Serological diversity of *Dichelobacter nodosus*

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Dichelobacter nodosus causes footrot

- Two clinical presentations: interdigital dermatitis (ID) and severe footrot (SFR) (Figure 1)
- Most prevalent cause of lameness in sheep in England:
- affects over 90% of flocks
- geometric mean prevalence of lesions 3.1% and 4.5% per flock for SFR and ID respectively.

Figure 1. Interdigital dermatitis (left) and severe footrot (right)

Serogroups and vaccination

- Ten serogroups (A–I and M) of *D. nodosus*
- The commercial footrot vaccine (Footvax™) contains nine (A–I)
- Not all serogroups are present in each flock
- Vaccination gives partial protection for 4–6 months and reduces the period prevalence of lameness by 20% (Winter et al. 2015)
- Mono/bi-valent *D. nodosus* vaccines induce a higher and longer lasting immune response – but only protects against homologous serogroups.

Study objectives

Carry out a survey of *D. nodosus* serogroups in sheep flocks in England, identifying:

- Serogroup diversity and distribution by flock, region and management
- Impact of vaccination on serogroup diversity
- Whether a vaccine with fewer serogroups could be more effective at controlling footrot in England.

Sample collection

In total, 164 farmers provided:

- Responses to a questionnaire, detailing lameness and management practices in their flock in 2015
- Up to 8 interdigital skin swabs from the feet of sheep with the disease state recorded (1,288 swabs in total).

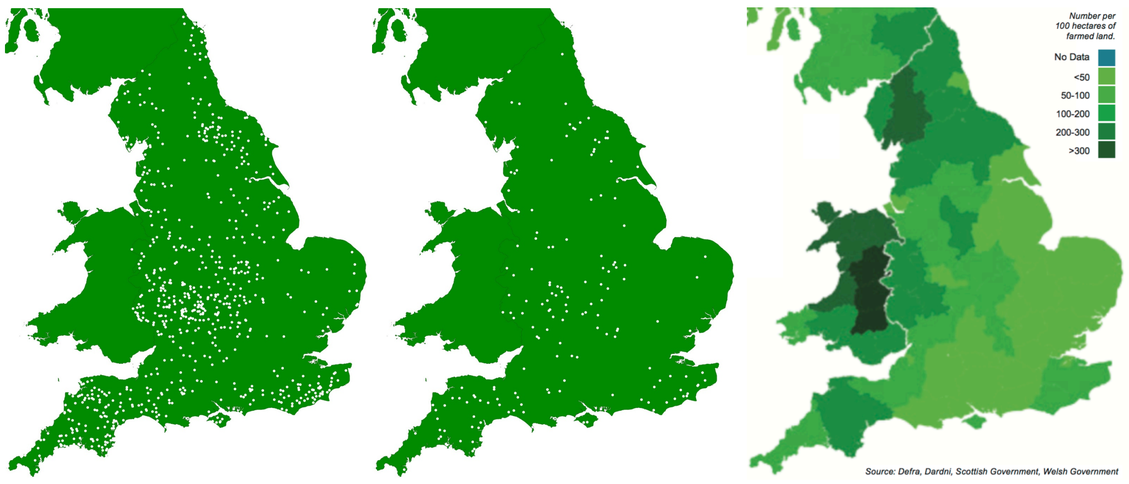

Figure 2. Locations of 723 invited flocks (left), 164 participating flocks (centre), and ewe density, modified from 'Density of breeding ewes, UK, June 2013', AHDB Beef & Lamb UK Yearbook 2016 Sheep (right)

Table 1. Lesions sampled by 1,288 swabs from 164 participating flocks

	Number	Percent
Footrot	957	74.3
Severe footrot	501	38.9
Interdigital dermatitis	496	38.5
Other/unidentified lesion	243	18.9
Healthy foot	88	6.8

Prevalence of footrot

- Approximately 94% of farmers reported footrot present in their flock in 2015 (ID: >93%, SFR: >91%)
- Approximately 36% (60) of farmers reported that they vaccinated their sheep against footrot in 2015.

Table 2. Types of use of Footvax™ by 60 farmers

Vaccinates:	Number	Percent
All ewes	47	78.3
Some sheep but not all ewes	13	21.7
Once a year	49	81.7
More than once a year	11	18.3

Future work

Laboratory

- After extracting DNA from the swabs, *D. nodosus* load in each sample detected with qPCR
- Samples positive for *D. nodosus* will be tested with single serogroup PCR against A–I. (There is no primer specific for M).

Statistical analysis

- A quasipoisson over dispersed model (R) is investigating the effect of management on lameness prevalence
- Other models will:
- investigate relationships between *D. nodosus* serogroups and ID and SFR
- predict the efficacy of vaccines targeting different serogroups on footrot in England.

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References

Winter et al., 2015 Prev Vet Med, 122, 121-128