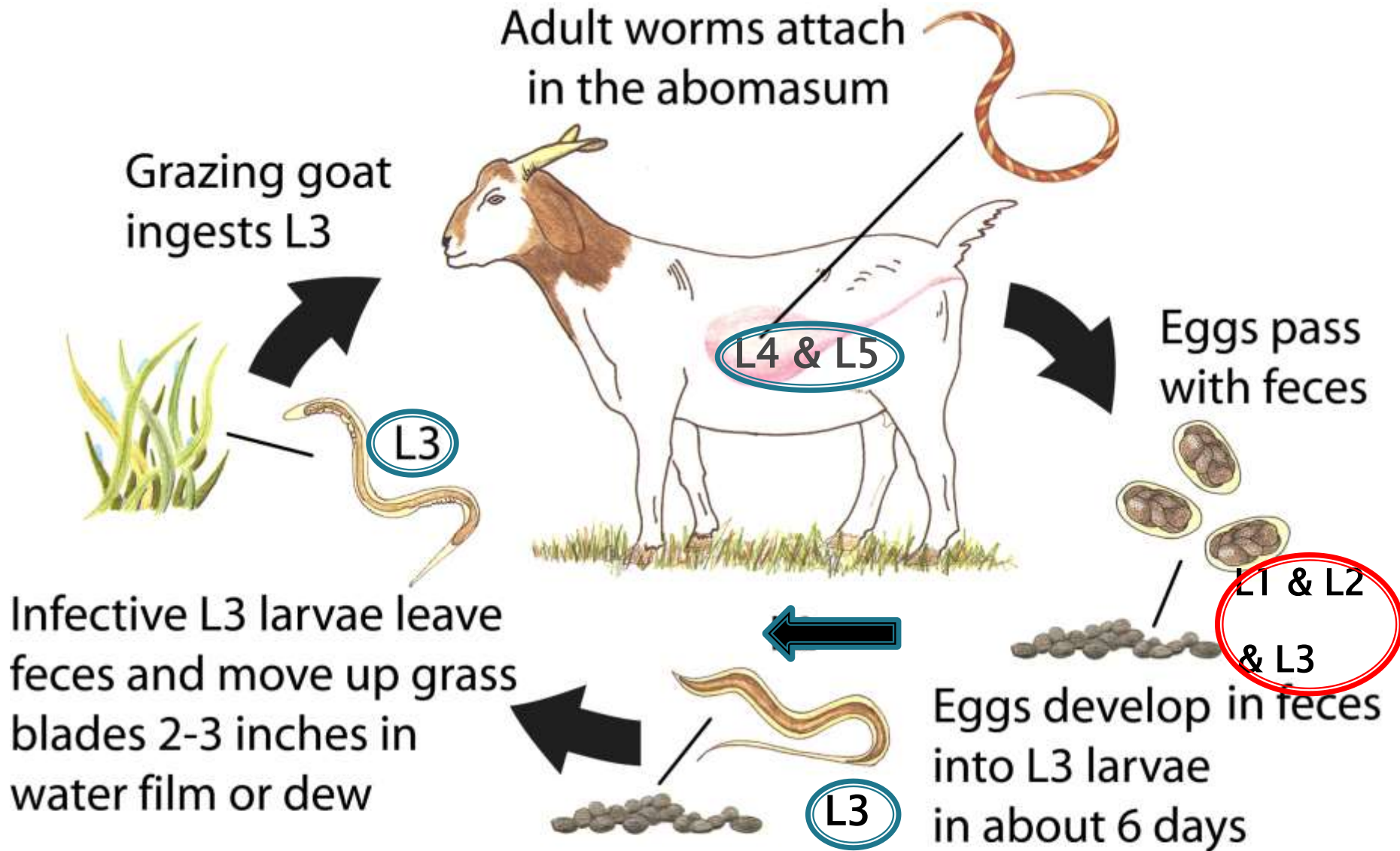
# This is War!!!



# Barber Pole Worm Life Cycle


- ▶ Think about the life stages of a butterfly
    - Egg–caterpillar–cocoon–butterfly
  - ▶ Barber Pole Worm has 5 stages
  - ▶ Very important to understand
  - ▶ Understanding the life cycle can help us maintain control
  - ▶ Management and environmental factors can increase parasite problems
  - ▶ Be vigilant...drought...rain
- 





