



WORM CONTROL PROGRAM

Rangelands (pastoral)

A regional worm control program for goats from WormBoss





WORMBOSS WORM CONTROL PROGRAM Rangelands (pastoral)

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Disclaimer: Each regional ‘WormBoss worm control program’ has been developed from local research results and experience proven to be relevant and successful for most farms in the region. ParaBoss acknowledges that this is not the only method of worm control in the region and more refined programs can be developed in consultation with your worm management adviser/veterinarian using information and knowledge specific to your property and goats.

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Program summary

The WormBoss worm control program for the Rangelands (pastoral) areas of Australia has five components that are most effective when used in combination.

A summary of the components is below (see further chapters for details).

Note: an [Australia Smallholders Program](#) and an accompanying [Drench Decision Guide](#) exists for goat owners who can regularly monitor and treat individual goats.

[1. Respond to unusual grazing conditions \(caused by dry times, drought, floods, fire\)](#)

- Move goats from areas where they have congregated as soon as possible and [WormTest](#) the mob.

[2. Breed and feed for goats resistant and resilient to worms](#)

- Consider choosing bucks with better than average worm egg count Estimated Breeding Values (WEC EBVs) in KIDPLAN by choosing the more negative values.
- Maintain goats above *condition score 2* at all times. Reduce stocking rates if cannot supplementary feed.

[3. WormTest at recommended times or situations](#)

- Goats that are showing signs that suggest a worm infection.
- Prior to weaning kids (or at 4–6 months old if a set weaning does not occur).
- Before mustering for management events.
- 6 weeks after rain that has resulted in a green pick of annual grasses and herbage.
- 6 weeks after goats have been congregating on small areas.
- Each 2–3 months for goats grazing along bore drains (especially where leakages occur) or irrigation channels, with little other paddock feed.

[4. Drench¹ only at recommended times](#)

- *Quarantine drench* all introduced goats with an effective short-acting drench that provides (for meat goats) four drench groups including one from either of the most recently available products or (for dairy goats) fenbendazole and abamectin which are registered for use where milk is for human consumption.
- At other times, use the [Drench Decision Guide](#) to make drenching decisions.

[5. Manage drench resistance](#)

- Conduct DrenchTests every 2–3 years. Use DrenchChecks between DrenchTests or if there are not enough goats in your herd to conduct a DrenchTest.
- Avoid unnecessary drenching by restricting treatment to recommended times or in response to WormTest results.
- Use effective drenches and multi-active³ combinations where possible. Note: multi-active combination and other drenches are not registered for use in goats. In some states and territories they can only be used with an off-label prescription from your veterinarian.
- In general, use short-acting treatments with long-acting products reserved for specific purposes or high worm-risk times and with an off-label prescription from your veterinarian.
- Calibrate your drench guns, dose to the heaviest goat and follow the label or your veterinarian's instructions.

¹This drench must be tested and shown to be effective on your property

²Drench refers to anthelmintics regardless of route of administration

³Drench groups are the chemical family to which an 'active' belongs. An 'active' is the chemical in a drench responsible for killing worms. Some drenches contain more than one active and are called 'multi-active' or drenches. See Appendix C: [Drench groups and actives](#).

Introduction

This is an up-to-date, integrated regional worm control program for goats in the rangelands regions of Australia. It particularly builds upon earlier programs including joint ventures by state departments of primary industries, district veterinarians from the Livestock Health and Pest Authorities NSW, CSIRO, and universities.

The program aims to improve the profitability and welfare of your goats through:

- fewer deaths and illness from worms
- fewer drenches, particularly long-acting drenches
- improved productivity
- prolonged life of drenches

Where is the Rangelands (pastoral) region?

This region covers the areas across Australia where goats are run under low rainfall conditions. In central and southern areas, this is generally less than 400 mm annual rainfall, but may be much higher in the northern summer rainfall areas during a very wet season.

In these areas some goats usually have some worms, but the hot and/or dry conditions keep them at very low numbers and goats generally tolerate these without the need for drenching. However, under wetter or more crowded conditions worm burdens can become severe, resulting in illness and deaths.

The WormBoss Pastoral region extends though Queensland, New South Wales, South Australia, Victoria and Western Australia, but is still generally restricted due to the presence of dingoes further north and inland of the areas shown on the map.

