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PRACTICE:

# **Parasite Control Year Planner**



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### **KEY POINTS FOR EFFECTIVE PARASITE CONTROL**

### Anthelmintics (wormers):

Anthelmintics to treat PGE (gut worms) – there are currently 5 groups of wormers (please see tables at end):

- Group 1-BZ (Benzimidazoles)
- Group 2-LV (Levamisole)
- Group 3-ML (Macrocyclic Lactones)
- Group 4-AD (Amino-acetonitrile Derivatives)
- Group 5-SI (Spiroindole) POM-V

Resistance has been recorded in Groups 1-3, with some flocks showing resistance to more than 1 group (multiple resistance). Group 4 and 5 are new wormers and there is no known resistance to them in the UK (although some reports to 4-AD abroad) so they should be incorporated into control strategies on farms with multiple resistance.

Anthelmintics to treat fluke – There are 5 main compounds:

- Triclabendazole (treats all stages including immature flukes).Closantel (effective against immature fluke from around
- 5-7 weeks post infestation).Nitroxynil (effective against immature fluke from around 5-7 weeks post infestation).
- Albendazole (effective against adult fluke at increased dose rate during late winter/spring).
- Oxyclozanide (effective against adult fluke during late winter/spring).

Triclabendazole is highly effective against all stages of fluke including the early immature fluke stages (>2days old) and so is the anthelmintic of choice for the autumn treatment of acute fluke. However resistance is increasing so it should be used sparingly at other times of year.

Combination fluke and worm products should only be used when necessary, as they can lead to off-target selection for resistance to broad-spectrum anthelmintics in nematodes.

### **Bio-security:**

If you don't have worm/fluke resistance in your flock it's vital to keep it out. When buying in sheep or rams follow a quarantine strategy: **PGE:** 

- On arrival isolate, yard and worm with 4-AD or 5-SI wormer and inject with moxidectin 1%.
- After 48 hours yarding, turn out onto contaminated pasture (pasture that has been previously grazed by sheep) and isolate for a further 3 weeks. Check for scab, CLA and CODD.

Fluke:

- Treatments should be "risk-based' depending on time of year and origin. If triclabendazole-resistance is suspected then use an alternative flukicide taking into account product variations in activity against immature fluke.
- Keep sheep yarded, or on quarantine pastures (no fluke habitats) for at least 4 weeks. Monitor by FEC to determine the need for any subsequent treatment.



Quarantine treatments are vital to ensure any in-coming sheep don't bring resistance with them.

### **Resistance:**

- PGE gut worm resistance:
- Have you had your flock tested for resistance to anthelmintics (wormers)?

NO

• If you have resistance on your farm - to which

group(s) is there resistance?

YES



 If you have not had your flock tested – you need to test for resistance – if worms on your farm are resistant to the wormers you are using, it will result in lower weight gains, clinical disease and possibly death – the cost to you is not only the cost of the wormer but the decreased weight gains.

#### • You can easily check for possible resistance:

- Take faecal egg counts (FECs) from a group of 10 sheep.
- Worm with your usual wormer and then repeat FECs post worming; time varies for different wormers i.e. 7 days post worming 2-LV, 14 days 1-BZ and 3-ML.
- Resistance is suspected if mean FECs have reduced by less than 95% post treatment.

#### Fluke resistance:

• Have you had your flock tested for resistance to triclabendazole?

YES		NO
-----	--	----

• If YES, do you have resistance to triclabendazole on your farm?

YES	NO

 A coproantigen ELISA test or fluke egg reduction test can be used to detect triclabendazole resistance two to three weeks after dosing – ask your vet.



Faecal worm egg counts (FWEC) prior to and after worming can determine if your farm has developed resistance to a wormer.

### Strategic dosing:

The timing of strategic dosing is weather dependent as it affects parasites life cycles and the potential for disease outbreaks, particularly nematodirosis in the spring and acute fluke in the autumn. There are 2 strategic treatment times:

• Nematodirosis – Spring nematodirosis worming. Weather will affect the timing of the hatch of *Nematodirus* eggs. If the peak hatch coincides with lambs of the right age grazing contaminated pasture it will result in disease and possible death, so it's vital your sheep vet advises on the timing of worming – generally Group 1-BZ wormers are used and in some years a second nematodirosis dose is required (see NADIS Parasite Forecast www.nadis.org.uk and SCOPS *Nematodirus* forecast www.scops.org.uk).



