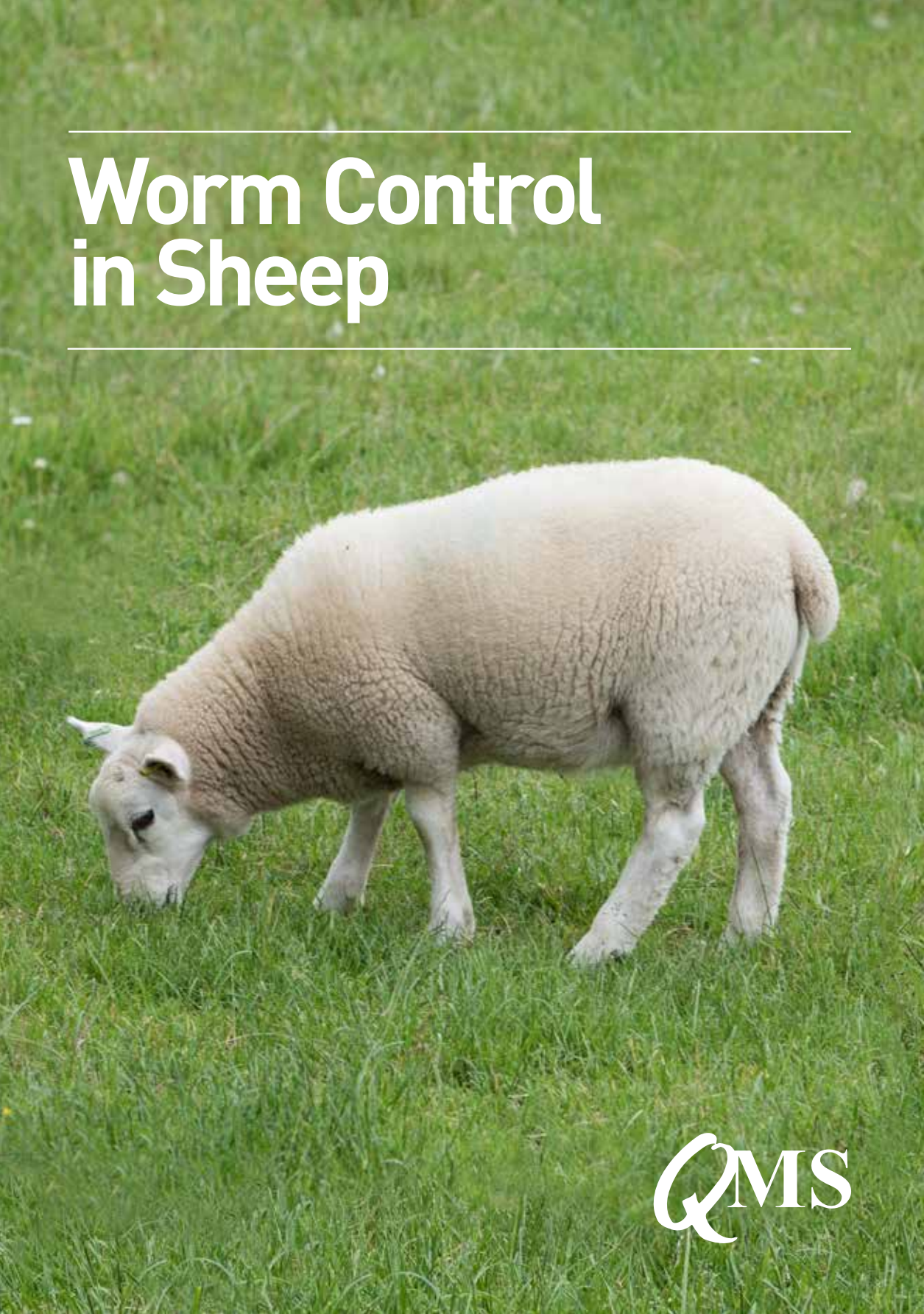
Worm Control in Sheep



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Introduction

As the UK sheep industry has intensified and become more reliant on pastures grazed only by sheep, the dependence on anthelmintics has increased. The heavy use and misuse of these relatively cheap products has led to the development of resistance. The industry needs to act now so worms can be effectively controlled in the years to come.

There are a range of tools at our disposal to plan worm control on farms to minimise development of anthelmintic resistance. These include an understanding of life cycles, grazing and pasture management, knowledge of farm anthelmintic resistance and avoiding highly selective practices. Two new groups of anthelmintics (groups 4 and 5) offer the opportunity to maintain good worm control for many years through strategic use as a quarantine treatment and a mid-to-late season dose for lambs.

Sustainable Control of Parasites in Sheep (SCOPS) is an industry-led group formed to develop sustainable strategies for parasite control in sheep. Based on proven science, the SCOPS recommendations incorporate the practicalities of sheep farming and animal health planning.

The group facilitates the delivery of these recommendations and ensures that new research and development is incorporated into advice given to the sheep industry.

scops.org.uk

The principles for best practice and responsible control of worms depend on:

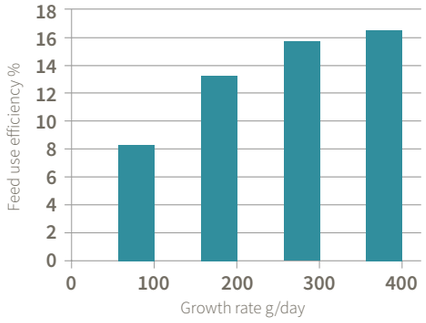
1. Careful understanding of the risks from contaminated pasture and strategies to use cleaner grazing.
2. Use of faecal egg counts (FECs) at appropriate times to inform the ongoing contamination risk and the need to treat.
3. An emphasis on only using the 'right product for the right animal at the right time' with 'as much as necessary but as little as possible'.

The benefits of parasitic worm control

Worm control is vital for good growth rates and profitable sheep systems. Heavy burdens result in stunted or dead lambs, and even modest levels reduce performance and increase costs.

Lamb growth rate can be reduced in lambs that have no clinical signs of infection. It is important to assess the risk and manage both the pasture and the flock to maximise performance.

