THE UNIVERSITY OF
WARWICK

University of Warwick institutional repository

This paper is made available online in accordance with
publisher policies. Please scroll down to view the document
itself. Please refer to the repository record for this item and our
policy information available from the repository home page for
further information.

To see the final version of this paper please visit the publisher's website.
Access to the published version may require a subscription.

Author(s: . Kaler and L.E. Green
Article Title: Naming and recognition of six foot lesions of sheep using
written and pictorial information: A study of 809 English sheep farmers

Year of publication: 2008
Link to published version:
http://dx.doi.org/10.1016/j.prevetmed.2007.06.003
Publisher statement: None

1 **Naming and recognition of six foot lesions of sheep using written and pictorial**

2 **information: a study of 809 English sheep farmers**

3 **J. Kaler* and L.E. Green**

4 Ecology and Epidemiology Group, Dept. of Biological Sciences, University of Warwick,

5 Coventry, CV4 7AL, UK

6 *Corresponding author, postal address as above

7 Tel. +44 2476 575860

8 Email:j.kaler@warwick.ac.uk

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1   **Abstract**

2   In 2004, 3000 questionnaires were sent to a random sample of English sheep farmers from a

3   list kept by the English Beef and Lamb Executive (EBLEX) to investigate whether farmers

4   could correctly name six common foot lesions in sheep from a characteristic picture and a

5   written description. The lesions were interdigital dermatitis (ID), footrot (FR), contagious

6   ovine digital dermatitis (CODD), shelly hoof, foot abscess and toe granuloma. In addition,

7   farmers were asked to report the total percent of lame sheep in their flock in 2004 and the

8   percent of this lameness attributable to each of the six lesions listed above. The overall

9   response percentage was 44 with a useable response of 32%.

10 Fifty nine farmers out of 262 (23%) who answered all six questions named all six lesions

11 correctly. This was greater than expected by chance. The same questionnaire of six lesions

12 was presented at a meeting of specialist sheep advisors, primarily veterinarians, 37/47 (79%)

13 responders named all six lesions correctly.

14 From the six lesions listed above, the percent correctly named by farmers was approximately

15 83%, 85%, 36%, 28%, 65% and 43% and the percent incorrectly attributed to another lesion

16 was 5%, 47%, 10%, 13%, 35% and 7% respectively. The most commonly used incorrect

17 name was FR, with farmers tending to name any hoof horn lesion as FR. A comparison of

18 the distribution of sheep lame by a lesion correctly named compared with the same lesion

19 incorrectly named as FR suggested that farmers recognised lesions but did not name them

20 correctly; the distribution of lameness fitted the pattern for the correctly named lesion rather

21 than the pattern of lameness attributed to FR. The results were validated with farm visits and

22 a repeatability study of the questionnaire.

23 The mean farmer-estimated prevalence for all lameness was 10.4%; with 6.9%, 3.7%, 2.4%,

24 1.9%, 0.9% and 0.8% of the sheep lame with ID, FR, CODD, shelly hoof, foot abscess and

25 toe granuloma respectively from respondents who correctly named these lesions. Whilst ID

1 and FR were the most prevalent causes of lameness in most flocks it is possible that in up to

2 17% flocks the primary cause of lameness was a different lesion.

3 *Keywords*: foot lesions; sheep; repeatability; validity; lameness; footrot

4

5 **1. Introduction**

6 Lameness in sheep has been identified by sheep farmers in GB as their highest cause of

7 concern for poor health in the flock (Goddard et al., 2006). There is no evidence that the

8 incidence or prevalence of lameness in sheep in GB has decreased in the last 30 years despite

9 recommendations for its control. In 1994, the estimated prevalence was 8% (Grogono-

10 Thomas and Johnston, 1997) and in 2000 it was 10% (Wassink et al., 2003, 2004). The most

11 common infectious causes of lameness in sheep are interdigital dermatitis (ID) and footrot

12 (FR) (Grogono-Thomas and Johnston, 1997) and more recently concern has been raised over

13 the newly emerging infectious disease, contagious ovine digital dermatitis (CODD)

14 (Wassink et al., 2003). In addition to these infectious causes of lameness, there are non-

15 infectious causes which include white line degeneration (shelly hoof), foot abscess and toe

16 granuloma. These are generally considered to be of low prevalence (Grogono-Thomas and

17 Johnston, 1997; Winter, 2004 a and b), but there has been no study to be sure of this (details

18 of the clinical presentation of these lesions is presented in Winter 2004a).

19 Recent research indicates that new approaches to managing FR and ID might be more

20 effective for control of these diseases than previous recommendations (Wassink et al., 2003,

21 2005; Green et al., 2007). However, another reason for the failure to reduce lameness in

22 sheep may be that farmers incorrectly diagnose the cause of lameness and therefore manage

23 lameness incorrectly. Most recent epidemiological studies in GB that have quantified

24 lameness in sheep and its causes (Grogono-Thomas and Johnston, 1997; Wassink et al.,

25 2003; Hosie, 2003) have used farmer opinion of the cause and prevalence of lameness in

1 their flock and are, consequently, based on the untested premise that farmers can recognise

2 and name the foot lesions associated with lameness and that they can identify lame sheep.

3 The former assumption is tested in this paper.

4 Self administered questionnaires are a valuable research tool to collect data. They are

5 generally more rapid to complete than telephone or personal interviews (Kelsey et al., 1996).