Nematodirosis is an important disease affecting young lambs during the late spring/early summer months.

• Acute Fluke – The danger of acute fluke is generally greatest in late summer and early autumn and depends on rainfall over the summer as well as pasture history. Triclabendazole is the treatment of choice (assuming no resistance issues) and in wet years a second dose may be necessary 4-6 weeks later.

### Targeted dosing - Faecal Egg Counts (FECs):

Apart from the strategic dosing above, dosing times for the rest of the year is based on monitored weight gains or FECs. To carry out a FEC, collect dung samples from 10 sheep. The samples will be mixed in the lab, and eggs counted in the combined sample. **PGE - Worm if over 500 epg** 

#### Fluke - Treat if 1 or more eggs present

Targeted worming is used to limit the build-up of resistance to wormers while improving growth rates.

### Plan for health - ask your vet for a Veterinary Parasite Control plan

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Sheep with acute fluke die suddenly from haemorrhage and liver damage with the first evidence of a problem being sudden death.

#### Use the correct product:

Use the product(s) recommended by your sheep vet.

#### Accurate dosage:

Under dosing is a common contributory factor for anthelmintic resistance – so don't guess:

- Split animals into different groups lambs, ewes and rams.
- Where groups vary considerably in size, subdivide.
- Weigh some of the heaviest animals in each group and dose to the heaviest.
- Dose according to manufacturer's recommendations.
- Check accurate calibration of dosing equipment.



Doses must be based upon the heaviest animals in the group (lambs, ewes and rams classified as different groups).



Check accurate calibration of dosing equipment.



### **PGE (Gut Worms)**

- Sustainable parasite control in lambs after weaning is about achieving acceptable growth rates while managing the parasite burden; sheep are rarely, if ever parasite free and freedom from parasites is therefore not an achievable target.
- **Post parturient (lambing) egg rise** ewes immunity to worms is suppressed due to lactation, resulting in a higher output of worm eggs – 2-4 weeks pre lambing to 6-8 weeks post lambing - key period for increasing worm contamination of pasture for lambs to pick up.

#### Pasture management:

- **Safe grazing** pasture not grazed by sheep this year (silage aftermath lower level of contamination) or preferably not grazed by lambs for 12 months (safer).
- Contaminated grazing pastures grazed by sheep this season and therefore likely to have a high level of worm egg contamination.
- **Resistant worms** a resistant worm survives treatment with the standard recommended dose of an anthelmintic. This is a heritable trait and can be passed on to the worm's offspring.
- The term *"in refugia"* refers to the population of worms coming from untreated sheep and the free-living sub-population i.e. eggs and larval stages not exposed to anthelmintics. The bigger the *in refugia* population the slower resistance develops.
- After weaning and a move to "safe grazing" lambs may not need to be treated with an anthelmintic for up to 6-10 weeks, however this will depend upon the amount of infection carried over, stocking rate and weather conditions (large numbers of lambs left untreated, high stocking rates and wet weather increase challenge).
- If dosing weaned lambs and moving onto safe grazing it is important to delay the move, by up to 7 days following treatment, to further reduce the pressure on selection for resistance.

## Strategic worming - Nematodirus battus (N. battus):

- The spring hatch is weather dependent so ask your vet and look out for the NADIS www.nadis.org.uk and SCOPS www.scops.org.uk Nematodirus forecasts.
- Nematodirosis can occur when lambs are 6-12 weeks old on contaminated pasture and may coincide with coccidiosis. Treatment is usually with a Group 1 BZ.



Nematodirosis is an important disease affecting young lambs during the late spring/early summer months.

 Nematodirosis can also occur in the autumn so watch out for poor growth rates in store lambs or take FEC.