Graph 1: Efficient lamb performance

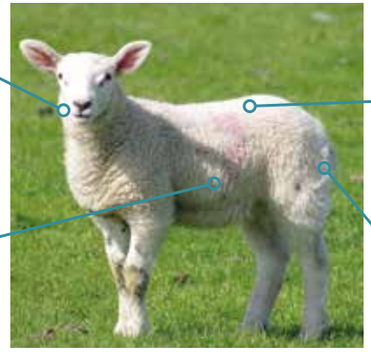


- For example, a weaned lamb growing at 100g/day needs nearly twice as much energy to reach the same weight as a lamb growing at 300g/day. This is because the feed efficiency is halved.
- So, if a weaned lamb needs to gain 10kg, it will take 14 weeks at 100g/day and eat 120kg of feed dry matter (DM). If it grows at 300g/day, it will take five weeks and eat 65kg of feed DM.
- A modest decrease in price per lamb over the additional nine weeks of 30p/kg reduces the value of the lamb by £5.70 (for a 19kg carcase), so with the additional costs of feed and grass competition with ewes, financial returns can drop by £10/lamb.

How worm burdens affect lambs

Depressed appetite reduces feed intake and growth rate.

Permanent gut damage reduces nutrient absorption and causes diarrhoea.



Impaired mineral retention causes a small skeleton and exacerbates trace element deficiencies.

Poor protein metabolism reduces muscle growth and carcase quality.

Successful worm control

The priority for worm control is to minimise the effect of internal parasites on lamb performance. However, farmers must also consider the long-term sustainability of their control programme. To achieve this, a range of management tactics should be used alongside careful use of anthelmintics.

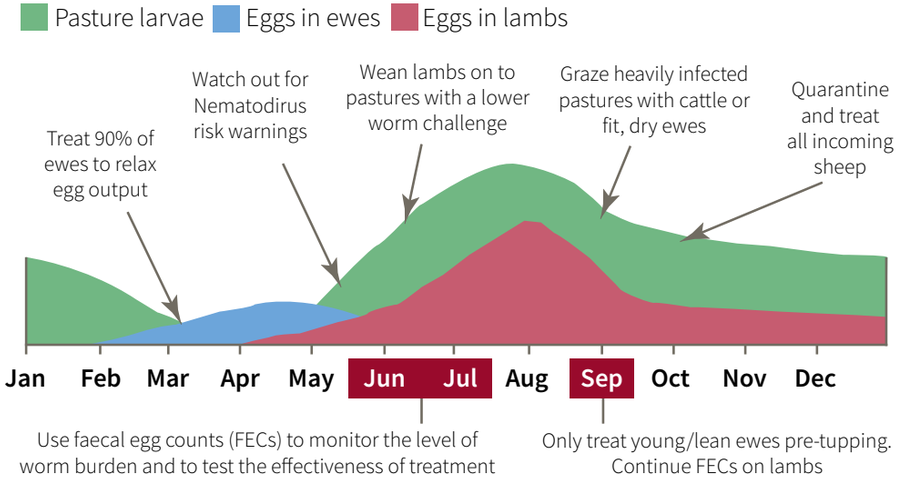
Sheep farmers should not rely on anthelmintics as the sole means of control.

A good control plan includes:

- A long-term worm control strategy in an animal health plan which is reviewed regularly with the vet and adapted to changing patterns from year to year.
- Grazing management to reduce or avoid high worm burdens on pastures.
- Minimising the risk of importing new parasites or anthelmintic-resistant worms with bought-in sheep.
- Knowledge of the different worm species, when they are a threat and why, using freely available regional forecasts and warnings, e.g. from SCOPS (scops.org.uk) or the National Animal Disease Information Service (NADIS, nadis.org.uk).
- Monitoring worm burdens, using faecal egg counts (FECs) and planning ahead, (see page 9).
- Allowing lambs, particularly breeding replacements, to develop immunity to worms.
- Ensuring treatments are always effective and testing for resistance.

Worm challenges through the season

The challenge to sheep from worms builds over the season. A successful control strategy takes these dynamics into account. Here is an example for a spring-lambing flock.



Worm life cycle

The life cycles of the main worm species are similar. It is important to understand this so the risks can be assessed and predictions made about when they are most likely to be a problem.

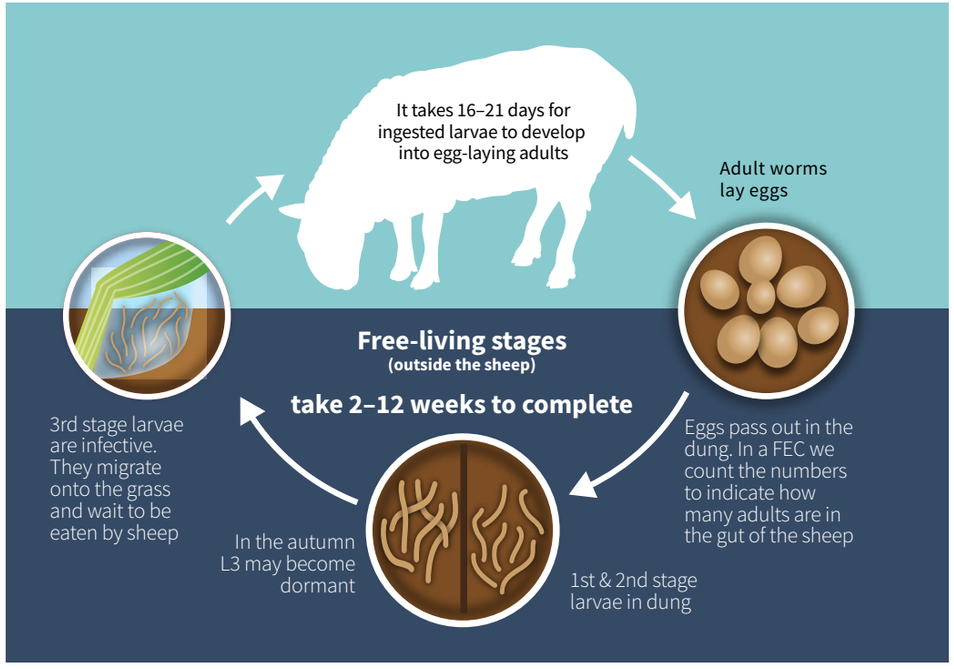
Sheep (the host) pick up worms in the form of infective larvae living on the pasture. These develop into adults in the sheep's gut and lay eggs, which are deposited back onto the grass in the dung. The eggs hatch and develop into larvae in the dung then migrate onto the grass, where they wait in water droplets to be eaten by another sheep. So the cycle begins again.

