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# Surveillance report into free ectoparasite examination for sheep scab in Wales

December 2021 to March 2022

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## Executive Summary

Sheep scab, caused by the highly contagious *Psoroptes ovis* mite, can have a significant adverse effect on animal welfare and the economics of the sheep industry. Examination of skin scrape samples from sheep showing suspect clinical signs of sheep scab was offered free of charge in Wales, between 13<sup>th</sup> December 2021 and 31<sup>st</sup> March 2022. This initiative was funded by the Welsh Government. In addition to the APHA small ruminant submission form, an epidemiological questionnaire was requested to be submitted with samples.

Thirty-three submissions were received for ectoparasite examination accompanied by a questionnaire. Ectoparasites were detected in 78.8% (n=26) of submissions. Sheep scab due to *Psoroptes ovis* was the predominate diagnosis being detected in 57.6% (n=19) of submissions. Statistical analysis of the questionnaire answers was carried out using chi-squared tests to assess for any significant difference between submissions which were positive or negative for scab and how they answered questions regarding treatment history and biosecurity. Two questions returned statistically significant outputs at a significance level of 0.05. Firstly, whether the sampled sheep had been treated with a product active against sheep scab or not. Of the 15 submissions in which the sampled sheep had been treated with a product active against scab in the preceding five months, 13 (86.7%) were positive for scab. This was significantly different to the 18 submissions where sampled sheep had not been treated for scab, of which only six (33.3%) were positive for *P. ovis* mites. A similar difference was also identified between submissions which had used organophosphate (OP) dips in the past 12 months or not and whether they tested positive or negative for scab. Nine of the 10 submissions (90%) which used OP dips in the last 12 months tested positive for scab, compared to 43.5% of the submissions which had not used an OP dip in the past 12 months. A limitation of these questions was the varying length of time between treatment administration and sample submission. In many cases it is likely that treatment persistence would have ended by the time of sampling, meaning the detection of *P. ovis* mites was likely due to reinfection. In cases where the timing between treatment and sampling was shorter, the possibility of a lack of treatment efficacy was raised. Further information would have been required to make an accurate assessment as to whether recently treated sheep testing positive for scab was more likely due to a lack of treatment efficacy, or other factors. The geographical distribution of the farms which submitted samples to this project was analysed using the county parish holding number or the postcode. This was compared to similar projects run previously, and one year of scanning surveillance data where no free testing was offered. Location mapping of positive results from this latest free testing project demonstrates that sheep scab is distributed across Wales.

## Background

Sheep scab, caused by the highly contagious *Psoroptes ovis* mite, can have a significant adverse effect on animal welfare and the economics of the sheep industry. Currently endemic in the UK, sheep scab is a notifiable disease in Scotland, while for England and Wales, it is a legal requirement to treat infected animals and all others in the flock. In Wales, [The Sheep Scab Order 1997](#) is the relevant legislation.

Clinical signs of sheep scab include pruritus (often displayed as rubbing against objects, nibbling and head tossing), dermatitis, wool staining and wool loss. Severe infections can reduce feed intakes and rapid loss of body condition can occur. Many sheep can carry live mites without showing clinical signs, or may develop clinical signs very slowly. These sub-clinically infected animals are still able to infect others during this time, and in some flocks 90% of the sheep can be infected before clinical signs develop. This can make diagnosis and control of the disease challenging.

Examination of skin scrape samples from sheep showing suspect clinical signs of sheep scab was offered free of charge in Wales, between 13<sup>th</sup> December 2021 and 31<sup>st</sup> March 2022. This initiative was funded by the Welsh Government. It followed similar projects which ran over the winters of 2017/18 and 2020/21, the full reports of which can be read here:

- [Report into free ectoparasite examination for sheep in Wales, December 2017 to March 2018](#)
- [Surveillance report into free ectoparasite examination for sheep scab in Wales, November 2020 to March 2021](#)

The aims of this project were to support accurate diagnosis of pruritic sheep in order to promote correct treatment and successful control of sheep scab. This is a priority of the [Wales Animal Health and Welfare Framework](#).

## Material and methods

The project was launched on 13<sup>th</sup> December 2021 and was promoted through direct communication with veterinary practices and Welsh farmers, APHA newsletters and social media. Communications were provided in Welsh and English. The first samples were received on 13<sup>th</sup> December and the last samples were received on 29<sup>th</sup> March.

Testing was undertaken at APHA Carmarthen Veterinary Investigation Centre, which is also the Centre of Expertise for disease surveillance of Extensively Managed Livestock (COEEML). Information about the COEEML can be found at <http://apha.defra.gov.uk/vet-gateway/surveillance/experts/exten-man-livestock.htm>

Skin scrape and/or wool samples were submitted to APHA Carmarthen Veterinary Investigation Centre via a farmer's private veterinary surgeon (PVS), either using the

APHA small ruminant submission form

(<http://apha.defra.gov.uk/documents/surveillance/forms/form-apha3-sr.pdf>) or via the online portal (ADTS). Information including submitter, farm and animal details, and a clinical history were requested to be provided when submitting samples.

