



Select the appropriate anthelmintic

Unnecessary exposure of worms to an anthelmintic can lead to increased selection pressure for anthelmintic resistance without providing any advantage in terms of worm control. This means that choosing the right product and getting the most from it are key factors, not only in the fight against anthelmintic resistance but also in ensuring optimum sheep performance at least cost. Knowledge of the various worm species on a farm and their respective AR status is vital for long term sustainable control. This will involve regular monitoring and testing, together with speciation to make sure the right worms are targeted. Click [here](#) for a full list of products available.

Use narrow spectrum anthelmintics where possible

Using narrow-spectrum drugs, for example, when one worm species is the target (e.g. *H. contortus*), is one option. Closantel or nitroxylnil, which have a narrow spectrum of activity against *Haemonchus* and *Fasciola*, are examples. On some farms, *Teladorsagia* and *Trichostrongylus* may be highly resistant to 1-BZ products while *Nematodirus* worms are susceptible to that class. In these flocks, the 1-BZ group could be considered as a narrow-spectrum anthelmintic against *Nematodirus*. This would avoid the off-target exposure of *Teladorsagia*, *Trichostrongylus* and others, to the three other broad-spectrum classes of wormer.

Avoid off-target use in combination products

Similarly, the use of combination products (for example a flukicide plus broad-spectrum wormer) should be avoided when only liver fluke is the target for control. Instead, the narrow-spectrum flukicide should be used, appropriate to the time of year. This also applies to the endectocides which have activity against both nematodes and sheep scab mites (*psoroptes ovis*).

Use of Larval Culture / PNA staining with FEC

Identification of the target pathogenic nematode species is important where *Haemonchus contortus* is suspected. larval culture and larval differentiation in conjunction with FEC can be used or alternatively PNA staining will differentiate *Haemonchus contortus* in faecal samples.

Using anthelmintics with persistent action

There are two sheep anthelmintic products on the UK market with persistent action - moxidectin (MOX) against *T. circumcincta* and *H. contortus*, and nitroxylnil against *H. contortus*. There is also a long-acting, injectable formulation of MOX giving greater periods of activity of approximately 14-16 weeks for these species respectively.

There has been much discussion with respect to the role of anthelmintics with persistent action; some say they have the potential to hasten the development of AR, because they continue to prevent the establishment of L3 for extended periods after dosing: conversely, MOX is a milbemycin and considered as more efficacious against 3-ML-resistant parasites than the avermectins (ivermectin and doramectin), so fewer ML-resistant parasites will remain in the sheep after dosing with MOX.

In recent years, MOX 2% (long acting injection) has been use increasingly as a treatment for ewes around lambing. However, a complicating factor is that there has also been increased use of this product as a control measure for sheep scab which results in significant inadvertent selection pressure on the worm population, often at times of low refugia over the winter months. Together with confirmed resistance not only in worms but also scab mites to MOX, SCOPS and Zoetis (manufacturer) held a joint workshop to agree best practice guidelines to protect the efficacy of MOX. A summary of the outputs and advice to prescribers and farmers plus a full record of the [meeting](#) are available on the SCOPS website – click [here](#)

In the case of **nitroxylnil**, the use of the narrow-spectrum anthelmintic to control *H. contortus* is almost always preferable to using a broad-spectrum drug, when only that species is the target for control. However, the use of nitroxylnil or closantel at times of year (e.g. autumn / winter) when the population of *Haemonchus* 'in refugia' is low is likely to be highly selective for AR and should be considered carefully.



Rotation of anthelmintic group – is this still valid?

Historically, rotation of anthelmintic group was considered to be a useful tool to delay the development of resistance and it was a message that was picked up widely by the industry. However, given we now have widespread 1-BZ-resistance and increasing incidence of resistance to the 2-LV and 3-ML anthelmintic groups, rotation is **unlikely to be effective**, because reversion is unlikely to occur once resistance has been detected in a worm population.

Rotation between anthelmintic classes should certainly not take precedence over other more important decisions about selection of anthelmintics. In particular, quarantine strategies for introduced sheep should be applied as a priority. Similarly, the option to use of a narrow-spectrum treatment (such as a 1-BZ against *Nematodirus*) should be considered wherever possible and the use of the 4-AD and 5-SI groups as a mid/late season dose is also important.