Parasites in grazing dairy cattle - when and why does it lead to problems?

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Why parasites and grazing?

- Pasture-borne parasites (worms) are unavoidable and ubiquitous in grazing systems
  - but some are more ubiquitous than others:
    gastrointestinal nematodes > liver flukes > lungworms
- Worms may cause production losses in all age groups
  - disease problems mainly but not exclusively in young animals
- Parasites affect climate impact of animal production and thus sustainability of grazing systems
  - subclinically parasitized sheep increase methane emission +33%
- Climate changes will affect future epidemiology of pasture-borne parasites
  - larvae and snails on pasture

(Fox et al., 2018)

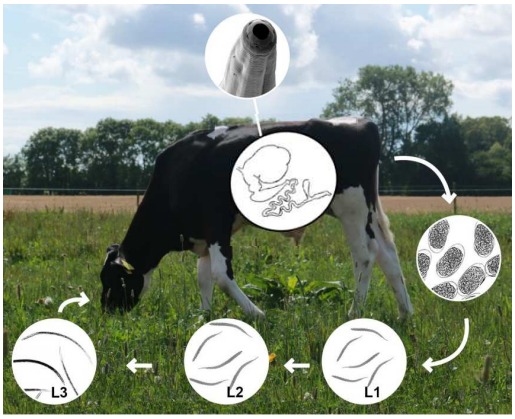
Outline

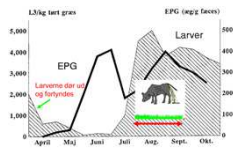
Today's focus: Parasites in relation to milk production

1. Prevalence
2. Impact
3. Drug resistance
4. Monitoring and control

Future perspectives

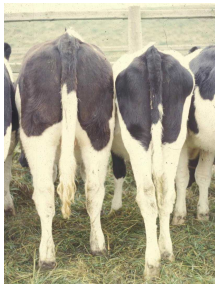
Gastrointestinal nematodes (GIN) (løbetarmorm)





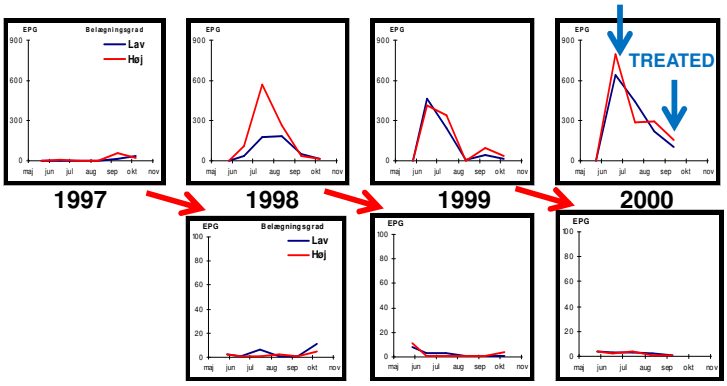
- In all grazing systems
- Most pathogenic and prevalent species in cattle:

- ***Ostertagia ostertagi*** (abomasum)
- ***Cooperia oncophora*** (small intestine)



Immunity reduces egg excretion in older animals

1st season calves (Fussingø)



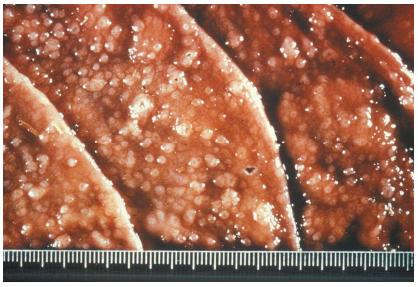
2nd season heifers

GIN infection levels in adult dairy cows, e.g.:

UK: 85% infected, mean faecal egg count (FEC): **4.8 epg** (Fox & Jacobs, 1981)

DE: 13% infected, FEC: **10-40 epg**, 100% by worm burden !! (Barth et al., 1981)

GIN-infections in Danish dairy cows



Survey of abomasal ulcers in dairy cows at slaughter

PhD student Sara Munch and Nynne Capion, IKV, KU (2017)

***Ostertagia* infections**

1.8% cows had 20-40 epg (N=553)

15% had worms (digestion of mucosa) (N=65)

(contents not examined; low analytical sensitivity)