6 In data collected via questionnaires the response to each question should be valid and

7 repeatable (Sargeant and Martin, 1998). Although questionnaire data are widely used, there

8 are only a few studies in veterinary epidemiology that discuss validity; only 11 articles out

9 of 120 (9.2%) using questionnaire data that were published in peer reviewed journals

10 between 1984 and 1988 stated the questionnaire validity (Vaillancourt et al., 1991).

11 This paper presents the results from a study of farmer and sheep-expert naming of six foot

12 lesions of sheep in 2004 with validation. The prevalence of lameness and lesion specific

13 causes attributed to this lameness is presented.

14

15 **2. Materials and Methods**

16 *2.1. Development and implementation of the questionnaire*

17 *2.1.1. Study population*

18 Win Episcope 2.0 was used to estimate the sample size. Sample size was calculated

19 assuming 50% of flocks affected with each lesion, based on the 34% to 77% of flocks

20 affected as estimated by Grogono-Thomas and Johnston (1997), with a precision of 2.5%

21 and a confidence interval of 95% (Cannon and Roe, 1982). This sample size was then

22 adjusted for an expected response rate of 50%, since the source list was known to contain

23 redundancy.

24 A stratified random sample of sheep farms was selected from a list belonging to the English

25 Beef and Lamb Executive (EBLEX) sorted by region and by flock size within each region.

1   Sheep farms in England were grouped into five regions, south west (Cornwall, Devon,

2   Somerset, Dorset, Wiltshire and Gloucestershire), south east (Norfolk, Suffolk,

3   Hertfordshire, Berkshire, London, Surrey, Kent, E. Sussex , W. Sussex and Essex), central

4   (Cheshire, Peterborough, Cambridgeshire, Lincolnshire, Nottinghamshire,

5   Northamptonshire, Warwickshire, Bedfordshire, Buckinghamshire, Oxfordshire,

6   Worcestershire, Leicestershire, Staffordshire, Shropshire and Herefordshire), north west

7   (Greater Manchester, Cumbria and Lancashire) and north east (Northumberland, Durham

8   and Yorkshire). Approximately 6% of the target population was surveyed.

9   *2.1.2. Questionnaire*

10 A questionnaire containing a characteristic picture and description (e.g. Figure 1) of six

11 lesions associated with lameness (ID, FR, CODD, shelly hoof, foot abscess and toe

12 granuloma) together with questions on flock size, location and prevalence of lameness was

13 developed. The questionnaire was pilot tested on 15 farmers and the final version developed

14 from these farmers comments and responses to questions.

15 The questionnaire, covering letter and a return stamped addressed envelope were sent out on

16 March 14, 2005 to 591, 414, 989, 331 and 675 farmers in each of the regions listed above

17 respectively. A reminder postcard was sent to all non respondents on April 14, 2005. A

18 second reminder, which included a copy of the questionnaire and return stamped addressed

19 envelope, was sent to the remaining non-respondents on May 14, 2005. Acknowledgement

20 postcards were sent to all those who responded to the survey.

21 *2.2. Farmer naming and prevalence of six lesions*

22 *2.2.1. Definitions/calculations*

23 **All answers** = the number of farmers who responded to a question.

24 **Correct name of lesion** = the percent of farmers who named the lesion correctly out of all

25 those who answered the question.

1   **Incorrect name** = the percent of farmers who incorrectly named a lesion out of all those

2   who answered the question.

3   **Most frequently used name for a misnamed lesion** = the name most attributed incorrectly

4   to a lesion e.g. the most frequent incorrect name attributed to shelly hoof was FR.

5   The distribution of proportion of lameness attributed to shelly hoof (correctly named by the

6   farmer) by flock was plotted. This was compared with the distribution incorrectly named as

7   FR and the distribution correctly named as FR. This was repeated for ID, CODD, foot

8   abscess and toe granuloma.

9   **Prevalence of a lesion** = percent of sheep lame with a lesion in flocks where the farmer

10   named the lesion correctly.

11   **The most prevalent lesion on a farm** = the picture of the lesion with the highest percent of

12   lameness in the flock according to the farmer, irrespective of the farmer's name for the

13   lesion.

14   Where ID or FR were correctly named and were the most prevalent lesion in the flock, the

15   farmer's ability to correctly name other lesions was estimated (43 farms were omitted from

16   both lesion categories because they had both ID and FR equally prevalent on farm).

17   *2.3. Validity and repeatability of questionnaire*

18   The location and size of the selected and participating farms were compared with the

19   DEFRA agricultural survey 2004.

20   (http://www.DEFRA.gov.uk/esg/work_htm/publications/cs/census/analyses/for_2004/pdf/fd/

21   tot_sheep.pdf).

22   Non-response bias was assessed by comparing the geographical distribution and average

23   flock size of respondents and non-respondents.

24   *2.3.1. Farm visits and examination of live sheep*

1 Four farmers from each category of zero to all six lesions correctly named from the postal

2 study (28 in total) were visited in May and June 2006. Visits were arranged by telephone and

3 were based on farmer availability and proximity to the university. Farmers were sent a letter

4 containing the date and time of the visit, farmers were asked to gather any lame sheep they

5 had in preparation for the visit. The objectives of the visit were to repeat the written lesion

6 recognition questionnaire (repeatability) and to investigate whether farmers named the

7 lesions on lame sheep as they had in the questionnaire (validity). On the farm, the farmer's

8 and the researcher's (first author) name for the foot lesions observed were recorded

9 independently. The researcher used codes for lesions to ensure that farmers did not learn the

10 identity of the lesions while the observations were made. After the recordings were complete

11 the farmer was asked to repeat the self administered questionnaire (the same person who

12 filled in the first questionnaire filled in the second one). Finally, the six lesions were then

13 discussed with the farmer. Each farmer was asked to rank the picture quality and written

14 descriptions in the self administered questionnaire using a scale of good, average or poor.