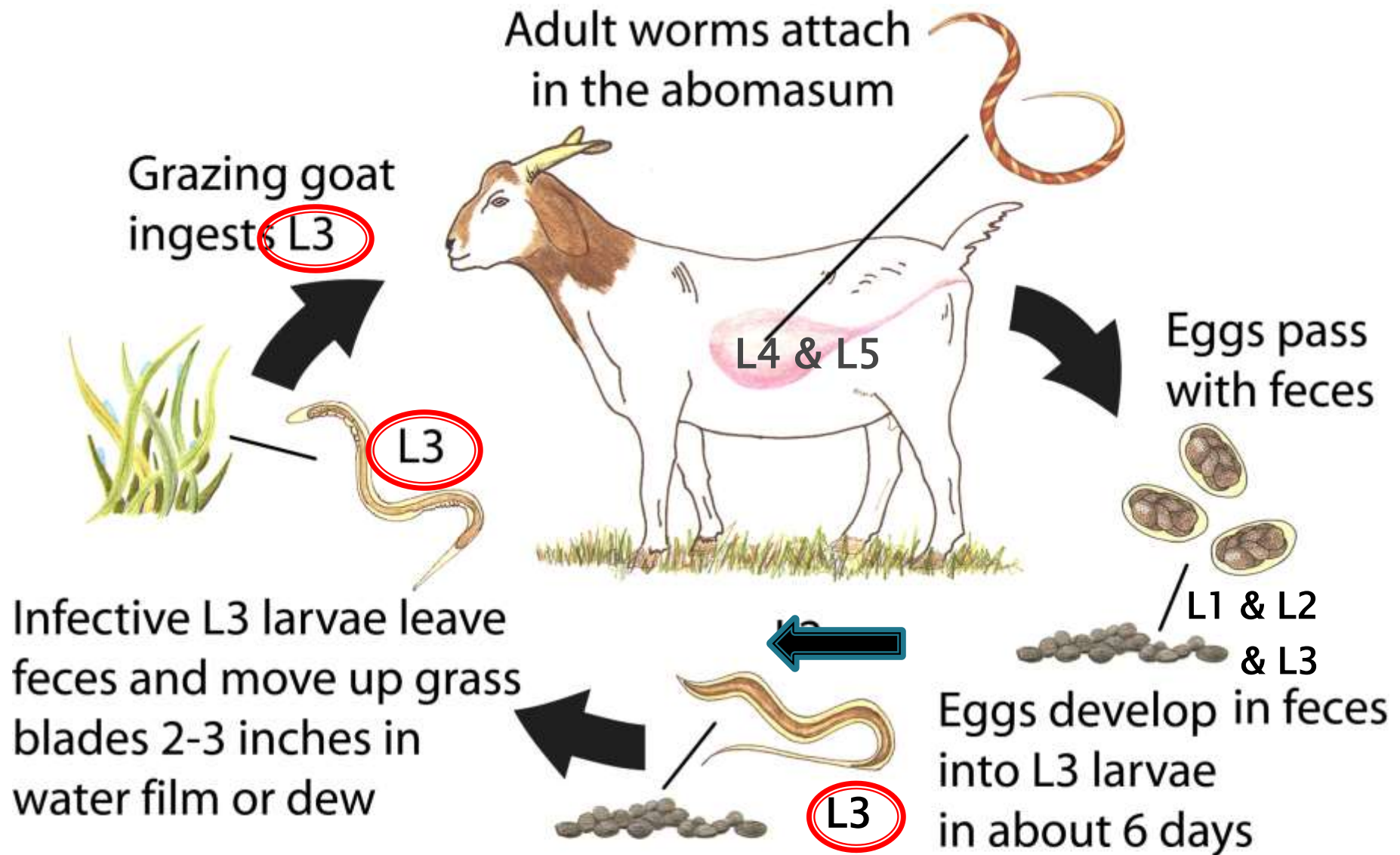
**Life Cycle of *Haemonchus contortus*,  
the barber pole worm**

# Development to L-1

- ▶ Eggs in fecal pellets deposited on ground
  - ▶ Need warmth  $> 50^{\circ}\text{F}$  and humidity to hatch to L-1
  - ▶ L-1 develops in 1-6 days
  - ▶ Hot, dry and cold conditions delay development
  - ▶ Direct sunlight can heat fecal pellet to  $155^{\circ}\text{F}$  and sterilize the egg
  - ▶ Shade trees and tall, dense grass increase humidity and shade fecal pellets
- 

# Development to L-2

- ▶ L-1 feeds on bacteria in fecal pellet
  - Molts sheds skin
  - L-1 becomes L-2
- ▶ L-1 and L-2 live only in the fecal pellet
  - Heat and low humidity will kill in fecal pellet
  - L-1 and L-2 can die by drying out




**Life Cycle of *Haemonchus contortus*,  
the barber pole worm**

# Development to L-3

- ▶ L-2 feeds on bacteria in fecal pellet
  - L-2 molts to L-3
  - Cuticle (skin) is not shed
  - L-3 has 2 layers of skin
  - L-3 more resistant to drying out
  - L-3 cannot eat – mouth is covered by cuticle
    - Lives off stored reserves
    - Live 40–60 days in hot weather
    - Live 120–240 days in cool weather

# Development Facts L-3

- ▶ 6–14 days from fresh fecal pellet to L-3
  - ▶ L-3 can only live about a week or two inside the fecal pellet if it dries out
  - ▶ **L-3 is the infective stage**
  - ▶ **L-3 must escape fecal pellet to infect animal**
  - ▶ What must the L-3 have to escape the fecal pellet?
- 

