Veterinary Sciences Division
DSIB
Parasitology Section

DRUG RESISTANCE IN PARASITIC WORMS

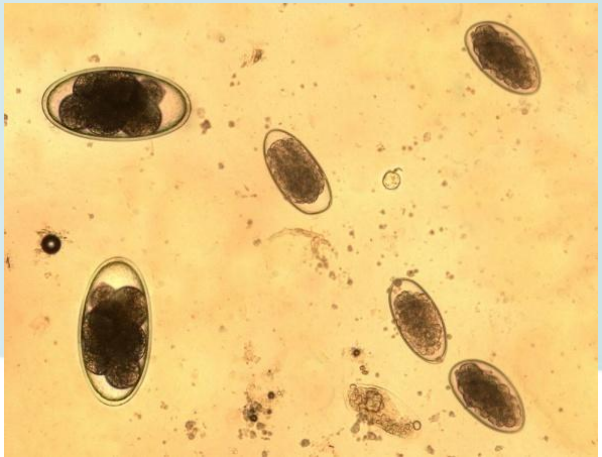
- Gut-living parasitic nematodes and liver flukes cause major economic loss and welfare problems in sheep and cattle in Northern Ireland and indeed worldwide. Liver fluke is a significant zoonosis (17m worldwide).

- Since 1960s worm infections have been controlled by regular dosing with anthelmintic drugs.

- Three major classes have been developed for the nematodes over 40 years, benzimidazoles, imidazothiazoles, macrocyclic lactones (avermectins, milbemycins).

- Initially effective, but now parasitic worms have become resistant to the drugs used.

- Aminoacetonitrile derivatives (Zolvix) now available; paraherquamides coming (Derquantel, 2012?)



In UK and ROI surveys have indicated that up to 98% of the sheep flocks are infected by gut nematode parasites resistant to one or more of the available types of drug. No records of resistance to Zolvix have been published – yet.

Also prevalent amongst dairy and beef enterprises.

Situation is worsening year-on-year as more and more flocks and herds develop multiple resistance.

Limited current information is available on the situation in Northern Ireland, but surveys are in progress. Results to date suggest that the picture is similar to that in the rest of the British Isles.

Mirrors the situation worldwide.

Many areas in certain countries particularly in South America and Australia, but also in England and Wales have had to abandon sheep and goat farming because drug-resistant parasites make the enterprises unsustainable economically and because of welfare issues.

None of the previously available drugs work any more on these farms.

Even if land is kept free of stock for years, there is no reversion to susceptibility.

Resistance emerges immediately if and when restocking is attempted.

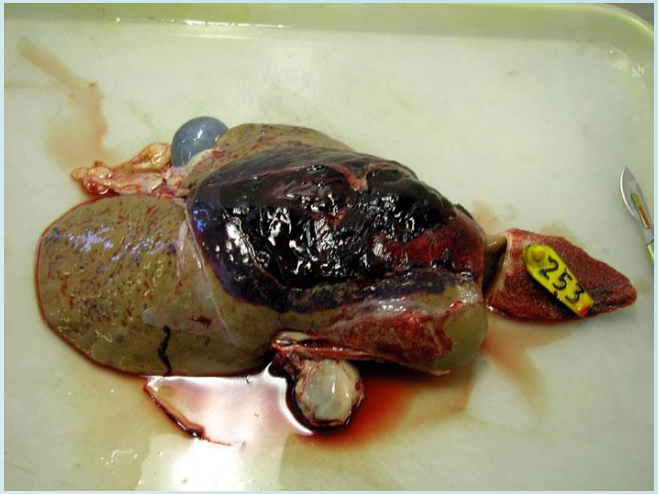
Superimposed on this is the rapidly evolving resistance in liver fluke populations to Triclabendazole, the only flukicide fully effective against the highly pathogenic immature stages of the parasite in the liver parenchyma.

ANIMAL WELFARE

(DARD Strategic Plan , Goal 3)

This is the reality:

Thin, ill-thrifty
Faecal soiling
Maggots
Wool-shedding
Belly bloated with fluid, liver malfunction
Anaemic



NOT a disease that MIGHT come here.

Here ALREADY, affecting animals in every flock or herd where worms cannot be effectively Controlled.

Rising year-on-year

THE biggest problem that will face livestock owners in the next 5-10 years

IMPACT ON RURAL ECONOMY

(DARD Strategic Plan, Goal 2)

Liver fluke disease ALONE costs ROI Agriculture €60m annually.

Costs Scottish Agricultural economy £50 m annually.

Northern Ireland similar, but figures undetermined.

£50m is equivalent to the annual income of over 4000 small hill sheep producers.

Not due to a disease that MIGHT come.

The diseases are ALREADY HERE affecting animals in every flock or herd where worms cannot be effectively controlled.

Rising year-on-year.

MARKET PERFORMANCE : FOOD SAFETY AND QUALITY

(DARD Strategic Plan, Goal 1)

Condemnation of bovine and ovine livers at abattoirs here has risen markedly in the last 10 years.
Lost livers alone worth £1m.

Recent rises after steady fall.

Additional problems of RESIDUES in meat.