15 *2.3.2. Questionnaire repeatability*

16 In addition to questionnaires administered on farms, 50 questionnaires were sent by post to

17 farmers selected randomly from respondents to the first survey, ensuring that all levels of

18 lesion recognition were represented, to test repeatability. For repeatability we calculated:

19 **Percent exact agreement** = percent of farmers who gave the same name to a lesion on both

20 occasions. In addition, kappa statistics and the number of correct answers for the six lesions

21 between the farm visits and the postal questionnaire were calculated. Kappa was interpreted

22 according to Landis and Koch (1977).

23 *2.4. Recognition of lesions by attendees at the Sheep Veterinary Society meeting*

24 The self administered questionnaire was distributed at the Sheep Veterinary Society meeting

25 Cambridge, England in April, 2006. The delegates were asked to complete the questionnaire.

In addition, they were asked their profession and whether they personally had a care of a flock of sheep.

2.5. Data analysis

Comparisons between proportions were made with a χ^2 test, two means with modified t-test (unequal variances) and more than two means with Kruskal –Wallis test (Petrie and Watson, 2000) with significance at $p \leq 0.01$.

3. Results

3.1. Number of replies to the postal questionnaire

A total of 1313 (44%) questionnaires were returned. The regional response percent was 43.0%, 42.8%, 41.4%, 47.3% and 45.3% for the central, north east, north west, south east and south west respectively. Out of the 1313 questionnaires returned, 809 (62%) were usable for the analysis which gave a useable response percent of 32 (Table 1). Three hundred and ten (38%) farmers out of 809 agreed to participate in any further study on lameness in sheep.

3.2. Flock attributes

The mean flock size was 318 sheep with a median of 220 (interquartile range 90 - 450). The altitude of the farms ranged from 60m to 244m above sea level. A total of 394/792 (50%) farmers had pedigree flocks producing replacement ewes and terminal sires while 746 (94%) produced meat and store lambs and 20 (2%) were hobby farmers or produced wool. Ninety seven percent of 809 farmers reported that they had lame sheep in their flock in 2004; the mean within flock prevalence of lameness was approximately 10.4%. This did not vary by region (H = 7.8, p>0.01) or flock size (H = 0.99, p>0.01).

3.3. Naming of lesions

The percent of lesions correctly named ranged from 28% (shelly hoof) to 85% (FR) (Table 2). Twenty three percent (59) of 262 farmers who answered all six questions named all six

1 lesions correctly. The probability of getting all six correct by chance was 0.2×10^{-4}. The

2 percent of farmers who identified any 5, 4, 3, 2 or 1 lesion correctly was 28%, 47%, 71%,

3 93% and 98% respectively. The names used by farmers for the incorrectly named lesions

4 ranged from 5% (ID) to 47% (FR) (i.e. 47% farmers incorrectly named other lesions as FR)

5 (Table 2).

6 *3.4. Comparison of the distribution of flock lameness for ID, CODD, shelly hoof and foot*

7 *abscess misnamed as FR*

8 Interdigital dermatitis, CODD, shelly hoof and foot abscess were most frequently misnamed

9 as FR. When the distribution of flock lameness attributable to ID, CODD, shelly hoof and

10 foot abscess correctly named and incorrectly named as FR were compared, there was no

11 significant difference (p>0.01) between the distributions of lameness (ID ($\chi^2 = 9.19$, df = 4),

12 CODD ($\chi^2 = 1.6$, df = 3), shelly hoof ($\chi^2 = 12.9$, df = 4) and foot abscess ($\chi^2 = 6.8$, df = 3)).

13 However, there was a significant difference between the distribution of the lesions

14 incorrectly named as FR and the distribution of FR when correctly named ($\chi^2 = 78.77$ df = 4,

15 $\chi^2 = 11.5$ df = 3, $\chi^2 = 15.7$ df = 4, $\chi^2 = 21.5$ df = 3 with p<0.01 respectively) (Figure 2). This

16 suggests that farmers recognised the description and photograph but misnamed the lesion.

17 For toe granuloma the most frequent incorrect name was foot abscess. There was no

18 indication that farmers recognised this lesion. Interestingly, approximately 12% (51/428) of

19 farmers who reported the presence of toe granuloma named it as 'other' and most of them

20 specified 'other' as 'strawberry footrot'(another cause of lameness in sheep, Winter 2004a).

21 Anecdotally, we now know that many farmers refer to toe granuloma (small spheres of

22 proud flesh) as strawberries.

23 *3.5. Prevalence of lameness and foot lesions in sheep in 2004*

1   A total of 264,076 sheep were in this survey. Out of these, 27,468 (10.4%) sheep were

2   estimated to be lame in 2004. The most prevalent causes of lameness were ID and then FR

3   (Table 2).

4   *3.6. Association between lesion naming and the most prevalent lesion*

5   A total of 421/514 (82%) and 160/189 (85%) farmers named ID and FR correctly where they

6   had stated this as their most prevalent lesion. A total of 7% (2/29), 13% (11/83), 38%

7   (20/53) and 57% (12/21) farmers correctly named toe granuloma, shelly hoof, CODD and

8   foot abscess where the farmer stated that these were the most prevalent lesion in the flock.