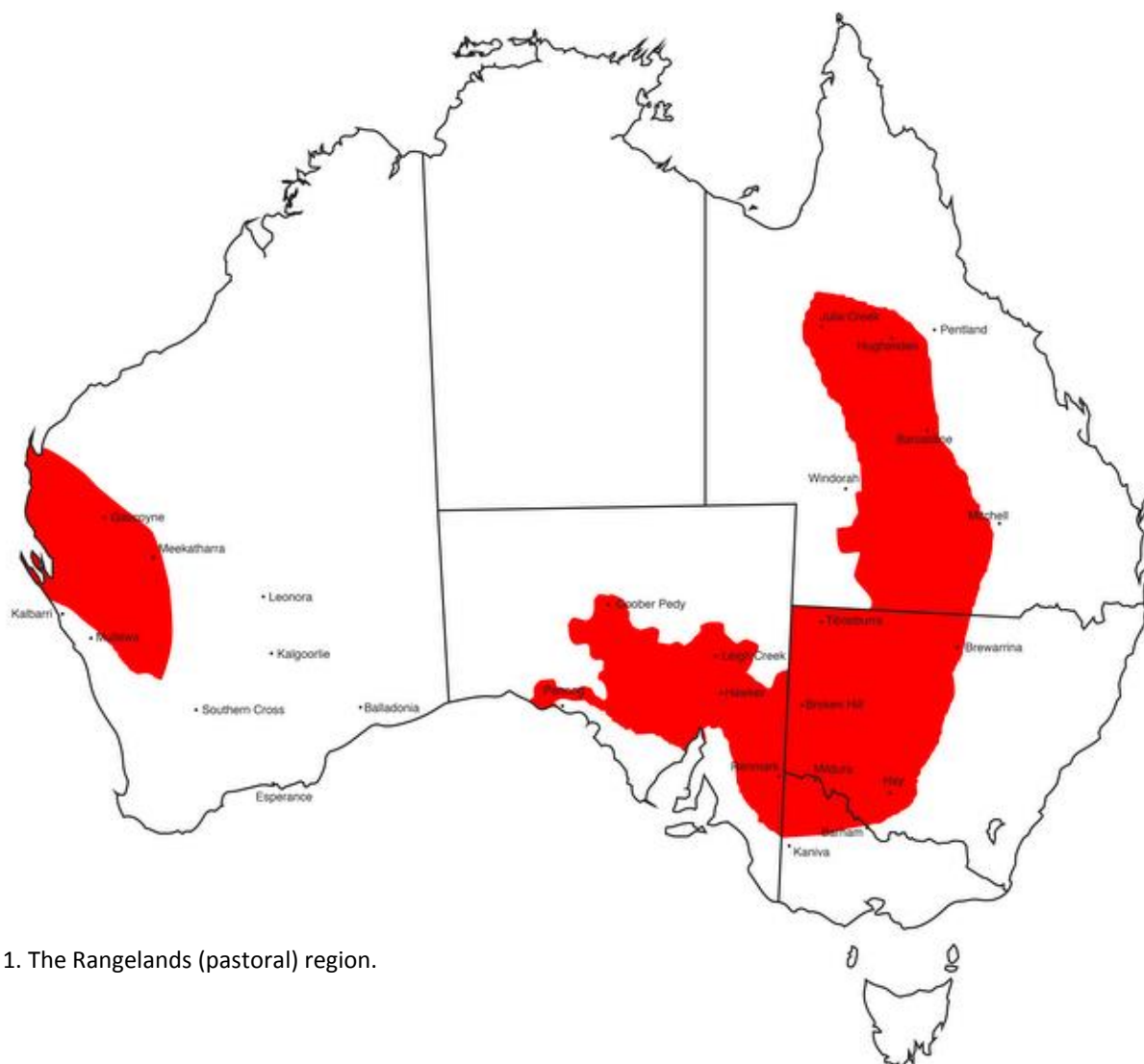


Figure 1. The Rangelands (pastoral) region.

In some districts within the areas described above goats rarely or never need treatment for worms. Low stocking rates help to reduce the worm problem, but these districts also tend to have one or a combination of the following that limits the completion of the worm's life cycle for much of the time: very seasonal rainfall, extreme heat, high evaporation rates, low humidity, and sparse pastures.

If you are new to these areas, see how much drench your local stock and station agent carries and talk to neighbours and veterinarians to find whether worm problems arise locally and adjust this program accordingly. Also, [WormTest](#) regularly while you build your experience in worm management. In the years with above average rainfall many goats have died in these areas from worms when local folklore says goats do not get worms.

The regional boundaries are approximations only due to the seasonal variability, mostly associated with rainfall in this region.

What worms are covered in this program?

Roundworms

The most important roundworms in this region vary according to latitude and rainfall patterns.

In southern areas or when there is winter rainfall:

- Scour worms
 - ♦ Black scour worm [Trichostrongylus species](#)
 - ♦ Small brown stomach worm [Teladorsagia circumcincta](#)

In northern areas or when there is summer rainfall:

- Barber's pole worm [Haemonchus contortus](#)
- Black scour worm [Trichostrongylus species](#)
- Nodule worm [Oesophagostomum columbianum](#)

Also important in both the north and south, but mainly for young goats

- Thin-necked intestinal worm [Nematodirus species](#)

Liver fluke

In this region [liver fluke \(*Fasciola hepatica*\)](#) only occurs in imported goats, except perhaps on irrigated pastures. When goats are brought here from areas with liver fluke, include a triclabendazole drench (which is effective against all stages of liver fluke) with quarantine treatments for roundworms.

Other gastro-intestinal parasites

Gastro-intestinal parasites of minor (stomach fluke and tapeworm) or occasional (coccidia) importance are not covered in this program.

Grazing management

In this region grazing management is not routinely used as a preventative strategy to reduce exposure of goats to worms as pasture contamination with worm larvae is usually low and the extensive nature of properties makes it almost impossible. However, under certain conditions, much higher levels of worm contamination on the pasture can occur, resulting in goats being affected by worms.

Note: goats can also be infected by brown stomach worm (*Ostertagia ostertagi*) from young cattle, unlike the situation with sheep and lambs. So where possible, i.e. where the country will support cattle, use adult cattle in multi-grazing situations as they do not carry worms.

These conditions are:

- provide adequate browse to enable goats to graze at least 10 cm above the ground i.e. on forage or longer pastures.
- higher than normal rainfall, especially in successive seasons and years.
- flooding causing ground to be waterlogged (resulting in worm eggs hatching despite no rainfall).
- flooding or fires causing goats to congregate on smaller areas.
- tall grass and strong winds causing goats to congregate in corners of paddocks.
- preferential grazing of green pick along the wet areas of bore drains or irrigation channels when there is little other feed in the paddock.

When these above conditions occur

- *WormTest* goats or monitor body condition and eye mucous membrane colour (FAMACHA[®] score) - (see '[When to WormTest](#) and when to drench').
- Move goats from areas where they have congregated as soon as possible.

Effective grazing management reduces the exposure of goats to worms. There are four basic steps:

- Avoid grazing on paddocks heavily contaminated with worm larvae
- Reduce contamination of paddocks with worm eggs
- Allow time for most of the eggs and larvae on the pasture to die
- Where possible, provide adequate browse

Breed and feed for resistance and resilience

Breed for worm-resistant goats

Genetic selection can be used to increase the resistance of goats to worms.

To increase the genetic resistance of your herd to worms use bucks with better than average worm resistance as measured by Estimated Breeding Values (EBV) for worm egg count (WEC) in [KIDPLAN](#). Research has shown that progress will be made, but may be slower than for sheep.

Resilience is independent of worm resistance so must be selected separately by choosing better production performance such as growth, fat and eye muscle depth.

What is the difference between resistance and resilience?

Resistance to worms

Goats that are resistant to worms have lower worm egg counts by reducing worm development and growth, and the rate of egg production of the female worms established in the gut. Reduced larval establishment and expulsion of adult worms are not often observed in goats.

Resilience to worms

Goats that are resilient to worms can grow and produce successfully, despite being infected. It is independent of worm resistance and therefore unrelated to worm egg count. When comparing two animals with similar EBVs for growth, a more resilient animal will perform better than a less resilient animal when both have high worm burdens.

Drench resistance

Drench resistance is the ability of a worm to resist the effects of a drench. Drench resistance is a genetic characteristic of the worm and differs from an animal's resilience and resistance to worms. Worms can be resistant to more than one group of drench.

Scouring

The propensity to scour has a substantial genetic component that is independent of both resistance and resilience to worms. Only fibre goats will show dags, but meat and dairy goats can display soiling of their hindquarters and under their tails, but these effects do not last long. Dag as an indication of scouring is not available as an EBV for goats.

