

# 'Living with liver fluke'

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# Liver fluke

- Highly pathogenic flatworm parasite, *Fasciola hepatica*
- Complicated life-cycle involving intermediate mud snail host
- Livestock become infected by ingesting fluke cysts on pasture
- Threat to both sheep and cattle of all ages
- Significantly affected by weather e.g. mild winters & wet summers!





Winter

Sheep and cattle ingest cysts

Juvenile fluke excyst and migrate through liver

Wildlife reservoir hosts

Adult fluke reside in bile duct & lay eggs

Cercariae encyst on vegetation

Fluke eggs in faeces

**Life-cycle of liver fluke, *Fasciola hepatica***

Eggs hatch to release miracidia

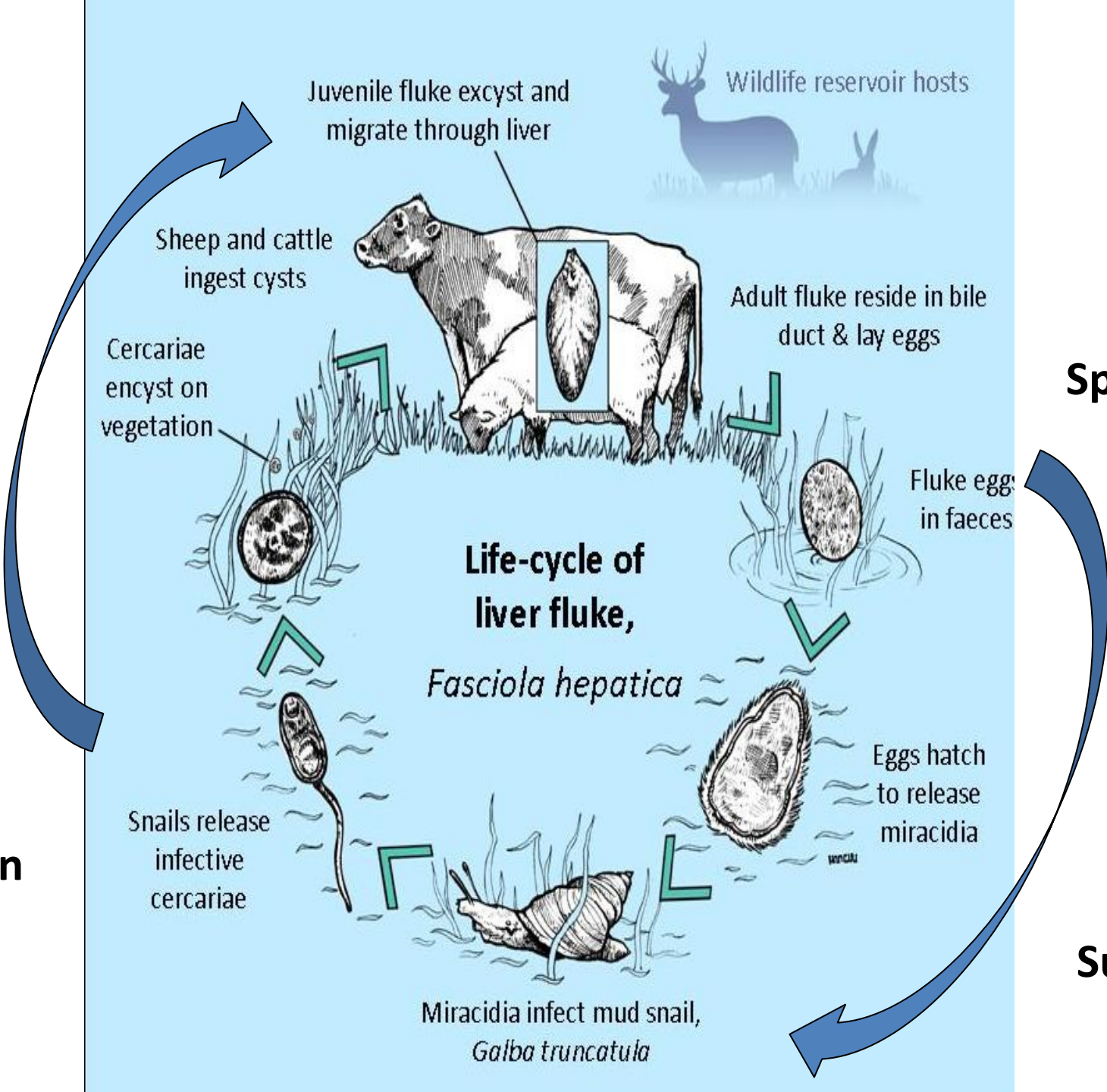
Snails release infective cercariae

Miracidia infect mud snail, *Galba truncatula*

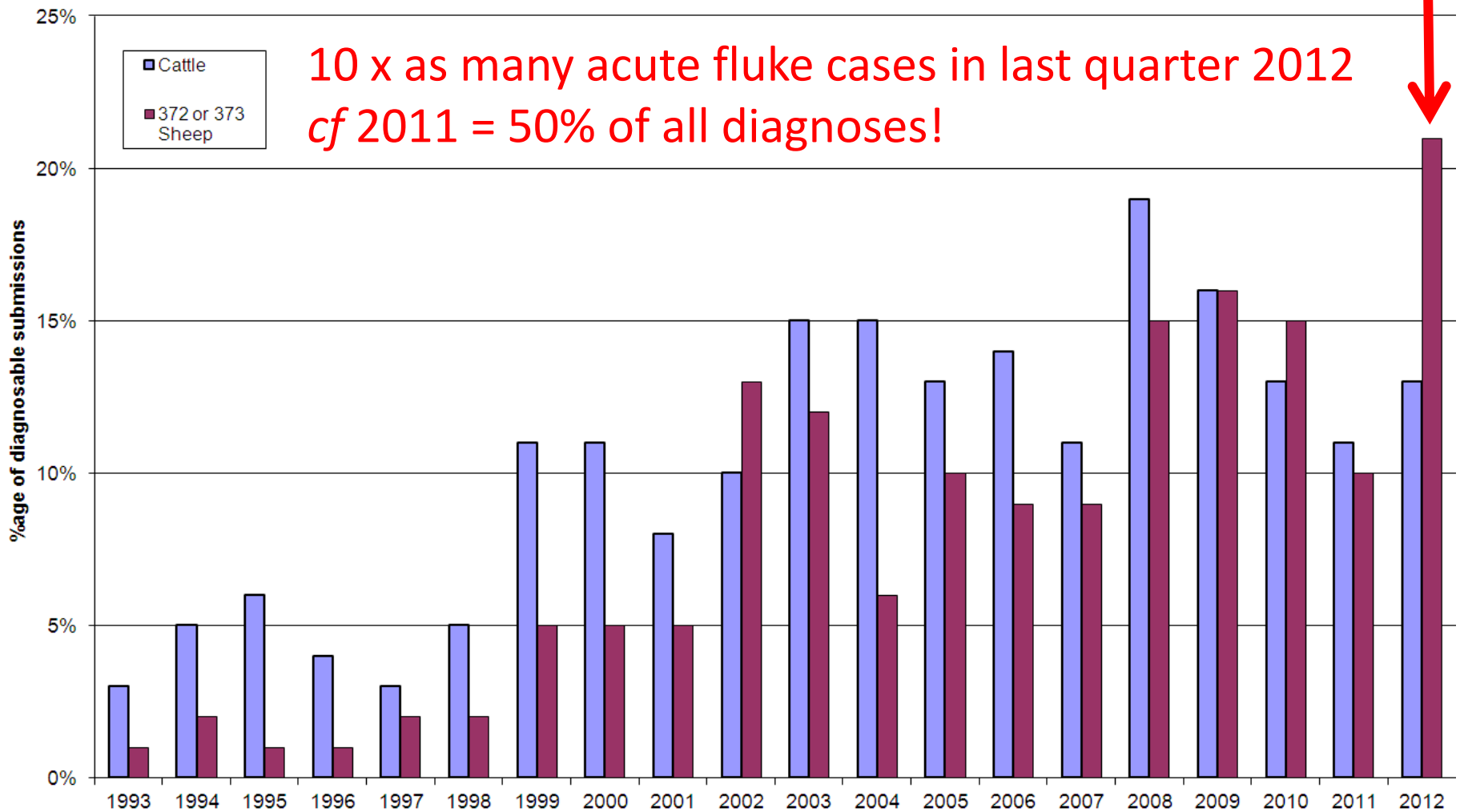
Spring

Autumn

Summer



# Liver fluke is on the increase...

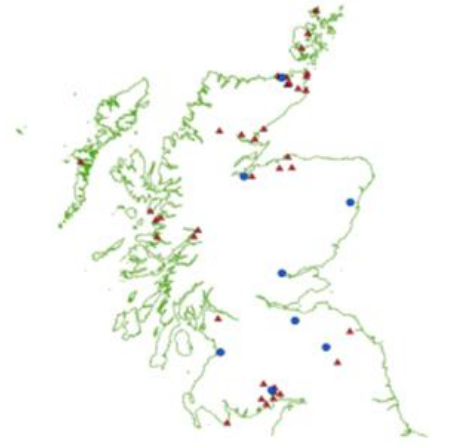


‘Tip of the iceberg’ – many animals didn’t make it to VI Centre or the abattoir in 2012-2013!

