WURMFUNDI

what works with worms

CONTENTS

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A. FAMACHA©
INFORMATION PAMPHLET and GUIDE

The FAMACHA© Worm Control System has been thoroughly tested in many countries since 1990 and found useful wherever *Haemonchus contortus* (Barber's Pole Worm) is an important problem in sheep and goats.

NOTE:

- Training and follow-up advice is essential to get the most benefit from this system.
- It is essential for the user to read and follow all the instructions and to understand the information supplied, to be able to obtain maximum advantage from use of the FAMACHA© Guide.
- As this Guide is used in circumstances outside the compilers' control, users must undertake to use it at their own risk. The compilers and/or any of their employees do not accept liability for any damage or loss suffered by any person as a result of or arising from the use of this Guide.
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WHY THE FAMACHA© SYSTEM WAS DEVELOPED

- *Haemonchus contortus* (wireworm, barber's pole worm) is usually the biggest disease problem of sheep and goats in summer rainfall areas, particularly in tropical or subtropical areas. Major production losses and deaths can arise where the worm is not adequately controlled.
- Due to overuse and misuse of worm remedies over many years, resistance to these remedies is an ever increasing problem. On many farms in many countries there is resistance to all the groups of anthelmintic drugs and the viability of sheep and goat farming is threatened. No-one can rely on the excessive use of drugs alone to control this parasite in future.
- While most sheep and goats (especially the adults) are able to withstand the unfavourable effects of this worm, a small minority cannot. In the past, treatment strategies were designed for the minority of sheep that did not have the ability to withstand infection.
- Both resistance (the ability to prevent or suppress infection) and resilience (the ability to withstand the effects of parasites) have been shown to be heritable, although not at a very high level. This means that sheep can be culled and selected for these traits.
- Once sheep that are unable to cope with existing worm challenge infections are identified, they can be targeted for special attention without the whole flock having to be treated. In the long term, by culling sheep which are repeatedly identified as unable to cope with moderate worm burdens, a more resilient flock, genetically suited to the environment, can be bred.

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THE PRINCIPLE ON WHICH THE SYSTEM IS BASED

Blood consists of a clear, fluid part (called plasma) and a cellular part (mainly red blood cells). The proportion of red cells to plasma determines whether the animal is healthy (normal) or unhealthy (too little or too much red cell content). This proportion can be measured in a laboratory (by special tests), but with training and practice can also be estimated fairly accurately by assessment of the colour changes of the mucous membranes of (especially) the eyes. As wireworms are blood-suckers, the effects of a heavy parasite burden in non-resilient sheep will therefore be evident as a low ratio of red cells to plasma. This is seen in the mucous membranes of the eyes as a visible paleness generally known as anaemia. By monitoring anaemia, resilient and susceptible sheep can be identified. Some animals may become slightly anaemic and then recover without treatment.

USES AND ADVANTAGES

- A significant drop in the amount and frequency of dosing can be expected for the majority of the flock on farms where the worm burden is high.
- Because fewer sheep are treated, the development of resistance in worm populations will be slowed down.
- In the long term, elimination of non-resilient sheep will allow for the breeding of better adapted sheep.
- Identified anaemic sheep can be given the correct drug, if necessary at a higher dose, or in split doses, as there will probably only be a small number of sheep to be treated at each examination.
- These sheep can be treated before the symptoms and effects become too severe, if the flock is examined regularly.
- Individual sheep that repeatedly fail to cope with wireworm in spite of an effectively designed control programme can be identified and eliminated from the flock.
- Sheep that escaped treatment or were under-dosed or improperly drenched (e.g. owing to a faulty drenching syringe), can be identified before severe problems occur.
- If an ineffective remedy for wireworm is used, this will become apparent because many anaemic sheep are seen after treatment. However, if an effective remedy is used, pale mucous membranes should become noticeably redder in colour within a week or so, provided protein intake is sufficient and body condition is adequate.
- If there is a severe build-up of infective larvae on the pasture, an early warning of the impending danger can be a sudden increase in the number of anaemic sheep.
- Paddocks, pens, camps and kraals which repeatedly present problems can be identified and appropriate action taken.
- The technique, once learned, is relatively cheap if labour costs (which should be reckoned as fixed costs) are not considered.
- The process of inspecting the eyes of the sheep is quick and can readily be integrated with other activities like vaccination, weighing, condition scoring or counting. Up to 500 sheep can be inspected per hour with good facilities and practice.
- Because sheep are examined frequently, other unrelated problems are quickly discovered.
- The technique is very easy and sufficiently reliable once learned under the guidance of a competent instructor.