The time it takes for the eggs to develop into infective larvae varies according to ambient temperature and moisture. In a warm, wet summer it can be very quick (less than two weeks); in spring and autumn, when it is colder, it takes longer.

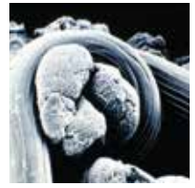
Some species halt their development as winter approaches, surviving on pasture during the coldest weather, before reactivating as temperatures rise the following spring. These larvae are a source of infection for young lambs.

Some worms overwinter in a suspended state inside the gut wall of the sheep, maturing and laying eggs in spring.

Nematodirus is the exception because its larvae take much longer to develop – around eight to nine months.



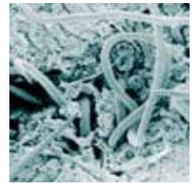
The key worm species



Nematodirus *(Nematodirus battus)*

Has a longer life cycle than those below. Eggs do not normally develop into infective larvae until the following spring, when they can be picked up by six-to-twelve-week-old lambs and cause significant losses.

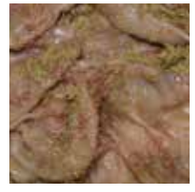
Key Action: It is the larvae that cause the damage in the lamb's gut, so predicting when a hatch will occur is the key to knowing when to treat.



Teladorsagia (*Teladorsagia circumcincta*, formerly known as *Ostertagia*)
– small brown stomach worm

Populations of this worm build up through the late spring and into the summer. At medium/low levels they reduce appetite in lambs, which lowers growth rates and causes general ill-thrift. Levels peak in mid-summer, increasing the risk of diarrhoea and death.

Key Action: Move weaned lambs off pasture that has carried sheep earlier in the season.



Haemonchus (*Haemonchus contortus*)
– the barber's pole stomach worm

This worm consumes large amounts of the host animal's blood, resulting in anaemia rather than scouring. Heavy infestations can occur very quickly in the right conditions. Adult sheep do not build up such a good immunity to this species, so knowing if it is present on the farm is vital.

Key Action: Haemonchus is not present on all farms, so quarantine treatment is essential to prevent importation. Investigate if suspected.

Trichostrongyles (*Trichostrongyles spp.*)
– the black scour worm of the small intestine

This is most commonly seen in the autumn in store lambs, but can occur earlier. It typically causes rapid weight loss, scouring and death, particularly in poorer lambs.

Key Action: Use fit, dry ewes post-weaning to reduce worm burdens on autumn finishing pastures. Monitor FECs to see what level of infestation is occurring. Keep monitoring into the winter months.

Key actions need to form part of the worm control strategy for the flock in the animal health plan.

Assessing and reducing pasture risk

Although in most systems anthelmintics are a key part of worm control, research shows that lambs with a high worm challenge regularly drenched with a fully effective anthelmintic grow half as well as lambs with no challenge.

Avoiding high worm burdens can be challenging where sheep are the only livestock, but there are options to graze lower-risk pastures such as hay and silage aftermaths or to use dry, mature ewes to 'hoover' larvae off infected pasture.

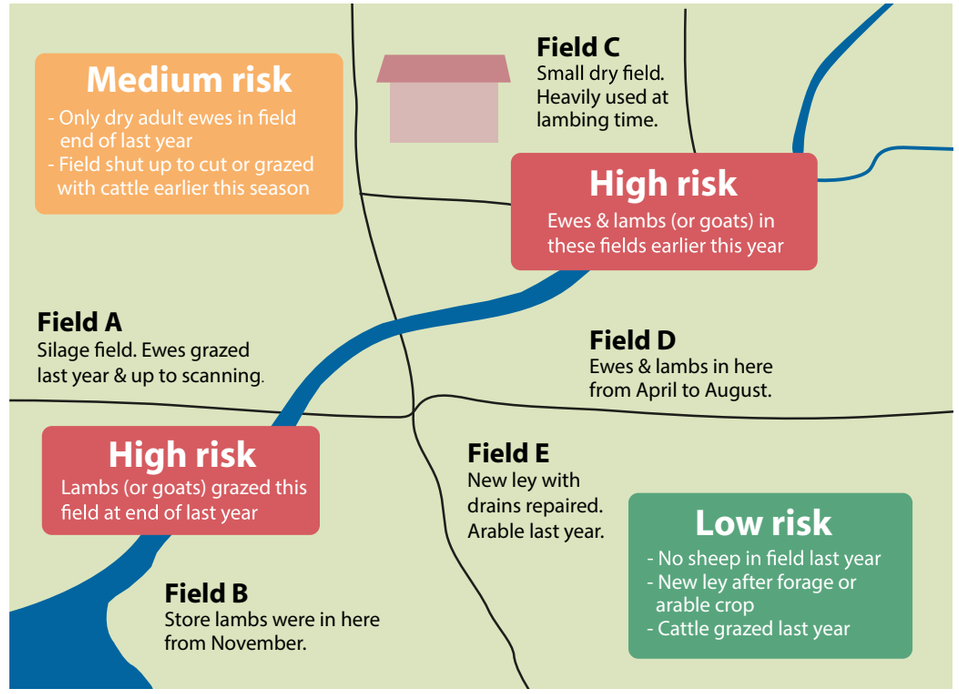
Examples of situations of high, medium and low-risk pastures

