Know Your Weapons

Dewormers and Dewormer Resistance
Introduction to Eye Scores

Steve Hart

Proper Drug Usage

- **Drugs must be labeled for the use and species.**
  - Applies to both OTC and Rx drugs
  - Off label use is the domain of licensed veterinarians who must address the questions of dose, route, duration and withdrawal time
- **FDA regulations require a valid client-patient relationship (vet has been to your farm and knows your animals) for off-the label use of drugs such as dewormers.**
- **Violations are the liability of the producer!**

Action Families

- **All members of an action family share the same mode of action despite there being several members in the same family**
- **Only 3 broad spectrum families available**
  - Benzamidoles
  - Levamisole and Morantel/Pyrantel
  - Avermectins/Milbemycins
- **If a drug is not effective, other drugs in that family may not be either.**

Benzamidoles

- All kill roundworms, eggs, 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 active roundworms (does not get arrested L-4)
- Overdose can kill!! You must know what goats weigh to use safely.

Avermectins/Milbemycins

- Ivermectin (Ivomec)
- Dormectrin (Dectomax)
- Eprinomectin (Eprinex)
- Moxidectin (Cydectin) long residual effect
- Effective against roundworms, arrested roundworms, lung worms, sucking lice

Use of Dewormers

- **Few are approved for use in goats**
  - Fenbendazole (Panacur or Safeguard)
  - Morantel (Rumatel or Positive Pellet)
- **Use 1.5 -2 x sheep or cattle dose per lb. because goats have faster rate of passage and larger livers.**
- **Administer orally back behind tongue so they go to the rumen.**

Use of Dewormers

- Observe withdrawal period before selling
- Pour-on works poorly in goats
- Dewormers should not be injected
- Blocks or feed-problems with each animal getting dose
- Deworming in water-suckling kids don't drink much

Use of Dewormers

- **Increasing effectiveness of dewormer**
  - Hold animals off feed 16 hours and deworm and keep off feed 12 more hours (not late preg).
  - Deworm twice 12 h apart-Benzamidoles

Parasite Dewormer Strategies

1. **Salvage save animal's life**

   Severe production loss has already occurred by this time and goats are more subject to other diseases

Parasite Dewormer Strategies

2. **Strategic-deworming at strategic times when worms are most likely to be a problem - Prekidding or prelambing and lamb/kid at weaning**

   Strategic times neglect year to year differences in the weather

Parasite Dewormer Strategies

3. **Opportunistic- when we are working the goats and it is convenient to deworm them.**

Effectiveness depends on when the time happens to fall that they get dewormed. Goats may need dewormed badly when we are not working them. They may not need dewormed when we work them.

Parasite Dewormer Strategies

4. **Tactical Deworming when weather conditions are favorable for transmission of parasites**

Barber pole worm requires 2 inches of rain in a month period and a mean temperature greater than 60F. Best to use FAMACHA or fecal egg counts.

Parasite Dewormer Strategies

5. **Suppressive-giving dewormer at regular intervals ie. 30 days**

   Expensive, effective in short term, but much faster development of dewormer resistance.

Deworming with Fecal Egg Counts

- Take fecal egg counts every 2-4 weeks depending on time of year.
- Mark certain animals and take fecal samples from them each time.
- Number of animals min 4 animals, square root of herd, 10 in a herd of 100.
- Be sure animals represent cross section of herd as to age, sex, class.

Deworming with Fecal Egg Counts

- May be a good idea to sample half or all the bucks so that you can tell their parasite resistance.
- Take grab fecal samples and do fec such as by McMaster.
- Individual counts best, but some have used composite for herd.

Deworming with Fecal Egg Counts

- During Haemonchus season, deworm dry adults at 2,000 epg, 1,000 epg for all others except dairy does 800 epg.
- Other times of year, 1000 epg for dry animals, 500 epg for all others.
- Disadvantage, takes 3 weeks from ingesting larvae until larvae is producing eggs and larvae is sucking blood all the time.

Parasite Dewormer Strategies

6. **Deworming individual animals only when they need it using FAMACHA.**

   Reduces development of dewormer resistance, helps to identify resistant individuals and reduces dewormer cost.

Dewormer Resistance

- Biggest threat to the goat industry in the near future 3-5 years
- Means we will have to rely on techniques other than dewormers to control worms
- Animal selection
- Pasture rotation
- Co-species grazing

