

Treatment against helminths in Norwegian sheep: a questionnaire-based survey.

Maiken Gravdal, Lucy Robertson, Kristoffer R. Tysnes, Johan Höglund, Christophe Chartier, Snorre Stuen

Corresponding author: Maiken Gravdal, Norwegian University of Life Sciences, Faculty of Veterinary Medicine, Department of Production Animal Clinical Sciences, Svebastadveien 110-112, 4325 Sandnes, Norway

maiken.gravdal@nmbu.no

Questionnaire regarding gastrointestinal parasites in sheep in Norway.

Dear sheep farmer!

This questionnaire is part of a four-year project to investigate gastrointestinal parasites in sheep. It is a multinational and multi-institutional project led by NMBU, Faculty of Veterinary Medicine and in collaboration with the Health Service for Sheep – Animalia.

You can answer the questionnaire here ([link](#)). The questionnaire should take 15 minutes to complete. Everyone completing the questionnaire will be entered into a draw with the possibility of winning a tablet computer or a one-year membership of the Norwegian Sheep Recording System (winner chooses).

Nematodes and liver flukes are widespread and are an important cause of clinical disease and production losses in sheep. The background of this project is that a lack of effect (resistance) has been found for drugs used to treat and prevent gastro-intestinal parasites in sheep in Norway. This leads to challenges related to the practical handling of infection, especially regarding the nematode *Haemonchus contortus* and the common liver fluke, *Fasciola hepatica*. Therefore, we want to investigate the prevalence of different parasites, effects of treatment, and the consequences they may have on production.

Based on the information obtained from this questionnaire, we would like to invite some farmers to participate in a sampling program during spring 2020/2021, to assess the efficacy of anthelmintics. Fecal samples from sheep will be collected from different parts of the country. This is a good opportunity to check the parasite-burden and the effect of anthelmintic treatment in your own flock.

The data will not be anonymous to us as we will see the questionnaire results, but all answers will be handled confidentially, and all results will be anonymized when published. Results from the questionnaire will be connected to production data in the Norwegian Sheep Recording System, in agreement with Animalia.

Thank you for your participation!

Best regards,

Maiken Gravdal

Ph.D.-student

Questionnaire regarding parasites in sheep in Norway.

Name:	Farm number:
Street name:	Zip code and place:
Municipality:	County:
Phone number:	E-mail:

General information on the holding.

S1

How often are you in contact with the veterinarian regarding parasite control in one year? <i>Check a box</i>
0 <input type="checkbox"/> 1-2 <input type="checkbox"/> 3 or more <input type="checkbox"/>

S2

Do you use organic farming? <i>Check a box</i>
yes <input type="checkbox"/> no <input type="checkbox"/> partly <input type="checkbox"/>

S3

Which breed(s) of sheep do you keep? Specify number of winter-fed sheep	Number (winter-fed)
Norwegian White Sheep	
Old Norwegian Sheep	
Old Norwegian Short Tail	
Texel:	
Other:	
Total number of winter-fed sheep	

S4

Do you have other livestock at your farm?	<i>Check box(es)</i>	
Cattle	<input type="checkbox"/>	
Horses	<input type="checkbox"/>	
Goats	<input type="checkbox"/>	
Other (specify):.....	<input type="checkbox"/>	
No	<input type="checkbox"/>	

S5

What type of flooring do your sheep have during winter/housing period?	<i>Check a box</i>
Slatted floor (expanded metal, plastic, wood, composite)	<input type="checkbox"/>
Solid floor with straw/wood shavings	<input type="checkbox"/>
Both solid and slatted floor	<input type="checkbox"/>

S6

Which month were the sheep turned out onto pasture?	<i>Check box(es)</i>	
	2018	2019
April	<input type="checkbox"/>	<input type="checkbox"/>
May	<input type="checkbox"/>	<input type="checkbox"/>
June	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):.....	<input type="checkbox"/>	<input type="checkbox"/>

S7

Which month were the sheep housed in the winter/autumn?	Check box(es)	
	2018	2019
October	<input type="checkbox"/>	<input type="checkbox"/>
November	<input type="checkbox"/>	<input type="checkbox"/>
December	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):.....	<input type="checkbox"/>	<input type="checkbox"/>

S8

Is it possible for the animals to go out onto pasture during autumn/winter after housing (e.g., during fine weather)? <i>Check a box</i>
Yes <input type="checkbox"/> No <input type="checkbox"/>