Coccidiosis also causes scouring. It is more common in young animals, and under intensive conditions with build-up of manure and moist conditions. It often occurs after management events that cause stress (such as transport), and goats of all ages can be affected and produce scours.

How can a buck be selected for worm resistance?

1. Choose bucks from studs that provide EBVs for worm egg counts (WEC EBV).
 - Raw WEC values alone are not reliable enough to use in selection as they do not account for environmental differences or pedigree data (which are included in WEC EBVs).
2. Ensure that selection for worm resistance is balanced with other performance traits.
 - Select better than average WEC by choosing the more negative values.
 - At the same time, select better than average EBVs for performance traits (e.g. growth) that are important to you. A compromise regarding the various traits will be required.
3. Note: when extra traits are included in a selection program, the progress that can be made with each individual trait may decrease slightly, however progress with your breeding objective can still be high.
4. Choose the WEC EBV age that corresponds to the time of most worm-challenge on your property, e.g. weaning (WWEC), post-weaning (PWEC), yearling (YWEC).

What are Estimated Breeding Values (EBV)?

EBVs are an estimate of an animal's genetic merit rather than its visual or phenotypic merit. The effects of factors such as birth type, dam age, nutrition and management are removed to reveal an animal's genetic breeding value: what can be passed onto its progeny. EBVs are calculated and reported by Sheep Genetics, the national genetic analysis service for the sheep and goat industry. Buck breeders who are members of [KIDPLAN](#) will have WEC EBVs available for their goats if they are measuring WEC.

More detailed information on using Estimated Breeding Values to select for worm resistance—note that this article is on Australian Sheep Breeding Values, but the principles are the same for goat EBVs.

FAMACHA[®] Scores

If you are regularly recording individual goat [FAMACHA[®]](#) scores as part of your barber's pole worm management, then it is possible to select for low FAMACHA scores and this is a method of selecting for resilience and resistance. Breed from animals with consistently low FAMACHA scores (i.e. deep pink to red colour of the mucous membranes of the lower inner eyelid) and these animals may require fewer drenches. Cull animals with consistently high FAMACHA scores.

Feed for resilience and resistance to worms

Young growing animals in their first year, and does during late pregnancy and early lactation are most susceptible to worms and have increased requirements for protein and energy. Protein is most important for regulating the resistance of goats to infection, but both protein and energy are equally important for improving resilience to infection.

To provide an [adequate diet](#), ensure that

- Young animals and kidding does have sufficient pasture (at least 1,000 (3 cm) –1,500 (5 cm) kg green pasture dry matter per hectare; more for higher production) or browse
 - ♦ Late pregnant and lactating does have a 2.5–3.0 fold increase in nutritional requirements.
 - ♦ Does need to be in the optimum body condition (CS 3.0 or slightly better) at kidding.
 - ♦ Weaners need to be at least 40% of adult body weight going into winter.
- Pasture quality is improved by the inclusion of legumes, improving soil fertility and grazing management.
- Include browse wherever possible.
- Energy-rich supplements such as cereal grains, lupins or oilseeds or (less effectively) hays and silages, will boost nutrition.
- Goats of any age in poor body condition are very susceptible to worms.

[More information on body condition scoring.](#)

When to *WormTest* and when to drench

In the Rangeland region, no drenches should be given routinely, apart from quarantine drenches for purchased goats (unless just captured), including bucks. Consideration could be given to drenching in unusual circumstances e.g. a predicted flood, which would mean goats would be concentrated in smaller wet areas.

Why check worm burdens in goats?

Checking worm burdens with a [WormTest](#) is essential for correct and timely drenching decisions and to confirm that your worm control program is on track. The result is healthy goats, without unnecessary drenching.

WormTests are the best basis for drenching decisions ([Drench Decision Guides](#)):

- To confirm whether signs of ill-health are likely to be due to worms. Many signs are not specific to worms, e.g. weight loss and poor growth rates, a weaker tail group lagging behind the others, scouring and possibly deaths. These signs occur well after production losses from worms are occurring in the herd.
- To check whether worm burdens are causing production loss, even though signs of worms are not present. Reduced weight gains and fibre growth occur well before signs of ill-health are seen.
- To show whether the number of worm eggs being passed onto pasture is too high for a particular time of year.
- To give early warning to prevent significant production losses (or where barber's pole worm exists, the risk of deaths).

Drenching based on WormTests is also the most cost-effective ongoing option for worm control in this region, as unnecessary drenching is expensive in both drench and labour costs, and contributes to the development of drench resistance.

How are worm burdens tested?

1. Using a WormTest

- Checking worm burdens throughout the year using WormTests is a critical part of the WormBoss worm control program. Most WormTests are done through a laboratory.
- Worm egg counts (but usually not larval cultures) can be done by producers if they have the equipment and skills. Ideally, producers should have their preparation and counting technique reviewed by an accredited laboratory and perform ongoing quality control checks, just like an accredited laboratory to ensure their results are correct.
- Seek professional advice where worm egg count results are not simple to interpret.

2. Checking on farm

Where it is not practical to conduct WormTests, [FAMACHA](#)[®] (for barber's pole worm only), Body Condition Scoring ([BCS](#)) and scouring can be used to indicate if treatment is required.

- For FAMACHA, check the conjunctiva (inside the lower eyelid). Normal healthy goats have a dark pink to red conjunctiva. Goats suffering from anaemia, which can occur with barber's pole worm and liver fluke, will have paler membranes; in severe cases they can be almost white. The FAMACHA[®] scoring system evaluates the level of anaemia in the individual animal.
- For BCS, check the back region—use the lumbar vertebra for condition scoring in meat goats. A condition score of 2.5–3.0 is desirable, while a score of 2.0 is too low, and above a score of 3.5 is too high. Does need to be in condition score 3.0 at kidding.
- Scouring. The consistency of faeces can indicate the need for treatment, however, there are other common causes of scouring. Look for watery (score 5) diarrhoea.

When using anthelmintic products in goats, a veterinary prescription is often required because:

- Goats require a different dose rate and withholding period than specified on most products, even for many registered goat drenches.
- Most sheep drenches are useful, but not registered for use in goats.

While cattle drenches can be used at the label rates on goats in South Australia and sheep drenches on goats in Victoria, a veterinary prescription is still required for dose rates recommended for goats.

Which goats and how many should have a WormTest?

It is best to test each herd or group of goats separately as it is difficult to extrapolate worm egg count results from one group of goats to another, even of the same age or class.