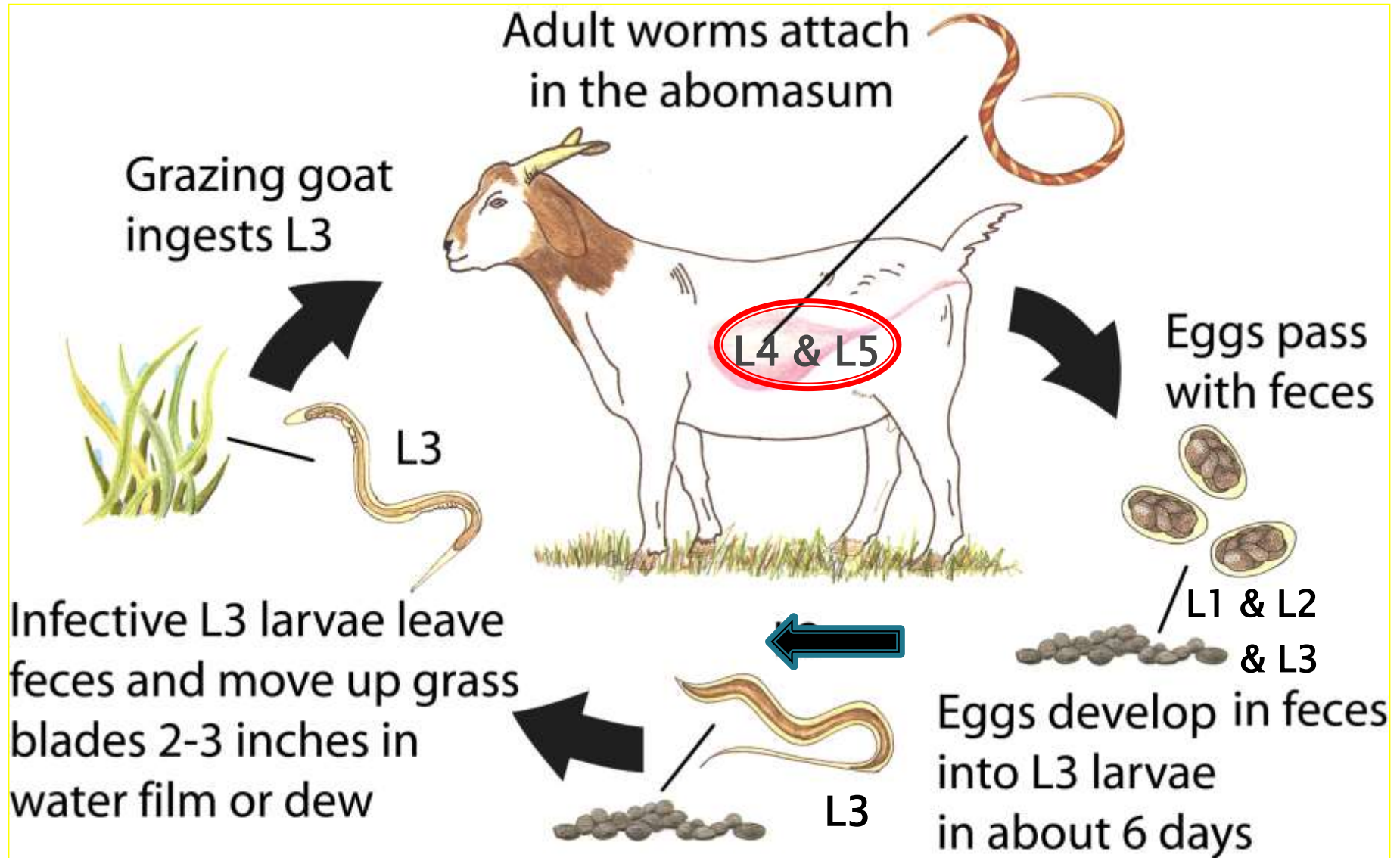


# Development Facts L-3

- ▶ Fecal pellet must be broken up by rain
  - 2 inches in a months time
  - L-3 floats on a film of water
  - Under fallen leaves or debris
  - L-3 moves on a film of water 2-3 inches up the forage \*\*\*\*\*
  - L-1, L-2, and L-3 can live in water

The L-3 larvae is eaten by grazing or goats picking up debris and infects the goats





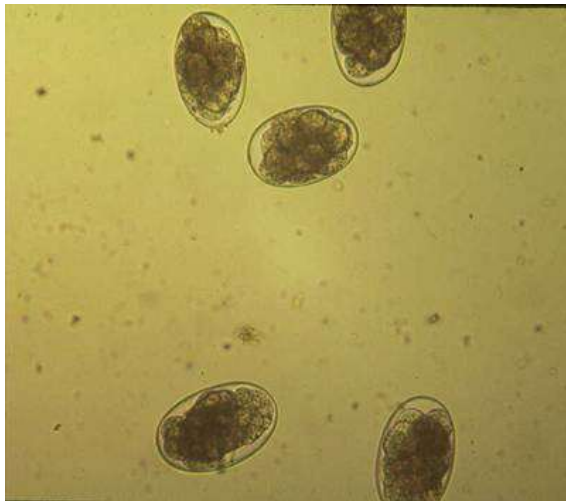
**Life Cycle of *Haemonchus contortus*,  
the barber pole worm**

# Development to L-4 and L-5

- ▶ After being eaten by the goat the L-3 travels to the abomasum(stomach)
  - L-3 in goat sheds it's sheath and molts to L-4 juvenile adult
- ▶ L-4 can enter into an arrested form or molt directly to an L-5 adult
  - Arrested...similar to hibernation
  - Doesn't stimulate immune system
    - Harder for dewormer to kill
- ▶ Barber pole worm can be killed by freezing or hot dry weather...BUT inside the goat
  - Overwinter as an arrested L-4
  - Arrest in hot, dry conditions

# Development to L-5 / Adult

- ▶ If doesn't arrest L4 molts to L5
  - Young worm develops ovaries and uterus
- ▶ Matures to an adult
  - Mates
  - Females lays thousands of eggs per day




# Symptoms of Infestation by Barber Pole Worm

- ▶ Voracious “**blood sucker**”
  - Each worm consumes 1–5 drops of blood per day
  - 1,000 worms consume nearly 1 pint of blood in a week
  - Anemia (low number of red blood cells)
  - Hypoproteinemia (low blood protein)
  - Edema (bottle jaw)
  - Ultimately death
- ▶ Blood – normally 36% red blood cells
  - Goat is about dead at 8% red blood cells
  - Coccidia, lice and liver flukes can also cause anemia



# Anemia

- ▶ Anemia is the ratio of red blood cells to the plasma (clear fluid part of the blood)
  - ▶ Under right conditions anemia can change rapidly
  - ▶ Is the best indicator of goat's barber pole worm's "wormload"
  - ▶ Principle that FAMACHA is based on
- 

# Adult barber pole worms in the stomach



**What You Can Do About It**



# Deworm

## ▶ Dewormer Action Families

- ▶ All members of an action family share the same mode of action
- ▶ Only 3 broad spectrum families available
  - Benzimidazoles (White Wormers)
  - Levamisole and Morantel/Pyrantel
  - Avermectins/Milbemycins

# Benzimidazoles



- All kill eggs, roundworms, lungworms and tapeworms
  - fenbendazole (Panacur, Safeguard)
  - oxfendazole (Synanthic)
  - albendazole (Valbazen) also kills flukes
- Greatest level of dewormer resistance because of long history of use

# Cell Depolarizers

- ▶ Levamisole (Tramisol, Levasole, Prohibit)
- ▶ Morantel/Pyrantel (Rumatel, Positive Pellet)
- ▶ Basically only effective against roundworms
  - The Barber Pole Worm is a roundworm




# Avermectins / Milbemycins

- ▶ Ivermectin (Ivomec)
- ▶ Dormectrin (Dectomax)
- ▶ Eprinomectin (Eprinex)
- ▶ Moxidectin (Cydectin)
  - Noted for long residual effect



# The Problem

- ▶ **DEWORMER RESISTANCE**
  - ▶ **Parasites ability to survive deworming**
  - ▶ **Causes**
    - Wormer overuse
    - Under dosing
    - Long term usage
    - No new Drugs
    - Overall poor management
    - Worldwide problem
- 