PRECAUTIONS AND POTENTIAL PROBLEMS

- Only wireworm infection control has been thoroughly tested using this technique. A programme for controlling other worms must be used as well. Although it has been successfully used for other blood sucking parasites, this has not been thoroughly tested.
- A good, integrated wireworm control programme must still be used - the FAMACHA© will only augment, not replace, this control programme.
- Flock (bulk) faecal egg counts should be measured regularly, every 4 – 6 weeks in the worm season.
- There are other causes of anaemia which could cause confusion.

Some examples are:

- hookworms
- liver fluke
- external parasites
- blood parasites
- infections
- nutritional deficiencies

However, by far the most important cause of anaemia in sheep in warmer summer rainfall areas like South Africa is the wireworm.

- On the other hand, certain conditions can make the eye's membranes appear redder than expected and thus mask the presence of anaemia. Some examples are:
  - dusty conditions or closed sheds, which irritate the eyes
  - hot conditions
  - driving animals a long way with no rest period afterwards
  - any fever
  - infectious eye diseases
  - diseases associated with blood circulatory failure
- The sheep have to be monitored regularly in the high worm risk period (at least every 2 - 3 weeks, and possibly as often as weekly at the peak of the worm season) to keep a check on developments.
- Lambs and pregnant or lactating ewes are more susceptible and need special attention.

PRACTICAL USE OF THE FAMACHA© SYSTEM

- The FAMACHA© system should be used only after it has been fully explained and demonstrated by properly trained instructors.
- It should be used only in conjunction with a properly designed, integrated worm control programme drawn up by a veterinarian. It cannot be used on its own.
- In the first half of summer, a regular anaemia-monitoring programme should be instituted in conjunction with monitoring of faecal egg counts, a rotational grazing system and alternation of grazing with cattle or horses.
- In the first half of summer (October to December in the Southern hemisphere) the examination of the flock using the FAMACHA© should be made every 2 to 4 weeks, by properly trained persons, fully competent to see changes indicating anaemia.
- In the second half of summer, or earlier in areas with mild climates and high humidity, rainfall or irrigation, it may be necessary to monitor the flock more often, even in the worst cases on a weekly basis.
- The integrated worm control programme should be continued through to the end of the danger period for wireworm (in the Southern Hemisphere from the end of March to the end of June depending on temperatures and rainfall; in the Northern Hemisphere, 6 months later).
- The FAMACHA© card itself should always be used on inspections – do not try to rely on memory from previous examinations.
- It is recommended that sheep permanently marked should also be given a temporary mark (wool marker) of different colours or at different sites so that the same sheep is not unfairly marked permanently at the next examination.
- If the system is used with goats, it is recommended that all animals graded as category 3 should be treated.
- Any sheep which becomes clearly anaemic (categories 3, 4 or 5 on the FAMACHA© guide) should be treated (dosed or drenched) with an appropriate remedy (in consultation with the supervising veterinarian) and marked or identified in some long-lasting way (ear tags, ear marks, notches, cable ties, etc.)
- If a large proportion (>10%) of the flock is found to be severely anaemic (categories 4 and 5) at any examination, it may be advisable to dose the whole flock or change camps if appropriate. Consult the veterinarian if in doubt.

However:

- If the flock has been on the same grazing for more than 2 months, only anaemic sheep should be treated before the flock is moved. If all sheep are to be treated, then the flock should be kept on the pasture for at least a week or two before being moved.
- The essential decision to be taken at each examination is which animals are to be treated, and which are not. Assignment to categories is less important.
- Sheep identified as needing two extra doses (more than the flock's normal treatment schedule) could be considered for culling, while those needing three or more extra doses should definitely be culled.
- The proportions of the flock in each category (from 1 to 5) can easily be recorded by counting off each sheep in a block histogram. This can be done by anyone and constitutes an easy visual record of the situation in the flock.
- Examine especially those sheep which lag behind the flock. These late-comers may be suffering from the effects of anaemia.
- Sheep with no pigment in their skins could be seen to be anaemic even at a distance, because their noses and vulvae appear pale.
- If the flock is very large, a random sample of 50 sheep can be checked. If the combined percentage of categories 1 and 2 exceeds 80% (preferably 90%) and there are no category 4 and 5 sheep in the sample, it is unlikely that there is a danger in not checking the whole flock. However, if any sheep are scored as 4 or 5, or the 3 category exceeds 10-20%, it would be safer to examine all the sheep.
- Always check the sheep for "bottle jaw" – the presence of a soft swelling under the jaw – all sheep with bottle jaw, regardless of the presence or absence of anaemia, must be treated.