There are usually differences between paddocks in the favourability for worm survival, the number of worm eggs being deposited by different groups of goats, and the time since a drench was given. In some cases, a drench may have been given to some goats but not to others.

When should WormTests and drenches be routinely done?

In this region there are only three situations when drenches should routinely be given.

- When bringing new goats onto the property
- When extensive flooding is predicted to isolate goats
- When nodule worm has been found to be a problem on your property (pimply gut)

Otherwise, always conduct a *WormTest* before drenching goats.

Use the results with the [Drench Decision Guide](#) to decide whether to drench and when other *WormTests* should be done. A larval culture (larval differentiation) with the *WormTest* is particularly useful in areas or seasons in which summer rainfall occurs and barber's pole worm is a risk.

Young bucks under 2 years and weaners are highly susceptible to worms and should be regularly monitored.

WormTest

- **Goats showing signs that suggest a worm infection**

Scour worms: dark scours (or sometimes clotted dung instead of pellets); weight loss; death.

Barber's pole worm: anaemia (pale inside eyelids and gums); 'bottle jaw' (swelling under the jaw); lagging or collapse when mustered; death.

Note: a *WormTest* can save an unnecessary drench if signs are from another cause, however, if severe anaemia and bottle jaw are noted, an immediate drench for barber's pole worm is usually warranted. A concurrent *WormTest* should also be carried out (take samples before drenching) to confirm the diagnosis, as similar signs may occur in this region from the blood parasite *Mycoplasma ovis* (formerly called *Eperythrozoon ovis*) and other causes.

- **Prior to weaning kids (or at 4–6 months old if a set weaning does not occur)**

Kids are the most susceptible mob on the property: if only one drench is ever needed on a property it will be the weaning drench. If monitoring worm egg counts and productivity over a number of years shows drenching at weaning is not required on your property, only *WormTest* again at weaning if the conditions have been wetter than usual.

- **6 weeks after rain that has resulted in a green pick of annual grasses and herbage**

Generally, a single fall of rain won't cause a significant increase in worms in this region. However, follow up rain sufficient to allow annual grasses to germinate and persist will also favour development of worm larvae; sometimes these can increase to a serious infection within a month or two.

- **4–6 weeks after goats have been congregating in small areas**

When goats are restricted to smaller areas, such as when paddocks are flooded, they are forced to re-graze areas more quickly and heavier than normal. The pasture becomes more contaminated with worm eggs and if conditions have favoured egg hatching, the goats will have higher worm infections.

- **Each 2–3 months for goats on bore drains/irrigation channels when there is little other paddock feed**

In very dry times or drought (when worms are otherwise not expected), goats preferentially graze green pick along drains and channels. This can lead to higher levels of worm contamination along the drains, and infection and illness in the goats, compounded by the generally poorer condition of the goats in these times.

- **In north-west Victoria and the western Riverina during November/December and February**

In years when winter and spring have been much wetter than usual check whether a first summer drench (November/December) and/or second summer drench (February) could be required. Under these conditions, consider a *WormTest* when the pasture is haying off and again in February.

- **In southern Queensland, if autumn and winter were wet and the spring and summer is wet or likely to be wet**

WormTest each 4–8 weeks (depending on the amount of rainfall) until the season dries out.

- **Before mustering for management events**

As goats are mustered infrequently in this region, it is good to conduct a *WormTest* before mustering for routine activities, rather than drenching 'just in case'.

Drench

- **In the situations listed above, drench if the mob's WormTest result is equal to or above the threshold figures in the table below for the class of goat and the type of WormTest result**
Unless professionally advised, use an effective registered short-acting drench when treating for worms.
- **Quarantine drench all introduced goats (including bucks)**
Use an effective short-acting drench that provides (for meat goats) four drench groups including one from either of the most recently available products or (for dairy goats) fenbendazole and abamectin, which are registered for use where milk is for human consumption. Goats coming from properties with liver fluke should also be treated with triclabendazole. If the goats being introduced are recently captured ferals this may not be needed.
- **Drench when predicted extensive flooding is expected to isolate and restrict goats for some weeks**
Drench (without a prior WormTest) prior to the flood arrival. Generally, use an effective short-acting product, but consider a long-acting product only if goats are likely to be isolated for more than 6 weeks and they are in a summer rainfall area and ground conditions are wet. Then move goats to higher paddocks. Long-acting drenches are not registered for goats and in some states may need a veterinarian's prescription.
- **In May, if goats have been found to have nodule worm**
Nodule worm can be a problem in this area; check for signs in the intestines when any sheep or goats die or are killed for rations. Open the abdomen and find the large and small intestines. Examine the outside wall of each for firm white pimples or nodules. If these are present, you should routinely drench in May with a drench that contains either a macrocyclic lactone (ML) or a benzimidazole (BZ).

Table 1. Threshold worm egg counts at and above which goats should be drenched in the rangeland region.

Class of goat	No culture or culture has less than 60% barber's pole (i.e. mostly scour worms)	Culture has more than 60% barber's pole
Does (dry to mid-pregnancy) or wethers	400 epg	700 epg
Does pre-kidding	300 epg	300 epg
Goats under 18 months or bucks	300 epg	500 epg

When choosing the drench to use, refer to the next section in this program: ['Managing drench resistance'](#).

For nodule worm, use a drench containing either a benzimidazole (BZ) or a macrocyclic lactone (ML) group.

The WormBoss website has a section on [drenches](#) where you can search on drench names, drench groups, or the parasite you wish to target.

What samples should be collected for WormTests?

Animals do not need to be yarded for a WormTest. Collect warm fresh dung from the paddock (but make sure that samples from ewes/does are not combined with those of their lambs/kids).

To conduct a WormTest obtain WormTest kits or sample collection details from your testing laboratory or advisor.

If you do your own worm egg counts, use the bulk sampling method where dung is collected into a single container.

- Collect 3 pellets per pile of dung from at least 20 individuals if the mob has fewer than 200 animals and at least from 40 individual dung piles from larger mobs.
- Choose pellets of equal size so that each animal is equally represented.
- If dung consistency is runny, use a plastic spoon. Don't avoid runny or soft dung.
- Collect ewe/does and lamb/kid samples separately.

Avoid delays in transit (when worm eggs can hatch) by collecting and posting early in the week. Also ensure samples are kept cool (refrigerate but do not freeze) before sending, include an ice brick in transit in very hot weather and exclude as much air from the sample bags as possible.