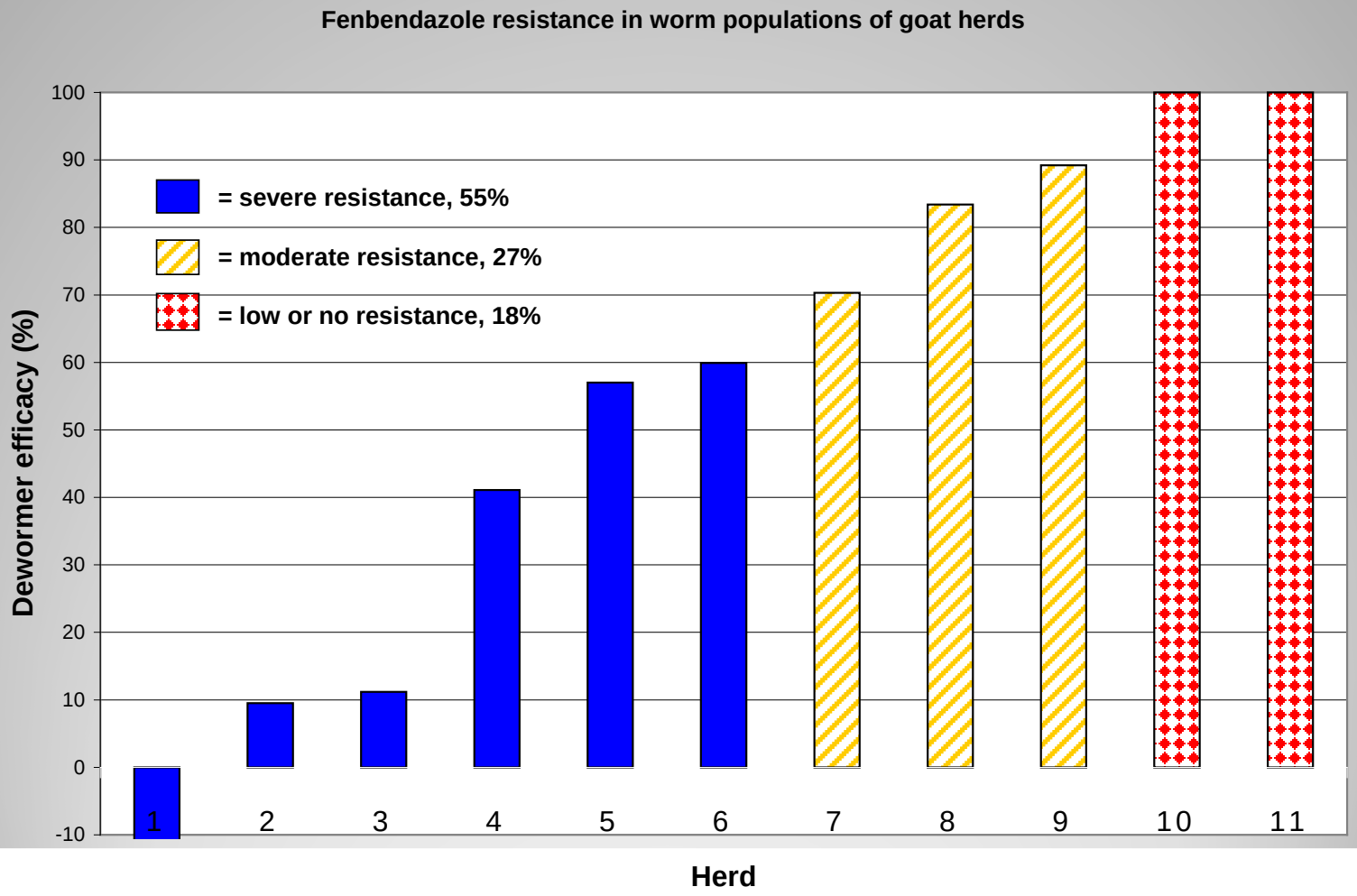
What Is Dewormer Resistance?

- An effective dewormer will reduce fecal egg counts by 95 % 7-14 days after giving the dewormer
- Fecal Egg Count before deworming 1,000 eggs per gram
- 10 days after deworming 200 eggs per gram = 80% fecal egg count reduction