### **Targeted worming:**

- Weighing every 3-4 weeks during grazing season (most effective way of targeting anthelmintic worming of lambs). Worm those lambs not achieving live weight gains. Usually only need to worm 40-60% of flock so considerable saving in wormers but more importantly better live weight gains.
- Faecal Egg Count (FEC) every 3-4 weeks during high risk grazing period (generally May – September). Take faeces from 10 lambs – carry out faecal egg count – if over 500 eggs /gram – worm but leave the heaviest 10% of lambs untreated.
  - It is also important to FEC store lambs, ewes and rams periodically throughout the year, as in milder, wet conditions, parasite activity can occur throughout the year.
- Choice of wormer will be advised by your sheep vet and depend on resistance status of your farm.
- Cobalt deficiency should also be considered as a potential cause of poor growth in weaned lambs and may exacerbate PGE. Your veterinary surgeon should be consulted for professional advice.



Parasitic gastro-enteritis affecting growing lambs from mid-summer onwards.

## Flocks with multiple resistance (to two or more groups) grazing safe pastures:

Where multiple resistance has previously been confirmed on your farm, products containing group 4-AD and group 5-SI anthelmintics will be especially useful in weaned fattening lambs before moving to safe pasture. Around 10% of the strongest lambs should be left untreated to ensure that some susceptible worms are carried over onto the new pasture to reduce selection on these new groups of wormers.

#### Pre-tupping worming:

- Worming all breeding females pre-tupping is rarely necessary and dosing all ewes pre-tupping may select for wormer resistance, however autumn infections (and fluke or *Haemonchus* infections) can be significant so carry out a FEC first.
- In general terms, anthelmintic treatment should be targeted at leaner ewes, gimmers, or those sheep with dags.
- Rams are often neglected at this time and a FEC will decide whether a pre-tupping anthelmintic treatment is necessary.

## Anthelmintic treatments of ewes at lambing:

- The timing of dosing and choice of wormer are both important. If
  ewes are still experiencing the post parturient egg rise when the
  effect of the wormer ceases, they are likely to become re-infected
  quickly, particularly on heavily infected permanent pastures. With
  long-acting treatments there may be a prolonged period before
  ewes re-establish a nematode infection from the *in refugia*population, which can be highly selective for resistance.
- Recommendations are to either leave a proportion of ewes untreated, or treat early in the post-lambing phase to ensure that ewes become re-infected with unselected parasites before their immunity is fully restored.
- With long-acting formulations of moxidectin the recommendation is to use these products prior to lambing, or at turnout.

### Fluke

#### Strategic treatment:

Acute fluke is weather dependent and can occur from July onwards, more usually September and October; with wet summers increasing fluke activity, a second dose may be required - so ask your sheep vet for advice based on local farm conditions and NADIS fluke forecast. Triclabendazole is the only flukicide effective against very young immature flukes. In high risk years a repeat treatment will likely be necessary 4-6 weeks later.

 Sheep with acute fluke infestation may simply be found dead without prior signs of illness therefore it is important to have all sudden deaths investigated to allow immediate preventive measures. Post mortem examination is essential to establish a diagnosis of acute fluke. Less severe clinical signs include reduced grazing, rapid weight loss, abdominal pain, anaemia and slow to gather.



Sudden death caused by acute liver fluke.

- Evasion strategies should also be adopted wherever possible by not grazing potentially contaminated, poorly-drained areas. Where flukicide treatment is necessary, sheep should be treated and moved from these infested pastures onto fluke free pastures as soon as possible.
- The effectiveness of fluke treatments should be monitored by your sheep vet. A coproantigen ELISA test or fluke egg reduction test can be used to detect triclabendazole resistance two to three weeks after dosing and farmers should contact their sheep vet for further advice where such drug resistance is suspected.

Plan for health - ask your vet for a Veterinary Parasite Control plan

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Chronic fluke in sheep peaks in the late winter/early spring.

- Not all sheep with a significant fluke infestation show classical "bottle-jaw".
- Liver fluke may cause scanning figures to be up to 30% lower than normal, with a higher barren rate (2% considered to be a normal barren rate).



Emaciation caused by chronic liver fluke infestation (not all affected sheep have "bottle-jaw").