9   Therefore there were 17% (141/809) farmers who reported lesions other than ID and FR as

10 their most prevalent lesion on the farm but did not name them correctly and there were 6%

11 (2459/43340) sheep in these flocks with these lesions.

12 The 421 farmers, who correctly named ID, and where it was the most prevalent cause of

13 lameness, were more likely to name all other lesions correctly than farmers who stated that

14 FR was most prevalent and had correctly named FR. In the flocks where FR dominated

15 (117), farmers had a tendency to also name other horn damage as FR (Table 3).

16 *3.7. Validity*

17 There was no significant difference in geographical distribution (χ^2 = 3.85, df = 4, p>0.01) or

18 average flock size (t = 1.96, p>0.01) between respondents and non respondents. The

19 geographical location of the selected farms (χ^2 = 122.0, df = 4, p<0.01) and participating

20 farms in the survey (χ^2 = 43.4, df = 4, p<0.01) was significantly different from that listed in

21 the DEFRA census for 2004. Similarly, the distribution of flock size of selected and

22 participating farms in the survey was also significantly different from the DEFRA census for

23 2004 (χ^2 = 420, df = 5, p<0.01), (χ^2 = 319.11, df = 5, p <0.01) respectively (Table 4).

24 *3.7.1. Farm visits*

1   At the 28 farm visits a total of 193 lame sheep were examined, this included 158 ewes, 4

2   rams and 31 lambs. Approximately 30% of the lame sheep were affected on more than one

3   limb. A total of 278/772 (36%) feet were clinically abnormal. There were 22, 12, 4, 5, 2 and

4   3 flocks with sheep with ID, FR, CODD, shelly hoof, foot abscess and toe granuloma

5   respectively on the day of the visit. Farmers generally gave the same name to the lesions

6   present on farm as they did in the postal questionnaire (Table 2). A total of 86% (CODD) to

7   100% (toe granuloma) farmers rated pictures and descriptions of lesions as good (Table 2).

8   *3.8. Repeatability*

9   *3.8.1. Farm visits*

10   The same farmer who had completed the postal questionnaire completed it again on farm

11   (self administered). The percent exact agreement for lesion naming ranged from 71% (foot

12   abscess) to 88% (ID, FR and toe granuloma) and the kappa coefficients of agreement

13   between farmer ratings showed substantial agreement ranging from 0.64 (ID) to 0.82 (toe

14   granuloma) (Table 2) Eight farmers gave one more correct answer to the repeatability

15   questionnaire than to the postal questionnaire.

16   *3.8.2. Repeatability questionnaires sent by post*

17   Thirty questionnaires (60%) out of 50 were returned. The percent exact agreement for lesion

18   naming ranged from 49% (foot abscess) to 79% (FR and ID) and the kappa coefficient of

19   agreement between farmer responses varied from fair to substantial ranging from 0.35 (foot

20   abscess) to 0.65 (FR). Out of 30 farmers, 11 (37%) had the same number of correct answers

21   in both questionnaires. Of those farmers who had a different number correct between the

22   questionnaires, 12 gave one or more extra correct answers and 7 gave fewer correct answers.

23   *3.9. Recognition of lesions by sheep specialists*

24   Fifty delegates completed the questionnaire; 40 were veterinarians, 7 other specialists and 3

25   did not state their profession. Seventeen had care of a flock of sheep. The percent of

1 correctly named lesions ranged from 86% (shelly hoof) to 98% (FR) (Table 2). A total of 37

2 out of 47 (79%) respondents named all 6 lesions correctly.

3

4 **4. Discussion**

5 The results from the study support the emphasis on education and research to minimize

6 lameness caused by ID and FR. However, the key finding from this study is that many

7 farmers could not correctly name all six lesions presented but probably could recognise

8 them. In contrast to the farmer naming of lesions, most sheep specialists were able to name

9 the six lesions correctly. This suggests that these specialists could be a useful source of

10 knowledge to farmers if we can improve knowledge transfer. Photographs (considered good

11 by farmers in this study) may assist with this transfer of knowledge, together with an

12 emphasis on the need to name lesions correctly (to ensure useful dialogue) and then finally

13 an understanding of how lesions occur and may be treated and prevented (to the best of our

14 current knowledge).

15 In this study, FR was the most commonly used incorrect name for other lesions. The

16 practical and important result of this is that lame sheep and flocks of sheep may be mis-

17 managed, assuming this sample of flocks is generalisable, and that our interpretation of the

18 results that farmers can recognise but not name the lesions is correct. Approximately 17% of

19 farmers stated lesions other than FR or ID were the most prevalent lesions on their farm but

20 did not name them correctly. Given that the majority of misnaming appears to be just that,

21 recognition of the lesion but an attribution of an incorrect name, it is of concern that 17% of

22 flocks (2459 lame sheep and their 40881 non-lame flock mates) might be managed

23 incorrectly. In addition, 6% (45/809) of farmers who did correctly name lesions other than

24 ID or FR as their most prevalent cause of lameness may not receive useful advice.

1   The most randomly named lesion was toe granuloma. The development of granulation tissue

2   occurs in response to damage to the sensitive dermis, often through trimming horn into

3   sensitive tissue but possibly also in response to footrot disease. In GB, we have emphasised

4   that it is poor practice to trim hoof horn into the dermis for many years (Grogono-Thomas

5   and Johnston 1997; Winter, 2004 a and b) and that an iatrogenic result might be the

6   development of toe granuloma, but this message is apparently unclear to farmers since toe

7   granulomas are still occurring on at least 66% of farms, and possibly many more given the

8   random misnaming of this lesion.