# F (VIDA) 200 Wales

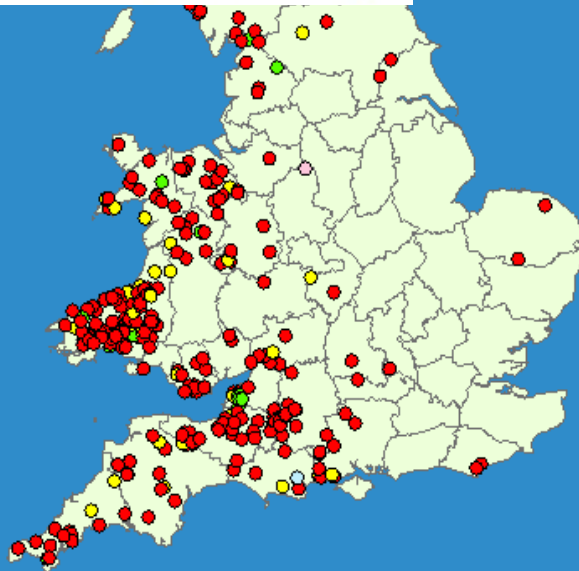
## Cattle Fluke Outbreaks - 1996

- ▲ Cattle Fluke Outbreaks - 1996
- SAC DDCs



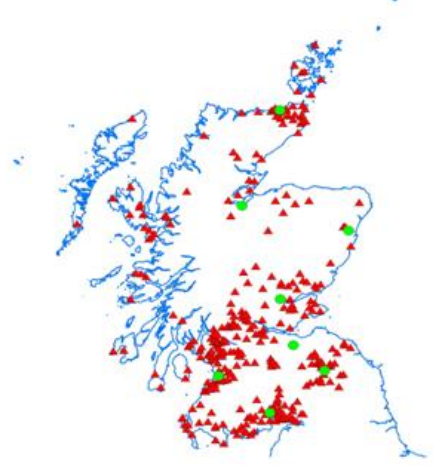
### SPECIES, DIAGNOSIS

- Alpaca, 371
- Cattle, 371
- Goat, 371
- Sheep, 372
- Sheep, 373



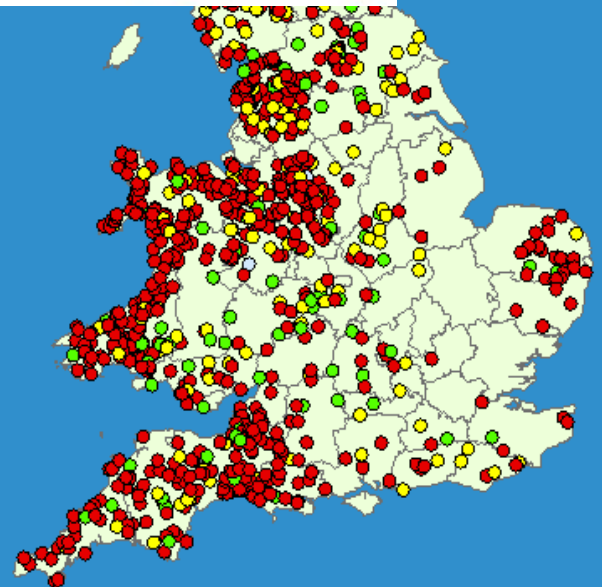
## Cattle Fluke Outbreaks 2008

- SAC DDCs
- ▲ Cattle Fluke Outbreaks 2008



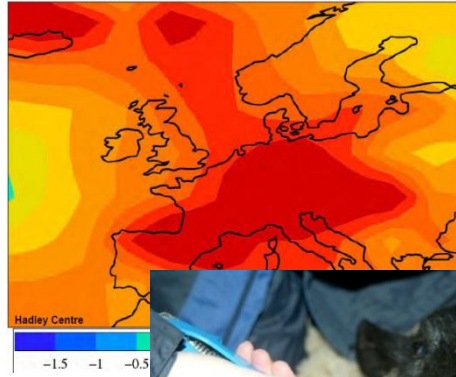
### SPECIES, DIAGNOSIS

- Cattle, 371
- Goat, 373
- Sheep, 372
- Sheep, 373



# Possible explanations?

- Climate change



- Drug resistance



- Animal movements



- Environmental schemes



# Fluke forecasting...

- Liver fluke risk essentially “predictable”, very much affected by the weather

- Risk based on “Ollerenshaw indices”:

$$Mt = n \left( \frac{R}{25.4} - \frac{P}{25.4} + 5 \right)$$

Mt = Fasciolosis risk value,

n = Number of rain days per month,

R = Rainfall (mm/month)

P = Potential evapotranspiration (mm/month).

