Strategies to combat Anthelmintic Resistance

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Learning Objectives

- Judicial use of Anthelmintic drugs
- Concept of Refugia
- TST/FAMACHA/5 Point Check
- Use of combined anthelmintics
- Other approaches to control Anthelmintic Resistance
- Alternate/ complementary / Ethno Veterinary Medicine

Judicial use of anthelmintic drugs

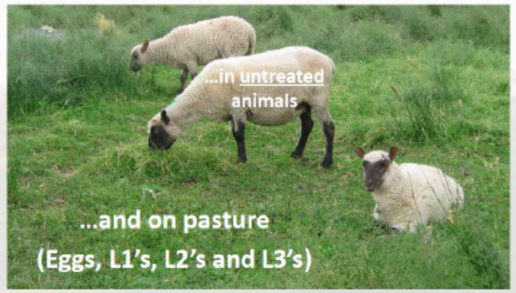
- AVOID
  - Very frequent use of same group of anthelmintic
  - Under dosing
- PRACTICE
  - Determine type of worm and intensity of worm load
  - Choose correct class of anthelmintic and use at recommended dosage
  - make sure that body weight is carefully calculated
  - Rotational use of different classes of anthelmintic drugs to slow down resistance development

Refugia

- Refugia is group of parasites that are unexposed to a dewormer
- Maintaining a worm population that are not exposed to anthelmintic drugs (refugium) is very important to maintain susceptible genes
- Refugia is essential to reduce the drug- resistance selection pressure caused by anthelmintics

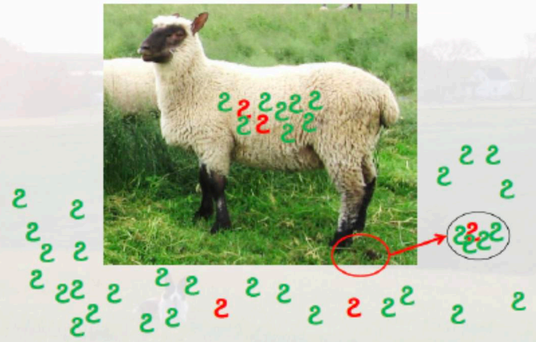
Refugia in susceptible and resistant worm population

Refugia: All parasite stages that are...

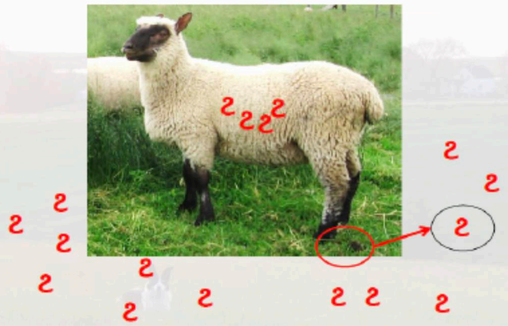


...have not been exposed to the drug and are said to be *in refugia*

How resistance happens: before dosing when most worms are *in refugia*



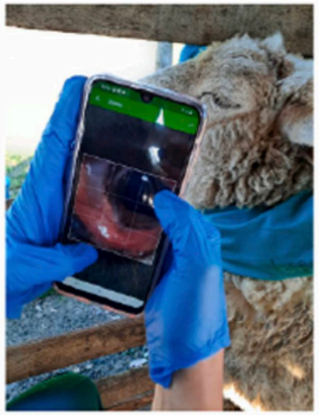
How resistance happens: after dosing when no worms are *in refugia*

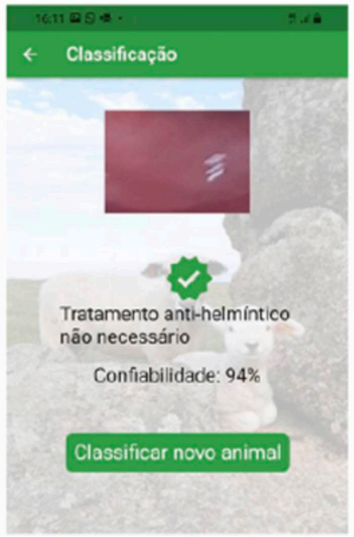


Policy Matters

- Deworm only animals with symptoms or that requires an anthelmintic dose
- Targeted selective Treatment (TST)
- Five Point Check
- FAMACHA

