Panel 2. On-farm factors that increase selection pressure for anthelmintic resistance

- High treatment frequency
- Underdosing due to poor weight estimation
- Continual use of anthelmintics or flukicides from the same class of anthelmintics
- Factors that promote low refugia, such as dose all animals, then move to clean pasture

infection levels – especially if wet weather continues into autumn when cercariae shed by snails migrate well on to pasture.

Flukicides do not have persistent activity, and animals can be reinfected soon after treatment, so treatment should be administered after housing. With the exception of triclabendazole, most flukicides are not 100 per cent effective against immature *F hepatica*. Due to triclabendazole resistance, use of this product should be limited in cattle and an alternative product used for targeting older fluke.

Consequently, treatment should be applied six weeks following housing to allow recently ingested flukes to develop to a stage where they should be drug sensitive. The use of flukicides in milking cattle is complicated; many products are not licensed for use in dairy cows, or milk withdrawal periods are substantial. For up-to-date information, refer to www.cattleparasites.org.uk/guidance/COWS_Flukicides_product_table.pdf

Mild winters allow better survival of fluke-infected snails, which can cause infection early the following year. As well as housing treatment, on farms where heavy infection is identified, flukicide treatment two to three months after turnout may help reduce infection of snails, and hence pasture, for the remainder of the year.

Rumen fluke has the same snail intermediate host as liver fluke, so is found in similar regions. It has received some attention as a pathogen, although its true impact on health and production remains to be confirmed. Some cases are described where young animals have shown clinical signs, with deaths reported. In terms of treatment (oxyclozanide), this should be applied only on veterinary advice, when a specific diagnosis of infection has been made based on testing (**Table 2**).

Grazing management

Risk of helminth-associated disease can be reduced by avoidance of highly contaminated grazing. Low-risk pastures (newly seeded fields, aftermath or pastures not grazed by cattle over a year) should be prioritised for grazing susceptible stock.

Silage or hay aftermath poses a low risk, provided it has not been grazed by cattle (or fluke-infected sheep) since the previous season. An anthelmintic should be given when moving to aftermath to reduce contamination, but some animals (the heaviest) should not be treated to maintain an element of refugia to reduce selection pressure for resistance.

Mixed or alternate grazing with sheep (**Figure 3**) can reduce infectivity for nematode infections, but this may increase liver fluke risk for cattle. If fields rested for a year contain mud snail habitats or were recently grazed by sheep, fasciolosis is still a risk. Good grazing management is critical in controlling liver fluke; implement practices that reduce the risk infection from the environment, including eliminating/avoiding snail habitats by improving drainage or fencing off wet areas.

Diagnostics and when to use them

Diagnostic tests should be used to support implementation of sustainable helminth control. Generally, tests can be used to help identify patent infections to support targeting of anthelmintics to reduce shedding of eggs/larvae. Tests are also useful in defining efficacy of anthelmintics.

Standard "McMaster-type" FEC tests for GI nematodes should be used in first season grazing calves to identify contamination on to pasture. Testing at housing is of no value, because the worm stages that are to be targeted for treatment are immature and do not release eggs.

Similarly, though, using slightly different methodology, FEC tests can be used to detect fluke infection. Sedimentation FEC tests can be used to distinguish liver and rumen fluke eggs. However, the method can be time-consuming and only detects adult worms (approximately 10 to 12 weeks postinfection).

In the late housing period, liver fluke FEC testing allows identification of residual infections and can be used to guide application of flukicides prior to turnout.

The "coproantigen" test can also be used for detecting liver fluke infection. It has been shown to detect *F hepatica* infection two to three weeks earlier than sedimentation-based FEC tests and can be used to examine flukicide efficacy one week post-treatment (compared to the three weeks required for standard FEC reduction tests). **Panel 1** explains best practice to perform FEC tests.