- Efforts must be taken to reduce reliance on triclabendazole by husbandry measures and the use of other flukicide treatments when appropriate. Closantel and nitroxynil are highly effective against immature flukes from around 7 weeks post infestation. Albendazole and oxyclozanide can be used for the treatment of adult flukes during late winter/spring.
- Where possible, sheep should be moved to safer pastures after treatment.
- Supplementary feeding may be necessary to restore body condition before late pregnancy.
- Flocks with no previous evidence of fluke disease must maintain their farm's biosecurity especially with respect to purchased sheep, but also cattle.



Sub acute fluke affected liver (left) compared to normal liver (right). Such damage has a huge effect on growth rate and body condition.



### **Coccidiosis**

Coccidiosis usually affects twin lambs from 3-4 weeks of age on heavily contaminated permanent pasture and may appear around the same time as Nematodirus, so infections can be confused with Nematodirus – diagnosis is based on clinical signs and previous history of disease. Faecal oocyst counts (FOCs) are helpful but not always conclusive so consult your sheep vet, as prompt diagnosis is essential.

- · Clinical signs include unthriftiness and profuse watery diarrhoea, often containing streaks of blood.
- Avoid overcrowding and mixing different age groups of lambs. It also helps to provide plenty of clean bedding in birthing and rearing pens, and to keep young lambs off heavily contaminated pastures.
- Preventative treatment with anticoccidials:
- Decoguinate creep feed for 28 days, or •
- ٠ Strategic drench of either diclazuril or toltrazuril during periods of high risk.



The common presenting signs of coccidiosis are a rapid loss of weight and diarrhoea containing mucus and flecks of blood, causing staining of the perineum and tail. Affected lambs are very dull and lifeless.



Coccidiosis is a significant risk in April for February/March born lambs managed intensively indoors

### **ECTOPARASITES**

### Scab

Sheep scab is typically encountered from September through to April.

- Sheep have disturbed grazing patterns and are observed kicking at their chest with their hind feet and/or rubbing themselves against fence posts. The fleece is wet, sticky, yellow and frequently contaminated with dirt from the hind feet. Typically after around eight weeks' infestation the hair loss on the flanks may extend to 20 cm diameter surrounded by an area of inflammation and serum exudation. The skin is often thrown into thickened corrugations.
- N.B.: Different rules apply in England and Wales vs Scotland on reporting of Sheep Scab, consult your vet or local APHA for details.

• Treatment is by either dipping in an approved acaricide (diazinon) or by injection with an ML. It is essential that all sheep in a flock are treated, regardless of whether showing signs.



Sheep scab continues to cause serious welfare problems throughout the UK

Active	Dose Rate	Treatment	Prevention
Ivermectin	1ml/50kg (200mcg/kg)	2 injections 7 days apart	-
Doramectin	1ml/33kg (300mcg/kg)	1 injection	-
Moxidectin 1%	0.1ml/5kg (200mcg/kg)	2 injections 10 days apart	28 days after one injection
Moxidectin 2%	0.5ml/kg *1mg/kg)	1 injection base of ear	60 days after one injection
Diazinon (Dimpylate)	See dispensing kit instructions	1 treatment	Up to 28 days after 1 treatment
Franklade The same	and and a second shift of a		

For details on products see tables

### Lice

Louse populations are highest in sheep during late winter. Spread occurs by close contact with infested sheep. Lice infestations are widespread in most sheep flocks.

- Use of plunge dipping for other reasons, such as control of sheep scab, blow fly and headfly problems, also effectively controls louse infestations and may be the most cost-effective and practical options provided that there are no short-term welfare concerns such as fleece loss.
- Louse infestations can also be controlled with topical application of alpha-cypermethrin or deltamethrin. These treatments are most effective when applied soon after shearing.



Heavy louse infestation revealed in an emaciated

### Keds

Keds are permanent ectoparasites and are most commonly seen during autumn and winter. As with lice, spread occurs by close contact.

• The treatments used for lice are also effective against keds.

### **Blowfly**

Check sheep daily for signs of blowfly. Adults flies are attracted to: Areas adjacent to faecal staining surrounding the anus.



Adult flies are attracted to areas adjacent to faecal staining surrounding the perineum.

#### Less commonly to:

- Virulent footrot lesions with exposed tissue.
- Dermatophilosis lesions on the skin.
- Urine scalding around the prepuce.
- ٠ Wounds.