SEASON	HIGH	MEDIUM	LOW
 Spring	Ewes and lambs grazed in the previous year High risk of Nematodirus if pasture carried ewes and lambs in the previous spring Goats grazed the previous year Store/ewe lambs grazed the previous autumn/winter	Grazed only by adult non-lactating sheep the previous year Grazed by ewes and lambs the previous spring, but then conserved and aftermath not grazed by sheep (NB Nematodirus still high risk)	New leys or forage crops Grazed by cattle or cut for silage or hay in the previous year (no sheep)
 Summer	Ewes and lambs grazed in the spring	Grazed only by adult non-lactating sheep in the spring Grazed by cattle or cut for silage or hay in the spring	Grazed by cattle or cut for silage or hay only in the first half of the grazing season Forage crops or arable by-products grown
 Late season / autumn	Stocked with ewes and lambs all season	Grazed by cattle since mid-season Grazed by fit, mature dry ewes since weaning mid-season	Grazed by cattle or cut for silage or hay only in the first half of the grazing season Forage crops or arable by-products grown

Farm pasture risk map

Use the farm map to identify which fields have held which class of stock over the last 12 months to highlight the level of risk in each field. Initially, much of the farm may be high risk, but careful planning of grazing will not only reduce risk to vulnerable stock, but also reduce risk levels in some fields. This may be as simple as ensuring ewes and young lambs are not spread over the whole farm.

Worms - risks vary in different fields across the farm



Grazing and livestock management for worm control

- Use farm pasture risk map to allocate grazing to different classes of stock.
- Provide lowest-risk pasture for weaned lambs and consider weaning as young as 12 weeks to avoid larvae build-up.
- Mixed grazing with cattle reduces pasture contamination through the lower sheep stocking density. It is harder to achieve efficient grassland utilisation, as targets for each species are different. Rotating cattle and sheep grazing is another way to dilute the worm burden.

- Good quality grazing needed for high lamb growth rates also improves resilience to worms during the season. Maintain optimum sward heights and avoid grazing below 4cm to minimise ingestion of infective larvae at the base of the sward.
- Grouping lambs by age at turnout makes treatment and management decisions more accurate and faecal egg counts more meaningful for the group.
- Reduce contamination on dirty pastures by grazing them with weaned ewes in good body condition. Dirty pastures are those that have carried sheep from turnout. The ewes ingest infective larvae and kill them off, which lowers the challenge and reduces pasture worm burdens for the following spring. This does not apply to nematodirus.
- Graze on 'bioactive' crops such as chicory, bird's-foot-trefoil, plantain and clover to reduce negative effects of worms on lambs.

- Consider sourcing or breeding replacement ewes selected for resistance to worms, using Estimated Breeding Values (EBVs) for faecal egg counts that have an improved resistance to worm challenge once their immune system begins to work.

Faecal egg counts

Faecal egg counts (FECs) indicate the number of adult worms in the gut and is measured as eggs per gram of faeces.

FECs can be used to:

- Help determine the need to treat.
- Test the efficacy of a treatment (drench test).
- Give information on contamination going onto the pasture.

FECs are a monitoring tool, and the results need to be interpreted with other information such as age of lambs, stocking density, time of year and performance levels.

Taking FECs

Samples must be collected fresh from the field on the same day, making sure they are from lambs, not ewes (unless ewe samples are needed).

It is very important that samples are taken randomly. Do not seek out scouring lambs or dry lambs, as this will give a false result.

Loosely gather lambs in a corner of a field for a few minutes and then pick up the fresh samples as they move off.

OR

Walk around a group and pick up fresh samples as they get up and move away.

Aim for ten samples per group of lambs and these will be pooled by the laboratory to give a single result. Vets may offer faecal egg counts with interpretation of the results. Commercial companies offer a similar service. Alternatively, farmers can set up their own microscope with the help of their vet or advisor. Commercial DIY kits are available.

Reducing anthelmintic use in ewes

Fit, healthy, mature sheep have good immunity to most species of worms, so the need to treat adult sheep is limited.

Traditionally, sheep farmers wormed ewes twice a year: pre-tupping and around lambing time. This is usually unnecessary and speeds up the development of anthelmintic resistance on the farm.

The key to knowing whether a ewe needs to be treated is her body condition.

A fit ewe's immune system minimises the number of worms establishing in her gut which means there are very few worm eggs in their faeces.

Ewes pre-tupping
The only ewes that may benefit from being treated before mating, are those that are lean or immature, i.e. ewe lambs and shearlings.

Ewes at lambing
The stress of late pregnancy and early lactation can reduce the ewe's immunity, which means she sheds more worm eggs in her dung. This is known as the 'peri-parturient rise' and is the main source of contamination of pasture for lambs later in the season.

Treatment at this stage is about finding the right balance so that ewes shedding a lot of eggs are treated, while those shedding fewer eggs are not. The ewes that do not shed many eggs are those that are well fed and in good body condition. These do not require treatment.*

Leaving a proportion of ewes untreated reduces anthelmintic resistance because not all the worms are exposed to treatment but contamination of pastures is still reduced.

The way to achieve the balance is to:

- Leave fit, healthy ewes untreated. Aim for at least 10% of the flock, but more if possible.
- Make sure the correct dose is given and that it is administered correctly.
- Treat ewes as close to lambing as possible. If FECs are being used to monitor the rise in egg output, use the results to plan the right time to treat.
- Use persistent anthelmintics with care. They should not be used year after year, and a proportion of ewes should always be left untreated.

** NB If treating for liver fluke or haemonchus, all animals should be treated.*

Case study 1 – Andrew Baillie

Andrew Baillie, from Carstairs Mains in Lanarkshire, farms 190 hectares, including an arable, suckler cow and expanding sheep enterprise.

Andrew's flock has increased to 550 ewes lambing in March and April. It is integrated with a spring-calving herd of 50 suckler cows. Tackling parasitic worms more effectively is key to improving liveweight gain at low cost through better grassland management and health planning.

The strategy is to maximise lamb growth rates by grazing management, grazing chicory and clover leys, and health planning. This includes using FECs to plan and control worm burdens, minimise anthelmintic use and ensure anthelmintic efficacy.