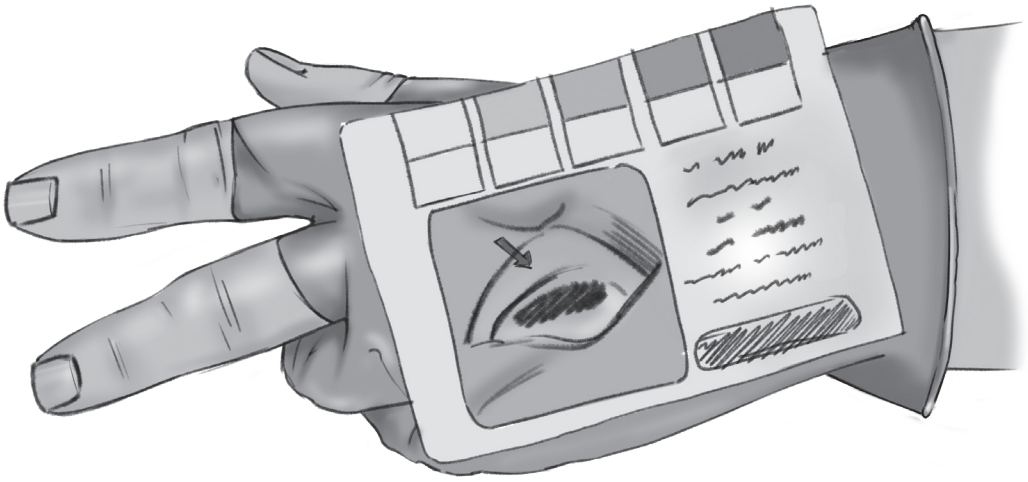
B. USING THE FAMACHA© ANAEMIA COLOUR GUIDE UNDER PRACTICAL CONDITIONS

The card as supplied should be held as close as practically possible to the eye mucous membrane of the animal. This will allow for the most accurate assessment. To free both hands for examining the sheep or goat, it is recommended that a method of fixing the card to the back of the hand should be used.

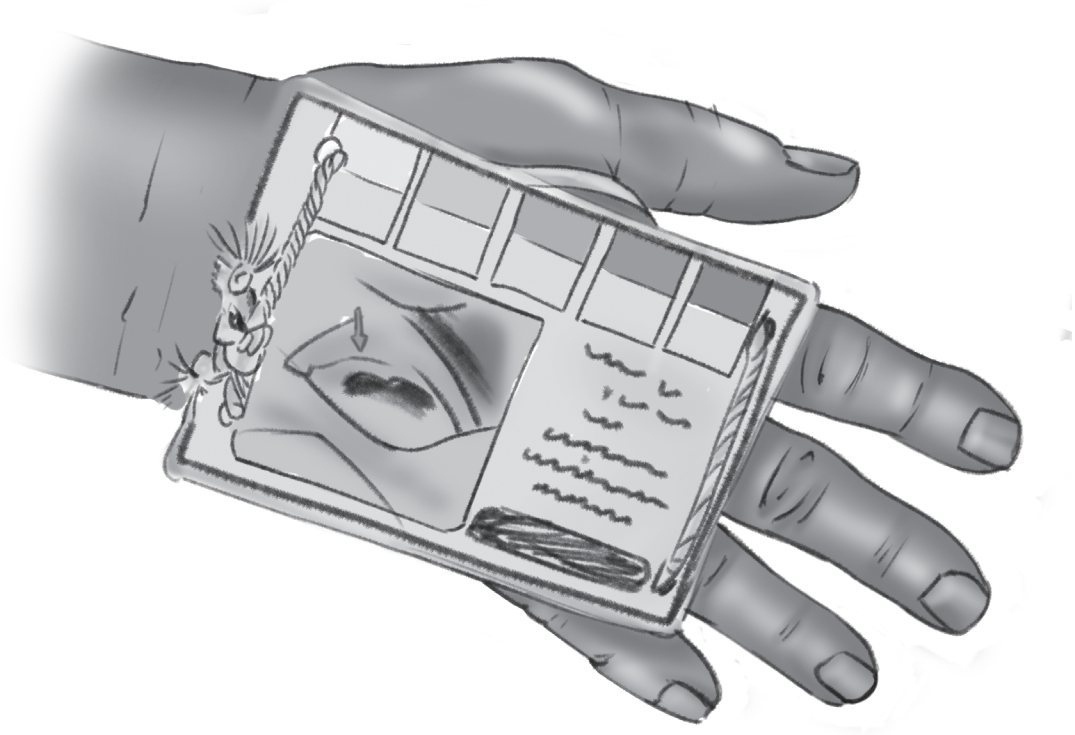
The authorised FAMACHA© cards are professionally printed and encapsulated (not just laminated) to protect the colours from degradation by oxidation, moisture or contamination. However, as soon as this protection is broken by cutting, punching or stapling, the card is liable to degradation. This must be considered when any method for fixing the colour guide to the hand or a finger is adopted.