More information:

[Checking a mob of sheep or goats with a WormTest](#)

[Checking a mob of sheep or goats without a WormTest](#)

The WormBoss Drench Decision Guide

The [Drench Decision Guide](#) helps to simplify decisions on whether and when to drench. There is a version of the Drench Decision Guide for each WormBoss region.

It considers:

- whether signs of worms are present
- the class of animal
- the [WormTest](#) results
- the condition of the animals
- the condition of the pasture
- the likely worm contamination of the paddock

The Drench Decision Guide will recommend:

- whether to drench now
- whether to use a persistent drench
- when to WormTest again

How to use the Drench Decision Guide

You can use the Drench Decision Guide at any time, whether you are contemplating drenching now or in coming weeks. Not all situations require a WormTest: the Drench Decision Guide will recommend when these should be done.

Each Drench Decision Guide is available as a separate 2-page printable version or can be used directly online.

Using the print-version:

1. Start on the page that shows the 'Drench Decision Guide Questions'.
2. Read Question 1.
3. Follow the 'go to' information on the right for the answer that applies to your goats.
4. Only go to the question or recommendation to which you are directed by your answer.
5. When you are directed to a letter, this is the final recommendation, and is shown on the next 'Recommendations' page.
6. Also, read the important information in the green boxes.

Using the web version

1. Agree to the terms of use and press start
2. Select an answer for the first question and you will automatically be taken to the next appropriate question.
3. Select an answer for each question and you will automatically be taken to the Recommendation, where your choices with also be shown as well as other important information.

See the online [Drench Decision Guide](#).

Managing drench resistance

Drench resistance can occur in very dry areas and this is mainly due to:

- Importing sheep carrying drench-resistant worms from somewhere else.
- Drenching at a time when it is very dry and there are no worm larvae on the pasture to dilute the progeny of resistant worms surviving the drench.

Never assume that a drench treatment will completely kill worms in your goats. Drench resistance is a result of worms having genes that enable them to survive treatment. It is likely that these genes were present in some worms before a drench was ever used. Drench resistance is now very common and in many cases severe for some drench groups, making testing for drench effectiveness a vital component of a worm control program.

Drench groups are the 'chemical families' of drenches and some groups contain a number of drench actives. For example the Benzimidazole group has the following actives: fenbendazole, oxfendazole, albendazole. When resistance is present for one of these actives, it is likely present for all other actives within the same group.

Selection for drench resistance happens when worms in the goat are exposed to a drench. Initially, there may be very few worms that survive the treatment (perhaps as few as 1 in 100,000) but these resistant worms lay eggs and their offspring constitute an increasing proportion of the worm population. In this way each treatment causes an increase in drench resistance because only resistant worms survive to reproduce.

Resistance may develop faster with more drenching and use of persistent products. Drench resistance is unlikely to be reversible, so not using a drench for a while will not permanently result in the worm population becoming susceptible again. While ever drenches are being used, drench resistance cannot be prevented, but the rate at which it occurs can be greatly reduced.

The first step is to know what drenches are effective on your property.

How can the effectiveness of drenches be tested?

Each property has its own drench-resistance profile based on its own drenching history and that of properties from which the goats were sourced. The profile of neighbouring properties can be quite different.

The extent of resistance is only known by testing. Obvious worm control failures may only occur when resistance is quite advanced.

In this region, a *DrenchCheck* is the preferred method to check individual drenches at any time. *DrenchChecks* should be considered when any drench is given and it is the most practical and cost-effective method of testing drenches in this region.

While a *DrenchTest* or Worm Egg Count Reduction Test (WECRT) is the most accurate test for drench resistance, this test is rarely feasible in this region as infections are often not high enough and when they are, they may be unexpectedly high and need swift treatment or are in lambs at weaning, which should not be put at risk in a *DrenchTest*.

The DrenchCheck

This simple and inexpensive test gives an indication of drench effectiveness and whether it should be properly investigated using a *DrenchTest*.

The *DrenchCheck* involves two *WormTests* with larval differentiation

- The first up to 10 days before drenching (usually at a routine *WormTest* time).
- The second at 14 days after the drench. The second *WormTest* should be based on individual samples and not the Bulk Collection Method.

The results from the two *WormTests* are compared to gauge the extent that worm egg counts (sometimes based on the larval differentiations) have been reduced by the drench. Discuss the results with a worm control advisor.

See ['Checking for drench resistance with a DrenchCheck'](#)

How can drench-resistant worms be kept out of your property?

Keeping other people's drench-resistant worms out of your property is part of sustainable worm control.

Assume that purchased goats are carrying worms with some degree of drench resistance to one or more [drench groups](#).

1. 'Quarantine' drench all goats (including bucks) new to the property.
 - Discuss with your veterinarian which drench groups and how many can be used, their dose rates and withholding periods, including those drench groups not registered for use in goats, but which can be used with an off-label veterinarian's prescription. The quarantine treatment should ideally consist of:
 - ♦ Meat and fibre goats: four drench groups are recommended, preferably including one from the most recently available products.
 - ♦ Dairy goats whose milk will be for human consumption: the number of registered drench actives is limited to two (fenbendazole and abamectin).
 - Do not mix different drenches unless the label states you can or under veterinary advice, as different products may be incompatible. Otherwise, use drench products concurrently—up the race with one product, then up the race again with the next.
2. Quarantine the goats after treatment.
 - Hold the sheep in quarantine in yards (small mobs) or a secure paddock (larger mobs) for 1–3 days (1 day if feed is green, high quality, 3 if it is dry, low quality) to allow worm eggs present at the time of drenching to pass out of the gut.
 - Provide adequate feed and water.
 - Keep this paddock free from goats, sheep or alpacas for at least 3 months in summer or 6 months in cooler months.

When using anthelmintic products in goats, a veterinary prescription is often required because:

- Goats require a different dose rate and withholding period than specified on most products, even for many registered goat drenches.
- Most sheep drenches are useful, but not registered for use in goats.

While cattle drenches can be used at the label rates on goats in South Australia and sheep drenches on goats in Victoria, a veterinary prescription is still required for dose rates recommended for goats.

How can the development of drench resistance be slowed?

Choosing drenches

Use all 3 principles where possible.

They are equally important and greatly slow the development of drench resistance.