By using regular faecal egg counts as a tool to reduce the number of times lambs were treated, Andrew saved £800 in drench for the 600 lambs and the 400 ewes in the first year of adopting this practice, whilst maintaining average lamb growth rates of 200–300g/day. Chicory and clover leys, grazed rotationally, provide a high-quality leafy diet that contributes to increasing lamb liveweight gains and reducing faecal egg counts.

The impact of anthelmintic resistance (AR)

What is anthelmintic resistance?

A worm is said to be resistant when it can survive exposure to the recommended dose of an anthelmintic that would normally kill it. This ability to survive is genetic. This means it is inherited by the next generation, so when these worms are left alive in the sheep, the eggs shed in the dung will contain only resistant genes.

Over time the proportion of the worm population carrying these genes increases. Once the proportion rises above 50% the process is irreversible.

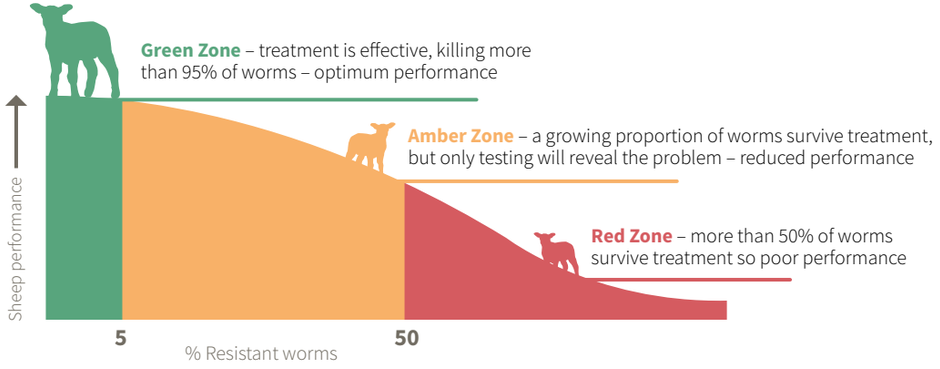
Routine treatment of sheep with anthelmintics has worked well for many years. However, on many farms in the UK, one or more of the three older broad-spectrum chemical groups (1, 2 and 3) is no longer working effectively enough to control all the worms. This means that the proportion of worms killed by treatment is decreasing because they are resistant to the wormer used.

Resistance builds gradually

The problem is that resistance does not happen overnight; it builds up gradually. Many farmers are unaware that their anthelmintic treatments are losing effectiveness and lamb performance is reduced.

It is only when the level of resistance exceeds 50%, with over half of the worms surviving the treatment, that it becomes very obvious.

Fortunately, farmers can maintain performance if they get an early warning of resistance by testing for it. Once it is known that an anthelmintic group is not fully effective, farmers can change to another. However, it is important that measures are put in place to protect those groups which are still working on the farm.

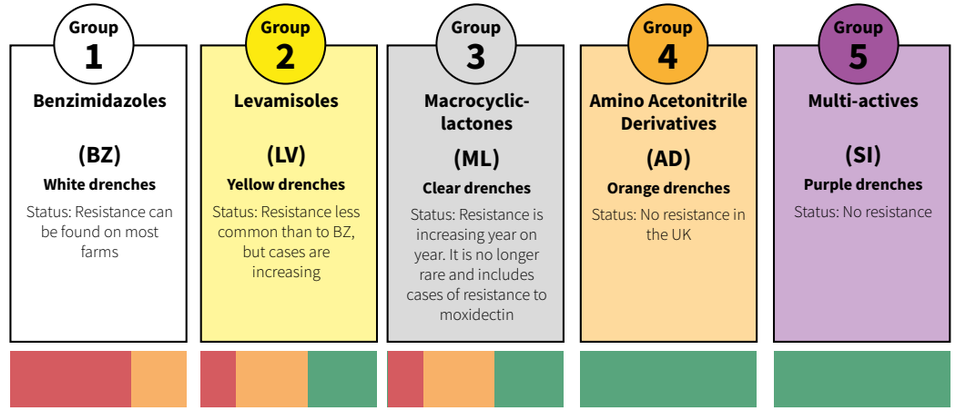


Anthelmintic resistance in the UK

Surveys and reports from farms in the UK suggest that resistance to the first three groups of anthelmintics is increasing.

The diagram below illustrates the proportion of farms in each category: green represents no resistance (<5% of worms survive treatment), amber, where resistance is building, and red, where resistance is high.

Most farms will have some resistance to the white (1-BZ) group; resistance to the other two older groups is less common, but increasing year on year.



There are three key steps in managing the speed that resistance develops on a farm.

1. Do not import problems – quarantine and treat.

If there are no resistant worms on the farm, keep them out by using treatments and quarantine procedures to stop them coming in.

2. Make sure treatments given are always fully effective.

An effective treatment is essential, not only to maximise performance but also to slow down the speed that genes for resistance build up in the worm population on the farm.
This includes making sure:

- The right product is chosen.
- The dose rate is right.
- The treatment is administered correctly.
- Resistance is tested for, to make sure the product is working.

3. Avoid unnecessary treatments and practices that select heavily for resistance.

Make sure sheep are not treated unnecessarily, in particular fit, healthy adults. This will significantly reduce the selection pressure on the worms on the farm. Use FECs to target treatments and avoid highly selective practices such as 'dose and move' on to clean or low-challenge pastures.

Effective quarantine

Take every precaution not to bring resistant worms onto the farm in purchased or returning sheep.

The objective of quarantine treatment is to remove any resistant worms (and sheep scab). To achieve this, two anthelmintic groups with the least chance of having any resistance should be used. Choose the best treatment option from the table below.

Step 1 – Yard	Step 2 – Treat	Step 3 – Quarantine
		
On arrival, yard or house sheep – do not put them directly on to pasture or in contact with other sheep.	As soon as possible, the sheep should be treated – the table below offers options based on whether or not sheep scab is a risk.	After 24–48 hours, turn out onto pasture that has carried sheep in the current season and keep isolated from the resident flock for at least three weeks.