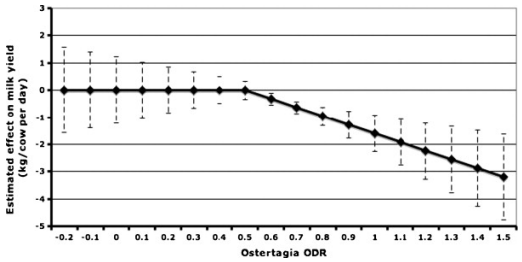
Abomasal mucosa of a dairy cow at abattoir, 22-3-2017

(© Ph.D. studerende Sara L. Munch)

Impact of GIN in adult cattle and monitoring

Methodology – three basic approaches:

- Experimental studies
- Treatment studies (meta-analysis 0.34 kg/cow/day)(Sanchez et al., 2004)
- Regression of *O. ostertagi*-specific antibodies in bulk tank milk (BTM) and production (low specificity)



(Forbes et al., 2008)

BTM-Ab is only relevant monitoring tool in adults

- Use for single farms?
- Can we monitor effect of interventions?

Monitoring by BTM in Danish dairy herds

Table 1
Ostertagia ostertagi BTM ELISA (ODR) profiles in European dairy herds with access to pasture, by country

Country	No. of herds (pastured/total)	Sampling time	Mean ODR	25th percentile	75th percentile	Minimum	Maximum
Denmark	146/146	Autumn 2005	0.48	0.26	0.67	0.04	1.23
Germany	78/131	Autumn 2006	0.48	0.29	0.65	0.01	1.14
Italy	47/140	Autumn 2006	0.31	0.13	0.48	−0.09	1.57
Netherlands	243/288	Autumn 2006	0.45	0.31	0.60	−0.19	1.15
Portugal	92/163	Autumn 2006	0.61	0.54	0.71	−0.06	1.00
Spain	91/143	Autumn 2006	0.53	0.27	0.81	−0.10	1.43
UK/Ireland	142/174	Autumn 2005	0.60	0.49	0.70	0.14	0.93

Risk factors (DK): daily grazing time; organic production; yield

Control of infections in adult cattle?

Treatments

- timing, risk of anthelmintic resistance
- eprinomectin: yield gains of around 1 kg milk/day (caveat: ectoparasites)

Grazing management

- late turn-out, mowing of pastures, reduced daily grazing time
- avoiding calf pastures

(Forbes et al., 2008; Charlier et al. 2009)

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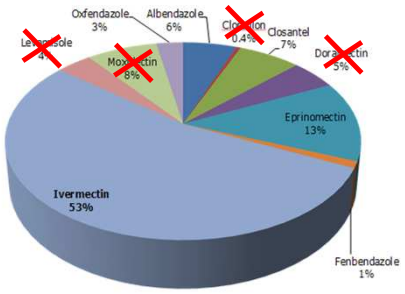
Use of anthelmintic drugs in Danish cattle:
based on number of treatments 2010-14



Source: VetStat

- The heavy reliance on **few** drugs increases the risk of drug resistance
- Particularly **ivermectin (MLs)**
- Increasing problems worldwide in cattle, also DK

(Pena-Espinoza, 2016; Vineer et al., 2020)

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Anthelmintic resistance in Danish cattle:
nematode faecal egg count reduction tests in 6 herds

	Farm #1 (Beef, conv.)		Farm #2 (Dairy, org.)		Farm #3 (Dairy, conv.)	
Reduction %	87^{R}	[81–93]	83^{R}	[72–92]	90^{I}	[62–98]

	Farm #4 (Dairy, org.)		Farm #5 (Beef, org.)		Farm #6 (Dairy, org.)	
Reduction %	81^{R}	[50–94]	92^{I}	[84–98]	81^{I}	[25–99]

- ivermectin 0.2 mg/kg sc.
- predominantly *Cooperia* post-treatment

(Pena-Espinoza et al, 2016)

Liver flukes in cattle: *Fasciola hepatica*

- All age groups (>1 year) get infected
- Older heifers and dry cows on **wet pastures** drive the infections
- Cows may clear infections but are susceptible to **re-infections**
- Important to find out whether reinfections take place in the milking herd

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Liver flukes on wet pastures:

where you find the snails! (*Galba truncatula* – lille pytsnegl)

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Recent status of liver flukes in DK:

based on official recordings of liver condemnations at slaughter

48.0% of 252 organic dairy cattle farms (≥100 animals) were positive on bulk tank milk Ab-ELISA in 2016