- Still forms basis of mainland UK NADIS parasite forecast (<http://www.nadis.org.uk>)



To view a WEBINAR (video) of the full Parasite Forecast please click [WATCH THE WEBINAR](#)

## NADIS Parasite Forecast – October 2013

Use of meteorological data to predict the prevalence of parasitic diseases

### Regional Weather

(based on Met Office figures)



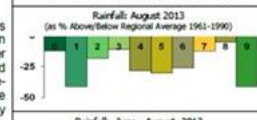
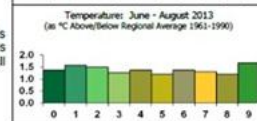
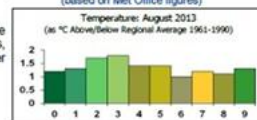
REGIONS  
0 N.W Scotland  
1 E Scotland  
2 N.E England  
3 E Anglia  
4 The Midlands  
5 S England  
6 S.W Scotland  
7 N.W England  
8 S.W England  
9 N Ireland

August was 1 to 2 °C warmer than the 1961-90 average in all UK regions, with the larger anomalies over towards the east of the country.

Following on from a warm July, this makes 3-month mean temperatures also 1 to 2 °C above expected in all regions.

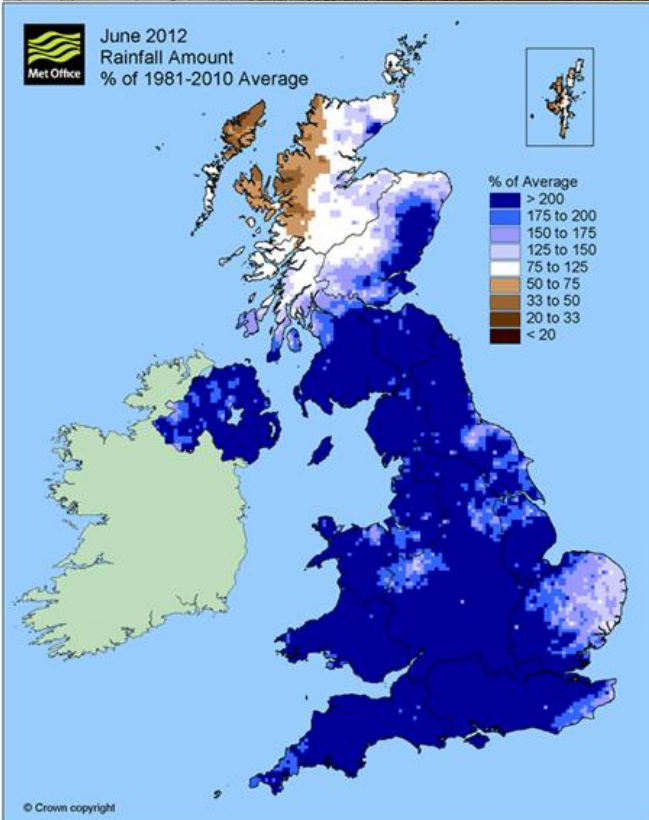
Rainfall across the UK in August was generally quite low, with Northern Ireland receiving less than 60 per cent of expected rain, while Scotland and England received about three-quarters of their usual rainfall for the month. Wales was actually slightly wetter than usual.

Three-month regional rainfall averages are quite mixed, but all drier than the long-term regional averages.



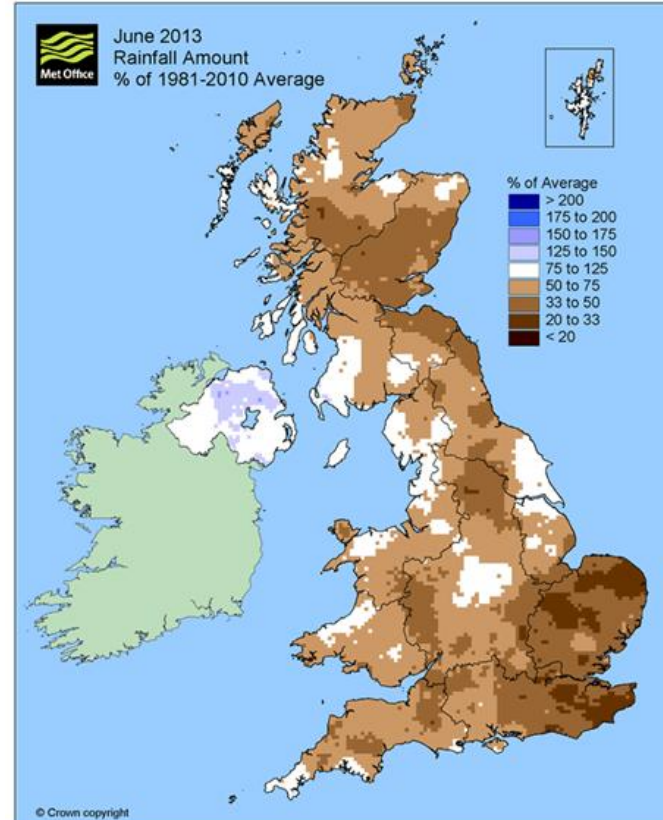


# Liver fluke 2012-2013...?



$$Mt = n \left( \frac{R}{25.4} - \frac{P}{25.4} + 5 \right)$$

June rainfall a key indicator – but not the only one!