Possible ways of using the card while keeping both hands free for restraining and examining animals are not restricted to the following examples. The principle is to be able to compare the colour guide and the animal's ocular membrane colour while leaving both hands free for examination.

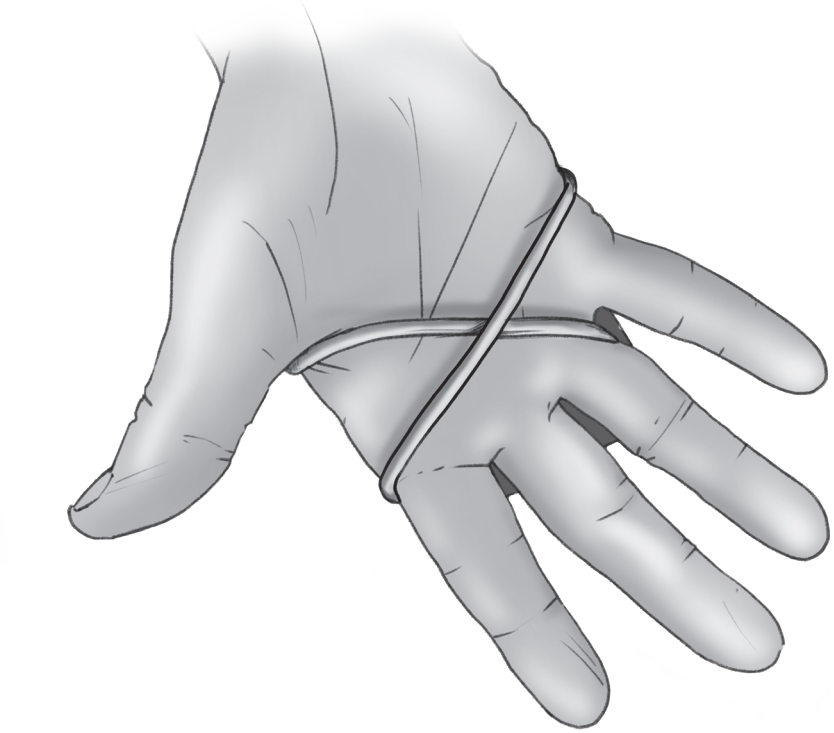
The colours of the card will fade if the card is not stored out of the light and sun after use. Every year, the card in use must be checked and compared with an unused card that has been stored away from any light, to ensure that the colour illustrations are still correct. Replace the card if the one in use is no longer accurate.



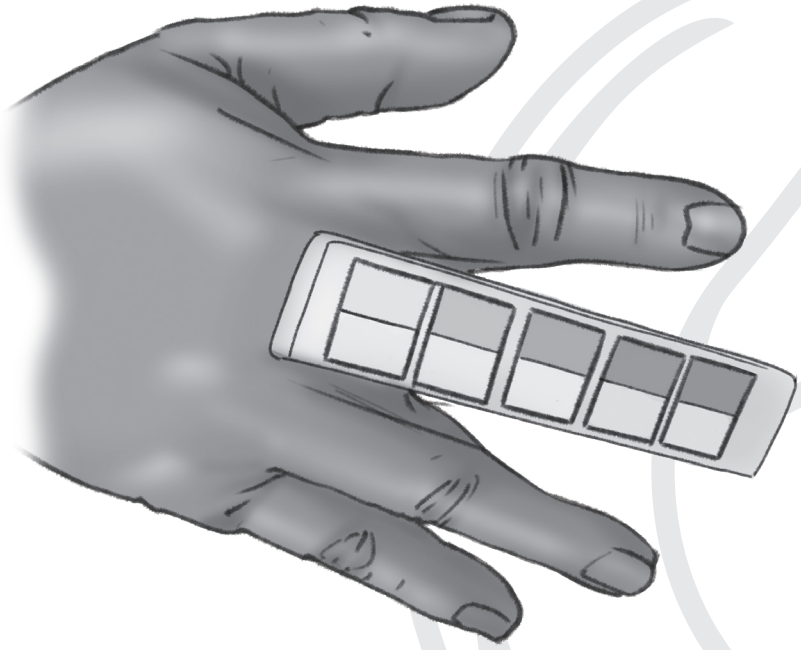
1. The card can be glued to a loop of cloth to fit over the hand, or to the back of a kitchen glove with the fingers cut off for easier handling. Use a flexible contact glue like Genkem that will stick to the cloth or glove and card. See illustration



2. Make 4 small punch holes at the edge of the card and thread a lace or string vertically in front and crossways at the back.