FAMACHA / Mobile APP

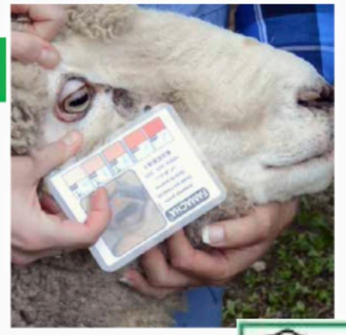




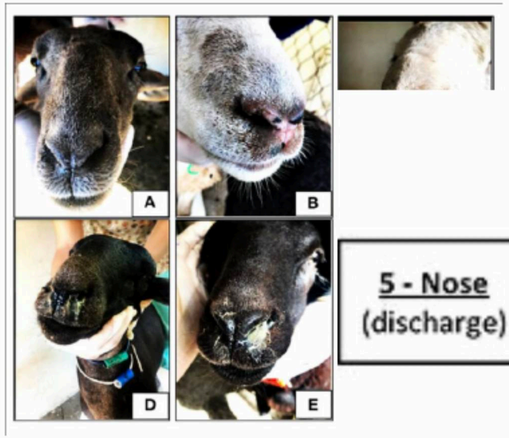
Assessing the severity of parasitism by using conjunctival mucous membrane colour chart
FAFA MALAN CHART

Souza *et al., 2023*

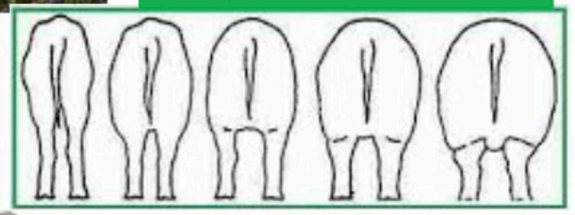
FAMACHA Score

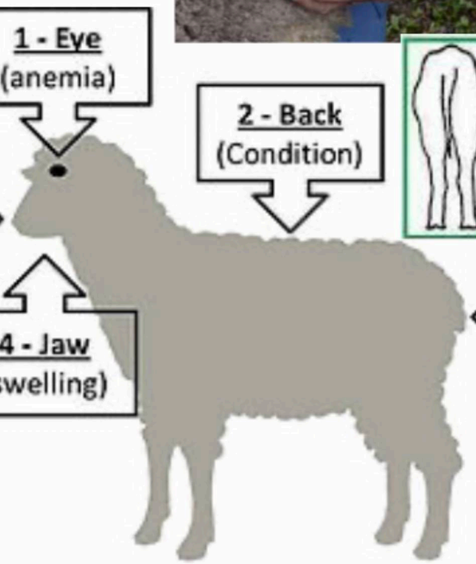


Nasal Discharge



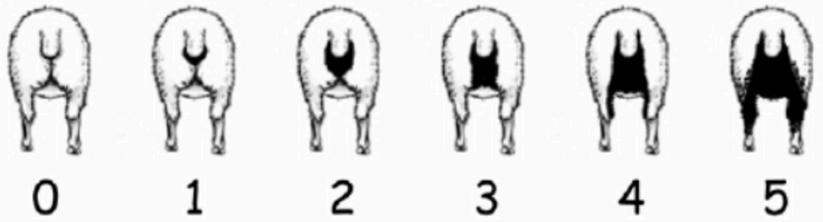
Body condition Score





Submandibular edema

Dag Score



Courtesy
Bello et al 2022
Pickering et al 2013
Thompson and Meyer, 1994
Schoenian, 2013

Other approaches to control Anthelmintic Resistance

- Integrated Parasite Management Practices
- Grazing management – rotating different animal species
- Improving nutritional status of animals
- Quarantine of newly introduced stock

Other approaches to control Anthelmintic Resistance

- Biological control Methods- Nematophagus fungi
  -Principle: Using natural enemies to kill the parasites to decrease the infection levels on pastures
  -Ex. *Duddingtonia flograns* in feed supplements and mineral blocks and slow releasing devices