# How to Determine if dewormer is effective on your farm

- ▶ Fecal Egg Count Reduction Test(FECRT).
- ▶ Check fecal egg count prior to deworming.
  - ▶ Repeat fecal egg count 10–14 days after deworming.
- ▶ Usually done by your vet
- ▶ Producers can be trained






# Determining Dewormer Resistance

- ▶ Example – Fecal Egg Count before deworming 1,000 eggs per gram
- ▶ 10 days after deworming 200 eggs per gram = 80% fecal egg count reduction.
- ▶ An Effective Dewormer
  - Reduces fecal egg counts by **95%** 7–14 days after giving the dewormer
  - In the above example that would leave only 50 eggs

# Determining Dewormer Resistance

- ▶ DrenchRite Larval Development Assay Test
  - ▶ Dr. Ray Kaplan's Lab
  - ▶ University of Georgia
  - ▶ Cost is \$450.00
  - ▶ Call for protocol
  - ▶ Generally requires minimum of 10 animals
  - ▶ Extensive test
- 



# How to slow development of dewormer resistance

- ▶ Our goal is to increase the ratio of worms not exposed to dewormer to worms that have been exposed to dewormer
- ▶ When an animal IS dewormed
  - Then whatever worms survive deworming and their eggs and larvae ARE THEN RESISTANT
- ▶ When an animal is NOT dewormed
  - Then the eggs deposited and the resulting larvae in the non-dewormed animals are still SUSEPTIBLE (vulnerable to dewormer)
  - When ingested they dilute the “dewormer resistant worms”
    - They are known as **refugia** (literally in refuge)

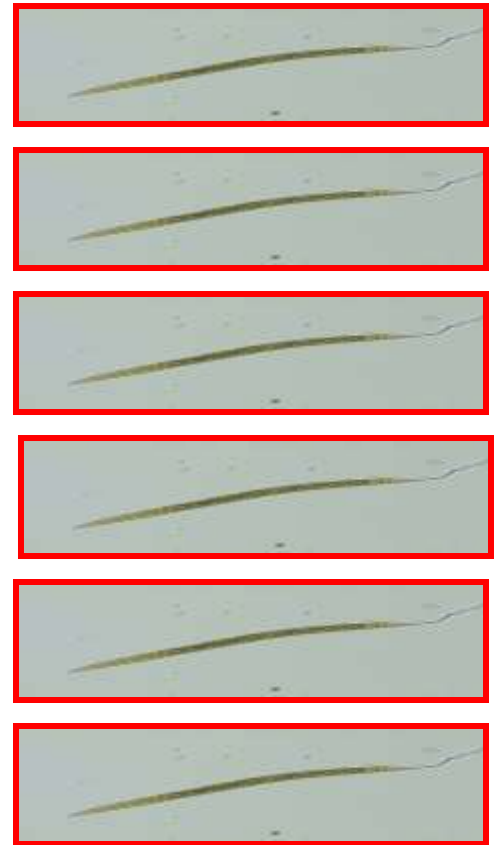
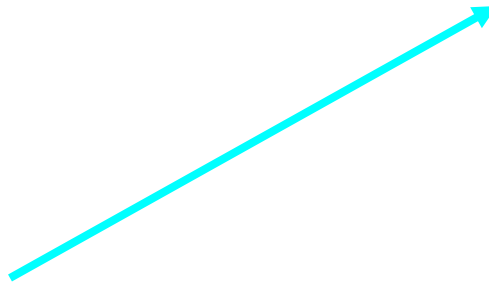
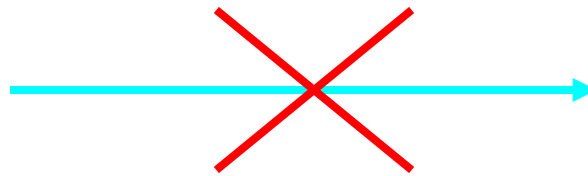
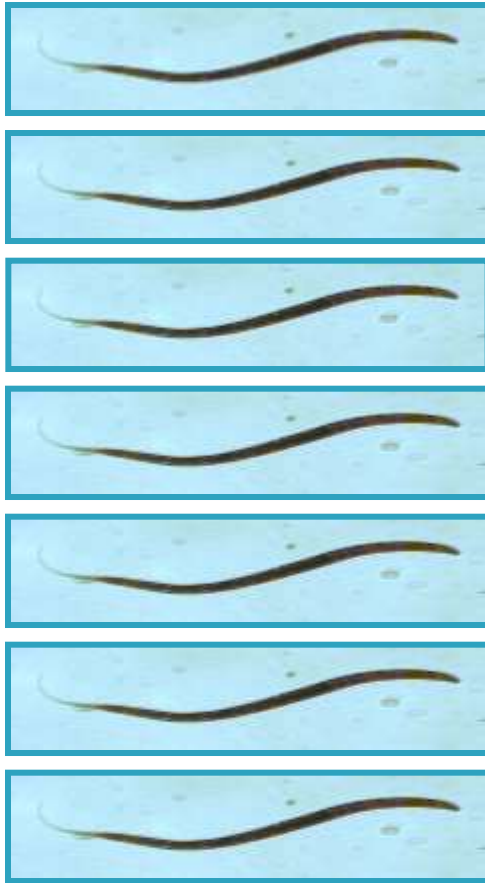
# Parents

Drug Treatment


# Next Generation

Susceptible


Resistant



# How to slow development of dewormer resistance

- ▶ Deworm **ONLY ANIMALS** that need it to increase the proportion of worms in refugia
  - ▶ Be sure your wormer is effective
  - ▶ Use the correct dosage
  - ▶ Administer correctly
  - ▶ This will greatly slow development of dewormer resistance
- 

# Traditional approach to Parasite Management

- ▶ Treated entire herd
  - ▶ Dewormed by the calendar
  - ▶ Rotated dewormers frequently
  - ▶ One pasture—may be only option
  - ▶ Overcrowding/overgrazing
  - ▶ If multiple pastures/dewormed and moved to new pasture
- 