# Prevalence of fluke infection in dairy herds in England and Wales

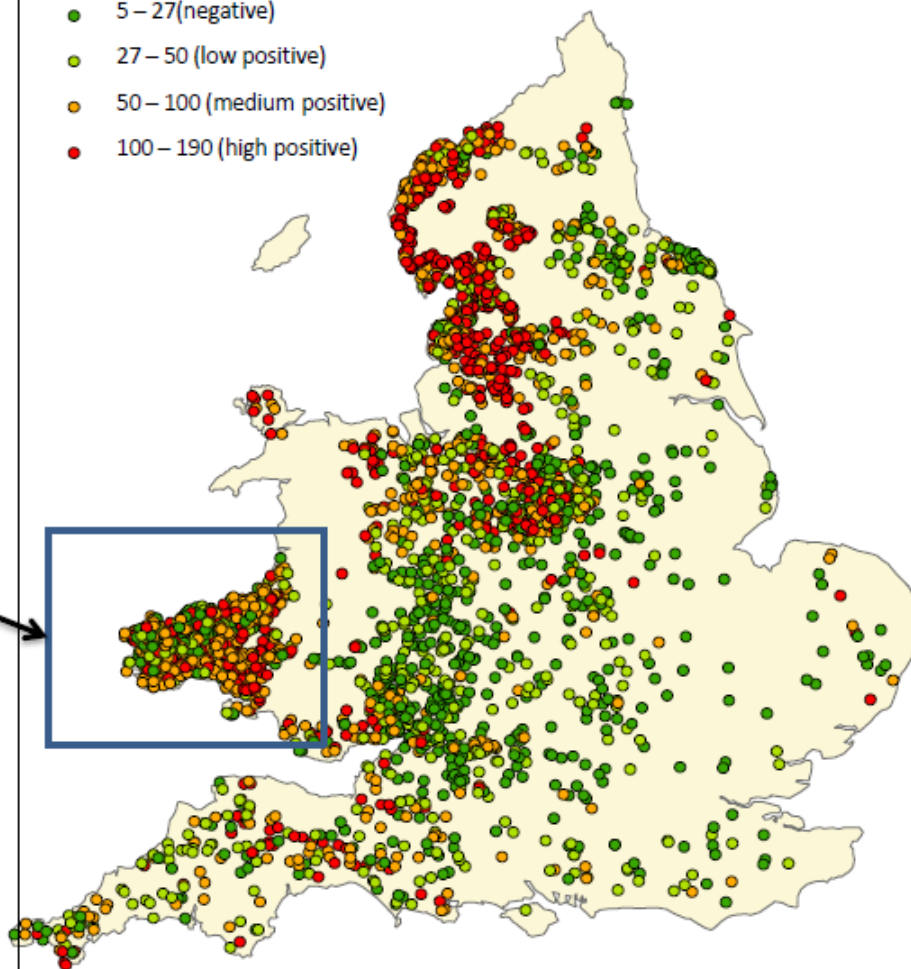
...it's not all about the weather!

Within one region,  
same climate but  
significant  
differences between  
neighbouring farms

Why?

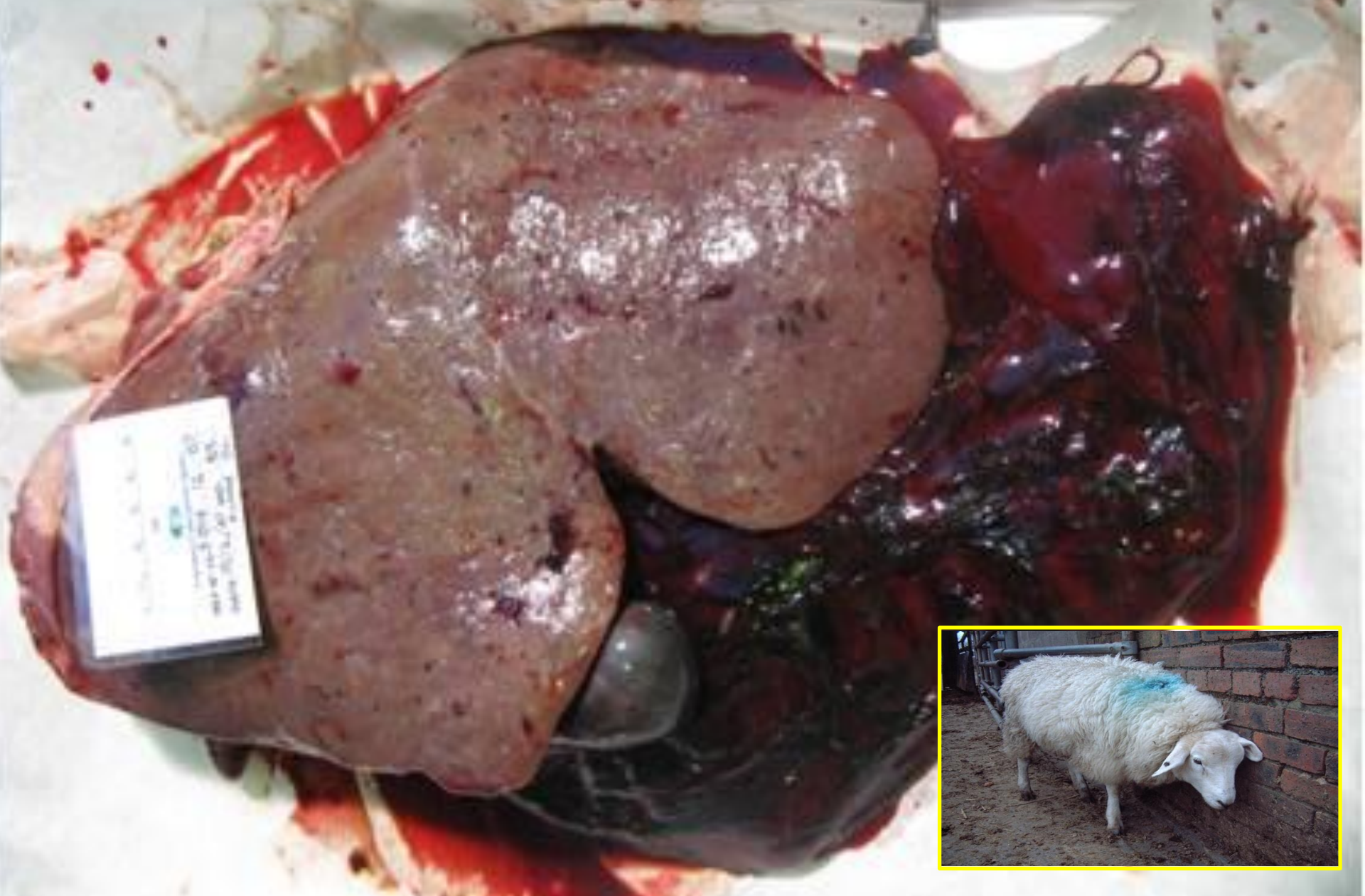
## Legend

- 5 – 27 (negative)
- 27 – 50 (low positive)
- 50 – 100 (medium positive)
- 100 – 190 (high positive)

