

## Supplementary Materials

**Table S1.** Details of the primers and TaqMan® probes.

Description	Sequence (5' to 3')
16S forward primer	CGGGGTTATGTAGCTTGCTATG
16S reverse primer	TACGTTGTCCCCCACCATAA
16S TaqMan® probe <sup>1</sup>	TGGCGGACGGGTGAGTAATATATAGGAATC-BHQ
<i>rpoD</i> forward primer	GCTCCCATTTTCGCGCATAT
<i>rpoD</i> reverse primer	CTGATGCAGAAGTCGGTAGAACA
<i>rpoD</i> TaqMan® probe <sup>2</sup>	CATTCTTACCGGATCCG-BBQ2

<sup>1</sup>5' labelled HEX = Hexachloro-fluorescein; <sup>2</sup>5' labelled FAM = Fluorescein amidite; BHQ = Black Hole Quencher®-2; BBQ2 = Blackberry® Quencher

**Table S2.** Univariable binomial mixed effects model of clinical status from 972 foot-level observations.

Variable	<i>n</i>	%	Odds ratio	Lower 95% CI	Upper 95% CI	<i>p</i>
<i>Sheep-level</i>						
<b>Ewe age<sup>1</sup> (<i>n</i> = 85)</b>						0.965
<4 years (baseline)	52	61.2	Ref			
≥4 years	33	38.8	0.98	0.36	2.67	
<b>Ewe BCS (<i>n</i> = 243)</b>						0.063
3.0 (baseline)	111	45.7	Ref			
<3.0	43	17.7	0.36	0.11	1.14	
>3.0	89	36.6	0.40	0.14	1.14	
<i>Foot-level (<i>n</i> = 972)</i>						
<b>Presence of <i>D. nodosus</i></b>						<0.001
Undetected (baseline)	725	74.6	Ref			
Detected	247	25.4	<b>28.18</b>	13.34	59.54	
<b><i>D. nodosus</i> load (all samples)</b>	972	100.0	<b>4.22</b>	3.20	5.57	<0.001
<b><i>D. nodosus</i> load (positives only)</b>	233	100.0	<b>15.02</b>	6.12	36.88	<0.001
<b>Sole and heel damage</b>						0.024
Good (baseline)	767	78.9	Ref			
Poor	205	21.1	<b>1.95</b>	1.09	3.47	
<b>Wall damage</b>						0.278
Good (baseline)	241	24.8	Ref			
Poor	731	75.2	1.40	0.76	2.58	
<b>Wall overgrowth</b>						0.812
Good (baseline)	268	27.6	Ref			
Poor	704	72.4	0.93	0.49	1.74	

<sup>1</sup>Age of ewe at start of study; Load of *D. nodosus* expressed as log<sub>10</sub> +1 *rpoD* genome copies μl<sup>-1</sup>; CI: confidence interval for odds ratio; Bold odds ratios are statistically significant at 0.05 as their CIs do not include 1; Ref: baseline category for comparison.

**Table S3.** Akaike's Information Criteria (AIC) and delta AIC during model selection for associations with clinical status.

Model	Variables	AIC	Delta AIC
Final model	Load of <i>D. nodosus</i> (all samples)	375.5	
Candidate model 5	Load of <i>D. nodosus</i> (all samples)	375.9	0.4
	Sole and heel shape and/or damage		
Candidate model 4	Ewe BCS	378.1	2.6
	Load of <i>D. nodosus</i> (all samples)		
	Sole and heel shape and/or damage		
Candidate model 3	Ewe BCS	379.7	4.2
	Load of <i>D. nodosus</i> (all samples)		
	Sole and heel shape and/or damage		
	Wall shape and/or damage		
Candidate model 2	Ewe age	381.7	6.2
	Ewe BCS		
	Load of <i>D. nodosus</i> (all samples)		
	Sole and heel shape and/or damage		
	Wall shape and/or damage		
Candidate model 1 (full*)	Ewe age	383.7	8.2
	Ewe BCS		
	Load of <i>D. nodosus</i> (all samples)		
	Sole and heel shape and/or damage		
	Wall shape and/or damage		
	Wall overgrowth		

\*Variable 'presence of *D. nodosus*' not included in full model as highly correlated to variable 'load of *D. nodosus* (all samples)'

**Table S4.** Univariable binomial mixed effects model of presence of *D. nodosus* from 972 foot-level observations.

Variable	<i>n</i>	%	Odds ratio	Lower 95% CI	Upper 95% CI	<i>p</i>
<i>Sheep-level</i>						
<b>Ewe age<sup>1</sup> (<i>n</i> = 85)</b>						0.301
<4 years (baseline)	52	61.2	Ref			
≥4 years	33	38.8	1.40	0.74	2.64	
<b>Ewe BCS (<i>n</i> = 243)</b>						0.051
3.0 (baseline)	111	45.7	Ref			
<3.0	43	17.7	0.54	0.24	1.19	
>3.0	89	36.6	0.49	0.24	1.02	
<i>Foot-level (<i>n</i> = 972)</i>						
<b>Clinical status</b>						<0.001
Healthy (baseline)	847	87.1	Ref			
ID	125	12.9	<b>18.13</b>	9.27	35.48	
<b>Sole and heel damage</b>						0.026
Good (baseline)	767	78.9	Ref			
Poor	205	21.1	<b>1.77</b>	1.07	2.92	
<b>Wall damage</b>						0.931
Good (baseline)	241	24.8	Ref			
Poor	731	75.2	0.98	0.62	1.55	
<b>Wall overgrowth</b>						0.033
Good (baseline)	268	27.6	Ref			
Poor	704	72.4	<b>0.56</b>	0.33	0.95	

<sup>1</sup>Age of ewe at start of study; CI: confidence interval for odds ratios; Bold odds ratios are statistically significant at 0.05 as their CIs do not include 1; Ref: baseline category for comparison.

