Detecting Anthelmintic Resistance

Testing for anthelmintic resistance (AR) is a vital part of the SCOPS recommendations. Early detection is essential because it encourages the adoption of practices which will sustain the effectiveness of anthelmintics. However, it is also important to balance the positive advantages of early detection of AR with the danger of over-stating the situation, which may deter farmers from taking appropriate action.

There are a number of benefits to testing for AR:

- Improves health of stock by ensuring any treatments administered have been effective.
- Improves productivity because reduced anthelmintic efficacy can lead to lower weight gains.
- Saves money by avoiding the use of ineffective treatments and the need for repeat treatments.
- Helps better decision making and product choices.
- Encourages the adoption of practices that will reduce the selection pressure for AR.

The presence of AR is dynamic. It will vary according to season and the worm species/strains present at the time a test was carried out, as well as the specificity and sensitivity of the test in detecting resistant alleles within the worm population. It is important, therefore that we do not assume we have full knowledge of the situation on an individual farm on the basis of one test for AR. It is common to find that the efficacy of the different actives changes throughout the season as the prominence of different roundworm species changes.

The most reliable method to test for resistance is by controlled comparisons of post-mortem worm counts in treated and untreated animals. However, this is usually restricted to experimental settings. Within farm settings, the presence of anthelmintic resistance can be detected in flocks in a number of ways. These vary in terms of their cost, complexity and robustness and are usually divided into *in vivo* (drench test and FECRT) and *in vitro* tests.

Post-dosing faecal egg counts ("Drench Tests")

A quick indication of the efficacy of an anthelmintic can be gauged by laboratory testing composite faecal samples from 10 sheep following treatment. It is vital that the animals are given the right dose and it is administered correctly. See the checklist below:

Drench test method:

1. Record treatment group and reasons for treatment.
2. Optional (see above)* - take faecal samples at random from 10 lambs and pool for FEC (to ensure at least 200 epg present and provide a baseline).
3. Record date of treatment and class of anthelmintic used. Ensure the group are all treated, and the dose administered is accurate.
4. Identify date for post treatment sample collection (after 7 days for 2-LV or 14 days for all other classes*) and collect faeces at random from 10 individuals for FEC
5. Pool the samples and undertake FEC.
6. Record FEC epg. There should be no eggs present if the wormer was working effectively
7. *If a pre-treatment sample was taken, then a reduction of 90% or more is considered to indicate efficacy of treatment for this test.

**Note: that current recommendations to check for Nematodirus resistance is to do a drench test 7 days after treatment.*

This test is an indicator of anthelmintic efficacy and not necessarily anthelmintic resistance *per se*, because many other factors can influence test results. **The utility of this test is improved if faecal samples from 10 sheep in the dosed group are collected and submitted on the day of dosing**. This provides a baseline from which an estimate of the reduction in FEC achieved can be calculated (and to confirm there was a measurable epg before treatment). A reduction of >90% is used as a guide to an effective treatment.

Faecal Egg Count Reduction Tests (FECRT).

A more structured on-farm test can be conducted in which several different anthelmintics are tested against a control. Ten to fifteen** sheep are randomly allocated to treatment groups, which might include a 1-BZ, 2-LV, 3-ML, 4-AD and 5-SI. FECs are collected on day 0 (pre-treatment) and post-treatment (7 days for 2-LV and 14 days for 1-BZ, 3-ML, 4-AD and 5-SI.

The percentage reduction is calculated by comparing the mean FECs pre and post treatment¥. AR is suspected if the percentage reduction is <95%. This is a very straightforward, well-established and, at the moment, the only on-farm method to calculate AR. However, the FECRT has some important limitations, due the composition of parasite species and the high variability in FECs as well as being relatively expensive and time consuming. Results may also differ according to whether arithmetic or geometric means are used in the calculations. Where necessary, the advice of an expert should be sought, where more advanced statistical methods can be used to improve the reliability of the results.

***NB. Sheep that have not been dosed within 30 days (or longer if MOX has been previously used), and a mean FEC of 150 epg or more is recommended before starting the trial.*

¥ WAVVP guidelines also use an untreated control group but current practice and robust statistic packages now available (e.g. Univ. Zurich egg counts software) suggest that only pre and post treatment groups are acceptable. A simple spreadsheet is also attached in this section of the SCOPS website.

FECRT method:

1. **Day 0. Randomly select and identify four groups with 10 sheep in each group.**
2. **Collect individual faecal samples from each lamb – directly from the rectum if possible.**
3. **Record weights of individual animals and calculate required dose for the anthelmintics.**
4. **Drench each different group with a different class of wormer and leave one group untreated as a control if required (see above).**
5. **Submit individual samples for FECs.**
6. **Determine date for re sampling at 7 and 14 days (see above). Re sample as on Day 0 and undertake FECs.**

7. Calculate the % change in egg count – See the spreadsheet to calculate the efficacy of the treatment.