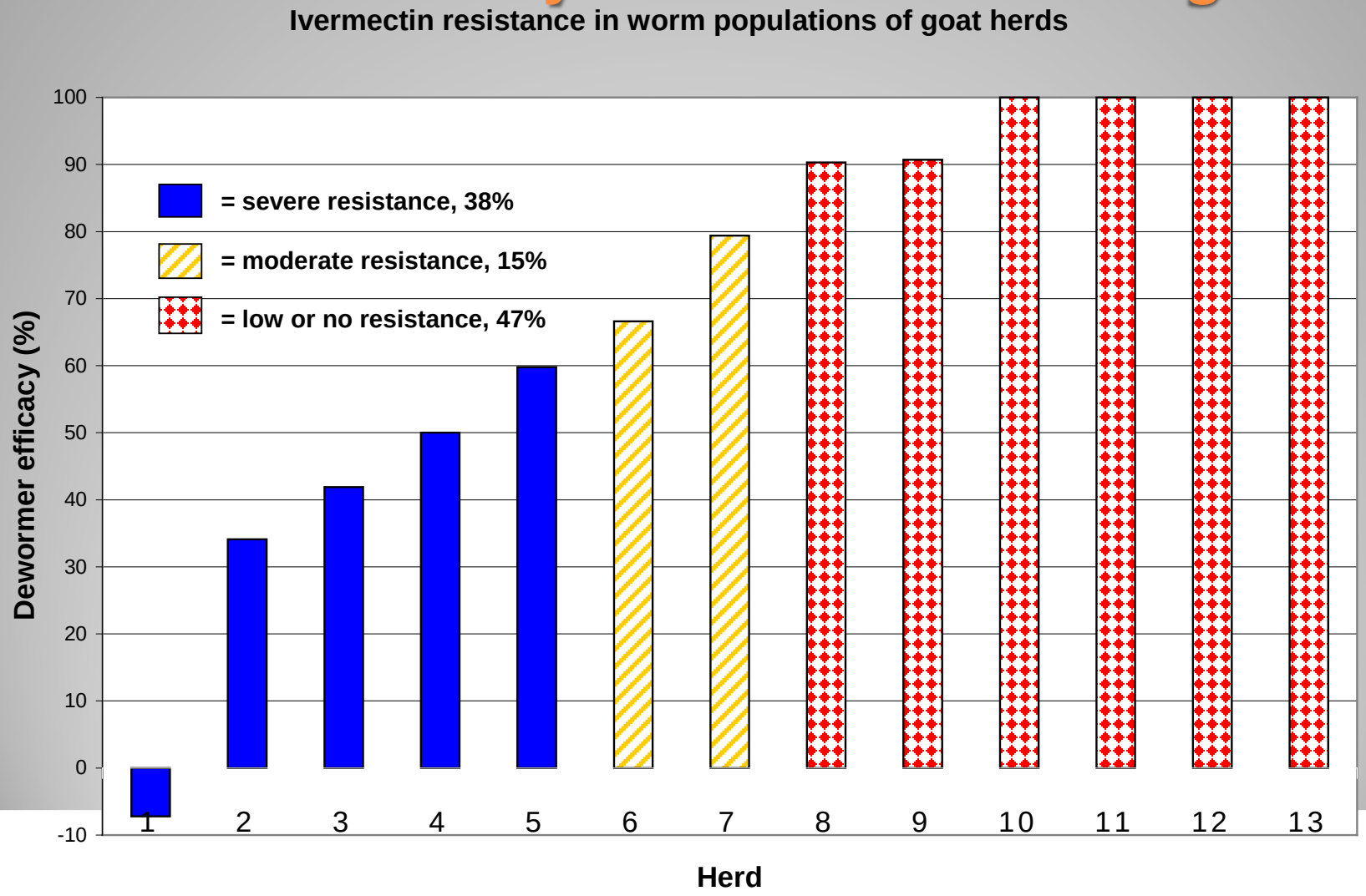
Fecal Egg Count Reduction Tests

- Need several animals, 5-6 minimum
- Take post treatment samples at least 7 days up to 14 days after deworming
- Compare post-treatment with pretreatment fecal egg counts
- Calculate fecal egg count reduction (% of eggs there at first sampling that disappeared by the second sampling)

Comparison of fecal egg counts before and 7 to 10 days after deworming



Comparison of fecal egg counts before and 7 to 10 days after deworming



Results

- 83% severely or moderately resistant to Safeguard
- 53% severely or moderately resistant to Ivermectin
- Also saw resistance to Valbazen), doramectin (Dectomax), and levamisole Levamisol

In summary

- Over half the farms tested (11 of 19) exhibited severe resistance to one or more dewormers and another 3 exhibited moderate resistance to one or more dewormers.
- Only five farms showed low to no resistance to the dewormers they tested and two of these farms had insufficient amounts of worm eggs in their initial fecal samples to accurately test whether the dewormers used were effective.
- Our results indicate that dewormer resistance is fairly common in pasture-based goat herds in New York and Northern Pennsylvania.

Followed Up in the Spring with Larval Development Assays on 10 Farms

- 70 %, 20%, 10% and 30% of the farms showed severe resistance to high dosages of thiabendazole, levamisole, thiabendazole X levamisole, or ivermectin.
- 30%, 40%, 50%, and 60% of the farms showed moderate resistance at high dosages to thiabendazole, levamisole, thiabendazole X levamisole, or ivermectin.
- Severe to moderate resistance to high dosages of thiabendazole, levamisole, thiabendazole X levamisole, or ivermectin was exhibited by 100%, 60%, 60% and 90% of the farms, respectively.
- All farms showed severe resistance to high dosages of at least one dewormer and three farms showed severe resistance to at least 2 different dewormer treatments.

