Implementing SCOPS quarantine treatment guidelines for sheep

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While the routine use of highly effective, modern anthelmintics has controlled gastrointestinal worms very successfully in the majority of UK sheep flocks, increasing reports of anthelmintic resistance (AR) have meant groups of wormers are no longer effective against some worm species in many parts of the UK (Bartley et al, 2003; Taylor et al, 2009; McMahon et al, 2013a).

Early reports and concerns over AR led to the production of the Sustainable Control of Parasites in Sheep (SCOPS) guidelines. These guidelines, first produced in 2004, were founded on research-based evidence and best practice principles for sustainable control of parasites in sheep (Abbott et al, 2012).

Implementation of SCOPS worm control guidelines requires ongoing consultations between farmers and their vets or advisors, requiring expert knowledge of worm parasites, and practical and detailed understanding of farms and their sheep flocks, and the health plans needed for other diseases and conditions. This has not proven easy, as data from surveys carried out in the UK suggest farmers have been relatively slow to adopt the guidelines (Morgan and Coles, 2010; McMahon et al, 2013b).

However, a study by Learmount et al (2016) has provided some evidence of the economic benefits of implementing the SCOPS initiatives by showing a significant reduction in anthelmintic use on the SCOPS farms, without loss in performance, compared to farms that implemented more traditional intensive worming practices, which exert a higher selection pressure for AR.

Treatments

Panel 1. The Sustainable Control of Parasites in Sheep three-step guide to quarantine treatments

1. Treat all sheep brought on to the premises with anthelmintics likely to remove both resistant and

susceptible genotypes of all worm species.

2. Hold sheep off pasture for 24 to 48 hours, until any worm eggs present in the gut have passed out in the faeces.

3. Turn out on to contaminated pasture to minimise the impact of any worms that survive treatment on the farm's anthelmintic resistance status.

One of the underlying principles of the SCOPS guidelines is preventing the introduction of resistance on farm through the effective treatment of all imported sheep (and goats).

The rationale for the recommended quarantine treatment strategy being if any resistant worms are present and survive treatment then their numbers should be so low that the emergence of AR will be greatly delayed. This may be increasingly difficult on farms where resistance to more than one group of drugs (multiple resistance) is reported.

SCOPS guidelines recommend all incoming sheep are treated sequentially with two wormers from different broad spectrum groups with the lowest frequency of reported resistance in the UK. The current recommendation is quarantined sheep should be treated with moxidectin (3-ML) and one of the POM-V anthelmintics, either monepantel (4-AD class), or derquantel (5-SI class) – available as a dual active with abamectin (3-ML).

Quarantine treatment is a three-step process summarised in **Panel 1**. Treatments should include sheep purchased from other flocks (including rams) and sheep that have been grazing on other farms (or common grazing) where the resistance status is unknown or likely to be different from the home farm. The recommendations also apply to any goats introduced to the farm because they carry the same worms as sheep.

The principle behind these treatments is moxidectin will remove all worms that might be resistant to 1-BZ and/or 2-LV (and, to some extent, those resistant to other 3-ML), and the 4-AD (monepantel) or 5-SI (derquantel) and abamectin dual active will remove all parasites, including those resistant to the 3-ML class (Taylor, 2012).

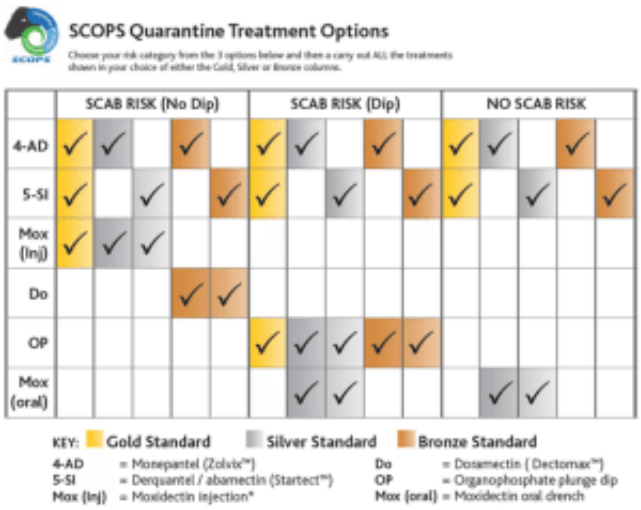

Figure 1. Sustainable Control of Parasites in Sheep quarantine treatment matrix based on “scab-risk”.

After sheep have been treated, they should be held away from pasture for a minimum of 24 to 48 hours. This time period allows eggs produced by worms before treatment to pass out in the faeces. After 24 hours, about 90% of the eggs will have been passed and, by 48 hours, 99% will have gone.

Faeces passed in 24 to 48 hours post-treatment should not be applied to pastures that will subsequently be grazed by sheep or goats and should by disposed of by incineration or by application to ground not grazed by sheep (Abbott et al, 2012).