9   A key assumption from this study was that farmers can recognise lame sheep and that the

10   estimates of farms affected and within flock prevalence are valid. Our results are similar to

11   those presented by Grogono-Thomas and Johnston (1997) and by Wassink et al. (2003) but,

12   of course, all rely on farmer recognition of lameness. Farmer recognition of lameness is

13   currently being investigated, but for the purposes of this paper we assume that these

14   estimates are reasonable. The improvement from this paper is that flock prevalence and

15   proportional contribution of each lesion to lameness is estimated and only from among

16   farmers who named the six lesions correctly.

17   ID was present in 96% of flocks in this study, more than the 51% and 88% as reported by

18   Grogono-Thomas and Johnston (1997) and Wassink et al. (2003) respectively and FR was

19   present in 90% of flocks. This was again higher than the 77% and 86% as reported by

20   Grogono-Thomas and Johnston (1997) and Wassink et al. (2003) respectively. ID and FR

21   were the most prevalent causes of lameness within flocks which is similar to the results

22   reported by Grogono-Thomas and Johnston (1997).

23   Not all foot lesions were present on each farm at the farm visits (Table 2), as might be

24   anticipated from our postal questionnaire results, but of those present, farmer recognition

25   was generally similar to that in the postal questionnaire, indicating that the pictures were a

1 valid technique where use of lame sheep was not possible. A useful finding was that there

2 were generally several farm workers on each farm and so it was possible to ensure that the

3 repeatability study was done with the same respondent; repeatability was moderate to high.

4 The repeatability by post was a comparatively lower; this may be because a different person

5 completed the second questionnaire. Repeatability would be lower if within respondent pairs

6 there was a higher or lower level of knowledge about the lesions.

7 For good precision and representation of sheep farmers in England, we selected farmers with

8 a representative range of flock sizes from each region. Stratified random sampling within the

9 strata should have minimised selection bias. However, the distribution of flocks selected was

10 different with respect to overall distribution of flocks in England from the DEFRA

11 agricultural survey, 2004 and the average flock size was apparently larger than the DEFRA

12 estimated flock size. In this survey there was an under representation of very small flocks

13 (<50) and larger flocks (>1000). We do not know why there was this difference.

14 The information in this study was obtained by post which is one of the most frequently used

15 modes to collect data in veterinary epidemiology (Vaillancourt et al., 1991). Although they

16 are less expensive to conduct than telephone and in-person interviews, postal questionnaires

17 are prone to number of errors (O'Toole et al., 1986) and their potential major disadvantage is

18 a low response percent. Even though two reminders were used we had a response percent of

19 44 rather than the 50% anticipated, and a useable response percent of 32%. However, this

20 was over 800 farmers, a number that it was not feasible to visit. The response percent in the

21 current study was high compared with the 20% in the 1993 study (Grogono-Thomas and

22 Johnston, 1997) which followed a similar random sampling strategy but did not use

23 reminders. However, the response percent in this study was moderate compared with the

24 64% by Wassink et al. (2003) which used a non random sample with two reminders and

25 targeted farmers from the survey of 1993 who had said they were interested in participating

in further research. Interestingly, this response percent was similar to the 60% in our repeatability study using compliant farmers. Considering the fact that sheep farmers are going out of farming and the address list was known to contain redundancy the response percent for this study was reasonable. Although there were no significant differences between respondents and non respondents with respect to geographical location and flock size; one cannot rule out non-response bias for other reasons, e.g. farmers who responded might have been more concerned about lameness in their flock than non-respondents.

5. Conclusion

This study indicates that there is a gap in knowledge between sheep advisors and sheep farmers in the naming of six common foot lesions in sheep. Some 20% of farmers named all six lesions correctly but the majority recognised only ID and FR while approximately 80% of advisors recognised all the lesions. FR was the name most commonly attributed to other hoof horn lesions. This is of concern for further education programmes and highlights that one of the first stages of a programme to reduce lameness in sheep is to ensure all parties use consistent lesion naming. Only then will education on prevention and treatment for each lesion be possible.

1   **7. References**

2   Beveridge, W.I.B., 1941. Footrot in sheep: A transmissible disease due to infection with

3   Fusiformis nodosus: studies on its cause, epidemiology and control. CSIRO

4   Australian Bulletin. 140, 1-56.

5   Cannon, R.M. and Roe, R.T., 1982. Livestock disease surveys: a field manual for

6   veterinarians, Canberra: Australian Government Publishing Service.

7   Goddard, P., Waterhouse, T., Dwyer, C., Stott, A., 2006. The Perception of the Welfare of

8   Sheep in Extensive Systems. Small Ruminant Research. 62, 215-225.

9   Grogono-Thomas, R., Johnston, A. M., 1997. A study of ovine lameness. MAFF Final

10   Report MAFF open contract OC59 45K. London. DEFRA Publications.

11   Green, L.E., Wassink ,G.J., Grogono-Thomas, R., Moore, LJ., Medley, G.F., 2007. Looking

12   after the individual disease in flock: a binomial mixed effects model investigating the

13   impact of individual sheep management of footrot and interdigital dermatitis in

14   prospective longitudinal study on one farm. Prev. Vet. Med. 78, 172-178.