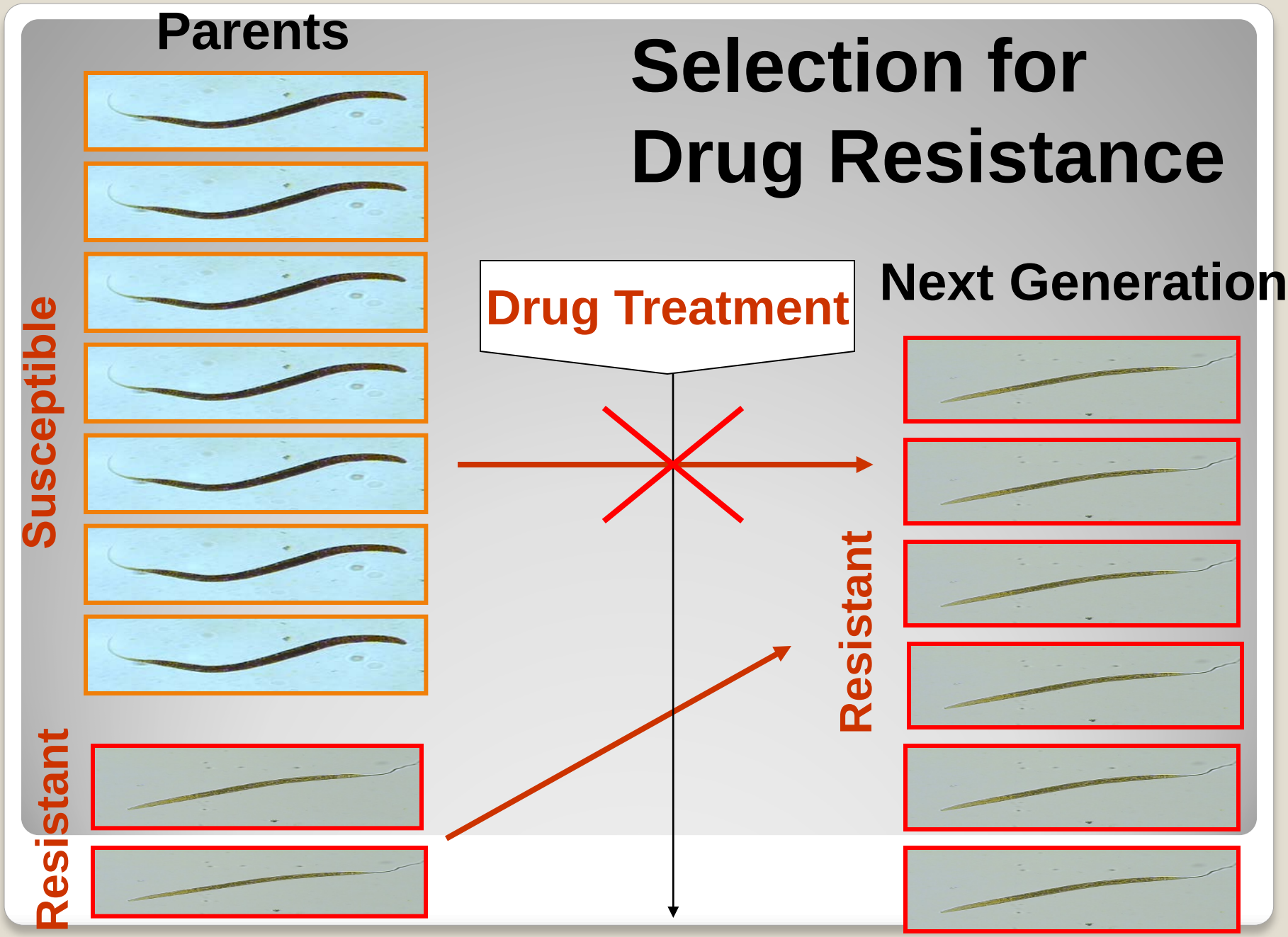
Preventing Dewormer Resistance

- Use the correct dose of dewormer
- Rotation of dewormers tends to develop resistance to all dewormers in rotation. Stay with dewormer for at least a year
- Must verify that dewormer is working by doing a fecal egg count reduction test
- If you are deworming more than 2-3 x a year you are building dewormer resistance
- Biggest factor is using other management practices to reduce need for deworming

Do Not Buy Resistant Worms

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

Selection for Drug Resistance



Why Doesn't it Seem As Bad As it Sounds ???

- Not all worms on farm are resistant to dewormers
- Killing some worms may relieve disease symptoms
  - Removing 50% of worms will result in clinical improvement
  - It appears that the treatment was effective
  - Animals require treatment again very soon
- Eventually most worms become resistant and treatment fails – animals may die

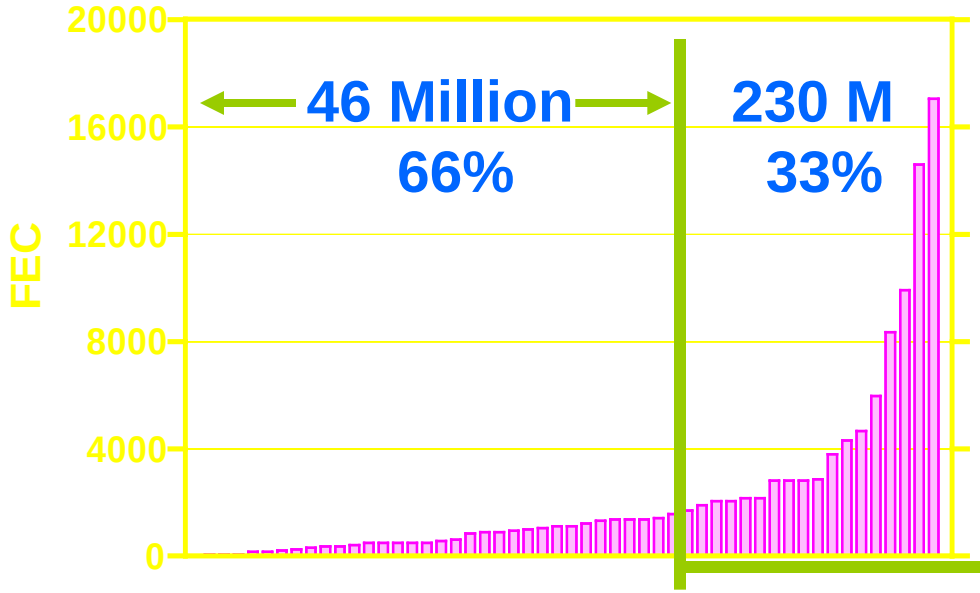
Refugia

- The proportion of the population that is not selected by dewormer treatment
  - In “refuge” from dewormer
- Worms in untreated animals
- Eggs and larvae on pasture before treatment
- Provides a pool of genes sensitive to dewormer
  - Dilutes genes resistant to dewormer
- Until recently, overlooked as the most important component of drug resistance selection