In addition to the APHA small ruminant submission form, an epidemiological questionnaire specific for sheep scab was created. The questionnaire was submitted alongside the samples. It was asked that the PVS completed this with farmers when taking samples. Submissions which were not accompanied by a fully completed questionnaire did not qualify for free testing. The questionnaire, which was not used in the sheep scab projects funded previously by the Welsh Government, was designed to gather valuable epidemiological information, to aid in interpreting results and providing relevant feedback.

Samples were examined following APHA standard operating procedures (SOP). This is a third party (UKAS) accredited test. If no ectoparasites were seen on direct examination, a potassium hydroxide (KOH) digest was prepared and examined.

The geographical distribution of the farms which submitted samples to this project was analysed using the county parish holding number or the postcode of the affected farms.

## Sample quality

The quality of samples received into this project was variable. There was the occasional submission of large clumps of relatively clean wool with little to no scab material being submitted, which may have limited the diagnostic value of these samples. The following information note highlights the importance of accurate diagnosis in suspect sheep scab cases [Mitchell, S. and Carson, A. \(2019\), Sheep scab – the importance of accurate diagnosis. Veterinary Record, 185: 105-106.](#)

Further information about diagnosing sheep scab (including the use of the ELISA blood test alongside skin scraping), sampling guidance, and resistance to macrocyclic lactones (MLs) can be found at the following sources:

- [OV Instructions on APHA Vet Gateway](#)
- [Sheep Veterinary Society - Sheep Scab guidance for vets](#)
- [APHA Information note on Sheep Scab resistance \(English\), \(Welsh\)](#)

## Results

### Ectoparasite examination

During the period 13<sup>th</sup> December 2021 until 29<sup>th</sup> March 2022, 35 submissions were received for ectoparasite examination. Two of these were not accompanied by a questionnaire and therefore have not been included in analysis of results. Some submissions had multiple separate samples submitted so 43 individual examinations were

carried out in this project. Testing for ringworm and *Dermatophilus congolensis* was not performed.

**Table 1 - Diagnoses made and the number of submissions involved**

Sheep scab due to <i>Psoroptes ovis</i>	19 (57.6%)
Ectoparasitic disease due to lice	7 (21.2%)
No ectoparasites detected	7 (21.2%)
Total submissions	33

Ectoparasites were detected in 26 (78.8%) submissions. Sheep scab due to *Psoroptes ovis* was the predominate diagnosis being detected in 57.6% (n=19) of submissions to this project. The only other ectoparasite diagnosed was the louse *Bovicola ovis* being detected in 21.2% (n=7) of submissions. There were no submissions where *P. ovis* was identified concurrently with another ectoparasite which differed from previous years. There were no ectoparasites detected in 21.2% (n=7) of submissions.

The majority of sheep scab positive submissions were from adult sheep, which is in accordance with positive sheep scab diagnoses on the VIDA database from 2002 to 2022, across England, Wales and Scotland (Table 2).

**Table 2 - Age category of positive sheep scab diagnoses in the VIDA database from 2002 to 2022 across England, Wales and Scotland**

Age Category	No. of diagnoses
Adult	1262
Mixed	218
Postwean	343
Prewean	51
Unknown/other	945

In the majority of cases sheep scab was detected in lowland animals (15 submissions), followed by hill sheep (nine submissions). However, this disease can affect all purposes of sheep, and in this project *Psoroptes ovis* was also detected in pet sheep.

In total 32 different holdings submitted samples to this project, with *Psoroptes ovis* being detected on 18 holdings. A diagnosis of sheep scab had previously been recorded on the VIDA database for five of these 18 affected holdings, with it being diagnosed in multiple years on three of these five farms. Of the 32 holdings that submitted to the project, nine (28.1%) had not previously submitted samples to APHA. Two of these nine submissions from new submitters to APHA were positive for *Psoroptes ovis* mites.

## Analysis of epidemiological questionnaire answers

There were 35 submissions received for ectoparasite examination. Of these, 33 were accompanied by a completed questionnaire. The questionnaire consisted of 10 questions, some of which included sub-questions.

Statistical analysis of the questionnaire answers was carried out using chi-squared tests to assess for any significant difference between submissions which were positive or negative for scab and how they answered questions regarding treatment history and biosecurity. The only questions which returned statistically significant outputs at a significance level of 0.05 were questions two and four.

The answers to the two questions which returned significant outputs are described below. The answers to all other questions are included in Annex 1.

Additional chi-squared tests were also run to assess for any association between answers to the treatment and biosecurity questions and whether there was a history of detection or suspicion of sheep scab within the last two years in the flock (question six). None of the results were significant at a p-value of 0.05.

### Q2. Have the sampled sheep been treated with a product active against sheep scab?

This question asked for details about the *most recent* treatment that had been given, including month of treatment. In 45% (n=15) (15/33) of total submissions the sampled sheep had been treated with a product active against sheep scab, with the time between treatment administration and month of sample submission ranging from zero to five months. Products used are listed in Table 3.