1. Use drenches most effective on your property. Drenches that reduce worm egg count by at least 98% are preferred. The more effective a drench is the fewer drench-resistant worms will remain in the animals after treatment. If drench effectiveness is unknown, conduct a [DrenchCheck](#) after drenching.
2. Use an effective combination of two or more drench groups, either in a multi-active product or using more than one product concurrently (up the race with one and then the other) to combine different drench groups. The higher the efficacy of each drench group and the more drench groups included in the combination, the greater the benefit for slowing drench resistance. The chance of a worm being resistant to all active ingredients in a combination is much lower than for each individual active on its own. For goats, be aware of what drench groups are registered or permissible with a veterinarian's prescription.
3. Use short-acting treatments and restrict the use of persistent products for specific purposes and high worm-risk times of year. Persistent products provide a long time during which ingested resistant larvae can survive and reproduce. There is little need to use mid-length or long-acting treatments if animals are being moved to low worm-risk paddocks.

A small benefit can be gained by rotating drench groups providing you also rotationally graze stock across the property so that paddocks are exposed to sheep that have received different drenches. However, if you set-stock, drench rotation will not slow the development of drench resistance.

While not affecting resistance, it is essential to choose a drench with an appropriate [withholding period \(WHP\)](#) and [export slaughter interval \(ESI\)](#) according to the time left before the animals may go to slaughter, or their milk may be used for human consumption.

[Search for drenches](#) based on the worms or other parasites targeted, drench group or active and product name.

Using drenches

Follow all 5 principles where possible:

1. Avoid unnecessary drenching, especially
 - during droughts or prolonged dry periods
 - immediately before or after moving goats onto very clean, low worm-risk paddocks (such as ungrazed cereal stubbles or paddocks that have been free from sheep or goats for extended periods). See points i) and ii) below for further discussion on this.
 - adult dry goats with low worm egg counts (refer to the Drench Decision Guide) or if WormTests are not practical then adult dry goats showing no clinical signs of worms based on eye mucous membrane colour (FAMACHA©) and adequate Body Condition Scores.
2. Calibrate drench guns to ensure the correct dose is delivered.
3. Calculate the dose based on the heaviest animals in the mob. Split mobs for drenching if there is a large weight range, so that heavy animals are not underdosed, and light animals are not overdosed.
4. Follow the label instructions to ensure correct dose and use of treatments.
5. After animals have been drenched, graze them initially on paddocks already contaminated with worms, not on paddocks that are being specifically prepared as low worm-risk. Eggs deposited on pasture from surviving drench-resistant worms in the animals will be diluted by eggs and larvae already on the paddock (these should be susceptible, or at least, less drench resistant).

If animals must be drenched onto low worm-risk paddocks, such as kidding, weaning or winter weaner paddocks, do both of the following:

- I. When the goats eventually leave these low worm-risk paddocks, treat them with an effective drench that is from a different group to the drench used when the goats first went onto the paddock. The aim is to remove any drench-resistant worms surviving in the sheep after the first drench.
- II. Ensure that the next time the paddock is grazed it is with a different mob of goats. This second mob should have a moderate to high worm burden and their last treatment must be different from the treatment used on the first mob that grazed the low worm-risk paddock. This will dilute drench-resistant worms already on the paddock with more susceptible worms that the second mob is carrying. Note that grazing with cattle will not dilute the proportion of drench-resistant worms, but they will decrease the total number of worm larvae on this paddock.

Should persistent treatments be used?

In this region the only time a persistent (also called long-acting treatment; an unregistered drench for goats) should be considered is in the summer rainfall areas where there has been a history of barber's pole worm outbreaks and extensive flooding threatens to isolate and crowd goats for a number of weeks.

Fortunately, producers often have some days' notice of large floods, so in a situation where goats are likely to be inaccessible for a month or more, the goats can be treated with a long-acting product before being moved to a safer paddock.

Do not use a long-acting drench more than once a year.

Appendix A: Roundworm life cycle and larval survival

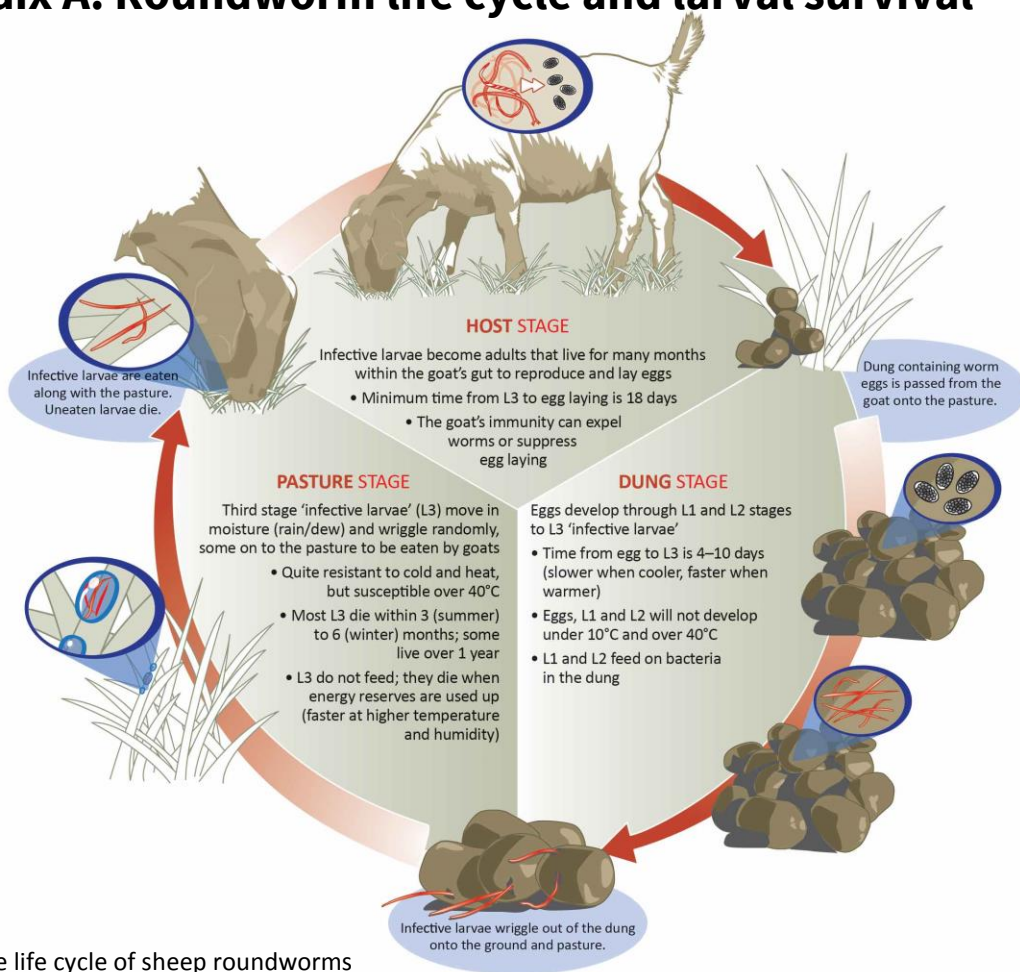
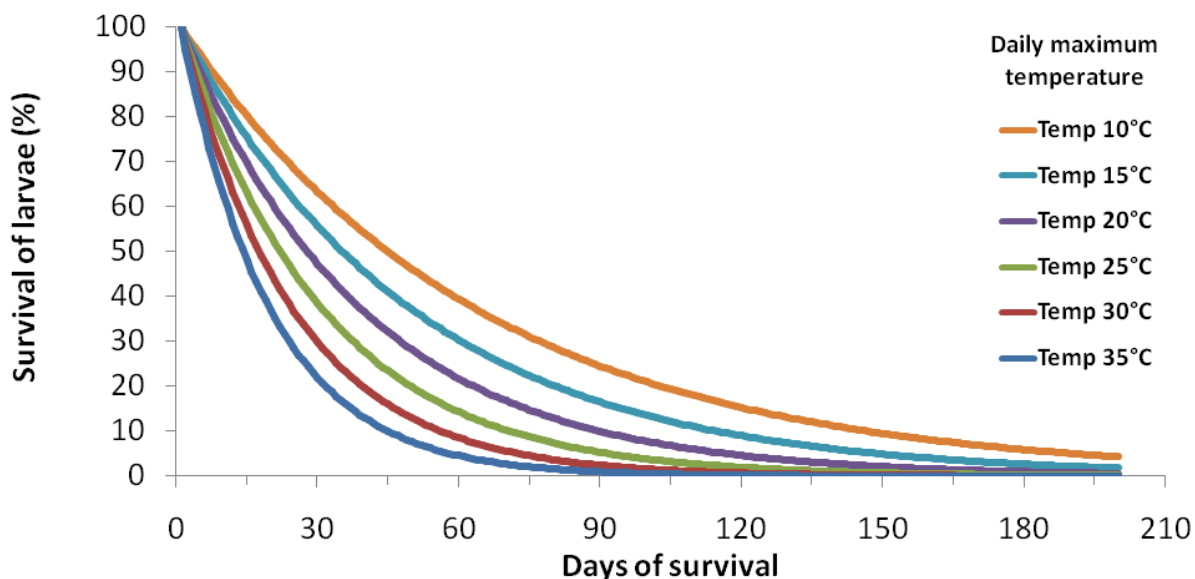