Blowfly lesions may range from one centimetre diameter areas of inflamed skin with a small number of maggots, to extensive areas of traumatised/devitalised skin. Large numbers of adult flies are seen on the fleece with maggots on the blackened skin, once the surrounding fleece has been lifted clear. There is an associated putrid smell, with extensive areas of traumatised/devitalised skin, causing death of the



Typical behaviour associated with flystrike with the lamb attempting to nibble at the flanks/tailhead.

Group	Active	Blo	wfly	Lice	Keds	Ticks	Scab	Route	Dose Rate	Product	Company
		Treat	Prevent								
OP	Diazinon		8 wks	,		(		Plunge	Dispensing kit	Osmonds Gold Fleece	Bimeda
	(Dimpylate)	Ň	~	v		Ň		Dip	instructions#	Paracide 62	Animax Ltd
	Alpha		8-10 wks	./		./		Pour-on	40ml	Dysect	Zoetis
	Cypermethrin	Ý	$\checkmark$	× ·		Ň			(<25kg -25ml	Zermasect Sheep	Downland
										Crovect	Elanco Animal Health
	Cypermethrin	<ul> <li>✓</li> </ul>	6-8 wks	$\checkmark$		$\checkmark$		Pour-on	5-10ml/20kg	Ectofly	Bimeda
SP									**	Vectocert	Downland
										Dectospot	Bimeda
									5ml	Deltanil	Virbac
	Deltamethrin	✓		$\checkmark$	✓	✓		Spot on	(<10kg -2.5ml)	Fly and Lice Spot on	Zoetis
										Flydown	Downland
										Spotinor	Norbrook Animal Health
ICP	Cyromazine		10 wks √					Pour-on	~1ml/kg***	Vetrazin 6%	Elanco Animal Health
IGN	Diguslanil		8-10 wks					Pour-on	0.6-2ml/kg	Clik 5%	Elanco Animal Health
	Dicyclanii		$\checkmark$					Pour-on	0.7-2ml/kg	Clikzin 12.5mg/ml	Elanco Animal Health

# initial dip bath and replenishment rates vary- see product literature for details \*\*Lice 5ml/20kg; ticks 10ml/20kg; blowfly prevention 20-40 ml (20-40kg+) or blowfly treatment 2.5ml/100-150cm2 \*\*\* Dose by weight bands 15ml- 11-15kg, 20ml-16-20kg; 30ml-21-30kg; 40ml-31-40kg; 50ml-41kg+

sheep in neglected cases. In severe infestations, the sheep are depressed and isolated from the flock. It is a legal requirement to inspect all low ground and upland sheep daily.

#### • Treatments include:

- Diazinon (dimpyate) plunge dip duration 6-8 weeks protection.
- Alpha-cypermethrin pour-on duration 8-10 weeks prevention and treatment.
- Deltamethrin spot on treats established strike only.

#### • Preventative treatments include:

- Cyromazine- duration 10 weeks.
- Dicyclanil duration 8-16 weeks.

### Ticks

All stages (larvae, nymphs, adults) of the sheep tick (*Ixodes ricinus*) can be found on sheep, particularly around the head, ears, groin and axillae

- · Heavy infestations may cause anaemia.
- Ticks also transmit a range of pathogens including louping ill, and tick pyaemia (Staphylococcus aureus).

#### Treatments include:

- Diazinon (dimpylate) plunge dip duration 3-6 weeks protection.
- Alpha-cypermethrin duration 8-12 weeks.
- Deltamethrin spot on duration up to 6 weeks.



Sheep being dipped.

