# Liver fluke in cattle – costs and control

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# **Production costs of bovine fasciolosis**

- Death of animals acutely infected with large numbers of flukes (unusual in cattle).
- Suboptimal liveweight gain and reduced production and/or quality of meat and milk in cattle with chronic liver fluke infections.
- Condemnation or down-grading of affected livers at abattoirs.
- Cost of prophylactic or therapeutic anthelmintic treatment.
- Animal welfare issues implications.
- Risk of zoonotic infection.



# **Some examples of production costs**

- The UK Meat Hygiene Service confirmed that 20% of cattle slaughtered in Q1 2010 had the liver condemned because of liver fluke damage.
- EBLEX estimates liver fluke costs the beef industry £8-9.5 million / year loss of productivity could be as much as £25 to £30 per case.
- Around 76% of dairy herds in England and Wales exposed to liver fluke.
- A high level of liver fluke infection in Belgian cows was associated with a decrease in the annual average milk yield of 0.7 kg/cow per day, a decrease in the average milk-fat of 0.06%, and with an increase of the mean inter-calving interval of 4.7 days



# **Prevalence is increasing**



#### Diagnoses of fasciolosis in cattle 2003 to 2010 in GB



## Liver fluke Fasciola hepatica

- Adult flukes found in livers of sheep, cattle, goats, horse, deer, (man!)
- Adult flukes shed eggs which pass down bile duct into intestines then deposited onto pasture in faeces
- Adult flukes can shed thousands of eggs per day
- Common in wet regions because the life-cycle is dependent on water





## Life cycle outside the animal

- Eggs hatch in spring (>10 °C) to release miracidia which must penetrate a mud snail (*Lymnaea* [*syn. Galba*] *truncatula*) within 3 hours
- Develop inside snail
- Cercariae emerge from snail
- Encyst on grass (metacercariae)
- Infection of a snail with one miracidium can produce over 600 metacercariae





## Life cycle inside the animal

- Once ingested metacercariae excyst in SI and immature fluke migrate through the gut wall to penetrate the liver
- Tunnel through liver for 6-8 weeks before entering bile ducts where they reach maturity
- Time from infection of cattle/sheep to adult egg-laying fluke is 10-12 weeks
- Little or no development of immunity









#### **Chronic fluke infection**

#### Acute fluke infection

Time from uptake of metacercaria to fluke eggs in faeces = 10-12 weeks Minimum time needed for 1 life cycle is 17-19 weeks

# **Epidemiology of liver fluke is changing**

In recent years, the monthly incidence of acute fasciolosis in sheep is higher from November to February than in September or October.

This means that cattle could also harbour immature fluke during the winter and spring.



Monthly diagnoses of acute fasciolosis in sheep 2004 to 2010 in GB

Source: VIDA data.

Available at: http://vla.defra. gov.uk/reports/rep\_vida.htm



### Miracidium hatching from a liver fluke egg





#### Galba truncatula [Dwarf pond snail]

- Adults 5-10mm
- 5-6 whorls
- Oval aperture, height less than <sup>1</sup>/<sub>2</sub> of shell height







Lymnaea (Galba) truncatula snails in mud

Metacercariae on a blade of grass Appearance of bovine liver with chronic fluke 'Pipe stem liver'

Appearance of bovine liver with chronic fluke 'Pipe stem liver'

## Liver fluke: factors that aid success

- Enormous biotic potential single adult can shed ~25,000 eggs per day; chronic infection ~100s of fluke
- Hermaphrodite can self-fertilise
- Longevity live as long as host (shorter in cattle), continually shed eggs
- Snail intermediate host spread & amplify infection
- Wildlife reservoirs (deer, rabbits)





## **Disease caused by liver fluke**

#### Acute fluke

• Due to liver damage caused by immature flukes migrating (>2,000) through the liver (autumn-winter) [Rare in cattle]

#### **Chronic fluke**

- Caused by adult flukes in the bile ducts (200-500) from infection picked up 4-5 months previously (winter-spring)
- 0.5ml blood/fluke/day



# Possible reasons for changes in prevalence and distribution

- Climate change recent climate changes favour fluke and intermediate host snail
  - increased temperatures (average, max, min)
  - increased rainfall, more extreme events
  - reduced ground frost, less severe winters
  - longer grazing (= parasite) seasons, >1 month
- Anthelmintic resistance reports of resistance to triclabendazole (TCBZ), drug of choice for acute fluke
- Animal movements significant movement of animals
- Environmental change introduction/ retention of wetlands favours fluke and intermediate host snail





## Liver fluke: clinical signs Chronic

- Loss of condition
- Lethargy
- Anaemia
- Bottle jaw
- Sub-optimal growth rates
- Diarrhoea
- Metabolic disease in dairy cows
- Reduced milk yield in dairy cows
- Reduced fertility
- Signs are exacerbated by poor nutrition or gastro-intestinal parasitism





# Diagnosis

- Faecal egg count
  - Examination of faeces for the presence of thin-shelled, oval, operculate, brown-coloured, 140 x 80 µm fluke eggs
  - Collect several fresh faeces samples from the herd. These can be batched at the laboratory to reduce costs
- Liver enzymes
- ELISA tests specific to fluke







## **Control of liver fluke**

#### Avoidance

• Fencing off snail habitat

#### Treatment

• Use of flukicides









## **Fluke treatments**

- Need to treat with a suitable product at the appropriate time of year
  - vs. immature fluke in autumn Seasonality now less discrete
  - vs. mature fluke in spring
- An oversimplification
- No flukicide has a persistent action to prevent reinfection



#### Spectrum of activity at recommended dose rates against *Fasciola hepatica*

	Age of fluke in weeks														
Drug	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Oxyclozanide															
Albendazole										50-	70%		80-999	6	
Clorsulon (Inj)															
Nitroxynil							E0.00%			01.00%					
Closantel								50-90%	6			91-99%	70		
Triclabendazole		90-	99%		99-100%										

Adapted from: Fairweather, I and Boray, JC (1999) Mechanisms of fasciolicide action and drug resistance in *Fasciola hepatica*. Chapter 7 In Fasciolosis, Ed JP Dalton. CAB International. pp 225-276

Early immature: 1-5 weeks; Late immature: 6-9 weeks; Adult: >9 weeks Ref: VICH Guideline 12, Efficacy of anthelmintics: specific recommendations for bovines. EMEA, 1999



## In conclusion.....

- High costs from clinical and subclinical disease
  To understand control, you need to have an understanding of the parasite lifecycle
- •.....which is complicated by changing epidemiology
- •Flukicides kill fluke at different stages of maturity
- •Use flukicides in line with SCOPS and COWS principles to minimise development of resistance
- •Consider combination (fluke/worm) products where appropriate
- Seek advice from your vet and advisers