SCOPS quarantine treatment options

Choose your risk category from the three options below and then carry out all the treatments shown in your choice of either the Gold, Silver or Bronze columns. Discuss with your vet to decide whether the use of both groups 4-AD and 5-SI are needed for the gold standard and choose from options 1–5 in each risk category.

	SCAB RISK (No Dip)					SCAB RISK (Dip)					NO SCAB RISK					
Option	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
4-AD	✓	✓		✓		✓	✓		✓		✓	✓		✓		4-AD
5-SI	✓		✓		✓	✓		✓		✓	✓		✓		✓	5-SI
Mox (Inj)	✓	✓	✓													Mox (Inj)
Do				✓	✓											Do
OP						✓	✓	✓	✓	✓						OP
Mox (oral)							✓	✓				✓	✓			Mox (oral)

KEY: Gold Standard Silver Standard Bronze Standard

* 1% preferred but seek advice.

4-AD = Monepantel (Zolvix™)
5-SI = Derquantel/abamectin (Startect™)
Mox (Inj) = Moxidectin injection*
Do = Doramectin (Dectomax™)
OP = Organophosphate plunge dip
Mox (oral) = Moxidectin oral drench

Effective treatment

Worm control is important for lamb growth rates. Anthelmintics are an integral part of a good worm control programme but need to be used sustainably to preserve their efficacy.

- Every dose must be administered correctly – avoid underdosing.
- Assess whether treatments are working on your farm – check for worm eggs 14 days after treatment with white 1-BZ or a clear 3-ML and seven days after treatment with a yellow 2-LV.
- Use faecal egg counts and growth rate monitoring to assess the need to treat.
- Quarantine treatment of all incoming sheep is essential.
- Use the principles of 'refugia' to preserve a susceptible population of worms.

Weigh

Always weigh the group to be treated and use the dose recommended for the heaviest sheep. Judging the weight by eye usually underestimates the weight. If there is a wide weight range, split the group and alter the dose. Remember to check the weigh crate is accurate.

Store products correctly

Keep products at 4–25°C and away from direct sunlight. Always check the 'use by' date. Once opened, use within the time stated on the label. Shake white group (1-BZ) products before use.

Maintain dosing guns and injectors

Clean all equipment with warm soapy water after use. Check springs and tubes to make sure there are no kinks that could allow air bubbles to form. Replace regularly for reliable performance.

Effective treatment

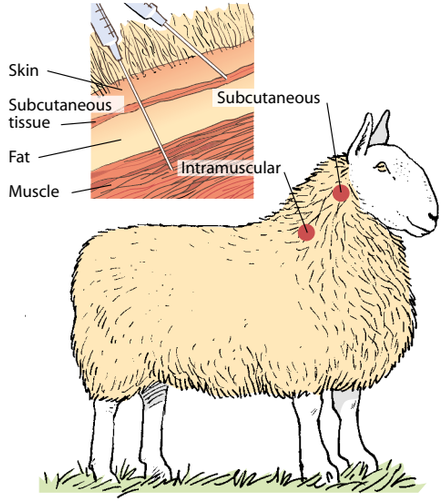
Injections

Subcutaneous injections

The product must be placed under the skin. 'Tent' the skin 10–15cm below the ear and gently massage the site after administration. A 1.6cm (5/8") needle is recommended.

Intramuscular injections

The product must go into the muscle 10–15cm in front of the shoulder on the neck, well above the jugular vein. A 2.5cm (1") needle is recommended. Insert at a 60° angle, aiming inwards and upwards towards the head.



Drench

Check the drenching gun by discharging into a measuring pot several times to make sure it is working properly and is calibrated to deliver the correct dose.

Administer correctly

Correct drenching is vital. Restrain sheep to avoid injury and ensure the full dose is swallowed.

Place a hand under the head, tilting it slightly to the side. Insert nozzle between molar and incisor teeth so the liquid goes over the back of the tongue.

Choosing the right products

The best worm control is achieved if the most appropriate product is used. This means taking into account the target parasite(s) and the resistance status of the various groups on the farm.

It is no longer simply a case of rotating between three groups of anthelmintics on an annual basis.

The table shows the groups of broad-spectrum products available and their activity against the main worm species. Where possible, choose a narrow-spectrum product to deal with specific parasites and avoid combination products unless they are necessary.

Chemical	Spectrum	Teladorsagia & Trichostrongylus	Haemonchus	Nematodirus
1. White Group 1-BZ Benzimidazole	Broad	✓	✓	✓*
2. Yellow Group 2-LV Levamisole	Broad	✓	✓	✓
3. Clear Group 3-ML Avermectin/moxidectin	Broad	✓	✓	✓
4. Orange Group 4-AD Monepantel	Broad	✓	✓	✓
5. Purple Group 5-SI # Derquantel	Broad	✓	✓	✓
Closantel	Narrow	✗	✓	✗
Nitroxynil	Narrow	✗	✓	✗

* Still the preferred option for Nematodirus in young lambs, even where resistance to other worms exists.
# Only available as a dual active.

When to use the 4-AD and 5-SI anthelmintics

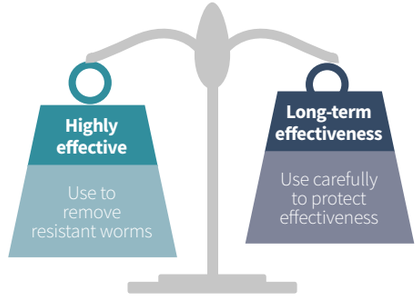
These two groups are the most recent additions to the anthelmintic range and worms that are resistant to them are extremely rare. This means they are highly effective and used correctly, will kill nearly 100% of the worms in treated sheep. They have a huge value in worm control programmes.

However, it is important to strike a balance between harnessing their effectiveness and sustaining use of the other groups while avoiding the risk of resistance developing due to over use.