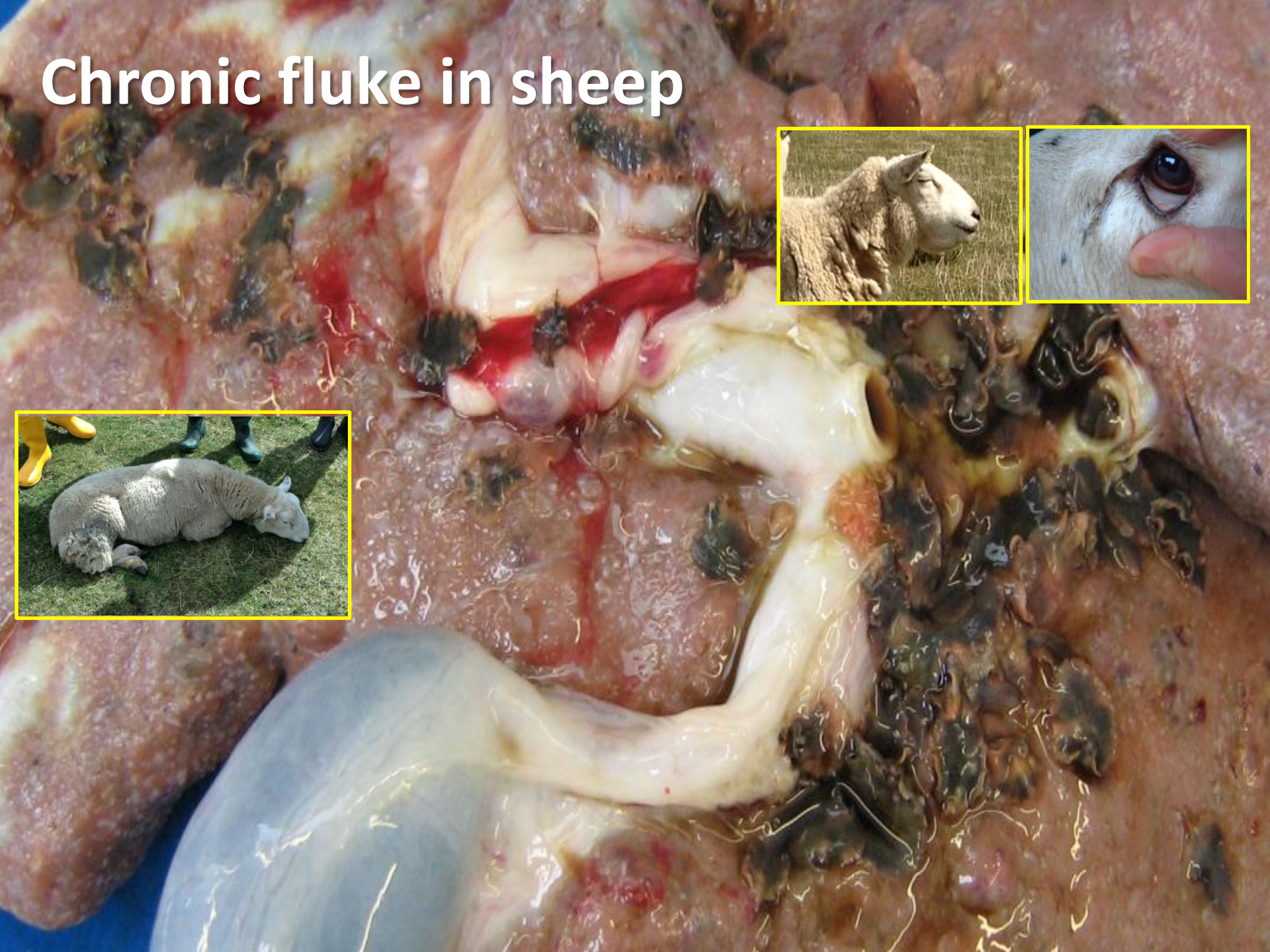


**What does liver fluke do to my animals?**

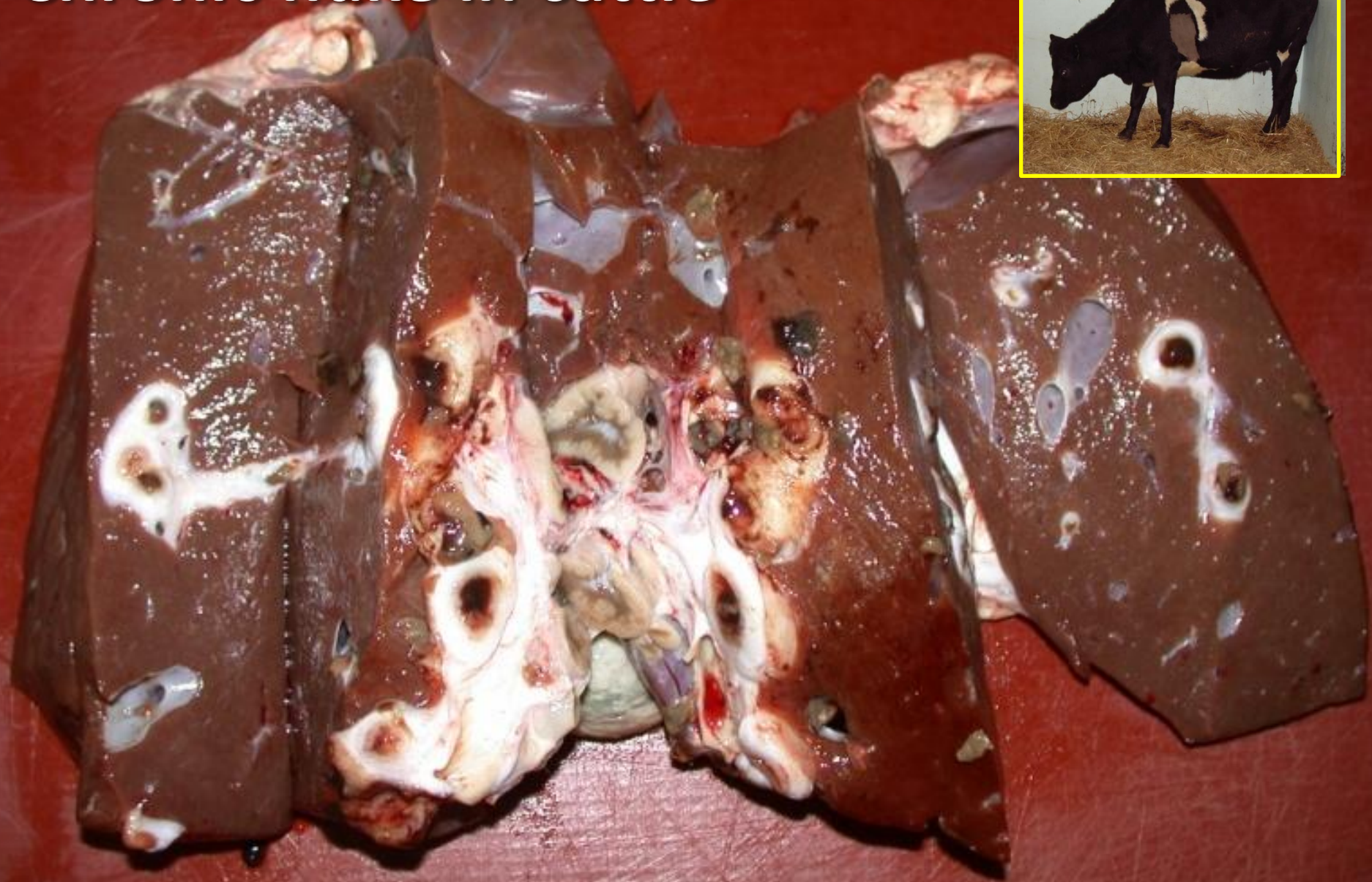
# Acute fluke in sheep



# Chronic fluke in sheep



# Chronic fluke in cattle



# What does fluke actually cost?

- **Direct production losses:**

– e.g. reduced milk yields in dairy cattle; impaired reproductive performance; beef cattle take an extra ~30-80 days to finish etc.

- **Estimated cost to the producer:**

- EBLEX figures - £25-30/head = £8-9.5m/yr to beef industry
- Swiss study (2005) – beef & dairy - 299€ per animal, mainly through reduced milk yield/quality & extended calving to conception period

- **Liver condemnations at abattoir:**

“5<sup>th</sup> Quarter” etc. – can be 100s of Kg/day - may be additional costs to render - average condemnation rates ~25%!



| Loss associated with           | Value in € ('000s)     |
|--------------------------------|------------------------|
| Meat                           | 461 (409-1207)         |
| Milk                           | 33,847 (4695-72,260)   |
| Extended calving to conception | 14,467 (6959-23,351)   |
| Additional services            | 3068 (2209-4112)       |
| Loss of livers                 | 332 (261-426)          |
| Treatment                      | 58 (46-69)             |
| Total                          | 52,238 (22,302-91,956) |
| Loss per infected animal       | 0.299 (0.125-0.533)    |
| Average loss per dairy farm    | 1.515 (0.615-2.897)    |

Schweizer et al, Vet Rec, 157, 2005



**How do I know my animals  
have got liver fluke?**



# Fluke diagnosis: Invasive tests

- **Post-mortem/meat inspection**
  - “too late” for individual
  - invaluable at herd/flock level
- **Blood sample – liver enzymes**
  - GLDH (liver damage)
  - GGT (bile duct damage)
  - Not specific for fluke
- **Blood sample – antibodies**
  - Serum ELISA (also used for bulk tank milk)
  - Positive after infection
  - Remains positive after treatment
  - Remains positive into next season



# Fluke diagnosis: Non-invasive tests

- **Clinical signs**

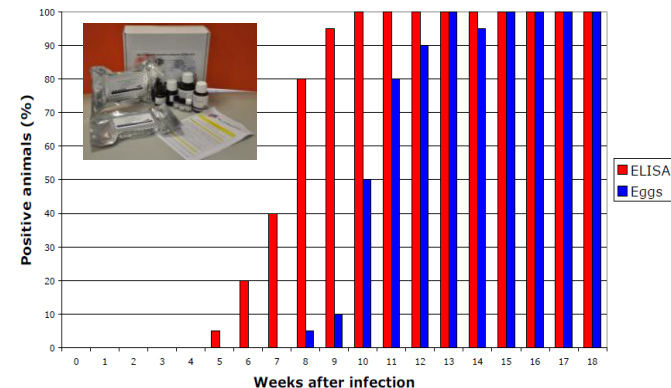
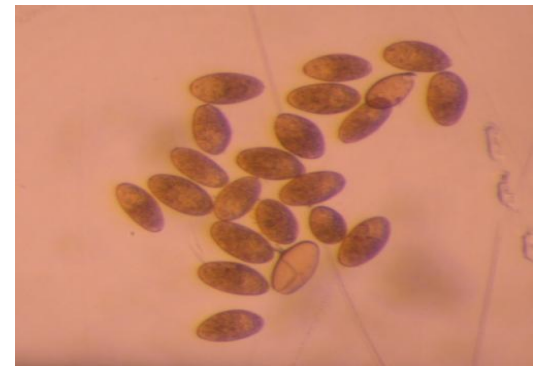
- Acute (death)
- Chronic (ill-thrift)

- **Faecal egg count (FEC)**

- Only measures presence of adult fluke
- Poor indicator of fluke numbers
- Can stay positive for weeks post-treatment

- **Copro (faecal) antigen cELISA**

- Measures fluke secretions in animal faeces
- Can detect late immature and adult fluke
- Good indicator of fluke numbers
- Negative within 3 weeks post-treatment



# What about rumen fluke?

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# How common is it?