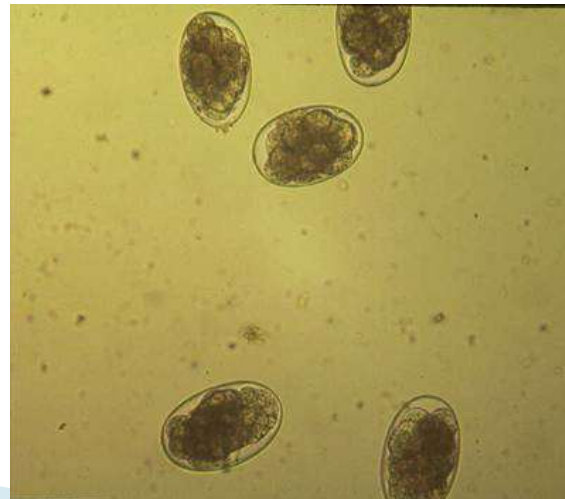
# A Better Approach

## Selective Treatment



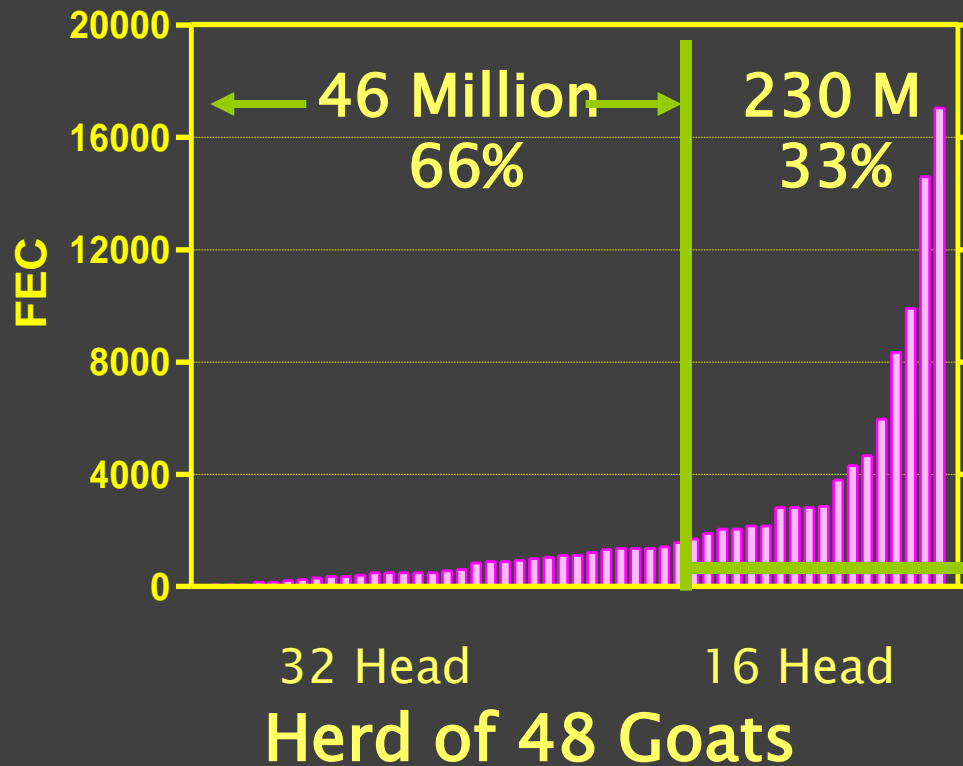
# Concept Behind Selective Treatment

- ▶ Parasites are not equally distributed in all animals
- ▶ Over dispersed distribution in few animals
  - 80:20 rule(could be 70:30 etc) – approximately 20% of the animals in a selected group harbor 80% of the worms
  - These animals are responsible for most of the fecal egg output.





# Distribution of FEC in Goat Herds



**33% of Goats  
80% of Eggs**

Yes, 276 Million Eggs A Day is Possible

1 goat x 1,000 worms x 5,750 eggs = 5,750,000 eggs

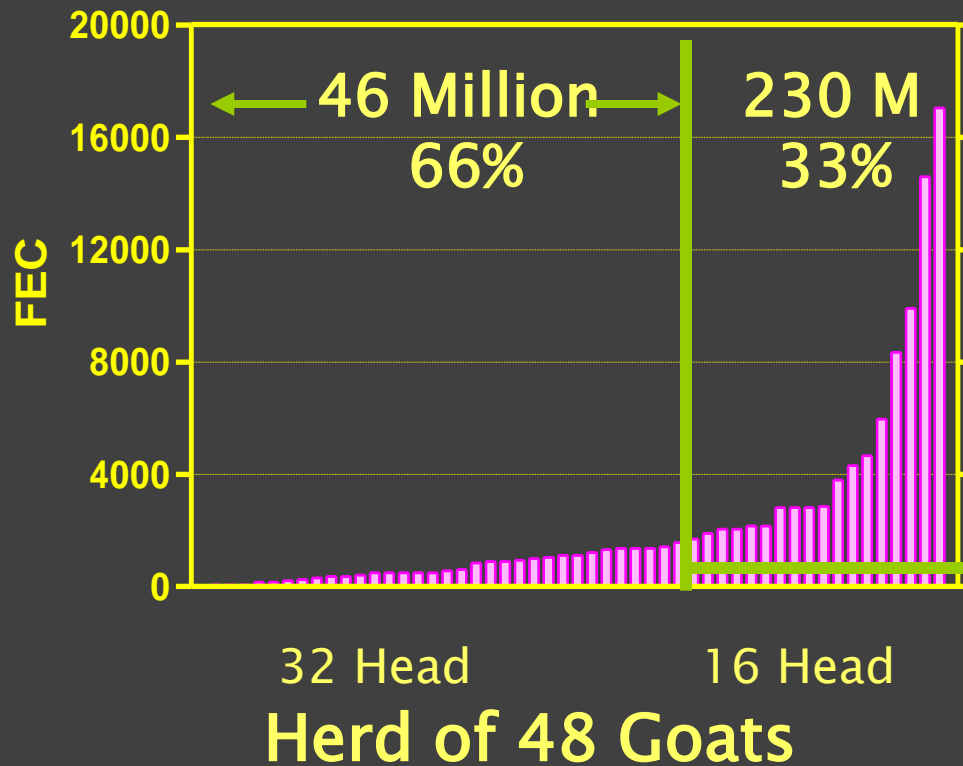
48 goats x 5,750,000 eggs each = 276,000,000