**Table S5.** Akaike's Information Criteria (AIC) and delta AIC during model selection for associations with presence of *D. nodosus*.

Model	Variables	AIC	Delta AIC
Final model	Clinical status	675.2	
	Wall overgrowth		
Candidate model 4	Clinical status	675.2	0.0
	Sole		
	Wall overgrowth		
Candidate model 3	Ewe BCS	676.5	1.3
	Clinical status		
	Sole		
	Wall overgrowth		
Candidate model 2	Ewe age	677.6	2.4
	Ewe BCS		
	Clinical status		
	Sole		
	Wall overgrowth		
Candidate model 1 (full)	Ewe age	679.2	4.0
	Ewe BCS		
	Clinical status		
	Sole		
	Wall		
	Wall overgrowth		

**Table S6.** Univariable linear mixed effects model of load of *Dichelobacter nodosus* on all feet from 972 foot-level observations.

Variable	<i>n</i>	%	$\beta$	Lower 95% CI	Upper 95% CI	<i>p</i>
<i>Sheep-level</i>						
<b>Ewe age<sup>1</sup> (<i>n</i> = 85)</b>						0.546
<4 years (baseline)	52	61.2	Ref			
≥4 years	33	38.8	-0.09	-0.38	0.20	
<b>Ewe BCS (<i>n</i> = 243)</b>						0.059
3.0 (baseline)	111	45.7	Ref			
<3.0	43	17.7	-0.29	-0.60	0.02	
>3.0	89	36.6	-0.21	-0.46	0.04	
<i>Foot-level (<i>n</i> = 972)</i>						
<b>Clinical status</b>						<0.001
Healthy (baseline)	847	87.1	Ref			
ID	125	12.9	<b>2.55</b>	2.36	2.74	
<b>Sole and heel damage</b>						<0.001
Good (baseline)	767	78.9	Ref			
Poor	205	21.1	<b>0.37</b>	0.17	0.57	
<b>Wall damage</b>						0.396
Good (baseline)	241	24.8	Ref			
Poor	731	75.2	0.08	-0.11	0.27	
<b>Wall overgrowth</b>						0.162
Good (baseline)	268	27.6	Ref			
Poor	704	72.4	-0.16	-0.37	0.06	

<sup>1</sup>Age of ewe at start of study;  $\beta$ : coefficient; CI: confidence interval for coefficient; Bold coefficients are statistically significant at 0.05 as their CIs do not include 0; Ref: baseline category for comparison.

**Table S7.** Akaike's Information Criteria (AIC) and delta AIC during model selection for associations with load of *D. nodosus* on all feet.

<b>Model</b>	<b>Variables</b>	<b>AIC</b>	<b>Delta AIC</b>
Final model	Clinical status Sole and heel shape and/or damage Wall overgrowth	2644.5	
Candidate model 3	Ewe BCS Clinical status Sole and heel shape and/or damage Wall overgrowth	2650.7	6.2
Candidate model 2	Ewe age Ewe BCS Clinical status Sole and heel shape and/or damage Wall overgrowth	2654.8	10.2
Candidate model 1 (full)	Ewe age Ewe BCS Clinical status Sole and heel shape and/or damage Wall shape and/or damage Wall overgrowth	2660.1	15.6

**Table S8.** Univariable linear mixed effects model of load of *Dichelobacter nodosus* on positive feet only from 233 foot-level observations.

Variable	<i>n</i>	%	$\beta$	Lower 95% CI	Upper 95% CI	<i>p</i>
<i>Sheep-level</i>						
<b>Ewe age<sup>1</sup> (<i>n</i> = 65)</b>						0.085
<4 years (baseline)	44	67.7	Ref			
≥4 years	21	32.3	-0.58	-1.24	0.08	
<b>Ewe BCS (<i>n</i> = 95)</b>						0.465
3.0 (baseline)	48	50.5	Ref			
<3.0	14	14.7	-0.28	-0.90	0.33	
>3.0	33	34.7	-0.21	-0.72	0.30	
<i>Foot-level (<i>n</i> = 233)</i>						
<b>Clinical status</b>						<0.001
Healthy (baseline)	137	58.8	Ref			
ID	96	41.2	<b>1.98</b>	1.71	2.25	
<b>Sole and heel damage</b>						0.003
Good (baseline)	164	70.4	Ref			
Poor	69	29.6	<b>0.48</b>	0.16	0.80	
<b>Wall damage</b>						0.1038
Good (baseline)	63	27.0	Ref			
Poor	170	73.0	0.28	-0.06	0.62	
<b>Wall overgrowth</b>						0.173
Good (baseline)	114	48.9	Ref			
Poor	119	51.1	0.17	-0.21	0.55	

<sup>1</sup>Age of ewe at start of study;  $\beta$ : coefficient; CI: confidence interval for coefficient; Bold coefficients are statistically significant at 0.05 as their CIs do not include 0; Ref: baseline category for comparison.

**Table S9.** Akaike's Information Criteria (AIC) and delta AIC during model selection for associations with load of *D. nodosus* on positive feet only.

Model	Variables	AIC	Delta AIC
Final model	Clinical status Sole and heel shape and/or damage Wall overgrowth	614.0	
Candidate model 3	Ewe age Clinical status Sole and heel shape and/or damage Wall overgrowth	615.2	1.2
Candidate model 2	Ewe age Clinical status Sole and heel shape and/or damage Wall shape and/or damage Wall overgrowth	618.6	4.7
Candidate model 1 (full)	Ewe age Ewe BCS Clinical status Sole and heel shape and/or damage Wall shape and/or damage Wall overgrowth	624.7	10.7