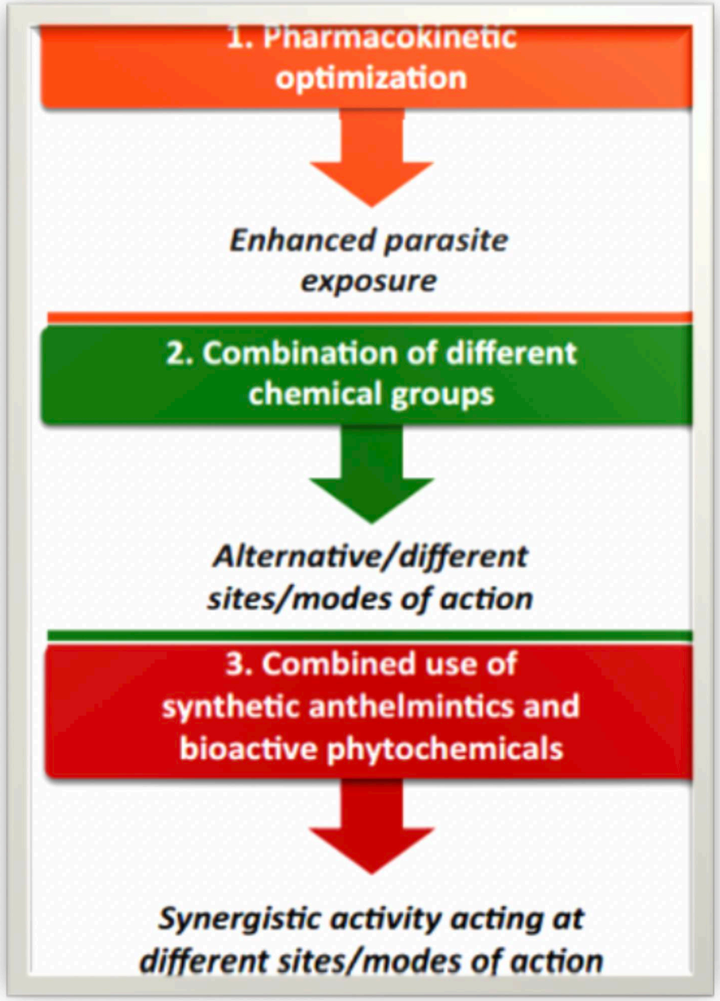
- Vaccines- Improving acquired immune response
  -Development of vaccine against helminth parasites will allow less frequent use of antiparasitic medications

Other approaches to control Anthelmintic Resistance

- Genetic selection and breeding of less vulnerable animals to lessen the helminth burden in animals

- Training and Creating awareness to the farmers on anthelmintic resistance and judicial use of anthelmintics