- Diagnosed as presence of rumen fluke eggs in faeces and/or rumen fluke parasites at post mortem
- Currently diagnosed in ~30% of sheep & 40% of cattle in NI (AFBI 2011)
- AHVLA report as many diagnoses of rumen fluke in UK in 2012 as previous 5 years combined (R. Daniel, pers comm)
- Sales of flukicides containing oxyclozanide have increased x 600% in Ireland in 2012

## Surveillance



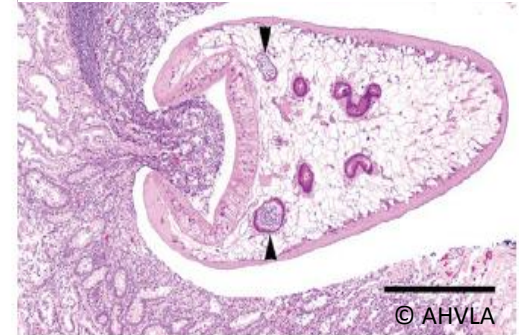
TABLE 2: Endoparasitic infections in ruminants in Northern Ireland, January to March 2011

|                | Total | Number negative | Number with           |                       | Number of parasitic ova |     |     |      | Percentage positive |
|----------------|-------|-----------------|-----------------------|-----------------------|-------------------------|-----|-----|------|---------------------|
|                |       |                 | <500 epg <sup>a</sup> | ≥500 epg <sup>a</sup> | +                       | ++  | +++ | ++++ |                     |
| Liver fluke    |       |                 |                       |                       |                         |     |     |      |                     |
| Bovine         | 797   | 693             |                       |                       | 83                      | 20  | 1   | 0    | 13.1                |
| Ovine          | 79    | 63              |                       |                       | 9                       | 5   | 1   | 1    | 20.3                |
| Paramphistomes |       |                 |                       |                       |                         |     |     |      |                     |
| Bovine         | 797   | 448             |                       |                       | 155                     | 138 | 34  | 22   | 43.8                |
| Ovine          | 79    | 54              |                       |                       | 13                      | 10  | 2   | 0    | 31.6                |



# How important is it?...

- Adult rumen fluke well tolerated on surface of rumen itself
- Disease invariably associated with heavy infestations of immature rumen fluke in the intestine
- Symptoms include anorexia, anaemia, non-responsive diarrhoea etc...
- Only 2 reports of disease in sheep, one in cattle, in 2012; *Trichostrongylus axei* – flooded farms!
- Lots of anecdotal evidence of production loss – scientific evidence of production loss is limited
- Advice to producers and others is NOT to treat on the basis of rumen fluke diagnosis (FEC or PM), unless there are confirmed clinical signs of parasitism!



