

Taking Action to Tackle Liver Fluke in Sheep and Cattle

OUTPUTS FROM WORKSHOP HELD AT THE UNIVERSITY OF LIVERPOOL 11th MARCH
2013

The workshop, held under the auspices of 'COWS – Control of Worms Sustainably', brought together farmers, producers, academics and funders to identify key research needs to improve control of *Fasciola hepatica* in sheep and cattle. Three areas where more research was needed were identified:

1 Diagnostics for liver fluke and Paramphistomes

- Sheep, dairy and beef enterprises all have different management systems therefore different diagnostic requirements.
- Sheep – tests or systems to provide early warning of acute fluke
 - rapid reports from abattoirs back to farmers particularly for fat lambs
 - better forecasting systems at a local level to help advise on when to treat in a specific area
 - pen-side diagnostic tests for individual sheep to monitor challenge in the autumn
- Cattle and sheep – routine surveillance tests
 - better availability of abattoir data feeding back to farmers (e.g. QBox system and Bovis system)
 - routine herd/flock tests such as bulk faecal analysis and bulk tank tests
- Individual diagnostic tests – particularly for dairy cows, such as a pen-side test and ways to identify heavily infected animals to reduce pasture contamination.
- Tests to monitor drug resistance/efficacy.
- Quarantine tests
- Tests to discriminate between liver fluke and rumen fluke.

2 Therapeutics and drug resistance

- Definition of resistance – what level of resistance (phenotypic, genotypic) should we aim to detect/ can we detect? Can we differentiate between true genetic resistance and treatment failure due to other factors?
- Tests to detect resistance – efficacy tests (field tests to detect phenotypic resistance), molecular tests to quantify resistance alleles within a population
- Impact of rumen fluke on which drugs to use and in confounding presence of resistant fluke populations
- Do combination wormers enhance effect of flukicide in resistant populations (e.g. ivermectin plus triclabendazole) or complicate use of flukicides by potentially and unwittingly selecting for nematode resistance?
- Economics – in the face of developing resistance, are available drugs sufficient to make farming in fluke endemic areas viable. Depends on efficiency reductions due to fluke – but need to know what they are, need to measure them to inform control. Are old drugs, not currently available an option?
- New flukicides would revolutionise the control of fluke; according to the pharmaceutical industry, flukicide discovery programmes do exist although we have

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no publically available information about the likely prospects of any new flukicides coming onto the market.

- Application of flukicides: do we know enough about current products and their application? It is important to preserve efficacy of existing drugs and to have the best advice about when to treat and with what drug (from vet or SQP/Herd health planning). How effective are SQPs in prescribing anthelmintics (best practice/advice)?
- Individual farm assessment: risk of fluke infection will vary year on year so farm health planning is vital, how do we engage farmers and their vets?

3 Control – vaccination, breed resistance, management of pasture and of stock, disease forecasting

- Vaccination – more research needed into immune responses in sheep and cattle to fluke infection, appropriate adjuvants, timing of vaccination (relative to turn out, age etc), how cost effective is vaccination, would multivalent vaccines be attractive? Could vaccination be integrated with other control methods? Do drug abbreviated infections foster development of immunity? Can immunity be boosted in anyway?
- Genetic markers for resistance/resilience in sheep and cattle, define resistance/resilience, what are the mechanisms involved?
- Do diet and co-infection affect resistance to infection? What are the impacts of fluke on liver metabolism, food conversion, pathology and links to issues such as copper toxicity?
- Snail control – limit populations, better understanding of snail biology, are some snail populations more resistant to infection for example?
- Genetic variation within fluke populations – do different populations differ in terms of virulence and other life cycle traits? Selection pressures?
- What impact, if any, will elimination of liver fluke have on prevalence of rumen fluke? Can metacercariae survive on silage/hayledge or hay and how long to they survive on pasture?
- Are there opportunities to change management systems – longer housing, zero grazing etc.

Conclusions:

Priority areas where more research was needed were identified and potential funding sources identified:

1. Development of better, local forecasting system with strong links to the abattoirs enabling rapid feedback particularly in the autumn [Research Councils, DEFRA, livestock industry].
2. Development of early and pen-side diagnostics, particularly for sheep and dairy cattle – [livestock industry, pharma and biotech].
3. Better understanding of drug resistance, mechanisms, detection and impact on fluke populations, virulence, population genetics [RCs].
4. Garnering proper evidence on which to base advice on resistance management (DEFRA/VMD). Quarantine advice– marketing of packs of flukicides specifically for quarantine dosing (i.e. smaller packages). Decision support tool for prescribing anthelmintics. [KE – academia and pharma].
5. Vaccine development and application – [RCs, pharma and biotech]
6. Defining host disease resistance, mechanisms and genetics – [farming industry, biotech, RCs]

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7. Improved advice on environmental management for holistic, farm-specific control (control of snail habitation, snail biology, development of stages of the parasite outside the host, reservoirs of infection in wildlife) [farming industry, pharma, RCs]

Finally it was highlighted, particularly by the farming representatives that fluke cannot be seen in isolation and its control must be part of the overall health and welfare management on a farm, with co-ordinated, evidence-based input from vets and animal health advisors including SQPs [farming industry].