3. Fix or staple one or two elastic bands at the back. The bands must be small enough to fit snugly over the wrist and palm of the hand or base of the fingers.



4. Some operators even cut off the 5 blocks of colour gradations and affix this to a finger of a kitchen glove or similar sleeve. The card is however then very susceptible to degradation.

5. Another option is to place the card across the back of the hand with the colours towards the fingers and simply use an elastic band over the card and across the palm of the hand to secure it.

C. THE FIVE POINT CHECK 5✓

FOR TARGETED SELECTIVE TREATMENT OF SHEEP AND GOATS SUFFERING FROM INTERNAL PARASITES

The misuse of remedies that are used to control the internal parasites of small ruminants has led to severe and widespread drug resistance. Part of the solution is to treat only the animals that will benefit from treatment, and leave those that are coping with current infections untreated. This is called Targeted Selective Treatment (TST).

What is the Five Point Check©?

This is a simple, quick, cheap, reliable and easily learned system of examining sheep or goats for key signs that will indicate whether an animal needs treatment, or is likely to benefit from treatment. It gives a list of major parasites (and other conditions) that may cause the signs that are seen, so that the right drug groups can be used. (Table 1)

Animals are examined at the following five points:

1. The nose, for discharge
2. The eye, for anaemia
3. The jaw, for swelling
4. The back, for condition
5. The tail, for diarrhoea

Having established the likely causes and if it is likely that these causes are parasites, then the user can identify which drug groups are best suited to treat the animals. (Table 2)

THE MOTTO: LEAVE THE BEST and TREAT THE REST

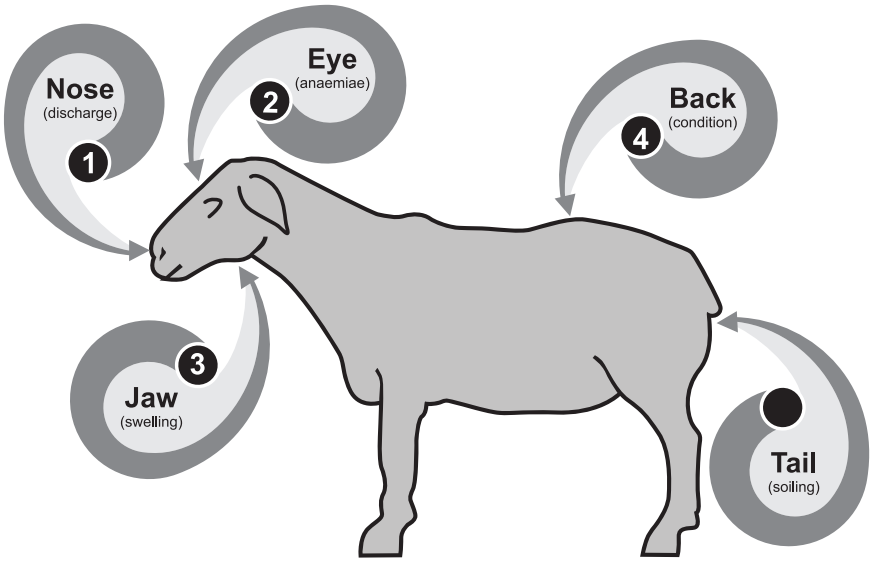


TABLE 1 - THE FIVE POINT CHECK OBSERVATIONS AND LIKELIHOODS

CHECK POINT	OBSERVATION	POSSIBILITIES
1. NOSE	Discharge 1 - 5	**Nasal Botfly** Lungworms Pneumonia **Other diseases**
2. EYE	Anaemia 1 - 5 (FAMACHA© card)	**Wireworm** Liver fluke Hook worms **Other diseases**
3. JAW	Soft swelling 1 - 5	**Wireworm** Liver fluke Hook worms Conical fluke **Other worms and Other diseases**
4. BACK	Condition score 1 - 5 (BCS card)	**Brown Stomach worm** **Bankrupt worm** **Long-necked Bankrupt worm** **Nodular worm** **Tapeworms?** **Other worms and Other diseases**
5. TAIL	Soiling 1 - 5 (Dag score card)	**Bankrupt worm** **Conical fluke** Brown Stomach worm Nodular worm **Other worms and Other diseases**