Concept Behind Selective Treatment

- Parasites are not equally distributed to all individuals
- Resistance of animals to the parasite differs
  - 20-30 % of animals harbor 80% of worms responsible for most of egg output and pasture contamination

Distribution of FEC in Goat Herds



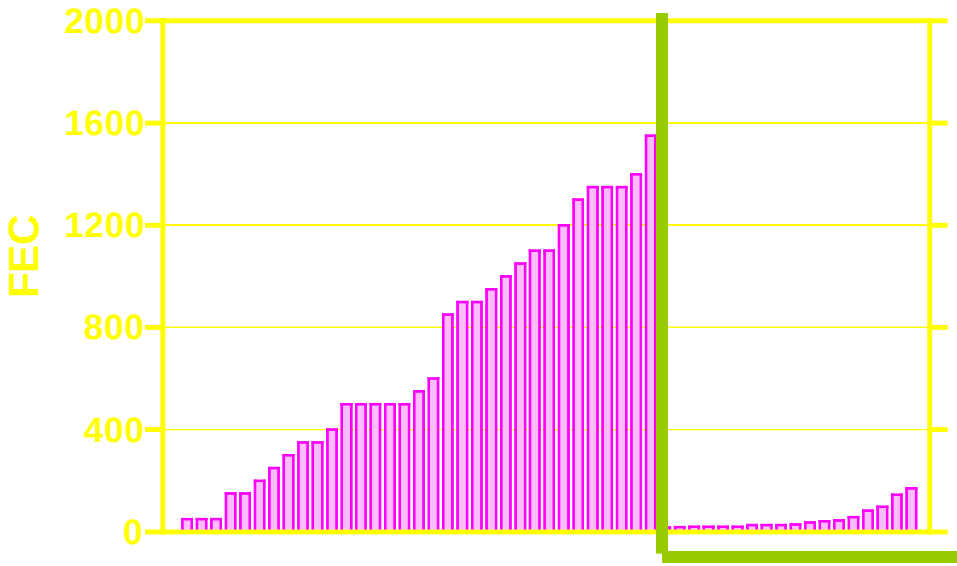
Treating high 33% Greatly Reduces Daily Pasture Contamination With Eggs

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% ???



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

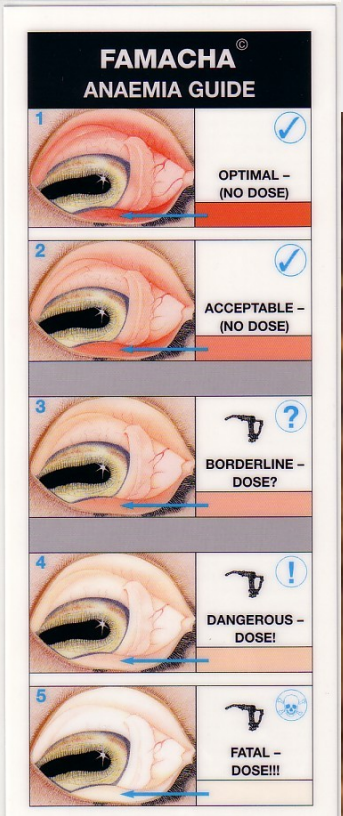
33% of Goats

< 5% of Eggs

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

Selective Treatment

FAMACHA



How Do We Achieve Selective Treatment???

- **The FAMACHA© system**
  - Novel technique for the assessment of Barberpole worm and need for treatment.
  - Developed in response to development of severe dewormer resistance in South Africa
  - Method of selective deworming which leads to a large reduction in the number of deworming treatments given
    - Significantly decreases the rate of development of anthelmintic resistance