OUR EXAMPLE:

TWO HUNDRED SEVENTY SIX MILLION  
EGGS PERS DAY



# Distribution of FEC in Goat Herds

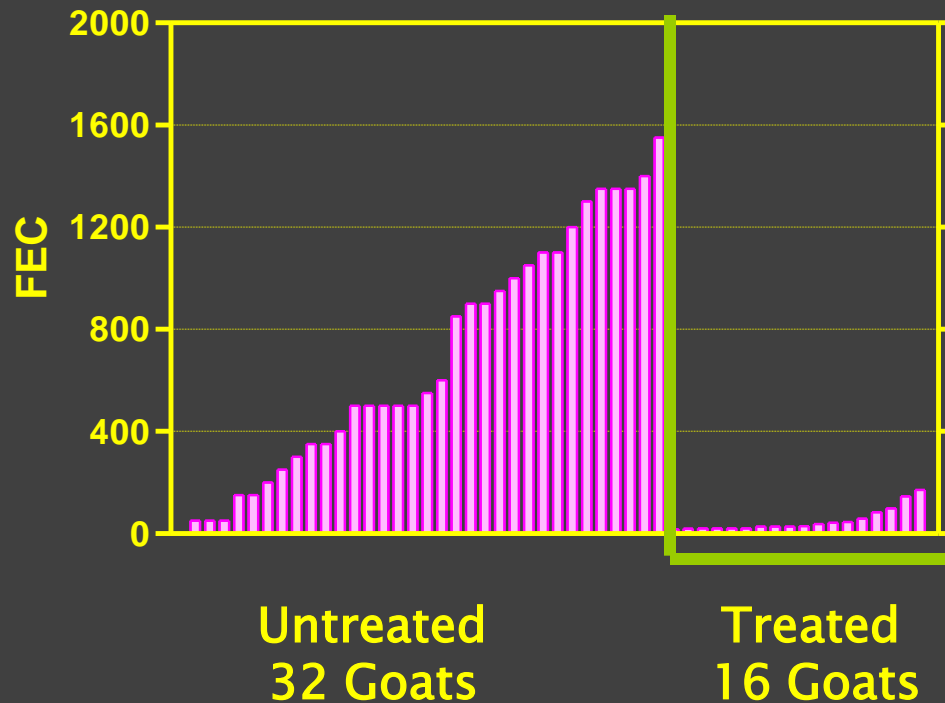


Treating high 33%  
Greatly Reduces  
Daily Pasture  
Contamination With  
Eggs

33% of Goats  
80% of Eggs

Treating 1/3 of  
goats gives just  
as good control  
as treating the  
entire herd

# What Happens If We Treat Only the High 33% ???



Herd of 48 Goats

Treating high 33% with a wormer that causes a 99% FECR reduces daily pasture contamination with eggs by 80%

33% of Goats  
< 5% of Eggs

Following treatment > 95% of eggs are being shed by untreated goats = REFUGIA

# HOW DO WE EASILY DETERMINE WHO TO TREAT?

## ▶ FAMACHA–Fafa Malan's Chart

- Saves Money
- Reduces stress
- Deworm only as necessary

# How Does FAMACHA Work ???

- ▶ Primary symptom of barber pole worm
  - Anemia – can indirectly measure parasite burden (and need for treatment) by measuring anemia
- ▶ Only useful where *barber pole worm* is the primary parasite species





# The FAMACHA® System

- ▶ Eye color chart with 5 color categories
- ▶ Compare chart with color of mucous membranes of the goat
- ▶ Classification into one of five categories
  - 1–Not anemic (red)
  - 5–Severely anemic (pale/white)







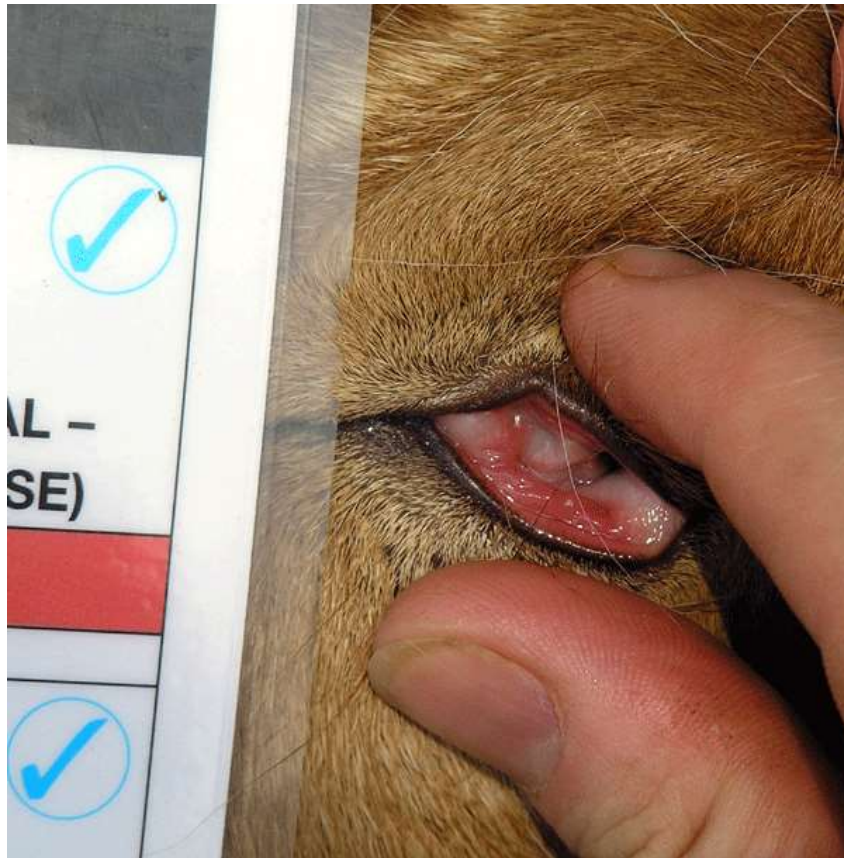
**1) Place gentle downward pressure on eye with upper thumb**

