Diagnostic and management protocols for liver fluke

Author : Sara Pedersen

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Liver fluke disease is caused by the internal trematode *Fasciola hepatica* and has been reported in livestock since the 13th century (Froyd, 1969). However, in the past 15 years the incidence of clinical fasciolosis has been increasing, along with the geographical spread of high risk areas (van Dijk and Skuce, 2015).

The most recent survey of 606 dairy farms across mainland Britain during October to December 2012 found 77.5% of farms in England, 88% in Wales and 73.4% in Scotland had been exposed to *F hepatica* based on bulk milk samples (Howell et al, 2015).

The study also found 46% of farmers were treating adult cattle against liver fluke and thus demonstrates a good level of awareness of the parasite. However, the increasing prevalence of the disease and the significant economic impact associated with infection highlights the need for close monitoring and management.

Diagnosing fluke status

Diagnosing active liver fluke infection is not straightforward as some tests only provide an indication of exposure and not necessarily current infection. However, they can add value in conjunction with clinical signs and fluke forecasts or help to provide an indication of degree of exposure at herd level.

Postmortem liver examination

Figure 1. Adult liver fluke present in bile ducts. Image: ©University of Liverpool.

Postmortem liver examination is the most definitive way of diagnosing all forms of liver fluke disease (acute, subacute and chronic). The identification of larval stages in the liver parenchyma or adults in the bile ducts (**Figure 1**) or gall bladder provide evidence of current infection.

The presence of fibrosis and calcification of the bile ducts (**Figure 2**) can also indicate previous infection, even in the absence of larval or adult fluke being present. However, it is important this is differentiated from general fibrosis of the liver, which is present following toxic insults such as ragwort poisoning (Daniel, 2003).

Monitoring livers at the abattoir is a very effective way of identifying whether liver fluke is present, and the prevalence of infection in the herd. Most abattoirs now report back if they have found disease or not, but if they don’t and livers are being condemned, then liver fluke is the most likely reason and this should be investigated further.

Faecal egg count

Figure 2. Damage to a liver caused by migrating larvae. Image: ©University of Liverpool.

In contrast to other internal parasites, liver fluke faecal egg counts are often reported as positive or negative rather than eggs per gram (epg), since egg numbers are not reliably related to infection level and are often low (two to five epg; Daniel, 2003). Submission of a greater quantity of faeces (30g) enhances the likelihood of fluke egg detection (Conceicao et al, 2002). Across a herd, infection may not be spread evenly and thus a small number of animals may carry a significant burden while others may be unaffected. Therefore, composite samples taken from a number of animals (that is, 10 × 5g faeces) can increase the likelihood of fluke eggs being found if infection is present in the herd.

A positive result indicates adult fluke are present in the bile ducts; however, since eggs can be passed for up to three weeks post-treatment, a positive result must be interpreted in conjunction with treatment history. False negatives can also occur since eggs are only excreted by adult fluke, not larval stages, and thus will not be present during the prepatent period (10 to 12 weeks). In addition, as fluke eggs can pool in the gall bladder, they may only be excreted intermittently into the intestines.

Bulk milk antibody test (ELISA)

Only applicable to dairy herds, a bulk milk antibody test provides a snapshot ofthe level of infection the herd has been exposed to (high, moderate, low or no infection). As a general rule, the higher the result, the higher the proportion of the herd infected/exposed.

Bulk milk samples can be repeated, easily providing a cost-effective tool to monitor levels of infection throughout the grazing season and the efficacy of any implemented control programmes.

Individual blood antibody levels

Antibody levels against *F hepatica* measured by ELISA are detectable two to four weeks after ingestion of infective eggs and will persist for four to 10 weeks following treatment with a flukicide (Williams et al, 2014). Therefore, a positive result doesn't prove active infection, just that the animal has been exposed to infection. The commercial ELISAs available provide high sensitivities (86% to 100%) and specificities ranging from 83% to 96% (Charlier et al, 2014).

Management protocols

Figure 3. Tack sheep are an important consideration when devising control strategies.

Control strategies must be considered not only on a farm by farm basis, but also year on year, since the risk and the timing of potential disease will vary.

All factors associated with infection must be considered, including other animals on the farm (particularly tack sheep; **Figure 3**), history of the herd, the level of challenge and possible wildlife reservoirs.

Strategies commonly involve a combination of both flukicide treatment and management of environmental factors. The aim is not to eliminate infection, but to find a balance between the costs of treatment versus the economic benefit.

Treatment

Following the European Commission regulation changes in July 2013 regarding the use of some flukicides in animals producing milk for human consumption, the treatment choices for dairy cattle are somewhat limited.

The only products licensed for use in lactating dairy cattle treat adult fluke only and are albendazole (60-hour milk withhold) and oxyclozanide (72-hour milk withhold). Fasinex 240 (Elanco Animal Health) and Endofluke (Bimeda) may be used at dry off; however, milk for human consumption can only be taken from 50 days and 47 days following treatment respectively.

Although treatment at dry off is common practice, the impact of this strategy on the dynamics of the fluke population, and thus level of control achieved, is unknown.

Treatment options in beef cattle are less restrictive and thus a more strategic treatment plan can be implemented. Traditionally, advice has been to treat with triclabendazole at housing and potentially repeat treatment later into the housing period with a different flukicide when all previously untreated early larval stages will have developed into adults.

However, a study by Forbes et al (2015) has challenged whether a second treatment is cost-effective based on weight gain.

Environmental management

Alongside flukicide treatment, environmental management is a key component of any fluke control strategy to reduce infection levels in the snails as well as the cattle. While molluscicides are an effective way of reducing snail populations, they are not permitted in the UK due to their effects on the environment. Another way of reducing snail habitats is to drain waterlogged pasture; however, in reality it is often cost-prohibitive and impractical.

Howell et al (2015) concluded when controlling subclinical infections in dairy herds, management factors were as important as most climatic and environmental factors. The single biggest predictor of exposure to infection was rainfall and accounted for 23% of the variation in degree of exposure between herds.

While little can be done about rainfall, farm management factors were highlighted as being one area where some risk factors could be influenced. In the study these accounted for 21% of the variation seen between herds. Grazing boggy pasture, presence of beef cattle on the farm, access to a stream or pond and smaller herd sizes were all significantly associated with increased risk of exposure.

Liver fluke has increasingly become a more widespread problem, with a high proportion of herds exposed to some degree.

While eradication of infection is almost certainly impossible, the aim must be to limit the effect of disease on productivity through a carefully designed control strategy for the individual farm.

While flukicides are an important tool in the treatment and control of infection, emphasis must also be placed on management factors, with the aim being to reduce fluke populations in both the cattle and snails.

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