15   Hosie, B., 2003. Ovine foot-rot: a Scottish Perspective. Proceedings of the Sheep Veterinary

16   Society. 27, p65.

17   Kelsey, J.L., Whittemore, A.S., Evans, A.S., Thompson, W., 1996. Measurement. I.

18   Questionnaires. In: Kelsey, J.L., Whittemore, A.S., Evans, A.S., Thompson, W.

19   (Eds.), Methods in Observational Epidemiology. Oxford University Press. New

20   York. 364–390.

21   Landis, J.R., Koch, G.G.,1977. The measurement of observer agreement for categorical data.

22   Biometrics.33 (1), 159-174.

23   O'Toole, B.I., Battistuta, D., Long, A., Crouch, K., 1986. A comparison of costs and data

24   quality of three health survey methods: mail, telephone and personal home interview.

25   Am. J. Epidemiol. 124, 317-328.

1   Petrie A, Watson P. Statistics for Veterinary and Animal Science.,1999. Iowa State

2   University Press, Amsterdam.

3   Sargeant, J.M., Martin, S.W., 1998.The dependence of kappa on attribute prevalence when

4   assessing the repeatability of questionnaire data. Prev. Vet. Med. 34 (2-3), 115-123.

5   Vaillancourt, J.-P., Martineau, G., Morrow , M., Marsh, W., Robinson A., 1991. –

6   Construction of questionnaires and their use in veterinary medicine. In Proc. Society

7   for Veterinary Epidemiology and Preventive Medicine (SVEPM) Annual Conference

8   (M.V. Thrusfield, ed.), 17-19 April, London. SVEPM, London. 94-106.

9   Wassink, G.J., Moore, L.J., Grogono-Thomas, R., Green, L.E., 2003. Exploratory findings

10   on the prevalence of contagious ovine digital dermatitis in sheep in England and

11   Wales during 1999 to 2000. Vet Rec .152, 504-506.

12   Wassink, G.J., Grogono-Thomas, R., Moore, L.J., Green, L.E., 2003. Risk factors associated

13   with the prevalence of footrot in sheep from 1999 to 2000. Vet Rec. 152, 351- 358.

14   Wassink, G.J., Grogono-Thomas, R., Moore, L.J., Green, L.E., 2004.   Risk factors

15   associated with the prevalence of interdigital dermatitis in sheep from 1999 to 2000.

16   Vet Rec. 154, 551-555.

17   Wassink, G.J., Moore,L.J., Grogono-Thomas,R., Green,L.E., 2005. Footrot and interdigital

18   dermatitis in sheep: farmers' practices, opinions and attitudes.

19   Vet Rec. 157, 761.

20   Winter, A., 2004a. Lameness in sheep. Diagnosis. In Practice.26, 58-63.

21   Winter, A., 2004b. Lameness in sheep. Treatment and Control. In Practice.26, 130-139.

22

1   Table 1: Pattern of the 1313 responses from the survey to 3000 English sheep farmers in

2   2004.

3

Types of responses	Number	Percent (%)
Usable	809	61.6
No sheep in 2004	443	33.7
Unknown address	42	3.2
Non- participation	19	1.4
Total	1313	100.0

4

5

6

Table 2. The number and percent of farmers and specialists who named lesions correctly and percent of farms and sheep affected by lesion with
validity and repeatability results from 809 English sheep farmers in 2004. * A = interdigital dermatitis, B = Footrot etc.

			Correct Name			
Named by farmer	A*	B	C	D	E	F
A. Interdigital dermatitis	595 (83%)	18 (3%)	11 (3%)	1 (<1%)	10 (2%)	1 (<1%)
B. Footrot	96 (13%)	531 (85%)	129 (30%)	253 (53%)	65 (14%)	57 (11%)
C. Contagious ovine digital dermatitis	5 (<1%)	13 (2%)	154 (36%)	8 (2%)	44 (10%)	11 (2%)
D. Shelly hoof	2 (<1%)	21(3%)	48 (11%)	135 (28%)	27 (6%)	5 (1%)
E. Foot abscess	3 (<1%)	37 (6%)	83 (19%)	40 (8%)	293 (65%)	154 (30%)
F. Toe granuloma	-	2 (<1%)	6 (1%)	35 (7%)	9 (2%)	223 (43%)
G. Other	20 (3%)	1 (<1%)	3 (<1%)	6 (1%)	6 (1%)	65 (13%)
Percent sheep specialists who named lesion correctly	96%	98%	94%	86%	90%	96%
Percent farmers with misnamed lesion names	5%	47%	10%	13%	35%	7%
Repeatability at farm visits (n=28) Percent exact agreement	88%	88%	83%	83%	71%	88%
Repeatability at farm visits: Kappa (95% C.I)	0.64 (0.31 – 0.96)	0.72 (0.41 - 1)	0.79 (0.60 - 0.97)	0.71 (0.49 - 0.94)	0.70 (0.46 - 0.91)	0.82 (0.63 - 1)
Repeatability by post (n= 30) Percent exact agreement	79%	79%	52%	67%	49%	55%
Repeatability by post: Kappa (95% C.I.)	0.50 (0.21 - 0.78)	0.65 (0.41 - 0.88)	0.36 (0.14 - 0.59)	0.48 (0.25 - 0.71)	0.35 (0.11 - 0.59)	0.46 (0.23 - 0.69)
Number of farmers with identical responses for sheep and questionnaire	16 (n=22)	12 (n=16)	4 (n=4)	4 (n=5)	1 (n=2)	4 (n=3)
Farmers rating of pictures and description as 'good'	89%	96%	86%	93%	96%	100%
Percent flocks affected (on farms with correct name for each lesion)	96%	90%	53%	72%	59%	66%
Percent lame sheep (on farms with correct name for each lesion)	6.9%	3.7%	2.4%	1.9%	0.9%	0.8%
Percent flocks with lesion (on farms with all 6 lesions correctly named, n = 59)	92%	92%	25%	56%	49%	51%
Percent sheep lame (on farms with all 6 lesions correctly named, n = 59)	7.0%	3.9%	0.9%	0.9%	0.7%	0.9%