**3) Read color of eye on mucous membranes of lower eyelid**

**2) Pull down lower eyelid with other thumb**



# Side by side Comparison





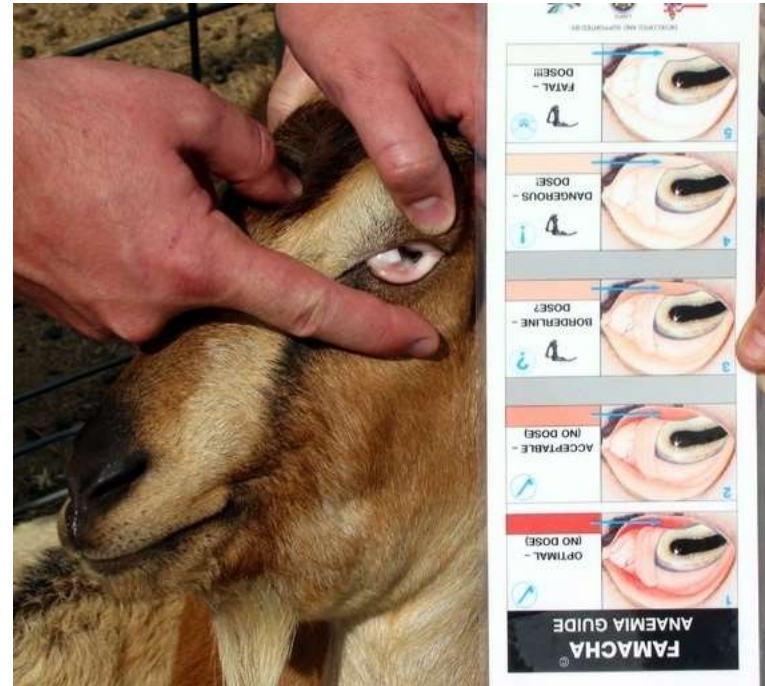
# FAMACHA® System “rules”

- ▶ Score using the chart
- ▶ Evaluate in bright light (sunlight)
- ▶ Be quick
- ▶ Score both eyes
- ▶ 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



# How Often Do I Monitor

- ▶ If <10% of the herd/flock scores in categories 4 or 5:
  - Re-examine in 2 weeks if it is *Haemonchus* “season” (warm, moist conditions)
  - In dry or cool times of year, every 4 –6 weeks is probably sufficient
  - More often at first to be safe – with experience you will learn what the proper intervals are for your farm


# How often...

- ▶ If > 10% of flock/herd scores in categories 4 and 5:
  - Recheck weekly
  - Treat the 3's
  - Change pastures (if possible)

# Precautions

- ▶ FAMACHA® only applicable where *Haemonchus* is the main worm causing clinical disease
- ▶ Conjunctival redness can be caused by eye disease, environmental irritants, and systemic disease

# Precautions....

- ▶ **Don't use it as a sole criteria for whether or not to treat**
    - If you see other symptoms such as bottle jaw, you know you need to treat
    - Look at all available signs
      - Body condition score
      - Coat condition
      - Consistency of feces
      - Heat/exertion intolerance
- 

# Classic symptoms



Severely Anemic

Bottle Jaw



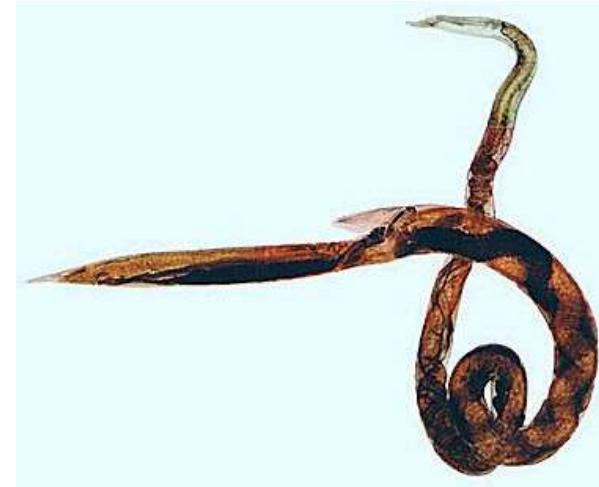
# The Famacha Card



- ▶ Store in dark place when not in use
- ▶ Replace card after 12 months' use
- ▶ Keep a spare card in a light protected place

# Why use FAMACHA

- ▶ **Decreased Worm burdens**
- ▶ **Creates “Refugia”**
  - Decreased development resistance
- ▶ **Saves money**
- ▶ **Identifies animals that need less frequent deworming -- keep for breeding**
- ▶ **Identifies animals that need more frequent deworming -- cull**





# Deworming Essentials

- ▶ Use PROPER DOSE by WEIGHT
  - Weigh Your Animals
  - Use your chart\*
- ▶ Dose for LARGEST ANIMAL (Caution with prohibit-levamisole)
- ▶ Administer drench in the back of the mouth (not on the tongue)
  - Use a dosing syringe
- ▶ Withhold feed from animal for 12 hours prior to treatment for more effective worm kill
  - Not necessary with Levamisol