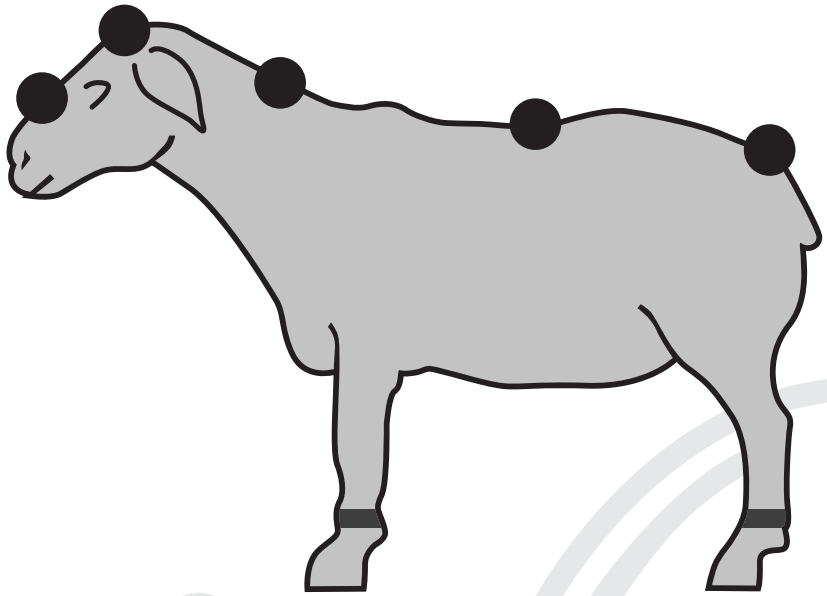
Note: The list of possibilities is largely confined to internal parasites, although the causes may be much more diverse.

POINT SCORING SYSTEMS

(INDIVIDUAL SCORECARDS ARE SUPPLIED SEPARATELY)

IDENTIFICATION AND RECORDING

- A simple, temporary system for identification of which animals were treated for different parasites can be used by applying stock marker crayon to different sites, which correspond with the observation of abnormality that was made, along the topline of the sheep (1, 2, 3, 4, 5)
- Alternately, use cable ties on the four fetlocks W, X, Y, Z for more permanent identification
- A set of 5 empty tins can be used to count out the number of sheep treated per observation, by putting in a stone or pip for each sheep treated into tins marked nose, eye, jaw, back, tail.
- Written records can be kept if this is preferred
- Records are not essential but will help identify the problem, how bad it is and which sheep needed treatment
- Animals that repeatedly need treatment are probably unsuited for breeding and should be culled.



1 = Nasal discharge
2 = Anaemia
3 = Swollen jaw
4 = Poor body condition
5 = Diarrhoea

Just count the number of sheep treated and express this as a percentage of the total number of sheep examined.

FIVE POINT CHECK – ANTHELMINTIC EFFICACY GUIDE (2018)

TABLE 2

Groups of Anthelmintic drugs and Group number (South Africa)										
Worms	**Macrocyclic Lactones**	**Benzimidazoles**	**Imidasoles**	**Salicylanilides**	**Nitrophenols**	**Sulphonamides**	**Organophosphors**	**Isoquinolones**	**AAD's**	**Spiro-indoles**
	1	2	3	4	5	6	7	8	9	10
Wireworm	✓	✓	✓	✓	✓	x	✓	x	✓	✓
Hook worms	✓	✓	✓	✓	✓	x	x	✓	✓	✓
Brown Stomach worm	✓	✓	✓	x	x	x	x	x	✓	x
Bankrupt worm	✓	✓	✓	x	x	x	x	x	✓	✓
Long necked Bankrupt worm	✓	✓	✓	x	x	x	x	x	✓	✓
White Bankrupt worm	❖	❖	x	x	x	x	x	x	✓	✓
Nodular worm	✓	✓	✓	x	x	x	x	x	✓	✓
Lung worm	✓	✓	❖	x	x	x	x	x	✓	✓
Other round worms	✓	✓	✓	x	x	x	x	x	✓	✓
Conical Fluke	x	x	x	❖	x	x	x	x	x	x
Liver Fluke	x	❖	x	✓	✓	✓	x	x	x	x
Tapeworms	x	❖	x	✓	x	x	x	✓	x	x
Nasal bots	✓	x	x	✓	✓	x	✓	x	x	x

✓ = generally effective | ❖ = some efficacy | X = ineffective

Note:
1. Resistance to anthelmintics may be found against any of the drug groups in any of the worm species
2. Efficacy of an individual anthelmintic must be checked on the label
3. Use a Faecal Egg Count Reduction Test (FECRT) to assess the result of treatment

1. **Macrocyclic lactones** – names end with "-ectin". Examples: ivermectin, moxidectin, doramectin
2. **Benzimidazoles** (white or creamy) – name ends with "-azole" usually. Example: albendazole
3. **Imidasoles** – examples: levamisole, morantel.