Testing for lungworm first stage larvae using the Baermann test is recommended in suspected outbreaks. At least 10g of faeces are required. Similar to the tests outlined previously, the Baermann will not detect pre-patent infection.

Serum or milk antibody-based tests specific for *O ostertagi*, *D viviparus* and liver fluke are available. These are most useful in establishing if groups of animals have been exposed to infection over the grazing period. These are not useful for testing anthelmintic efficacy, as antigen-specific antibody levels take several months to drop.

Anthelmintic resistance

Anthelmintic resistance in the UK sheep industry is well-recognised, with multiple reports of resistance to class one to three anthelmintics, including multi-class resistance. It is less recognised in the cattle sector, but this does not mean it does not exist. Few large studies have been undertaken and in those small studies that have investigated resistance, it has been identified – especially in *C oncophora*.

An EU-wide study spanning the UK, Germany, Italy and France indicated low efficacy of ivermectin and moxidectin in more than 50 per cent of farms studied in Germany, France and the UK. *Cooperia* species were most frequently identified after treatment, although *O ostertagi* was identified in post-treatment samples on some UK and German farms.

Fluke resistance to the most potent compound, triclabendazole, is common in some parts of the UK – particularly in sheep. While treatment failure has been less commonly reported in cattle, both cattle and sheep are infected with the same populations when co-grazed. Because of triclabendazole resistance, it is recommended this product is only used in cattle when it is likely to have maximum effect; that is, in youngstock on high-risk pastures or cattle showing signs acute infection in autumn (**Panel 2**).

Product efficacy should be assessed at farm level. For nematode infections, the FEC reduction test (FECRT) is the method of choice. Although the test is relatively insensitive and only detects resistance genes once they are present at relatively high levels, it is the best option.

As a "look-see", dung samples can be taken one or two weeks post-treatment from around 10 animals that have been grazing together. This provides a rough estimate of anthelmintic effectiveness.

If positive FEC are identified, a FECRT should be done. Here, individual samples are taken from as many animals as possible (10 plus) at treatment and two weeks later. Resistance is suspected if the mean reduction in FEC compared to day zero of the FEC is lower than 95 per cent. Other classes of anthelmintic would need to be considered for nematode control.

Sedimentation FEC reduction tests and coproantigen tests can be used to assess effectiveness of flukicides. For further information on these tests, refer to the UK cattle industry group Control

Continued on **page 4**

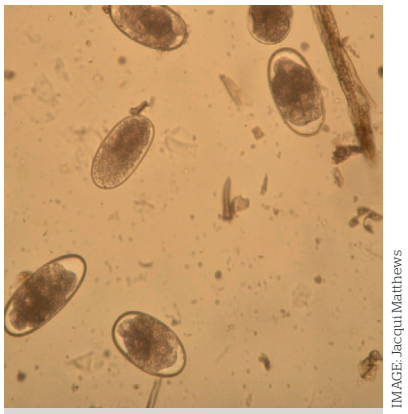

IMAGE: Jacqui Matthews

Figure 1. Typical trichostrongyle eggs observed in cattle samples during faecal egg count testing.

Figure 2. Adult lungworm in the trachea and mainstem bronchi of an infected animal at postmortem.

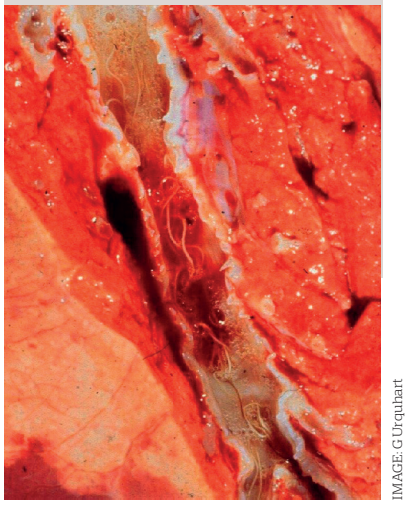

IMAGE: G Urquhart