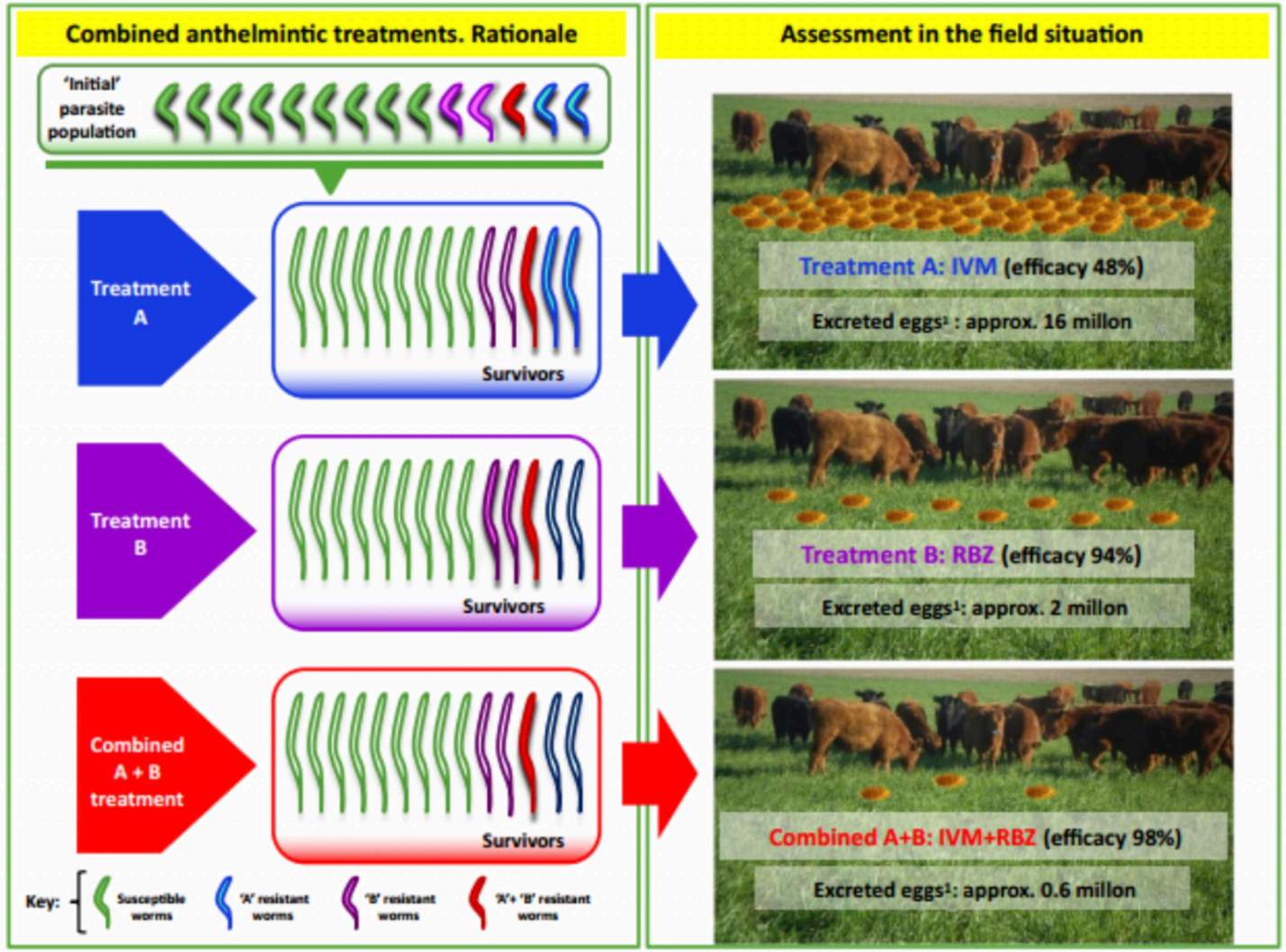
Alternate Approaches



(Launesse et al., 2018)

Use of combined anthelmintics

- It is a way to slow down AR development
- Combining drugs with related spectrum of activity but different mode of action



Launesse et al., 2018

Ethnoveterinary Approaches

Alternate and Complementary Medicines / Ethno-veterinary Practices

- Many researches and validation process are taken up to disseminate ethnoveterinary practices for treatment and control of helminth parasites
- Screening Plants for anthelmintic potentials is essential to evolve holistic management of helminth infection

Steps in ethnoveterinary Practice

- **Documentation** of Indigenous Technical Knowledge practiced by ethnic community

- Scientific **Validation** of Indigenous practices

Fig 1: Abomasum of sheep with *Haemonchus contortus* worms

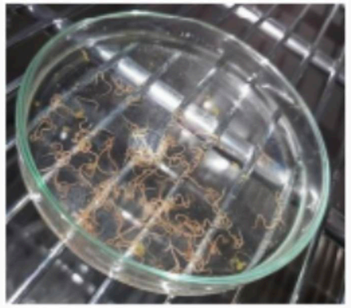


Fig 2: Adult female *Haemonchus contortus* worms in Normal saline incubated at 37 °C

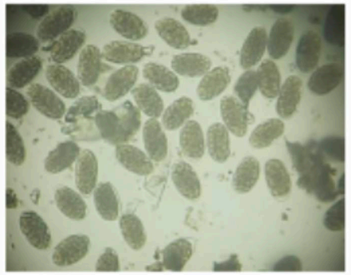


Fig 3: Harvested eggs of *H. contortus*

Plants with Anthelmintic properties

YashBhargava et al., 2023)

S.no	Name of plant	Common name	Active component	Part of plant	Heleminth affected
1	*Ferula asafetida*	Hing	Ferulicacid & Umbelliferone	Resin	Broad spectrum
2	*Embelia ribes*	False black pepper & Devnagari	Embelin (tannin & glycosides)	Seed	Tapeworm
3	*Picrasma excels*	Bitter wood	Quassinoids	–	–
4	*Chenopodium ambrosioides*	Worm seed	–	–	Haemonchus contortus
5	*Echinacea purpurea*	Purple coneflower and scurvy root.	glycol-proteins, aklomide, and flavonoids.	–	–
6	*Trifolium repens*	Dutch clover /white clover	–	Areal shoot	Hymenolepis diminuta

Plants with Anthelmintic properties

YashBhargava et al., 2023)

7	*Ficus insipida*	–	Ficin	Latex	Syphacia obvelata, vampirolepis nana.
8	*Cucurbita maxima*	Winter squash plant	–	Seed	Tape worm (trematode cestode &nematode)
9	*Tachyspermum ammi*	Ajwain plant	–	Seed	Haemonchus contortus
10	*Thymus vulgaris*		Thymol & camphor	Leaves & stem	Hook worms
11	*Punica granatum*	Pomegranate	Pelletierine, Alkaloid	Root, stem,bark	Nematodiasis &filariform larvae of haemonchus contortus
12	*Mimusops elengi*	Spansh cherry ,bullet wood	Taraxerol, ursolic acid	Stem bark	Ascardia galli
13	*Juglan nigra &tansy*	Black walnut	–	–	Enterobius vermacularis (pin worms)
14	*Moghinia vestita*	–	Genistien & various extracts	Tuberous root & peel.	Trematodes and nematodes

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Anthelmintic Resistance- Current Problem with future perspectives

1. Anthelmintic Resistance and its impact on animal Health

2. Anthelmintic Resistance in poultry

3. Mechanism of Anthelmintic Resistance

4. Methods to detect Anthelmintic Resistance

5. Strategies to combat Anthelmintic Resistance

Thank you