4. **Salicylanilides** – examples: closantel, resorantel, rafoxanide, niclosamide
5. **Nitrophenols** – example: nitroxynil
6. **Sulfonamides** – chlorsulon
7. **Organophosphors** – trichlorfon
8. **Isoquinolones** - praziquantel
9. **Amino-acetonitryl derivatives** – monepantel, plus 'others'
10. **Spiro-indoles** - derquantel

Important notice

- The tabulated guidelines on the efficacy of various groups of drugs are generalisations and approximations only. The registered list of efficacies against susceptible strains of the parasites that appears on labels must be consulted and these are the definitive indicator of the individual product's usefulness. The table is therefore only a GUIDE to assist farmers to identify which drug groups are most likely to be useful given a certain finding, and which are not.
- Note also that within a drug group there may be considerable variation in the range of worms covered by various products, and the efficacy of these products against different worms.
- Farmers should be wary of buying only on price, because all generic drugs (those with the same chemical name) are not necessarily equally effective. Quality may vary between apparently identical products.
- All drug groups are subject to the development of drug resistance in all worms listed, and this has to be considered when selecting a drug to be used.
- To establish the level of resistance, use the Faecal Egg Count Reduction Test (FECRT).
- Drug groups are identified by name but also by number on the container for easy reference.
- Farmers are strongly advised to consult with their veterinarian before deciding on the best drug to use in a given situation.

SCIENTIFIC ARTICLE

Bath G.F., van Wyk J.A. 2009. **The Five Point Check** © for Targeted selective treatment of internal parasites in small ruminants. *Small Ruminant Research*, 86, 6-13

D. THE 'BIG FIVE' APPROACH FOR WORM CONTROL IN SHEEP AND GOATS

The Problem:

Relying exclusively on dosing to control worms in sheep worked previously but this unintentionally led to laziness and bad habits in our efforts to control the worms. This was reinforced by sales force pressure where representatives were paid commissions on sales turnover. There was a long lag period for problems to emerge and this led to a "Silver bullet" mentality that there would always be another new drug to turn to. However, multiple anthelmintic resistance became rampant and what we needed was changed attitudes, not new drugs. Unfortunately, sustainable, holistic worm control is complex, and farmers (and often their advisors) fall back on the bad, unsustainable practices of the past.

These are the things to avoid:

- Blanket treatments, where all the animals are treated at once
- Frequent treatments, whether they need it or not
- Dry Season treatments that tend to kill off all the susceptible worms, leaving only drug-resistant worms to replace them
- Fixed dosing programmes that provide false security but unnecessarily drive up costs as well as promote the development of drug resistance
- 'Dose all animals and move them immediately' is now known to be a sure way to select for drug resistance
- Estimation of animal weights is dangerous, misleading and costly
- Home-made mixtures are illegal, unproven and often dangerous
- "Herbs & spices" may provide marginal benefit but cannot be relied on in the face of serious worm challenge
- Similarly, unregistered "remedies" are a hazardous and illegal illusion.

Exercise caution with the following:

- Long-acting remedies that may apparently work well but ultimately lead to drug resistance and lull farmers into a false sense of security
- Combination remedies that appear to work well but when they fail there is multiple drug resistance, i.e. several drugs have failed
- Ultra-wide spectrum drugs are easily over-used and mis-used
- Generics may be good but some are poor and misleading in their efficacy – cheapest is not necessarily best
- "Specials" on sale are tempting but these may be short-dated with limited shelf-life. Beware of perverse incentives for sales staff
- Using the same remedy continually may ensure solid resistance
- The latest "best" remedies may be over-used as the latest 'silver bullet'
- And advice from the seller may not be the best for the circumstances.

What measures should be followed?