## Dewormer Chart for Goats

**\*Important –Please read notes below before using this chart\***

1 ml = 1cc	Valbazen (albendazole) <u>ORALLY</u>	SafeGuard (fenbendazole) <u>ORALLY</u>	Ivomec Sheep Drench (ivermectin) <u>ORALLY</u>	Prohibit (levamisole) <u>ORALLY</u>	Cyductin Sheep Drench (moxidectin) <u>ORALLY</u>	Rumatel (morantel) Feed Pre-mix <u>ORALLY</u>
Weight Pounds (lbs)	20 mg/kg 2 ml/ 25 lb	10 mg/kg 1.1 ml/ 25 lb	0.4 mg/kg 6 ml/ 25 lb	12 mg/kg 2.7 ml/ 25 lb	0.4 mg/kg 4.5 ml/25 lb	10 mg/kg 45 gm/100 lb BW (Durvet)
20	1.6	0.9	4.8	2.2	3.6	
25	2.0	1.1	6.0	2.7	4.5	11 grams
30	2.4	1.4	7.2	3.3	5.4	
35	2.8	1.6	8.4	3.8	6.5	
40	3.2	1.8	9.6	4.4	7.3	
45	3.6	2.1	10.8	4.9	8.2	
50	4.0	2.3	12.0	5.5	9.0	23 grams
55	4.4	2.5	13.2	6.0	10	
60	4.8	2.7	14.4	6.6	11	
65	5.2	3.0	15.6	7.1	12	
70	5.6	3.2	16.8	7.7	12.7	
75	6.0	3.4	18.0	8.2	13.6	34 grams
80	6.4	3.6	19.2	8.8	14.6	
85	6.8	3.9	20.4	9.3	15.4	
90	7.2	4.1	21.6	9.9	16.4	
95	7.6	4.3	22.8	10.4	17.3	
100	8.0	4.6	24.0	11.0	18	45 grams
105	8.4	4.8	25.2	11.5	19	
110	8.8	5.0	26.4	12.1	20	
115	9.2	5.2	27.6	12.6	21	
120	9.6	5.5	28.8	13.2	22	
125	10.0	5.7	30.0	13.7	22.7	56 grams
130	10.4	5.9	31.2	14.3	23.6	
140	11.2	6.4	33.6	15.4	25.4	
150	12.0	6.8	36.0	16.5	27.3	68 grams

**Valbazen** Suspension (11.36 % or 113.6 mg/ml): 20 mg/kg orally; withdrawal time is 9 days for meat and 7 days for milk Do NOT use in pregnant does in the first trimester of pregnancy

**Safe-Guard/ Panacur** Suspension (10% or 100 mg/ml): the label dose in goats is 5 mg/kg, but a 10 mg/kg dosage is recommended. At 10 mg/kg, withdrawal time is 16 days meat and 4 days for milk. Add 1 day for each additional day the drug is used (e.g. if administered 2 days in a row then withhold milk for 5 days after 2nd dose).

**Ivomec Sheep Drench** (0.08% or 0.8 mg/ml): 0.4 mg/kg orally; meat withdrawal time is 14 days and milk withdrawal is 9 days.


**Prohibit Soluble Drench Powder (Sheep):** (Note that this drug is also sold as Levasol and Tramsiol) 12 mg/kg oral dose with meat withdrawal of 4 days and milk withdrawal of 3 days. Solution prepared by dissolving a 52 gram packet in 1 quart (943 ml) of water. This yields a solution with 49.6 mg/ml. If dosing kids, it is safer to dilute further (1 packet in 2 quarts of water), and then administer twice the amount listed on the chart. The larger volume administered will then provide a wider margin for safety if there are small errors in dosing.

This chart is available at [wormx.info](http://wormx.info)


# Deworming Essentials

- ▶ Use PROPER DOSE by WEIGHT
  - Weigh Your Animals
  - Use your chart
- ▶ Dose for LARGEST ANIMAL (Caution with Prohibit–Levamisol)
- ▶ Administer drench in the back of the mouth (not on the tongue)
  - Use a dosing syringe
- ▶ Withhold feed from animal for 12 hours prior to treatment for more effective worm kill
  - Not necessary with Levamisol

# Management Strategies

- ▶ FAMACHA is part of a total worm control program – not a replacement
  - ▶ Fecal egg counts to determine wormer effectiveness
  - ▶ Use two or more classes of wormers together for more effectiveness
- 


# Pasture Management Strategies

- ▶ Rotational grazing (rotate every 5 days)
  - ▶ Rotate pastures (6 weeks or more)
  - ▶ A pasture is considered clean after a year
  - ▶ Keep Stocking Rates Low (2 or 3 Head per acre)
  - ▶ Don't Graze too close to ground
  - ▶ Graze Cattle or Horses with goats
  - ▶ Haymaking or tillage
  - ▶ Browse animals high off ground\*
  - ▶ Plant tannins, sercia lespedzia\*
- 





# Pasture Management Strategies

- ▶ Rotational grazing (6 weeks or more)
  - ▶ Resting pastures (2 or more months)
  - ▶ A pasture is considered clean after a year
  - ▶ Keep Stocking Rates Low (2 or 3 Hd per acre)
  - ▶ Don't Graze too close too ground
  - ▶ Graze Cattle or Horses with goats
  - ▶ Haymaking or tillage
  - ▶ Browse animals high off ground
  - ▶ Plant tannins, sercia lespedzia
- 



# A Happy Goat Eating Sercia Lespedzia



# Other Management Strategies


- Choose a Breed that is resistant to parasites
  - Studies indicate that Kikos and Spanish do best in the humid southeast
- Choose to keep from your herd the goats or sheep that have the best FAMACHA scores
- Use Copper Oxide Wire Particles (COWP)




# Planning a Parasite Control Program

- Deworm new animals coming on your farm with 2 or 3 classes of dewormer
- ▶ Notice eye mucous membrane color when you check animals
- ▶ Use good nutrition
  - Protein supplementation

# Risk Factors for Parasites

- ▶ 1. Warm weather
  - ▶ 2. Two inches of rain in a month
  - ▶ 3. Grazing pastures short
  - ▶ 4. High stocking rates
  - ▶ 5. Thin animals
  - ▶ 6. Pregnant animals
  - ▶ 7. Young animals
  - ▶ 8. Animals in lactation
  - ▶ 9. Long residence on a pasture
- 

# Coping With Dewormer Resistance

- ▶ FAMACHA
  - ▶ Management strategies
  - ▶ Pasture rotation
  - ▶ Selection of parasite resistant animals
  - ▶ Selection of different drug
  - ▶ Combination of drugs – 2 or 3 different classes used together.
- 

# Conclusion

- ▶ If you do not manage your pastures, browse, and parasites, this guy will manage to put you out of the goat business.





# Questions?