1   Table 3. Farmers naming of other lesions where FR or ID was most the prevalent lesion and was correctly named in English sheep flocks in

2   2004. * A = interdigital dermatitis, B = Footrot etc.

3

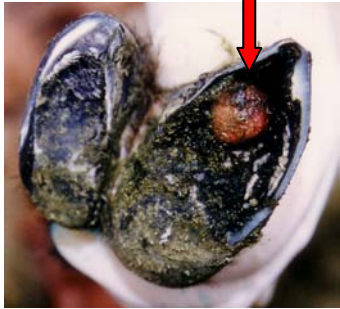|		Farmer response to lesion							
Correct Name	Most prevalent lesion	A*	B	C	D	E	F	No answer	Other name given by farmer
A. Interdigital Dermatitis(ID)	FR	70 (60%)	19 (16%)	1 (1%)	-	-	-	23 (20%)	4 (3%)
	ID	378	-	-	-	-	-	-	-
B. Footrot (FR)	FR	-	117	-	-	-	-	-	-
	ID	7 (2%)	273 (72%)	8 (2%)	15 (4%)	14 (4%)	2 (<1%)	58 (15%)	1 (<1%)
C. Contagious ovine digital dermatitis	FR	3 (3%)	24 (21%)	16 (14%)	3 (3%)	19 (16%)	2 (2%)	50 (43%)	-
	ID	1 (<1%)	54 (14%)	97 (26%)	29 (8%)	38 (10%)	4 (1%)	155 (41%)	-
D. Shelly hoof	FR	-	35 (30%)	1 (1%)	19 (16%)	5 (4%)	5 (4%)	51 (44%)	1 (1%)
	ID	-	131 (35%)	3 (<1%)	83 (22%)	21 (6%)	16 (4%)	120 (32%)	4 (1%)
E. Foot abscess	FR	3 (3%)	14 (12%)	5 (4%)	3 (3%)	36 (31%)	2 (2%)	53 (45%)	1 (1%)
	ID	1 (<1%)	27 (7%)	32 (9%)	15 (4%)	167 (44%)	3 (<1%)	130 (34%)	3 (<1%)
F. Toe granuloma	FR	3 (3%)	24 (21%)	8 (7%)	-	1 (1%)	24 (21%)	48 (41%)	9 (8%)
	ID	4 (1%)	67 (18%)	19 (5%)	-	2 (<1%)	142 (36%)	103 (27%)	41 (11%)

1   Table 4. Number and percent of sheep holdings by flock size listed by DEFRA and those in

2   the study of 809 English sheep farmers in 2004.

Flock size	DEFRA survey 2004	Percent of all flocks	Study survey 2004	Percent of all study flocks
1 -<50	18548	38.1	91	11.7
50-<100	5553	11.4	107	13.7
100-<200	6300	12.9	147	18.9
200-<500	8666	17.8	255	32.7
500-<1000	5355	11.0	145	18.6
1000+	4317	8.9	34	4.4

3

4

1   Figure1. An example of a question to investigate farmer / expert ability to Name foot lesions

2   in sheep

What you might see when you look at the foot	Photograph	What do you call this lesion	*Did you see this lesion in your flock in 2004?*
• **Strawberry- like growth at the toe** • **Bleeds when handled**		☐ *FR* ☐ *ID* ☐ *Shelly hoof* ☐ *Foot abscess* ☐ *CODD** ☐ *Toe granuloma* ☐ *Other_____*	☐ *No* ☐ *Don't know* ☐ *Yes* *What percentage of <u>lame sheep</u> had this lesion?* *_____%*

3   *Contagious ovine digital dermatitis

4   (See www.warwick.ac.uk/go/e2/farmers/sheeplameness for all six lesions and their correct

5   name).

6

7

8

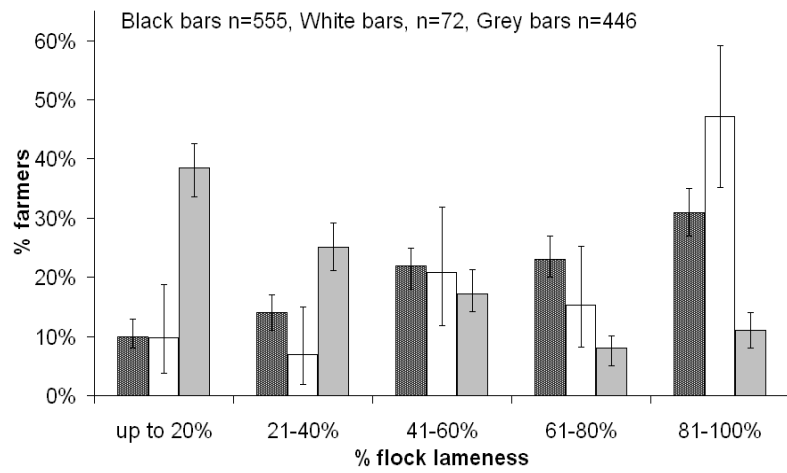9

10

11

12

13

14

15

1   Figure 2. Comparison of distribution of proportion of flock lameness attributed to a) interdigital dermatitis , b) contagious ovine digital dermatitis,