Concentrate on using practices that support holistic, integrated sustainable management of parasites; concentrating on just one or two practices is unbalanced. Treatment, pasture management or monitoring are all just part of a much bigger picture. That is why we developed a system of sustainable, holistic internal parasite management in sheep and goats:

- However, there is a problem: there are over 25 tools and points to be implemented as part of the overall solution
- So, we grouped these into 5 Sections of importance
- Note that each Section is important for balanced control
- This system was given the name of "The Big Five"

For good worm control, try to use all 5 of these Sections

1. SHEEP

- Select rams for proven (measured) resistance / resilience to worms
- Cull ewes that repeatedly fail the FAMACHA or Five Point Check
- Nutrition must be good enough to enable animals to deal with worms

- Exposure to worms is essential to develop sheep immunity
- Other diseases must be controlled to enable the animals to cope with worms effectively

2. WORM LOAD

- The grazing period is important – the longer it is, the greater the danger
- Grazing pressure – many animals in small areas leads to high parasite build-up on these pastures
- Time of absence from a camp determines the danger – the longer the camp is not used, the lower the risks ('camp' here = field or enclosure)
- Alternating grazing spells with cattle or ostriches can reduce the risks
- 'Hot Spots' must be identified and reduced or eliminated

3. PASTURES

- The grazing height determines the risk – the shorter the grazing height, the greater the risk (most larvae are present closest to the soil)
- Pasture type is important – matted grasses like kikuyu are more dangerous, while herbs are safer
- The slope of the pasture determines the run-off – flat, marshy grounds favour worms
- Aspect: south-facing camps (in South Africa) are cooler, moister and favour parasites
- Irrigation can favour the survival of worm larvae

4. MONITORING

- **Dung samples**, if used and interpreted correctly, may be useful as an extra measure of pasture contamination and therefore risk
- **Animals** – use the Five Point Check for indications of parasitism
- **Weather patterns are a warning** – check the temperatures and rainfall, as particularly warm and wet conditions are dangerous
- **Grazing** – check for signs of over-grazing
- **Drug effects** – use the Faecal Egg Count Reduction Test (FECRT) to check if the drugs being used are working; this should be a regular practice

5. DRUGS AND OTHER MEASURES

- Use TST / or targeted treatment – the Five Point Check will reduce drug use and extend the useful life of the drugs as well as identify poor sheep or goats
- Read what the label recommends and follow the directions carefully
- Ensure that the dose is correct – weigh the heaviest animals in the group and dose that group accordingly
- All newly introduced animals must be quarantined and treated with the best drug available to minimise the risk of introducing drug-resistant worms; 10-14 days later they must be checked for FEC, and only released if they are clear
- Warnings on labels must be observed
- The use of a vaccine for haemonchosis is available for use in suitable circumstances
- A product that entraps worm larvae hatched in the dung is available in some countries

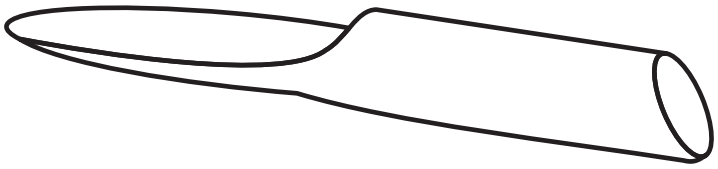
Mottoes to remember:

- **Stop selecting sissy sheep!**
- **Leave the best, treat the rest**
- **Look before you treat**
- **Mindful managers must monitor**
- **Avoid Farmercologist's Advice**
- **The best solution is not always in a bottle.**

E. FAECAL (DUNG) SAMPLING

Reason: The purpose of sampling is mainly for worm egg counts and larval culture, or for testing drug effectiveness. All classes of animals can be sampled, but they must be done separately.

Methods: Use a glove. After lubrication, the index and middle fingers are introduced into the rectum and rotated. Pellets are caught up by the same gloved hand. Alternately, use a specially made device (a faecal scoop tube - also lubricated; it must be the right size, shape and smoothness).



The faecal scoop can most easily be made from a section of smooth white household electric conduit tubing about the same thickness as your finger – just be careful to smooth all the edges completely to avoid any injuries to the rectum.

Samples are put into labeled plastic bags, or for bulk samples, the end of a disposable syringe can be cut off and the faeces compressed into this for a standard quantity of material from each of 10-20 animals in a group. Consult the vet or the laboratory for what will be needed. If the dung is compressed into an airtight plastic bag it need not be chilled, but otherwise submit the sample on ice (but not frozen).

The laboratory or vet will interpret the results and provide advice based on this. Most of the round worm eggs cannot be told apart, and single, simple egg counts can be misleading. These counts give information on which worms are present, and how severe they are, as well as the contamination of the pasture. By combining equal amounts of dung from 10 - 20 sheep, a composite egg count can give information about the flock at a very small cost.

By taking such a composite sample twice from the same sheep 10-14 days apart, when these sheep have been dosed at the first sample, the effectiveness of the drug used can be estimated. This process is called the Faecal Egg Count Reduction Test (FECRT).

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