*Are we over panicking about this whole "Stomach Fluke" thing. I don't think it is as widespread as people think. Jasus, a lot of people don't even do them for liver fluke.*

**What can I do to control fluke?**

# Fluke Control Measures



- **Grazing management**

- Avoid grazing high risk pastures
- Avoid co-grazing sheep and cattle

- **Snails**

- Drainage
- Fencing

- **Flukicides**

- Strategic (pasture contamination)
- Therapeutic (animal welfare & performance)
- Quarantine treatment

# Current fluke control – flukicidal drugs

But, remember...

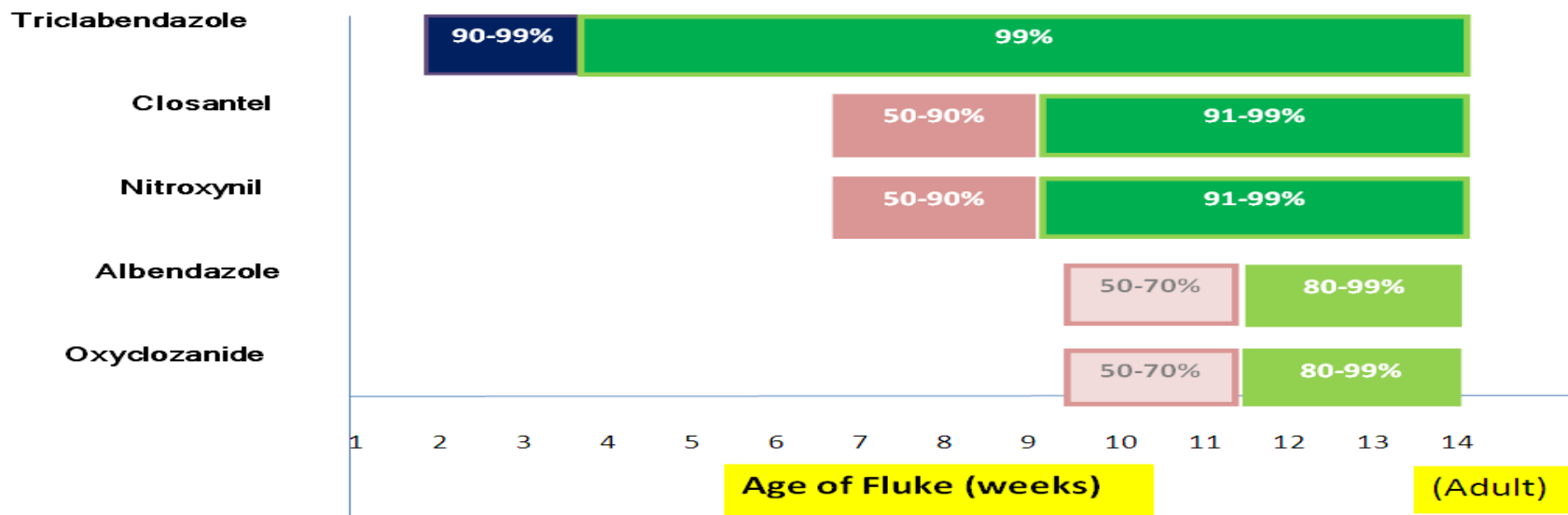
1. Drugs that kill “worms” tend **NOT** to kill fluke!...

2. Most flukicides **DON'T** kill all stages of fluke!



CHEMICAL GROUP

% Liver Fluke Killed by age





# Treatment failure

- **Underdosing**
  - Underestimating weight
  - Poor drenching technique
  - Poor dosing equipment
- **Poorly stored product**
  - Too hot, too cold, too long
- **Wrong diagnosis**
  - Fluke vs. other problem
- **Wrong timing/product**
  - Adult vs. juvenile
- **RE-INFECTION**
  - fluke drugs not persistent
  - little/no natural immunity
- **RESISTANCE?**



## LIVER FLUKE

# Confirmation of triclabendazole resistance in liver fluke in the UK

WE would like to report confirmation of triclabendazole resistance (TCBZ-R) in liver fluke, *Fasciola hepatica*, from the UK, based on a dose and slaughter trial. Currently, there has been concern about the use of triclabendazole

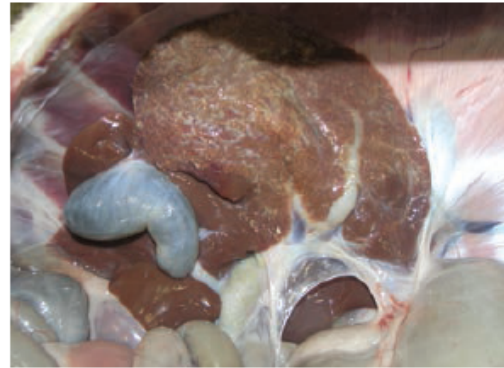


FIG 1: Sheep liver in situ showing damage to the liver tissue and thickening of the bile ducts 17 weeks after challenge with *Fasciola hepatica*

later, animals entered a dose and slaughter trial, that is, triclabendazole treatment was repeated and the numbers of fluke present were counted at postmortem examination 14 days later (Fig 1). Between 19 and 70 live adult fluke were retrieved from the liver and bile ducts of each animal, confirming the TCBZ-R status of the fluke isolate.

The dose and slaughter trial-based confirmation of TCBZ-R in liver fluke in the UK, which was suspected on the basis of FECRT and CRT, should be seen as a further incentive to apply the best possible management strategies for control of liver fluke on sheep and cattle farms. This should include use of preventive measures where possible, treatment where necessary and the evaluation of treatment efficacy. Before declarations of TCBZ-R are made in the field, problems due to inadequate dosing, poor product storage or inferior quality products need to be ruled out, as triclabendazole is still the drug of choice for migrating juvenile fluke, particularly in sheep.