S9

What kind of pasture do the sheep use during the different seasons?	Check box(es)			
	Spring	Summer	Autumn	Winter
Cultivated pasture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home pasture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rangeland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forest pasture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

S10

Do the sheep have access to wet/moist areas (e.g. bogs/marshland, ditches, etc.) when on pasture?
<i>Check a box</i> Yes <input type="checkbox"/> No <input type="checkbox"/>

S11

What kind of water source do the animals have access to on pasture? <i>Check box(es)</i>		
Surface water (e.g., natural ponds, streams, lakes)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Trough with surface water	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Trough with treated water	Yes <input type="checkbox"/>	No <input type="checkbox"/>

S12

Which other species use the same pasture together with your sheep (mixed grazing)? <i>Check box(es)</i>		
	Home pasture	Rangeland
No mixed grazing	<input type="checkbox"/>	<input type="checkbox"/>
Goats	<input type="checkbox"/>	<input type="checkbox"/>
Cattle	<input type="checkbox"/>	<input type="checkbox"/>
Wild deer	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):.....	<input type="checkbox"/>	<input type="checkbox"/>

S13

If you have mixed grazing, are the other species treated against parasites?				
<i>Check a box</i>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input type="checkbox"/>	Not applicable <input type="checkbox"/>

Are newly purchased animals treated with anthelmintics before being introduced to your flock?

Check a box

Before purchase

Yes

No

Unknown

After purchase

Yes

No

Unknown

Is any form of quarantine (housed/kept separately etc.) used in conjunction with purchase of animals? *Check a box*

Yes

No

Unknown

Have you seen or experienced any of the following in your flock during the last 5 years?

Check a box

	Yes	No	Unknown
Pale/anemic animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diarrhea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bottlejaw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loss of wool on pasture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduced growth on pasture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sudden death on pasture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coughing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condemned liver (at abattoir)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low slaughter weight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How often are parasitological analyses performed in your flock (fecal samples with egg count)?

Check a box

	Lambs	Adults
Never	<input type="checkbox"/>	<input type="checkbox"/>
Once a year	<input type="checkbox"/>	<input type="checkbox"/>
Twice a year	<input type="checkbox"/>	<input type="checkbox"/>
3 or more times per year	<input type="checkbox"/>	<input type="checkbox"/>
On suspicion (diarrhea, other symptoms)	<input type="checkbox"/>	<input type="checkbox"/>

What are the reason(s) for checking for parasites in your flock? *Check box(es)*

- Disease/death
- Diarrhea
- Reduced growth
- General surveillance
- Other

Who do you consider to be your most important advisor regarding treatment against parasites, graded from 1 to 5, where 1 is the most important and 5 is the least important advisor?

Check a box

	1	2	3	4	5
Journals/articles/internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Veterinarian	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Abattoir advisors/Animalia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farmers community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neighbors/colleagues/family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Which parasites do you have in your flock? Check box(es)

	Present	Detected by egg count	Not present	Unknown
<i>Nematodirus battus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Haemonchus contortus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tapeworm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lungworm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common liver fluke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coccidia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ticks	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Lice	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>

Treatment of gastrointestinal parasites and liver flukes:

S20

How do you decide the timing of treatment against parasites in your flock?		<i>Check box(es)</i>
Experience from previous years		<input type="checkbox"/>
Weather and climate		<input type="checkbox"/>
Parasitological analysis (egg count)		<input type="checkbox"/>
Pasture rotation		<input type="checkbox"/>
Regularity, e.g. lambs every 3-4 week		<input type="checkbox"/>
Disease (death/diarrhea/reduced weight gain)		<input type="checkbox"/>
Housing for the winter		<input type="checkbox"/>
Other, specify?.....		<input type="checkbox"/>

S21

Which anthelmintic preparation(s) have you used in the following years?				<i>Check box(es)</i>
	2017	2018	2019	
Valbazen vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Curaverm vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Panacur vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Ivomec vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Ivermax vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Dectomax vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fasinex vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cestocur vet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other (specify?):.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

How do you estimate the dose? *Check a box*

- | | |
|--|--------------------------|
| Individual weighing | <input type="checkbox"/> |
| Visual appraisal | <input type="checkbox"/> |
| Weigh medium-sized animal, and dose the rest based on this | <input type="checkbox"/> |
| Weigh heaviest animal, and dose the rest based on this | <input type="checkbox"/> |
| Other, specify?..... | <input type="checkbox"/> |

How often do you calibrate your drench gun during a year? *Check a box*

- | | |
|--|--------------------------|
| Never | <input type="checkbox"/> |
| Only on suspicion that it is not working | <input type="checkbox"/> |
| 1 time | <input type="checkbox"/> |
| 1-2 times | <input type="checkbox"/> |
| More often | <input type="checkbox"/> |

Tick the appropriate boxes.