Figure A1. The life cycle of sheep roundworms

Survival of barber's pole worm infective larvae on pasture at various daily maximum temperatures and 60% relative humidity



Source: Modeled from death rate of the L3 population in 'Simulation of pasture larval populations of *Haemonchus contortus*' by IA Barger, PR Benyon & WH Southcott. Proceedings of the Australian Society of Animal Production (1972) 9: 38

Figure A2. Survival of barber's pole worm infective larvae on pasture

Appendix B: Factors contributing to paddock contamination with worms

Table B1. The following table applies to brown stomach worm (*Teladorsagia circumcincta*), black scour worm (*Trichostrongylus* species) and barber's pole worm (*Haemonchus contortus*).

Factor	Time or conditions		Effect
Minimum time before worm eggs can become infective larvae.	4–10 days		Short graze periods (less than 4 days) prevent 'auto-infection' (animals becoming infected by larvae arising from worm eggs the same mob have recently deposited onto the pasture).
Conditions required for significant numbers of worm eggs to hatch and become infective larvae.	4–10 days of: Brown stomach worm Temperature: daily maximum >8°C ¹ Moisture in this time: >10–15 mm rainfall ² Black scour worm Temperature: daily maximum >15°C for <i>T. colubriformis</i> or >12°C for <i>T. vitrinus</i> Moisture in this time: >10–15 mm rainfall ³ Barber's pole worm Temperature: daily maximum >18°C ¹ Moisture in this time: >10–15 mm rainfall ³	Notes: ¹ Some hatching of worm eggs of all worm species can occur below these daily maximum levels, but this is usually at a small and insignificant rate. ² Brown stomach worm eggs can develop at low rates without rainfall even in a relatively dry faecal pellet. ³ Development to infective larvae may occur without rainfall if soil moisture profile is high.	Unsuitable conditions prevent eggs hatching and developing into infective larvae. Note: The eggs of the brown stomach worm are much more tolerant of cold and dry conditions, and in general, grazing management has less effect on its control.
Maximum time worm eggs can live awaiting suitable hatching conditions.	Brown stomach worm: 21 days Some brown stomach worm eggs may survive for longer periods. Black scour worm: 16 days Barber's pole worm: 5 days	Notes: Once hatched, infective larvae of both black scour and brown stomach worm can remain in the faecal pellet until conditions are more suitable.	Prolonged periods without the right conditions (temperature/moisture) for egg development will result in the eggs dying. This lowers the worm-risk of paddocks.
The time for about 90% of the barber's pole worm infective larvae (L3s) to die (making paddocks low worm-risk).		Maximum temperature (°C)	Time for 90% larvae to die
	Cold	less than 15	4 months
	Warm	about 22	3 months
	Hot	about 35	1.5 months
	Very hot	more than 40	1–2 weeks
Minimum time for infective larvae eaten by animals to mature and lay eggs (the 'pre-patent period').	Sheep: minimum of 18 days for most sheep roundworms. Goats: minimum of 14 (typically 21) days for barber's pole worm and 21 days for scour worms.		Worm larvae eaten by animals soon after an effective drench will take at least 18 days (in sheep) or 14–21 days (in goats) before they can lay eggs. During this period after administering an effective drench, animals are not re-infecting the pasture.