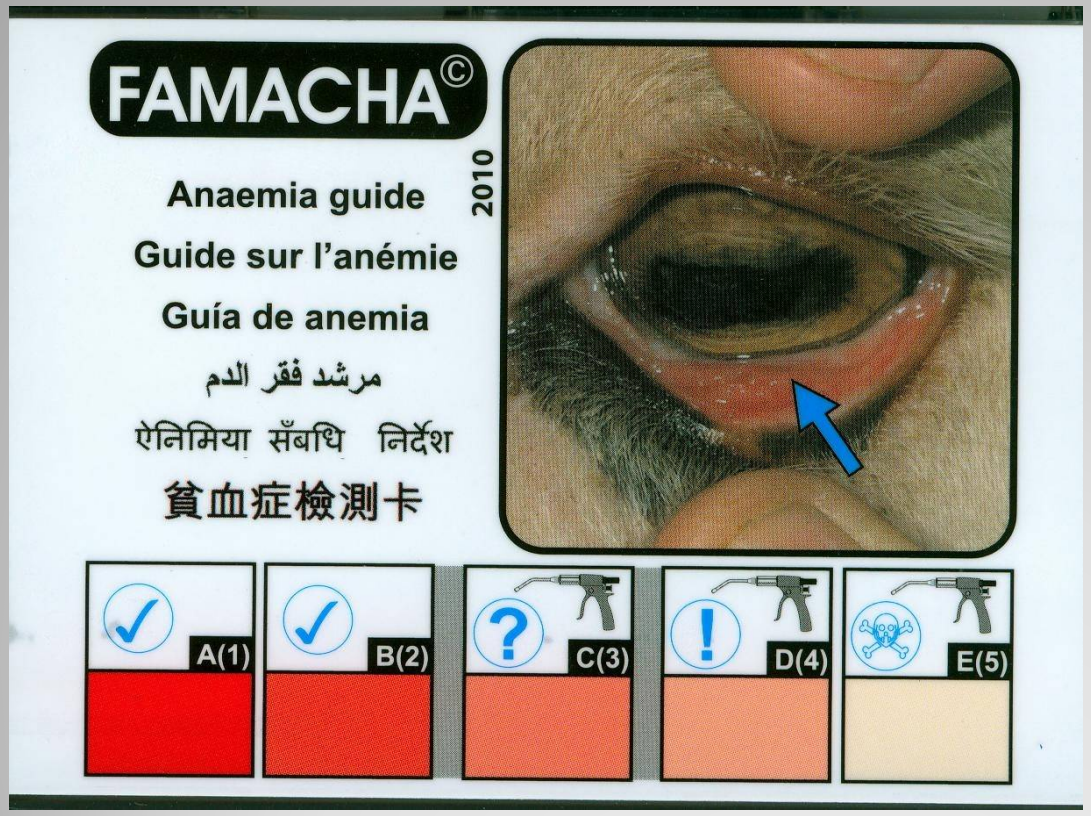
How Does FAMACHA Work ???

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

FAMACHA

- **Use as guide to determine which animals to treat**
  - Significantly reduces number of treatments given when compared with conventional deworming practices
  - Decreases the rate of development of dewormer resistance

The FAMACHA© System



Eye color chart with five color categories
Compare chart with color of mucous membranes of sheep or goat

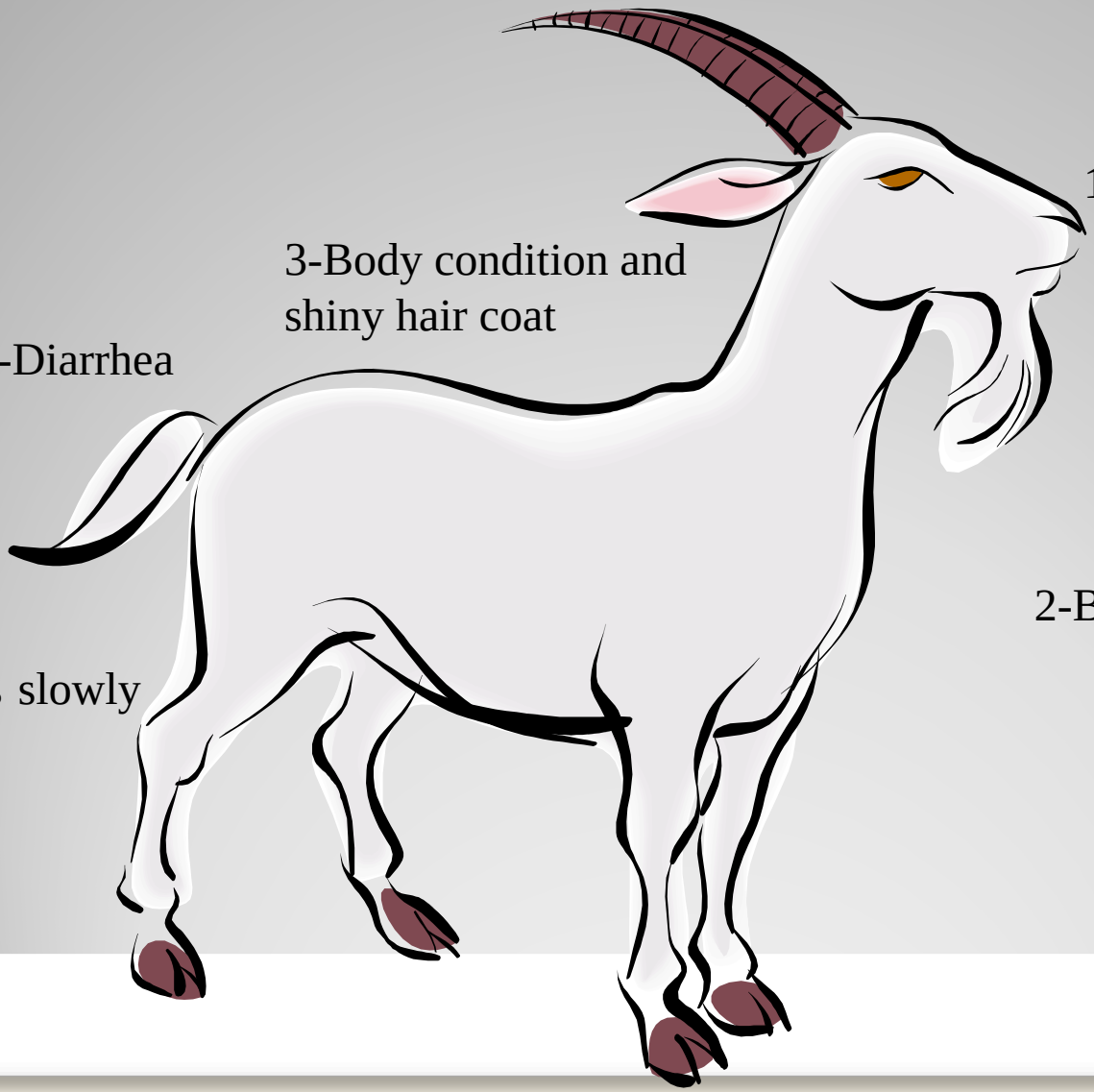
Classification into one of five color categories:

1 –- not anemic 5 -- severely anemic

- **Examine in sunlight**
- **Open as shown - for a short time only**
- **Look at color inside lower eyelid**


DOSE?
4
DANGEROUS – DOSE!
5
FATAL – DOSE!!!
DEVELOPED AND SUPPORTED BY:
University of Pretoria
LHPG
SAVA
ARC • LNR
NWGA
Intervet
FAO

Five Point Check



1-FAMACHA

3-Body condition and shiny hair coat

4-Diarrhea

2-Bottle jaw

5-Moves slowly

Other Recommendations for Proper Use

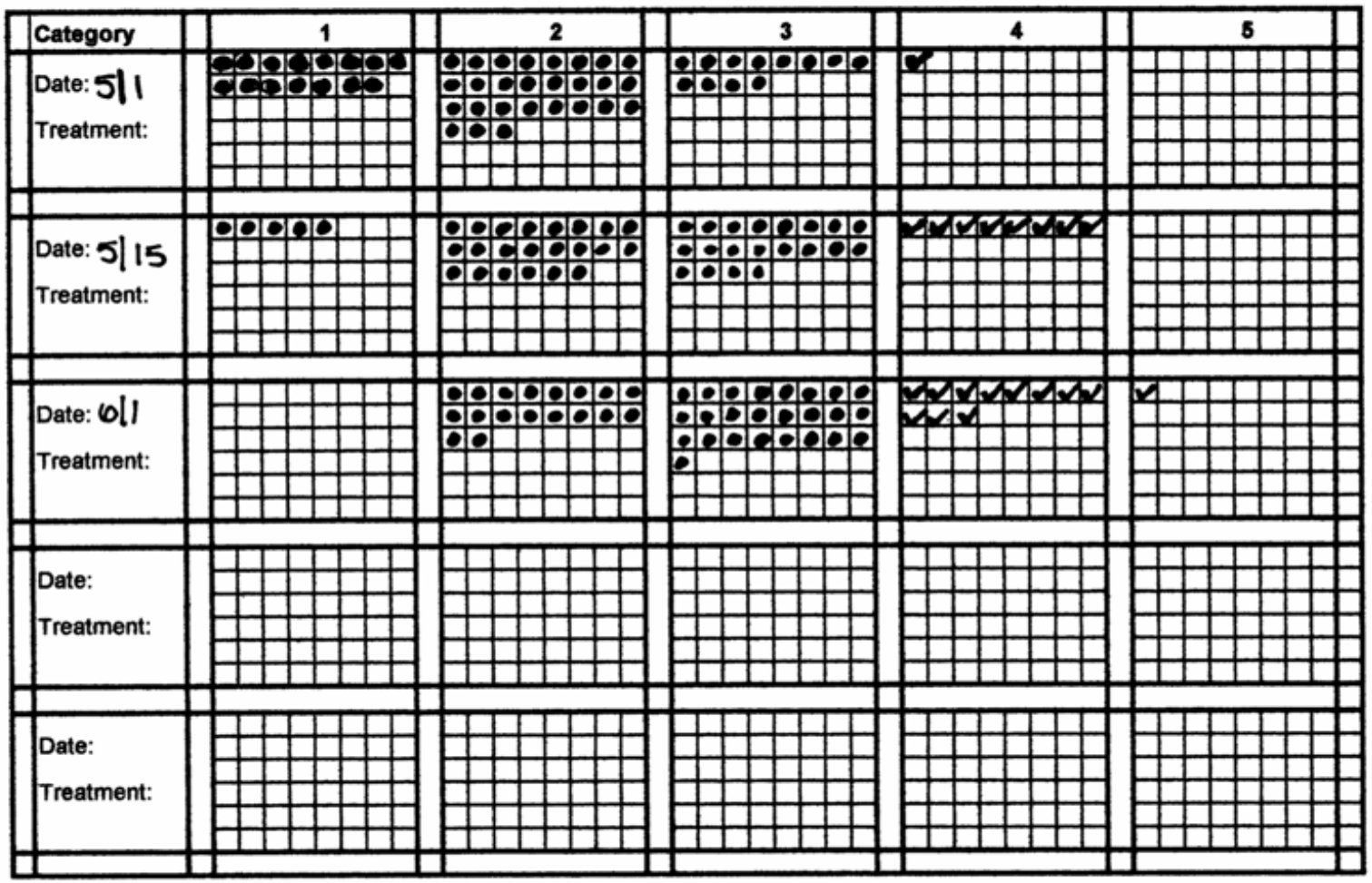
- **Check both eyes if in doubt**
  - Score animal based on highest eye score
- **No ½ scores**
  - Assign higher whole number score if unsure
- **Do not hold eye open more than few seconds**
  - Wait and retry in other eye