Balancing the use of worm control products

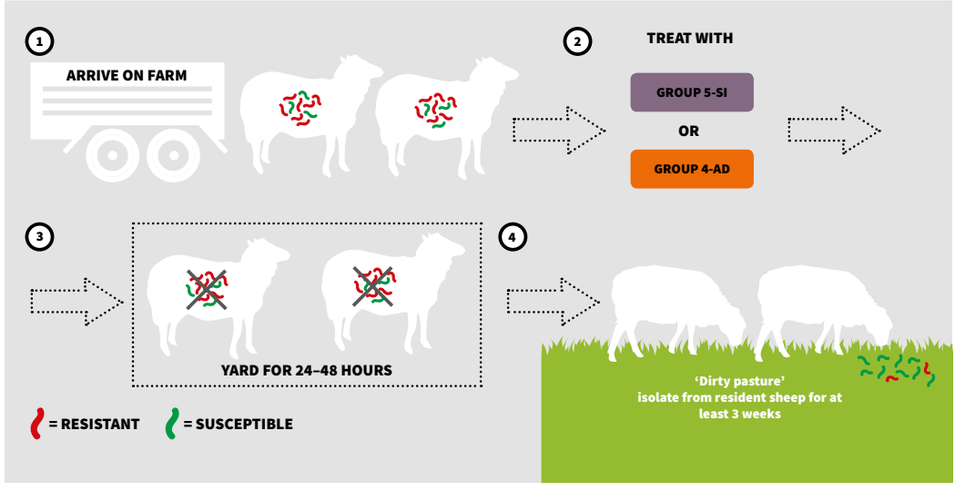
To keep this balance, there are two times when one or other of these anthelmintics should be used:

1. As part of a quarantine treatment to ensure no resistant worms are brought onto the farm.
2. To reduce the selection for anthelmintic resistance in the worm population to the three older groups, use one of them as a single treatment for lambs in the mid/late grazing season



1. Quarantine drench

Using either a 4-AD or 5-SI for all incoming sheep prevents the sheep bringing in resistant worms from another farm.

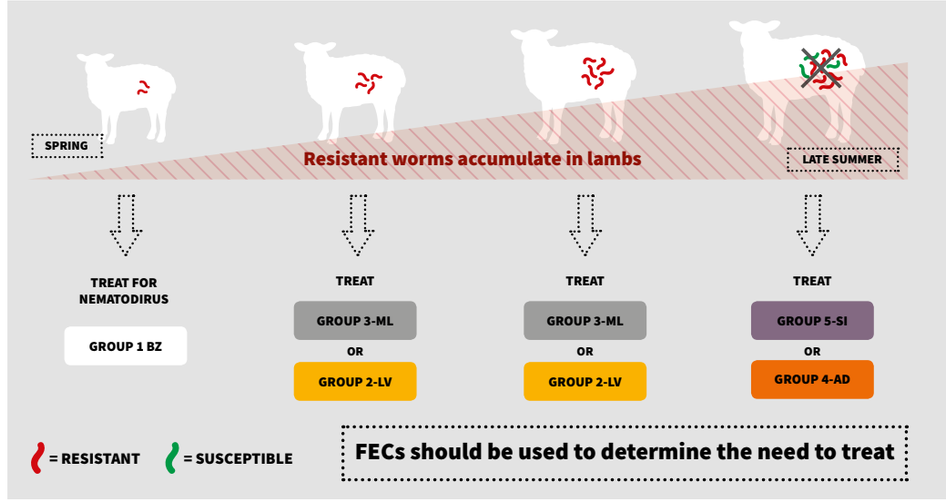


2. Mid/late season treatment for growing lambs to reduce the development of anthelmintic resistance

If a FECs indicates the need to treat, using 4-AD or 5-SI products as a single 'one-off dose for all lambs' on the farm later in the grazing season has two important benefits:

- Improved lamb performance, because all the accumulated worms in the gut are killed.
- When worms have survived treatment with other groups so are likely to be resistant. Killing these worms means they cannot add their genetics to the farm's worm population. This helps slow the development of resistance to other groups.

To understand how that works, we need to look at what happens inside grazing lambs over the season. The example below shows a typical situation on permanent pasture, with lambs treated for Nematodirus in the spring and then receiving another two treatments when FECs were high.



Remember

Do not move lambs directly on to fields with very low worm burdens (e.g. aftermaths and new leys) after treatment. Leave them where they are for four to five days and then move.

Case study 2 – Ben and Diana Anthony

Ben and Diana Anthony's flock of 800 ewes and ewe lambs run on mainly permanent pasture at 400–650ft above sea level in Carmarthenshire and since 2013, they have increased the kgs of carcase sold/ewe by 30%.

Improved nutrition and ewe body condition score (BCS) are key to this success, along with better worm control. There are three key changes they have made:

Reduced anthelmintic use in ewes
The number of ewes that require drenching at lambing has dropped significantly now that the majority are in good BCS and protein levels in the diet are not limiting. A pre-tupping drench is only given to the shearlings and any ewes below target BCS, meaning overall use of wormer for ewes is a fraction of previous levels.

Targeted anthelmintic use in lambs
They now have their own FECs sampling kit on the farm and can monitor the need to treat closely. Having established early on that they have some issues with resistance, it means they can also do regular drench checks to make sure the wormers they are using are fully effective. The introduction of forage crops for lamb finishing has also avoided late season problems with worms.

Integration of the newer group 4-AD and 5-SI anthelmintics
Quarantine treatments for incoming sheep are an essential part of the farm regime and the use of 4-AD or 5-SI is an important part of this. They have also started using them as a mid/late-season drench to help clear any resistant worms out of lambs, which provides a potential performance boost and helps reduce the development of any further resistance to the older wormer groups.

Testing for anthelmintic resistance

Detecting resistance of worms to anthelmintics at an early stage allows farmers to maintain good worm control and avoid losses in production associated with declining product efficacy.

Waiting until an anthelmintic group is not effective means lamb growth has been compromised for many years and it is too late to retain any useful function for that group, as resistance is irreversible.

Drench test

A drench test is a practical and relatively simple way of identifying whether the product group being used is starting to lose its effectiveness.

Step 1
Take a dung sample before the lambs are treated, to establish the initial egg count.

