6.4.2 Check the dosing gun

Dosing guns should be checked regularly to ensure that they are delivering the required dose. For drenches, this should be done by delivering two or more 'doses' into a graduated measuring device (e.g. a 20 ml syringe), immediately before dosing commences. Use the anthelmintic not water, because the higher viscosity anthelmintic will be a better 'test' for the equipment.

6.4.3 Dosing technique

Dosing guns are designed to deliver into the oesophagus and not into the buccal cavity. If anthelmintic is administered into the buccal cavity and then swallowed, some or the entire dose may by-pass the rumen and go direct to the abomasum because of the action of the oesophageal groove. Anthelmintic that enters the abomasum is absorbed and metabolised very rapidly. This means that the parasite may have insufficient exposure to the anthelmintic to provide the expected level of efficacy.

Injections should be given either subcutaneously or intramuscularly at the recommended site of injection, following manufacturer's instructions. When given subcutaneously, care should be taken to ensure that the needle is inserted correctly by parting the fleece, and should be withdrawn from the skin with pressure applied at the point of insertion for several seconds to prevent leakage. For injectable, long-acting moxidectin, for example, the site of subcutaneous injection is the base of the ear.

6.4.4 Restrict feed before dosing

Where a period of feed-restriction is unlikely to be harmful (but NEVER for ewes in late pregnancy), the activity of 1-BZ and 3-ML anthelmintics can be enhanced by withholding food for 24 hours before dosing (access to water must be maintained). The slower rate of digesta flow from the rumen prolongs the availability of the anthelmintic for absorption by both the sheep and the parasite, and can significantly improve anthelmintic efficacy and reduce selection pressure for AR.

6.4.5 Do Not Mix

Anthelmintics must not be mixed with any other products prior to administration.

6.5 Use anthelmintics only when necessary

6.5.1 Dosing of ewes at tupping

There is a strong case for withholding anthelmintic treatment from ewes at tupping, or dosing only those individual sheep that appear to require treatment on the basis of low condition, or FAMACHA score (see section 8.2.5). Pre-tupping, very few adult ewes will have significant worm burdens and FECs are likely to be very low because they have a strong acquired resistance to worms. Treatment at this time selects heavily for AR because any worms that survive the anthelmintic treatment from this small population will enjoy a prolonged period or reproductive advantage, during which they dominate worm egg production. In addition, there is concern that removal of the ewes' worm burden may temporarily reduce the strength of her acquired immunity, thus being counterproductive.

It is recommended that only lean, immature or clinically affected ewes, are treated at this time.

The other exception is where *H. contortus* is known to be present on farm and where preventative treatment may be required. Any treatment of ewes during the autumn and winter months will exert a powerful selection pressure, because most of the worm population that survives over winter with this parasite does so as hypobiotic L4 in the sheep, rather than as L3 on pasture, thus the *'in refugia'* population is relatively small. FEC monitoring and a knowledge of each farm's *H. contortus* status will assist with the decision making process.

6.5.2 Dosing of ewes at turn-out

For most of the season, healthy adult ewes have high levels of acquired immunity. However, during the period of the peri-parturient relaxation of immunity (PPRI), their immunity wanes and FECs rise. (Section 3). Treatment at this time may have less serious consequences for the development of AR, but the timing of dosing and the choice of anthelmintic are both important. If ewes are still

8.3 Risk management for pastures

	HIGH	MEDIUM	LOW
SPRING	**Ewes and lambs in the previous year** **For *Nematodirus* carried ewes and lambs in the previous spring** **Goats the previous year** **Store/ewe lambs the previous autumn/winter**	**Grazed only by adult non lactating sheep the previous year** **Grazed by ewes and lambs previous spring but then conserved and aftermath not grazed by sheep *(NB Nematodirus still high risk)***	**New leys / seeds or forage crops** **Cattle or conservation only in the previous year**
SUMMER	**Ewes and lambs in the spring**	**Adult non lactating sheep only in the spring** **Cattle or conservation in the spring**	**Cattle or conservation only in the first half of the grazing season** **Forage crops or arable by-products**
LATE SEASON / AUTUMN	**Ewes and lambs all season**	**Grazed by cattle since mid season** **Grazed by mature dry ewes since weaning mid-season**	**Cattle or conservation only in the first half of the grazing season** **Forage crops or arable by-products**

8.4 Other management actions

8.4.1 Weaning

Action can be taken from late June, when lambs can be moved on to less contaminated areas after weaning, thereby avoiding the high levels of infectivity on pastures they have grazed with their mothers since turnout. Ewes can be left on the heavily contaminated grazing, while lambs require a much smaller area, for example an aftermath or pasture grazed by cattle since turnout.

8.4.2 Grouping lambs by age

Keeping lambs in tight age groups at turnout has benefits when it comes to the need for treatment and the utility of FECs in determining treatment requirements and other management decisions, for example weaning and withdrawal times post treatment when drawing for market.

8.4.3 Mixed grazing and Reduced Stocking Densities

The level of contamination on a pasture can be reduced by grazing cattle, ***(not goats),*** and sheep together. This effectively reduces the stocking density of the host species, but can make pasture utilisation more difficult. A system of rotation between the cattle and sheep during the season would address this though has practical issues.