F. h. liver condemnations peak in old heifers and dairy cows (+steers)

(Kähler & Pedersen, 2005; Olsen et al 2015; Takeuchi-Storm et al., 2018)

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Liver flukes – impact on milk production

Herd-level

- ↓ 580.8kg/cow in ELISA positive herds (218 organic herds)

Individual level (284 cows in 55 organic herds)

- ↓ 919.5kg/cow in positive cows (>3rd lactations)

Uninfected SP<30

Avg. 9100kg/cow
6% herd level,
10% individual level

(Takeuchi-Storm et al., 2021)

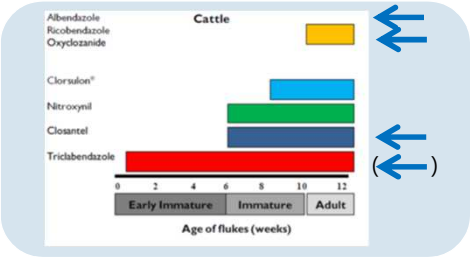
Liver flukes – monitoring and control

Monitoring tools/diagnostics:

- liver condemnation records, egg counts, serum-Ab, BTM-Ab
- good correlation between within-herd prevalence and BTM-Ab

Control:

- few drugs available for cows and timing is crucial
- resistance worsening abroad



Liver flukes – monitoring impact of interventions

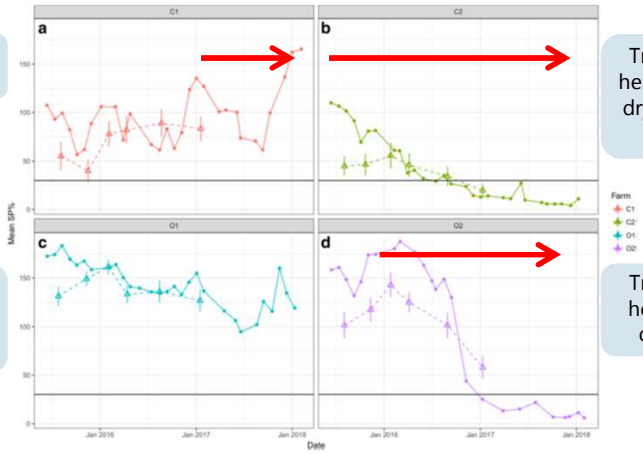
Monthly *Fasciola*-antibodies in BTM

Treatment: heifers only

Treatment: heifers only+ dry cows off pasture

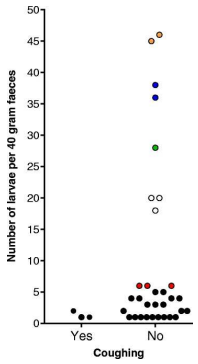
No treatments, all wet paddocks

Treatment: heifers and dry cows



Lungworms

Prevalence/incidence in DK?
(30% organic farms once in 5 years)
Sporadic - unpredictable
Monitoring tools:
- Faecal samples (15-30g)
- BTM Ab (patent!)
- (Clinical suspicion)



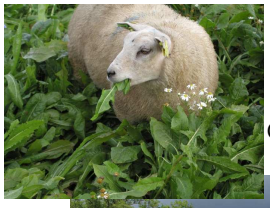
Recent German study; cows on pasture
- 4/17 farms +/ve (2000 samples)
- 0.9% and 3.4% +/ve cows in summer and autumn
- >90% 1st lactation
- Reduction in yield if patent infection: 1.6 kg/day

(May et al. 2018)

Sustainability in cattle production:

Some crops/plants with documented activity against nematodes

Sainfoin or Esparsette
(*Onybrychus viciifolia*)



Chicory (*Cichorium intybus)*

Take home messages and future perspectives

Gastrointestinal nematodes
- Options for control – grazing management / diversified crops
- Anthelmintic treatment of adults pro/cons
- Do we already now have an issue with anthelmintic resistance?

Liver flukes
- High infection levels and high impact (+organic farms)
- Avoid grazing lactating and dry cows on wet (snail) pastures
- Control may rely on regular treatments (?)

Lungworms
- We know too little!

Future perspectives
- Development of better monitoring tools (non-invasive)
- Resistance and drug availability
- Climate change
- Managing of larger flocks on e.g. natural grasslands

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