Step 2
Treat all the lambs in the group, taking extra care to ensure dose rate and administration technique are correct – if not, the test results will be misleading.

Step 3
Wait for seven days (for Group 2-LV products) or 14 days (for Group 1-BZ or Group 3-ML products) and re-sample the same group of treated lambs.

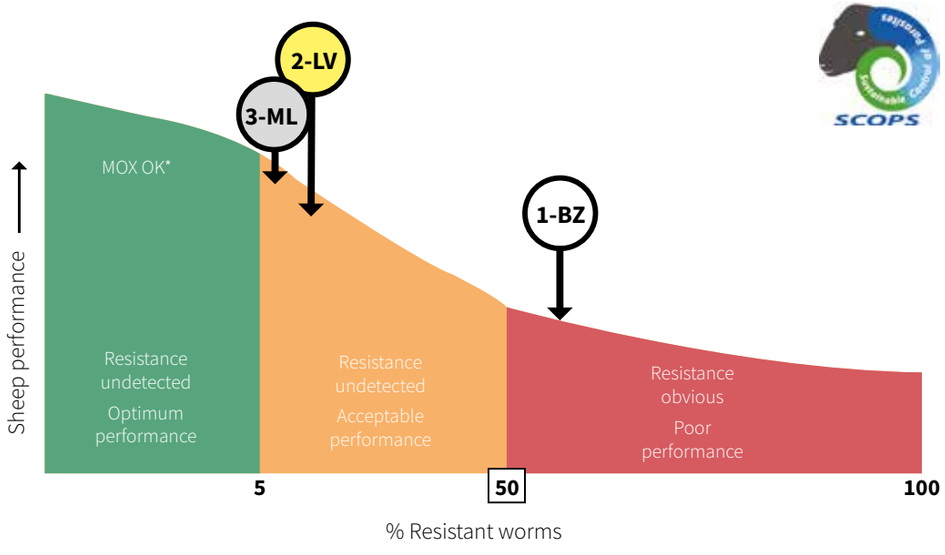
Is the product working?
A reduction in FEC of 90% or more means the drench given has done its job. For example; if the initial pre-treatment FEC was 500 eggs per gram (epg) then the post-test FEC should be no more than 50 epg.

If it is higher, talk to your vet or adviser about changing to a different product group and what further action to take. This may include a more accurate Faecal Egg Count Reduction Test (FECRT) or hatching collected larvae to establish which specific worm species is involved.

Case study 3 – Matt Blyth

Matt Blyth of Didling farms in Midhurst, West Sussex, runs a flock of 1,200 ewes. There were problems with poor ewe body condition and low lamb growth rates at grass.

Matt joined the SCOPS monitoring project and established that there was a significant level of Haemonchus on the farm. In addition, some resistance to groups 1-BZ, 2-LV and 3-ML anthelmintics was identified.



With knowledge of resistance on Matt Blyth's farm, a plan was put together to maintain good worm control using the SCOPS principles.

SCOPS principle		Adoption by Matt Blyth
Drench correctly	✓	Equipment always checked and calibrated. Dosing to the heaviest animal and good technique. Electronic Identification (EID) and auto-draft/weigh facility greatly enhances ability to dose to weight.
Quarantine treatments for all incoming sheep	✓	SCOPS recommendations fully adopted for incoming sheep and updated.
Test for anthelmintic resistance	✓	AR status investigated over the past six years and taken into account within the strategy. Ongoing drench tests every year and Faecal Egg Count Reduction Test (FECRT) carried out when possible.
Use anthelmintics only when necessary	✓	FECs monitoring used to determine the need to treat lambs. Routine pre-tupping drench removed. Moving away from whole-flock treatments. Now using growth rates to help determine the need to drench individual lambs.
Select the most appropriate product	✓	Different products now used within the season. Use of narrow-spectrum products whenever possible (not combinations) such as closantel for Haemonchus control. Integration of new groups (4-AD and 5-SI) underway but very carefully with good monitoring.
Maintain a susceptible population of worms *in refugia* (i.e. outside the sheep)	✓	Partial flock treatments a vital part of this objective. Moving away from whole-flock treatment at housing a major step. Delay the move or partial group treatment when going on to new leys or low challenge aftermath.
Reduce dependence on anthelmintics	✓	Use of FECs/grassland improvement/rating challenge for different pastures/avoidance strategies including earlier weaning/use of dry sheep. Possibly look at resistance/resilience in breeding policy in the future.

Avoid practices that select for resistant worms

When sheep are correctly treated with anthelmintics , the only worms surviving the treatment will be resistant to the chemical group that was used.

If these animals are then put on a pasture which is clean (for example, a new ley), the only eggs that will be dropped on that pasture will also be resistant. So the worm population that subsequently develops on that pasture will be resistant. Even on pastures that are not clean, but have a very low worm burden, the effect is significant. This is because the resistant worms introduced by the sheep are the next generation of worms and are much less likely to mate with worms susceptible to anthelmintics. This is why moving to clean grazing is so dangerous.

Whenever there is a larger proportion of the worms in the sheep rather than on the pasture, the selection for resistance is much greater. Sometimes worms on pasture are referred to as '*in refugia*'. This means they are outside the sheep and not exposed to any treatments. When the population of worms '*in refugia*' is low, then treating requires even more planning and care.

To avoid this very heavy selection for anthelmintic resistance, there are two practical options:

Treat 90% of the group and leave 10% of the biggest/fittest sheep

or

Treat the whole group, but leave them on the dirty pasture for four to five days to pick up a few susceptible worms

Checklist for improving worm control

	YES	NO	Page number
Is worm control a key part of your animal health plan drawn up with your vet?			5-8
Could you use management to reduce the use of anthelmintics in adult sheep?			8 & 10
Have you used FECs to monitor worm burdens and contamination levels?			9 & 11
Do you have an effective quarantine strategy in place?			14
Do you know the anthelmintic resistance status on your farm?			21
Do you check that you are using the right product?			17-19
Do you always treat correctly at the right dose rate?			15-16
Do you avoid highly selective 'dose and move' actions?			24

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