### Group 1. Benzimidazoles (1-BZ) Sheep Products

Active		Gutw	orms		Lung	Таре		Fluke		Combination	Route	Dose Rate	Product	Company
	Adult	DL	AL	NbL4	Worms	Worms	adult	late	early	Active		(Fluke rate)		
													Albenil 2.5% SC	Virbac
													Albex SC 2.5%	Chanelle Animal Health
												1ml/5kg	Albacert 2.5%	Downland
Albondozolo	,	,		,	,	,	,				Oral	(1.5ml/5kg)	Benzimole	Mole Valley
Albenuazoie	~	~	±	~		×	~				Drench		Endospec SC 2.5%	Bimeda
													Tramazole SC 2.5%	Tulivin/Denimex
												1ml/20kg	Endospec SC 10%	Bimeda
												(1.5ml/20kg)	Albex 10%	Chanelle Animal Health
											Oral	1ml/5kg	Zerofen 2.5%	Chanelle Animal Health
Fenbendazole	$\checkmark$	$\checkmark$		$\checkmark$	~	~					Uldi	1ml/20kg	Panacur 10%	MSD Animal Health
											Drench	TITI/ZUKY	Zerofen 10%	Chanelle Animal Health
Mahandarala	,				,			,		Clocantal	Oral	1 ml/Elm	Mebadown Super	Elanco Animal Health
Webendazole	$\checkmark$	$\checkmark$			$\checkmark$	~	<b>~</b>	~		Closafilei	Drench	тті/экд	Supaverm	Elanco Animal Health
Ovfondazala	,	,		,	,	,					Oral	1 ml/4 Elva	Bovex 2.265%	Chanelle Animal Health
Oxienuazoie	~	~		~	✓	~					Drench	Tmi/4.5Kg	Parafend 2.265%	Norbrook Laboratories
<b>N</b> 1 1 1												1ml//8kg	Allvorm 4%	Elanco Animal Hoalth
Ricobendazole	./	./	-	./	./	./	./				Oral	(1ml/5.33kg)	Allverin 4%	Eldrico Ariinal fiediur
(albendazole	· ·	Ŷ	Ŧ	•	Ů	Ť	v				Drench	1ml/5kg	Rycohen SC 2 5%	Flanco Animal Health
υλίας												(1.5ml/5kg)	Nycobert Se 2.5 /	Elanco / uninar ricultir
												1ml/10kg	Endofluke	Bimeda
												TIII/TOKY	Fasinex 100	Elanco Animal Health
							,				Oral		Fasinex 5%	Elanco Animal Health
							$\checkmark$	$\checkmark$			Drench	1ml/5ka	Tribex 5%	Chanelle Animal Health
Triclabendazole												iiii, sig	Triclafas 5% Drench	Norbrook Laboratories
													Triclacert 5%	Downland
	$\checkmark$	$\checkmark$		±			$\checkmark$	$\checkmark$	$\checkmark$	Levamisole			Combinex sheep	Elanco Animal Health
	$\checkmark$	$\checkmark$	$\checkmark$		<ul> <li>✓</li> </ul>		$\checkmark$	$\checkmark$	$\checkmark$	Moxidectin	Oral	1ml/5kg	Cydectin TriclaMox	Zoetis
	<ul> <li></li> </ul>	$\checkmark$	<b>~</b>		<b>√</b>		$\checkmark$	$\checkmark$	$\checkmark$	lvermectin	Drench		Fasimec Duo	Elanco Animal Health

DL=Developing larvae; AL= arrested larvae; NbL4 -= Nematodirosis battus L4; Late= late immature fluke (>7wk old fluke); Early=early immature fluke (<6 wk old fluke)

#### Group 2. Levamisole (2-LV) Sheep Products

•				•	-									
Active		Gutw	vorms		Lung	Таре		Fluke		Combination Rout		Dose Rate	Product	Company
	Adult	DL	AL	NbL4	Worms	Worms	adult	late	early	Active		(Fluke rate)		
											Oral	1ml/10kg	Chanaverm 7.5%	Chanelle Animal Health
	,	,									Drench	2.5ml/10kg	Levacur SC 3%	MSD Animal Health
	$\checkmark$	$\checkmark$	±	±							S/C Inj		Levacide Injection	Norbrook Laboratories
Levamisole											Oral Drench	1ml/10kg	Levacide Low vol	Norbrook Laboratories
	$\checkmark$	$\checkmark$		±	$\checkmark$		<ul> <li>✓</li> </ul>	$\checkmark$	$\checkmark$	Triclabendazole		1ml/5kg	Combinex sheep	Elanco Animal Health
	$\checkmark$	V		±	$\checkmark$		~			Oxyclozanide	Oral Drench	1ml/4kg	Downland Fluke and Worm	Downland
													Levafas Diamond	Norbrook Laboratories

Key:  $\checkmark$  = Active  $\checkmark$  = Combination active  $\pm$  = Variable activity

The information in these tables was correct at the time of printing (September 2017). Always check the data sheet before using any product.