2   c) shelly hoof and d) foot abscess by farmers who correctly named the lesion and those who misnamed these lesions as footrot compared with the

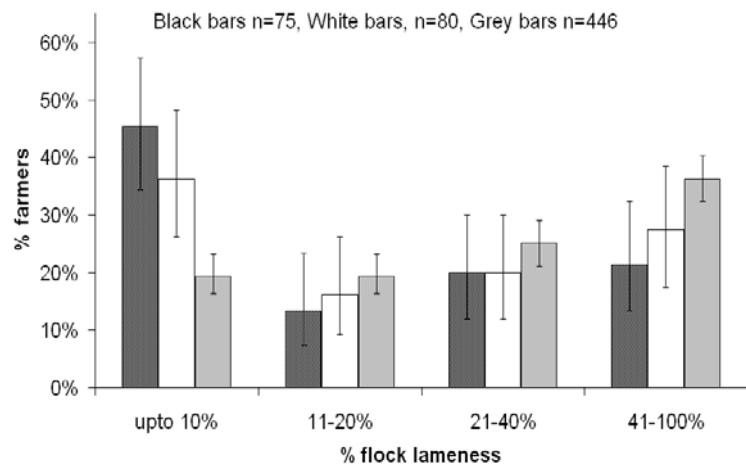3   distribution attributed to correctly named footrot, with 95% C.I.

4

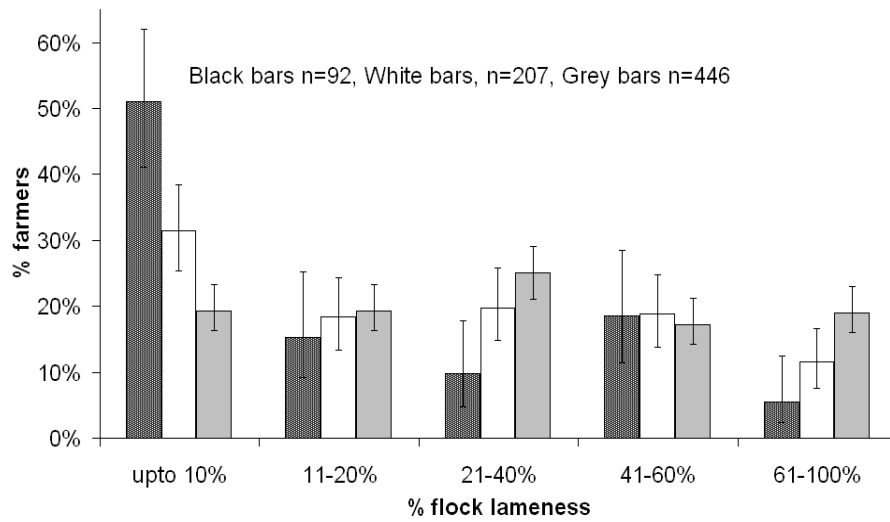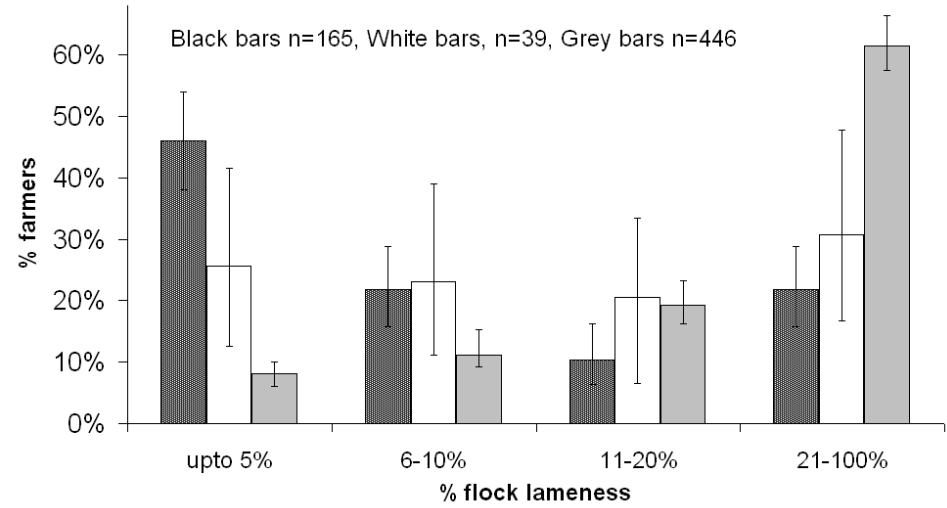5   a) ID   b) CODD

6

1

2

3

1

2

3

4   c) Shelly hoof   d) Foot abscess

Black bars n=92, White bars, n=207, Grey bars n=446

% farmers

% flock lameness

Black bars n=165, White bars, n=39, Grey bars n=446

% farmers

% flock lameness

5

6

7   Black bars - lesion correctly named, White bars- lesion misnamed as footrot, Grey bars- footrot correctly named