Appendix C: Drench groups and actives

Table C1. Drench groups and actives

Drench groups and actives	Worms	Brand names (actives)
BZ or benzimidazole group ('white') ^B albendazole fenbendazole oxfendazole	barber's pole worm, 'scour worms', adult liver fluke, nodule worm, aids control of intestinal tapeworm (<i>Moniezia</i>)	Alben, Valbazen, WSD Albendazole (albendazole) Beezed, Fenbender 25, Panacur 25, (fenbendazole) Beezed LV, Oxfen LV (oxfendazole)
LV or levamisole group ('clear') ^B morantel levamisole	barber's pole worm, 'scour worms', nodule worm	Oralject (morantel citrate) None registered (levamisole)
ML or macrocyclic lactone group ^B (sometimes called 'mectins') ivermectin abamectin moxidectin	barber's pole worm, 'scour worms', nodule worm	None registered (ivermectin) Caprimec (abamectin) None registered (moxidectin)
AD or amino-acetonitrile derivative group ^B monepantel	barber's pole worm, 'scour worms'	None registered
SI or spiroindole group ^M derquantel	barber's pole worm, 'scour worms', nodule worm	None registered
OP or organophosphate group ^M naphthalophos (NAP)	barber's pole worm, 'scour worms'	None registered (OPs have lower or variable efficacy against 'scour worms' in the upper GIT and immature barber's pole worm)
TZ or benzimidazole group (flukicide) ^N triclabendazole	Liver fluke (all stages); not effective against round worms	Flukare C
SA or salicylanilides/phenols group ^N closantel	Liver fluke (> 9 weeks and adult) and barber's pole worm	None registered
IQ or isoquinolone group ^N praziquantel	Intestinal tapeworm (<i>Moniezia</i>)	None registered

*These are all of the commercial anthelmintics registered and commercially available for goats at August 2016. In most states of Australia, sheep drenches can be used in goats with an off-label veterinary prescription.

Breadth of activity across different worm species: B—Broad-spectrum; M—Mid-spectrum; N—Narrow-spectrum

Actives: An 'active' is the chemical in a drench responsible for killing worms. Some drenches have more than one active and are called 'multi-active' or 'combination' drenches.

Combination or multi-active treatments: Proprietary treatments containing more than one active. Formulated to be compatible as a mixture. Note: Do not mix your own drenches unless the labels state that you can.

Product formulation: All single actives are available as oral drenches. Moxidectin is also available in injectable products. Moxidectin is not registered for use in goats and an off-label prescription is required from your veterinarian. Pour-on products should not be used in goats for worm control.

Length of protection: Varies from short-acting ('knock-down' that kills susceptible worms within the animal) to mid-length (1–6 weeks) and long-acting (approx. 3 months), which not only kill susceptible worms already in the animals, but also infective larvae that the goats eat during the protection period.

'Scour worms': Mainly black scour worm and (small) brown stomach worm, but also others.

Label: Check product labels for full details. Follow the label or veterinarian's instructions.

Using sheep drenches in goats: Veterinarians can prescribe sheep drenches for goats, but must provide written details of withholding periods and dose rates.

Other parasites: ['Drenches'](#) shows effectiveness of groups against other parasites of minor importance.

Legal use of drench products

There are strict regulations about veterinary medicines in Australia. However, veterinarians can prescribe the “off label” use of some worm drenches not registered for goats.

A veterinary prescription is required for use of most drenches for goats because

- Goats require a different dose rate and withholding period to that on the label (even on products registered for goats).
- Many drenches are not registered for use in goats.

It is particularly important that goats whose meat or milk is intended for human consumption are not treated with chemicals that could result in excess chemical residue levels in those meat or milk products.

Whilst most meat goats are run in the rangelands where drenches are infrequently used, it is the larger number of goat owners running smaller numbers of goats in the moderate to high rainfall areas that are likely to put the goat export market at risk through their misuse of drenches.

State legislation

Victoria

Victorians can use products sold “over the counter” in retail stores for major species (e.g. cattle and sheep) “off label” in minor species (e.g. goats and alpacas). Under this use, the Victorian authorities specify that this should not cause chemical residues in goat products to exceed Maximum Residue Limits and that the product must not be used at a higher dose rate than stated on the label. Therefore, to use the product at a different dose rate requires a veterinary prescription.

South Australia

South Australian legislation considers goats a ‘minor trade species’ and certain cattle products can be used on them, but cattle pour-on products should not be used on goats. Use at a dose rate different from the label requires a veterinary prescription.

New South Wales, Queensland, Tasmania, Western Australia, Northern Territory, Australian Capital Territory

In all states and territories other than Victoria and South Australia, veterinary medicines, including worm drenches, must be used strictly according to the label or according to a veterinary prescription.

Prescriptions must be in writing and must include details of the product name, the dose and the withholding period. Note: your veterinarian cannot override a “Do Not Use” statement on the label, e.g. Do Not Use in goats whose milk may be used for human consumption.

Veterinarians can only issue these prescriptions if there is a true client–veterinarian relationship and the veterinarian is familiar with your farm and your farm management practices. This normally requires a visit within the last 6–12 months.

If you participate in the on-farm food safety program: the Livestock Production Assurance (LPA) program, administered by Meat & Livestock Australia, you may be audited and will need to show copies of veterinary prescriptions for any worm drenches that have been used that are not registered for use in goats or have been used at a different dose rate from that on the label.

Sharing drench

Unless you are a registered veterinarian, it is illegal to take smaller amounts of product from the original package and repackage them in other bottles or containers.

wormboss

The WormBoss web site is the most complete and current source of information for producers, advisors and students on goat worms, drenches and worm control in Australia.

On the site you will find information and tools:

Regional worm control plans

A step-by-step guide to controlling worms practically, effectively and profitably on your property all year round.

Regional Drench Decision Guides

A tool to help you decide whether your goats need drenching now, and if so, what length of protection is required and when to check the goats again.

Drenches

Lists all of the drench groups and combinations as well as actives and brand names.

Tests and tools

'How to' guides are provided on WormTests, DrenchTests and more.

Worms

Describes the important worm species, their lifecycle and how they affect goats.

Subscription

Subscribe to the ParaBoss monthly e-newsletter to keep up to date on your regional worm situation and new information.

Legal use of drenches in goats

Control of worms in goats may require the use of drenches and with few drenches registered for goats, sheep drenches may be indicated.

When using drenches not registered for goats or any drenches at different dose rates than stated on the label, a veterinary prescription is generally required.

Legislation varies between states and territories, so advice should be sought from your relevant government department or your veterinarian.

It is critical that all goat producers use drenches responsibly, not only so they are both safe and effective, but importantly to prevent goat products entering the market with residues from drenches over the Maximum Residue Limits (MRL), as this would damage the goat industry's reputation and could result in an export market being closed. Responsible use will also help to slow the development of drench resistance.

Producers in the Livestock Production Assurance scheme need to keep their veterinarian's prescriptions for drenches in case they are audited.

See inside the back cover for more information.



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