### Group 3. Macrocyclic Lactones (3-ML) - Sheep Products

Active		Gutw	orms		Lina	Tane	Sheen		Fluke		Combination	Route	Dose Rate	Product	Company
Active	Adult	DL	AL	NbL4	Worms	Worms	Scab	adult	late	early	Active	noute	(Fluke rate)	Houdet	company
Abamectin	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$						Derquantel	Oral Drench	1ml/5kg	Startect Dual Active (POM-V)	Zoetis
Doramectin	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$					I/M inj	1ml/5kg	<b>Dectomax Injection</b>	Elanco Animal Health
Eprinomectin	$\checkmark$				$\checkmark$							Pour-on	2ml/10kg	Eprinex Multi	Merial Animal Health
														Animec	Chanelle Animal Health
														Depidex Drench	Elanco Animal Health
														Molemec	Mole Valley
														Oramec Drench	Merial Animal Health
	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$							Oral	2.5ml/10kg	Panomec Drench	Merial Animal Health
												Drench		Premadex Drench	Downland
														Noromectin Drench	Norbrook Laboratories
														Paramectin	Norbrook Laboratories
	~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			~	~	~	Triclabendazole	Oral Drench	1ml/5kg	Fasimec Duo	Elanco Animal Health
Ivermectin														Closiver	Downland
	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$	$\checkmark$		Closantel	S/C inj	1ml/25kg	Closamectin	Norbrook Laboratories
														Bimectin	Bimeda
														Ecomectin 1% Inj	Eco Animal Health
														Ivomec Classic	Merial Animal Health
														Molemec injection	Mole Valley
	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$					S/C Inj	0.1ml/5kg	Noromectin Injection	Norbrook Laboratories
														Panomec Inj	Merial Animal Health
														Paramectin	Newburgels Labourstanian
														Injection	Nordrook Laboratories
														Premadex 1%	Downland
														Qualimec Injection	Elanco Animal Health
												Oral		Cydectin 0.1%	Zoetis
	$\checkmark$	$\checkmark$	$\checkmark$		~							Drench	1ml/5kg	Zermex 0.1% Drench	Downland
														Cydectin 1%	Zoetis
Moxidectin	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		~					S/C Inj	0.1ml/5kg	Zermex 1% Injection	Downland
												S/C inj	0 Em//10/	Cydectin 2% LA	Zoetis
												base ear	0.5mi/10kg	Zermex 2% LA	Downland
	$\checkmark$	$\checkmark$	~		~		~	~	~	~	Triclabendazole	Oral Drench	1ml/5kg	Cydectin TriclaMox	Zoetis

DL=Developing larvae; AL= arrested larvae; NbL4 -= Nematodirosis battus L4; Late= late immature fluke (>7wk old fluke); Early=early immature fluke (<6 wk old fluke)

### Group 4. Amino-acetonitrile Derivatives (4-AD



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) Shee	4-AD			
ombination Active	Route	Dose Rate (Fluke rate)	Product	Company
	Oral Drench	1ml/10kg	Zolvix	Elanco Animal Health

# 5-SI

### Group 5. Spiroindole (5-SI) Sheep Products POM-V

Active		Gutw	/orms		Lung	Таре	Fluke			Combination	Route	Dose Rate	Product		Company
	Adult	DL	AL	NbL4	Worms	Worms	adult	late	early	Active		(Fluke rate)		1	
Derquantel	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$					Abamectin	Oral Drench	1ml/5kg	Startect Dual Active		Zoetis