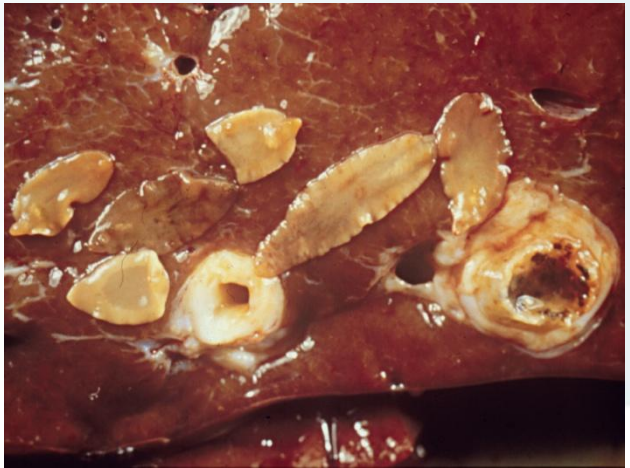
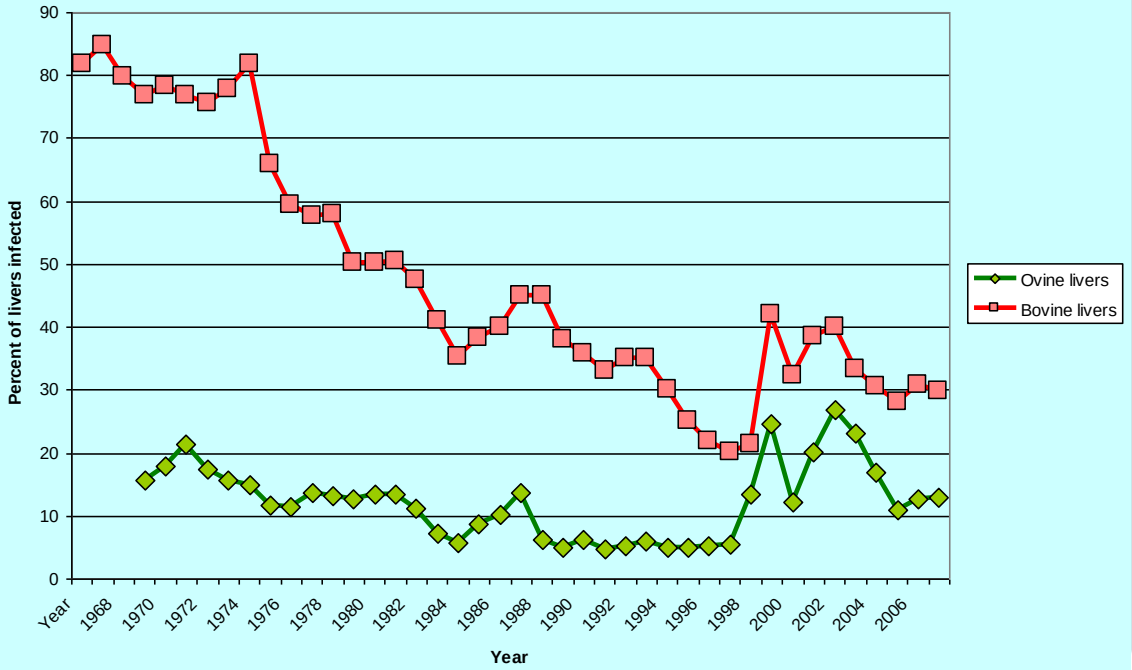


Figure 1. Annual percentage of ovine and bovine livers found infected with *Fasciola hepatica* at slaughter in Northern Ireland.



The Parasitology unit at VSD has largely a diagnostic function.

Examines samples from farms all over Northern Ireland and identifies nature and intensity of parasite problems on individual farms.

Current tests only identify resistance when it is already well established on farms (25% of worms showing resistant phenotype)

BUT no effective tests are available to diagnose early anthelmintic resistance.

To deliver effectively our service to farmers we need to:

- use existing tests to survey resistance status in Northern Ireland.
- develop new tests to identify early resistance on farms.

- also need to maintain the facilities and critical mass of trained personnel so that any new drugs or parasite control options that appear in the international forum can be field-tested here.

- aim to provide an on-going farm-by-farm assessment of drug efficacy and where necessary provide advice on change of product or regime.

Can generate income by offering these facilities for the use of pharmaceutical companies to fulfil R&D and EC drug-licensing requirements.

VSD is already well-established as a world class research centre in Veterinary Parasitology.

Network of collaborators in UK, Europe and overseas:

Queen's University, Belfast
University of Madras, India
Faculty of Veterinary Sciences, Argentina
Etc.

On – going projects with QUB post-graduates:

Questionnaire survey of sheep and cattle management practices, particularly with regard to anthelmintic use (based on an earlier survey by McCoy in 2005).

On-farm drug efficacy trials – determination of the efficacy of the various anthelmintic regimes used by farmers.

On-farm clinical field trials – comparison of the performance of a range of anthelmintics against gut nematodes and fluke carried out under controlled conditions on 12 selected well-managed sheep farms across the province.

Development of new methods to diagnose anthelmintic resistance:

- coproantigen analysis, egg development assay, pre-and post-treatment fluke histology for fasciolosis
- egg and larval development assays for GIT nematodes are time-consuming, costly, complex and at present unsuitable for extensive screening
- larval motility test? – for levamisole resistance
- molecular tests sought, but so far the only potentially useful genomic marker is for benzimidazole resistance in *Haemonchus*.

Thanks to Connor McMahon and Sharon Ellison, post-graduate students in the School of Biology, QUB, who are driving these projects, and to Hillary Edgar (Stormont) and Dessie Irwin (Hillsborough) who are managing the field sampling and laboratory work.

The questionnaire is based on an original survey designed by Maurice McCoy and carried out by him and his co-workers in 2005.

We are grateful to him for the opportunity to compare anthelmintic usage and practice in Northern Ireland over 10 years.