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e-mail: ruth.zadoks@moredun.ac.uk  
**Neil Sargison, Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush Veterinary Centre, Roslin, Midlothian EH25 9RG**

## References

- COLES, G. C., JACKSON, E., POMROY, W. E., PRICHARD, R. K., VON SAMSON-HIMMELSTJERNA, G., SILVESTRA, A., TAYLOR,

**Viewpoint**  
Raising the bar on reporting 'triclabendazole resistance'

Exaggerated and potentially false claims of resistance to triclabendazole may be hampering control of fasciolosis by encouraging farmers to use less effective products, says Ian Fairweather, who argues for more accurate diagnosis before such claims are made.

**Why does this matter?** To the extent that triclabendazole (TCBZ) is being described as resistant to liver fluke, the use of this drug will be reduced. This will have a direct impact on the ability of sheep and cattle farmers to control the disease. The fact that TCBZ is still the drug of choice for migrating juvenile fluke, particularly in sheep, makes this a significant issue. The fact that TCBZ is still the drug of choice for migrating juvenile fluke, particularly in sheep, makes this a significant issue.

**Neil Sargison and Philip Skuce respond to the view expressed by Ian Fairweather to a recent Viewpoint that unrealistic reports of resistance to triclabendazole may be hampering the control of fasciolosis, suggesting instead that they might help raise awareness of more sustainable management strategies.**

**Viewpoint**  
Anthelmintic resistance: potential benefits of 'over-diagnosis'

Over-diagnosis of anthelmintic resistance may be a benefit, as it encourages farmers to use more effective products, says Neil Sargison and Philip Skuce.

**Neil Sargison and Philip Skuce**

**Viewpoint**  
Anthelmintic resistance: potential benefits of 'over-diagnosis'

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**Neil Sargison and Philip Skuce**

# Determining fluke treatment efficacy

- Based on **Faecal egg count reduction test (FECRT)** = comparison of FEC before and after treatment
- If flukicide is working, there should be 95% fewer eggs in faeces 2-3 weeks later
- Not perfect but still worth doing!
- Currently under evaluation:
  - Use of composite/pooled faecal samples
  - cELISA reduction test



# Best practice advice?



Tackling the Threat from Liver Fluke – Top 10 actions.

<http://www.scops.org>

## Top Ten Tips for Controlling Liver Fluke in Cattle



Sound and informed preparation will minimise liver fluke infections with positive effects on enterprise returns

<http://www.cattleparasites.org.uk>

**‘George’s Journal’** - initiative in Scotland aimed at giving real-time advice and information to farmers & vets on managing fluke, (hosted on NSA website, [www.nationalsheep.org.uk](http://www.nationalsheep.org.uk))

✓ One of the most significant practical things George did last summer, with a little help from the weather, was to improve the condition of his pasture – as a result, his farm and his animals are in much better condition than 2012!

**NSA NATIONAL SHEEP ASSOCIATION**  
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### George's Liver Fluke Journal Entry 2

2nd December 2012

George Hing, NSA Scotland Regional Development Officer, farms near St Andrew in the east coast of Scotland. This is one part of the world where fluke would be expected to cause major losses, but in the summer of 2012 it has a season when it happened. George has kindly let his farm be used as a fluke surveillance farm in a project led by the Scottish Government and various animal health, and supported by Heriot-Watt Research Institute, Roslin Farm College, University of Edinburgh, Parasite Use and the National Sheep Association. The surveillance farm is part of the Scottish Fluke Action Group, a group representing many aspects of the Scottish sheep industry that aim to give real-time information to vets and farmers on managing fluke. George will be adding to the journal on a regular basis, you can read the first instalment of this story [here](#).

**George's Journal**

During August and September, Richard, Robert and myself continued to take dung samples from the lambs to see if they started to produce fluke eggs and also if the men had (coproantigen) for fluke had gone positive. We knew they had been exposed to fluke early in their lives, as the blood tests in July were positive. The blood test gave positive very soon after infection but fluke takes 10-14 weeks after infection to produce eggs. The good thing was that the lambs all remained negative for eggs and continued to grow well during the summer as they were still in good condition. They were not treated. The rest of the flock were all treated for fluke earlier in the summer and the groups of 12 sheep were out onto different fields, one with a high fluke risk and the other a lower fluke risk. The vets and I took dung samples from both groups in August before and after they were treated and there were no fluke eggs after treating, so we knew the product worked. From now on, every time the flock is treated, we will take dung samples to see when they are effective for fluke.

We are taking samples from individual sheep for the surveillance information this will provide, but the vets often take mob samples from groups of sheep, which also gives useful information and doesn't take as much time. As I don't read Latin, I need to be someone and produce for fluke does happen. Taking mob samples from sheep before and after treatment can tell you if treatment may be a problem before it gets out of hand.

**Pasture management**

Thankfully, the weather this summer has been dry so I have been able to make improvements to the farm to try to reduce the habitat for the mud and that the fluke need to develop. One area that in the wrong year would be full of fluke has been cut back to make it less attractive to the snails (see picture). It will always be a winter area but as it is so small I may be able to cut it from round it to prevent sheep grazing over the winter. I have also had a chance to repair the rutted areas on the gates so we can now live in the paddles that form there and around water troughs.

With the weather being better, the grass has improved greatly this year (see picture) as the sheep are in much better condition this year compared to last. Thankfully, I was able to cut more grass this year for haylage as a result of being able to graze some of the sheep at my horse farm over the summer. The main bit of the ground had a break from sheep grazing (leaving the clover to grow to a mature stage before cutting). This also means that the pasture will be able to have more nitrogen taken up by the soil and establish the strength of the plants. As a result of all this I saw a significant improvement in the grass yield, and while I understand not everyone may be in a position to do this, it has certainly helped in my situation.

With the farm dried out from last year and the grass in good condition, I am about to start buying in sheep to start building the flock up again. In my next entry, I will discuss what we did when we brought the sheep on to the farm and the results of the ongoing testing.

# 'Take home messages'

- ✓ Fluke is an ever-changing picture, don't assume it's gone away because of one fine summer...
- ✓ Make best use of all available information – e.g. farm history, abattoir returns, diagnostic samples, on-farm risk factors, climatic conditions etc...
- ✓ Consider pasture management - if you have to treat, use the **right drugs** at the **right times** on the **right animals** at the **right dose**
- ✓ Always consult your vet and/or AH advisor to devise sustainable fluke control strategies tailored to your own farm





# Acknowledgements



Moredun Staff & students

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Moredun Comms Team

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## THANK YOU FOR YOUR ATTENTION! ANY QUESTIONS?