- | | Yes | No |
|--|--------------------------|--------------------------|
| Do you suspect a lack of effect from an anthelmintic drug? | <input type="checkbox"/> | <input type="checkbox"/> |
| Can you change spring pasture from one year to another? | <input type="checkbox"/> | <input type="checkbox"/> |
| Can you use a spring pasture that wasn't used during the previous autumn? | <input type="checkbox"/> | <input type="checkbox"/> |
| Have parasites in sheep been an increasing problem in your flock? | <input type="checkbox"/> | <input type="checkbox"/> |
| Are you satisfied by the guidance (*PT) you receive from the veterinarian? | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you use preventive measures to reduce parasites on pasture: | | |
| - Mowing/cutting of vegetation (after grazing)? | <input type="checkbox"/> | <input type="checkbox"/> |
| - Plowing? | <input type="checkbox"/> | <input type="checkbox"/> |
| - Drenching? | <input type="checkbox"/> | <input type="checkbox"/> |

*PT = parasite treatment

Roundworm

S25

How often do you treat against roundworms (Valbazen, Curaverem, Panacur, Ivomec, Ivermax, Dectomax)? *Check a box*

	Lambs	Adults
Never	<input type="checkbox"/>	<input type="checkbox"/>
Once a year	<input type="checkbox"/>	<input type="checkbox"/>
Twice a year	<input type="checkbox"/>	<input type="checkbox"/>
3-4 times a year	<input type="checkbox"/>	<input type="checkbox"/>
More often	<input type="checkbox"/>	<input type="checkbox"/>

S26

When are adults treated against roundworms? *Check box(es)*

At housing	<input type="checkbox"/>
At turnout to home pasture	<input type="checkbox"/>
At turnout to rangeland	<input type="checkbox"/>
Other, specify?.....	<input type="checkbox"/>
Not applicable	<input type="checkbox"/>

S27

Why do you treat against roundworms? *Check a box*

Prophylactic – have not had previous problems with roundworms	<input type="checkbox"/>
Prophylactic – have had previous problem with roundworms	<input type="checkbox"/>
Treat when symptoms/disease observed	<input type="checkbox"/>
Not applicable	<input type="checkbox"/>

Haemonchus contortus

S28

If *Haemonchus* is present in your flock, when do you treat against it? Check box(es)

	Lambs	Adults
Treat in the autumn	<input type="checkbox"/>	<input type="checkbox"/>
Treat in the spring	<input type="checkbox"/>	<input type="checkbox"/>
3-4 times a year	<input type="checkbox"/>	<input type="checkbox"/>
More often	<input type="checkbox"/>	<input type="checkbox"/>
Not applicable <input type="checkbox"/>		

S29

Which drug(s) do you use against *Haemonchus*? Check box(es)

Panacur/Valbazen/Curaverm	<input type="checkbox"/>
Ivomec/Ivermax	<input type="checkbox"/>
Other	<input type="checkbox"/>
Not applicable	<input type="checkbox"/>

S30

Do you have the impression that the treatment against *Haemonchus* is effective? Check a box

Yes	No	Not applicable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Liver flukes

S31

How often do you treat against liver flukes (Fasinex, Valbazen)? *Check a box*

	Lambs	Adults
Never	<input type="checkbox"/>	<input type="checkbox"/>
1-2 times a year	<input type="checkbox"/>	<input type="checkbox"/>
More often	<input type="checkbox"/>	<input type="checkbox"/>

S32

Which drug(s) do you use against liver flukes? *Check box(es)*

Valbazen	<input type="checkbox"/>
Fasinex	<input type="checkbox"/>
Other	<input type="checkbox"/>
Not applicable	<input type="checkbox"/>

S33

Do you have the impression that the treatment against liver flukes is effective? *Check box*

Yes	No	Not applicable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

S34

Why do you treat against liver flukes? *Check a box*

Prophylactic – have not had previous problems with liver flukes	<input type="checkbox"/>
Prophylactic – have had previous problems with liver flukes	<input type="checkbox"/>
Treat when symptoms/disease observed	<input type="checkbox"/>
Detected at abattoir	<input type="checkbox"/>
Not applicable	<input type="checkbox"/>

Would you like to participate in this project?

Check a box

Yes

No