Following the period of confinement off pasture, the treated sheep should be turned out on to pastures already contaminated with worm eggs and larvae originating from home-reared sheep. This is to ensure the genes of any surviving worm progeny will be diluted by those of pre-existent, free-living stages on the contaminated pasture.

This will have the effect of keeping any introduced resistant genes at a low frequency in the free-living population, while encouraging rapid reinfection of the newly introduced sheep to indigenous worms as quickly as possible and limit the time when resistant worms may be dominant post-treatment.

In some circumstances, the efficacy of the quarantine treatments should be assessed by faecal egg count (FEC) and, if positive, further treatments may be required until FECs are zero. However, a negative result may not mean a zero FEC, depending on the test sensitivity. Most laboratories use a standard McMaster method with a test sensitivity of ?50epg, and, for post-treatment quarantine FEC, a more sensitive FEC method may be indicated.

Other parasitic diseases will also have to be considered in the quarantine strategy and the

treatment strategy adapted accordingly based on risk assessment. The suggestive SCOPS quarantine treatment matrix that also takes into account “scab-risk” is shown in **Figure 1**.

Panel 2. Fluke risk assessment

Low: no suitable mud snail habitats or history of liver fluke.

Medium: no history of liver fluke, but suitable mud snail habitats present.

High: previous history of liver fluke and suitable mud snail habitats.

The risk from liver fluke and the need for treatment can be considered under the three scenarios listed in **Panel 2**. With a low-risk scenario, even if fluke-infected animals are introduced, transmission and establishment is unlikely to occur, and a test and treat policy to maintain health and productivity of individual animals can be considered as an alternative to quarantine treatment.

With the medium-risk and high-risk scenarios, there is the chance surviving fluke become established and/or resistant fluke populations are introduced. In both of these situations, two treatments may be required depending on the time of year and presence of immature fluke.

As immature fluke are most likely to be present in the autumn, which coincides with many of the sheep sales in the UK, then incoming sheep should be treated with triclabendazole on arrival, followed by a further treatment six weeks later with either closantel or nitroxynil. As sheep can pass fluke eggs for up to three weeks after any adult fluke are killed, sheep should be kept either in quarantine or on “low-risk” pastures with no fluke habitats for at least four weeks post-treatment.

An alternative is to treat with closantel or nitroxynil on arrival then repeat six to seven weeks later, or use FEC monitoring to determine the need for any subsequent treatments.

Case study

Having been involved with SCOPS since its inception, and worked on SCOPS-related research projects for more than a decade, it has been evident that implementation of the quarantine principles has often proved difficult for both advisors and farmers.

The opportunity arose for the author to establish his own small flock of sheep on newly acquired premises in the Yorkshire Wolds with land not previously grazed by sheep for a number of years, which, for all intents and purposes, could be deemed “clean” or safe grazing. This led to the acquisition of four Hebridean gimmers from a colleague who kept a small flock of this breed. The challenge was to not only establish a small flock, but, being a parasitologist, also aim to keep them “parasite-free” as far as possible.

The area of the Wolds where the flock is situated is mainly arable with few livestock premises nearby. Contact with other sheep was, therefore, highly unlikely, but before any sheep could be introduced, the sheep field was fenced with new posts, netting and a field shelter with handling pen installed. Areas of the field were resown with grass seed and, by late May 2016, there was a good sward height that required topping.

Quarantine protocol

Prior to the sheep arriving, a visit and inspection were made on their premises of origin in the Yorkshire Dales. No history of sheep scab and liver fluke existed, nor of any significant worm problems on the farm – the latter possibly a consequence of low stocking densities, an element of natural innate breed resistance to worms, an appropriate worming programme, or a combination of all these factors.

Figure 2. Fresh sheep faecal pellets.

The quarantine procedure, therefore, seemed fairly straightforward and it was decided to treat with moxidectin (cydectin 1% injectable solution) on the origin farm prior to loading and departure, and with monepantel on arrival. This strategy was deemed to be the least stressful for the sheep, which were not used to too much handling at this stage. It also fulfilled step one of the SCOPS three-step guide to quarantine treatment (**Panel 1**) and, in the author‘s mind, was equivalent to “gold standard” from the choices in **Figure 1**, based on risk assessment, and being the most practical and cost-effective option. The single injection of moxidectin 1% also had the added benefit of negating any potentially, albeit low scab risk, which gave 28 days of protection.

Post-treatment monitoring

Fresh faecal samples were collected from all four sheep for FEC prior to treatment with the oral monepantel, which was given by syringe at the recommended dose (2.5mg/kg) for 31kg to 35kg animals. As the animals were restless and agitated, it was decided to release them into their field – rather than pen and isolate – and collect all faeces off the ground for a period of 24 hours.

While this did not comply with steps two and three (**Panel 1**), contamination was effectively

prevented by faecal removal, and dilution with indigenous worms was not an issue due to the “low risk” or “clean” status of the field.

Faecal samples were examined by the improved modified McMaster technique with a sensitivity of 50epg (Ministry of Agriculture Fisheries and Food, 1986). Three samples were positive (ranging from 50epg to 150epg) and one negative (