### **Combination Wormers and Flukicides**

Active		Gutw	orms		Lung	Таре		Fluke		Combination	Route	Dose Rate	Product	Company
	Adult	DL	AL	NbL4	Worms	Worms	adult	late	early	Active		(Fluke rate)		
	,	,	,		,		,	,		huarmactin		1ml/2Ekg	Closiver	Downland
Clacantal	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$		ivennecun	S/C IIIJ	ПП/25ку	Closamectin	Norbrook Laboratories
Closantei	antel				,	,	,	,		Mohandazala	Oral	1ml/5kg	Mebadown Super	Elanco Animal Health
	~	~			~	V	$\checkmark$	~		Webenuazoie	Drench	mi/Jky	Supaverm	Elanco Animal Health
													Downland Fluke	Decordand
Oxyclozanide	$\checkmark$	~	/	±	$\checkmark$		$\checkmark$			Levamisole	Oral	1ml/4kg	and Worm	Downland
											Dielicit		Levafas Diamond	Norbrook Laboratories
	<ul> <li>Image: A second s</li></ul>	$\checkmark$		±	<ul> <li>Image: A second s</li></ul>		$\checkmark$	$\checkmark$	$\checkmark$	Levamisole	Oral		Combinex sheep	Elanco Animal Health
Triclabendazole	$\checkmark$	$\checkmark$	$\checkmark$		<ul> <li>Image: A second s</li></ul>		$\checkmark$	$\checkmark$	$\checkmark$	Moxidectin	Drench	1ml/5kg	Cydectin TriclaMox	Zoetis
	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	Ivermectin			Fasimec Duo	Elanco Animal Health

### Flukicides

Active		Gutw	orms		Lung	Таре	Fluke		Combination	Route	Dose Rate	Product	Company	
	Adult	DL	AL	NbL4	Worms	Worms	adult	late	early	Active		(Fluke rate)		
													Albenil 2.5% SC	Virbac
													Albex SC 2.5%	Chanelle Animal Health
												1 Eml/Eka	Albacert	Downland
Albandazala	./	./	+	./	./	./	,				Oral	т.эпп/эку	Benzimole	Mole Valley
Albenuazole	v	~	Ŧ	v	v	Ŷ	~				Drench		Endospec SC 2.5%	Bimeda
													Tramazole SC 2.5%	Tulivin/Denimex
												1 5ml/20kg	Endospec SC 10%	Bimeda
												1.5m/20kg	Albex 10%	Chanelle Animal Health
Ricobendazole												1ml/5.33kg	Allverm 4%	Elanco Animal Health
(albendazole oxide)	~	√	±	~	$\checkmark$	~	~				Drench	1.5ml/5kg	Rycoben SC 2.5%	Elanco Animal Health
crude,											Oral		Flukiver	Elanco Animal Health
	±						$\checkmark$	$\checkmark$			Drench	1ml/5kg	Solantel	Norbrook Laboratories
													Closiver	Downland
Closantel	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$		lvermectin	S/C Inj	1ml/25kg	Closamectin	Norbrook Laboratories
											Oral	4 1/51	Mebadown Super	Elanco Animal Health
	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		Mebendazole	Drench	1ml/5kg	Supaverm	Elanco Animal Health
Nitroxynil	±						$\checkmark$	~			S/C Inj	0.5-2ml**	Trodax	Merial Animal Health
						7	$\checkmark$					4.5ml/10kg	Zanil Fluke Drench	MSD Animal Health
											Oral		Downland Fluke	Deverland
Oxyclozanide	$\checkmark$	$\checkmark$		±	$\checkmark$		$\checkmark$			Levamisole	Drench	1ml/4kg	and Worm	DOWINGIN
													Levafas Diamond	Norbrook Laboratories
												1ml/10kg	Endofluke	Bimeda
												TIII/TOKY	Fasinex 100	Elanco Animal Health
							,	,	,				Fasinex 5%	Elanco Animal Health
							V	V	V				Triclafas 5%	Norbrook Laboratories
Triclabendazole											Oral	Oral Drench 1ml/5kg	Tribex 5%	Chanelle Animal Health
											Drench		Triclacert 5%	Downland
	<b>V</b>	<b>v</b>		±	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	Levamisole			Combinex sheep	Elanco Animal Health
	$\checkmark$	1	<b>v</b>		$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	Moxidectin			Cydectin TriclaMox	Zoetis
	-	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	Ivermectin			Fasimec Duo	Elanco Animal Health

\*\* Dose range 0.5ml 14-20kg; 0.75ml-20-31kg; 1ml 31-40kg; 1.5ml 41-55kg; 2ml 56-75kg

Key:  $\checkmark$  = Active  $\checkmark$  = Combination active  $\pm$  = Variable activity

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