Other Recommendations for Proper Use

- **Keep records !!!!**
  - Record numbers of animals in each category on the block histogram score sheet provided
    - An easy visual record of situation in herd/flock
  - On large farms animals can be tagged in a variety of ways

FAMACHA ANEMIA RECORD

Group ID:_____



● Counted ✔ Counted and Treated ✕ Bottle Jaw - Treated

General Treatment Guidelines When Using FAMACHA

- Treat goats and sheep in categories 4 and 5 with an effective anthelmintic
  - You must know what drugs are effective on your farm.
- If in doubt, score at paler category
- Do not use in isolation – use FECs, rotational grazing, strategic or tactical treatments

Integrating the FAMACHA© System

- **If there are none in categories 4 or 5, then safe**
- **Re-examine two weeks later if weather is warm**
- **In dry or cool times of year every 4 -6 weeks may be sufficient**
  - Gain experience
  - Be careful

Integrating the FAMACHA© System

- If there are < 10% in categories 4 or 5, then safe but remember to treat categories 4 and 5
- Re-examine two weeks later

Integrating the FAMACHA© System

- **If >10% of flock/herd in categories 4 and 5, consider treating 3s as well**
- **Change pastures if possible**
  - Do not treat all animals before move
- **Consider checking more frequently**
  - 1X per week

Recommended To Treat 3s When:

- >10% of herd or flock is in categories 4 or 5
- Young animals
- Ewes/does around the time of lambing/kidding
- Thin poorly conditioned animals
- If down to 1 effective drug, consider using less effective drugs in these animals

Integrating the FAMACHA© System

- **Examine especially animals which lag behind the flock/herd**
- **Check for animals with “bottle jaw” and treat these, regardless of whether they look anemic or not**
  - This may indicate large numbers of other roundworms that do not cause anemia.

Other Advantage of Selective Treatment (FAMACHA)

- **Identify animals that need treatment most often**
  - These are the ones contaminating the pasture for others in the herd/flock
  - **Cull animals that required the greatest number of treatments, along with their offspring**
  - Improves genetics of resistance of the herd/flock
  - Significantly cuts down on need for dewormer in subsequent years

Precautions

- Paleness or reddening of the eyes may have other causes than the Barberpole worm
  - Other causes of anemia:
    - Other parasites such as liver flukes, lice and external parasites
    - Nutritional deficiencies, esp. copper and cobalt
    - Other diseases
  - Other causes of redness:
    - Environmental conditions such as dust or allergies
    - Diseases such as pinkeye
    - Infectious eye diseases

Precautions

- Only properly trained persons should apply the FAMACHA© system
- The card is an AID in the control of *Haemonchus* ONLY
- Maintain an integrated management-based worm control program
- The system is best used by producers where back-up assistance is available from a veterinarian

Precautions

- Lambs/kids and pregnant or lactating ewes/does need special attention
- Always score animals with the help of the card, not from memory
- Replace card after 12 months' use due to inherent fading of colors

Precautions

- **FAMACHA is part of a total worm control program – not a replacement**
- **Maintain standard worm control measures:**
  - Monitoring of fecal egg counts
  - Rotational grazing
  - Resting pastures (2 or more months)
  - Alternation of goat grazing with cattle or horses

Precautions

- **System Sounds Simple**
- **If used improperly death of animals is a possibility**
  - Cannot be used in a vacuum
    - Must take other factors into consideration in making treatment decisions
  - Must know that dewormer being used is effective

Where Do I Get FAMACHA Cards ???

- **By request of Professor Bath in South Africa, only properly trained lay individuals can purchase the cards**
  - Sanctioned Training Workshop
- **Through a veterinarian**
  - Vets expected to train themselves before training others
- **Through extension agents who have received training**
- **Information at famacha@vet.uga.edu**

Management to Reduce Parasite Problems

- Stocking rates < 2 hd/ acre
- Grazing cattle or horses with goats
- Don’t graze close to ground
- Haymaking or tillage
- Pasture rotation with 6 or more weeks rest
- Browse or animals eating high off ground

Future prospects

- **New Dewormers**
  - at least 3 years away, so plan for making do with the existing ones
  - not likely new dewormers will be licensed for use in goats and will be expensive?
- **Vaccines**
  - Lot of research for last 20 years, but still no practical effective vaccine
- **Fungi**
  - currently being researched
  - feed spores to stock → fungi grow in faeces → fungi kill worm larvae in faeces
  - no slow delivery system avilable at present

Future prospects

- **Use of specialized crops**
  - mainly those with tannins-sericea lespedeza and chicory

  -have been demonstrated to be effective in goats
- **Breeding for enhanced immunity**
  - possible but slow - similar heritability of about 0.3 as in sheep
  - some research in Scotland has shown progress over some years (5-6 generations) at a similar rate to improvements in sheep
  - are differences in mature immunity between breeds ?
  - Angoras < Boer< Spanish? Kiko?<hair sheep
  - There are resistant individuals in all breeds

Near Future

- Dewormer resistance will have a major impact on the goat industry in the next few years
- We are going to have to use more management and less dewormer
- We are going to have to monitor parasites whether by FAMACHA or FEC