Of these 15 submissions where treatment had been given, 13 (86.7%) were positive for scab. This was statistically significantly (p-value 0.01) when compared to the six (33.3%) out of 18 submissions from untreated sheep testing positive for *P. ovis* mites.

**Table 3 – Products used for prior treatment of sampled sheep for sheep scab**

Product type	No. of submissions
Macrocyclic lactone (ML) injection	9
Organophosphates (OP)	3
ML injection + OP	1
Unknown	2

In cases where treatment had been administered to the affected sheep, four reported a resolution of clinical signs, four reported no resolution, four described a partial resolution and three were non-applicable or not answered.



In 80% of cases the treatment was administered to the entire flock. In only 13% of cases microscopical examination or the ELISA test was used to determine the presence of *P. ovis* prior to treatment.

#### Q4. Have organophosphate (OP) dips been used in your flock in the past 12 months?

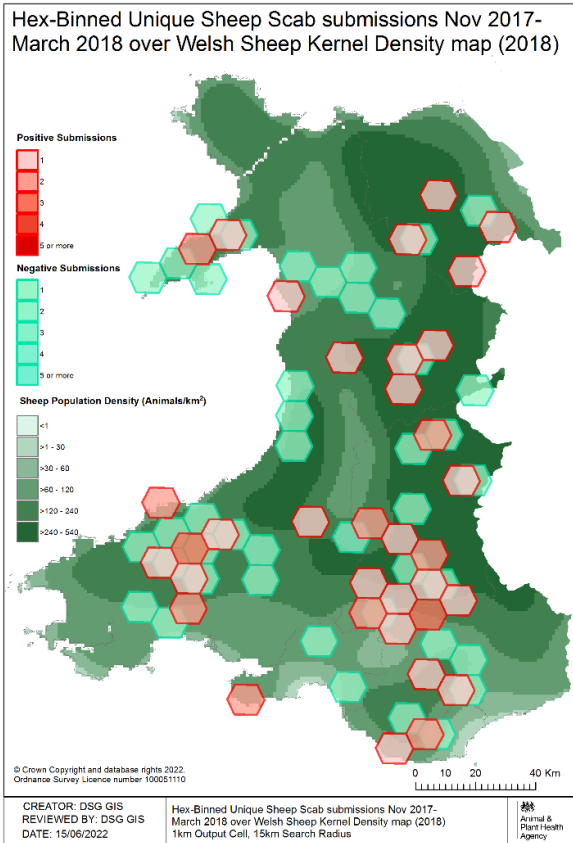
Ten out of 33 (30%) submissions had used OP dips in their flocks in the past 12 months. When this product was administered it was used either for scab treatment (three), or for scab prevention (three), or for both scab treatment and prevention (one). Three did not answer this sub-question.

Nine out of 10 submissions (90%) which used OP dips in the past 12 months tested positive for scab. This was statistically significant (p-value 0.04) when compared to the 23 submissions which had not used an OP dip in the past 12 months, where only 43.5% of these were positive for scab.

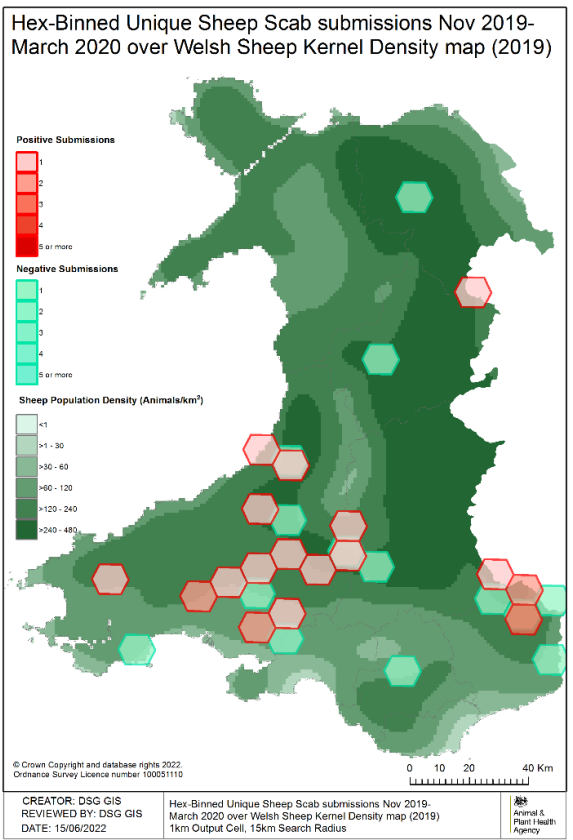
## Geographical distribution

The following maps compare the results of submissions from Welsh sheep examined for ectoparasites during the winter period in four different years. There were free testing initiatives during the winters of 2017-2018 (Figure 1), 2020-2021 (Figure 3) and 2021-2022 (Figure 4). Mapping of results from ectoparasite examinations carried out on routine diagnostic samples during the winter of 2019-2020 under APHA's scanning surveillance programme (Figure 2) was included as a comparison, as no free testing was offered during this period.

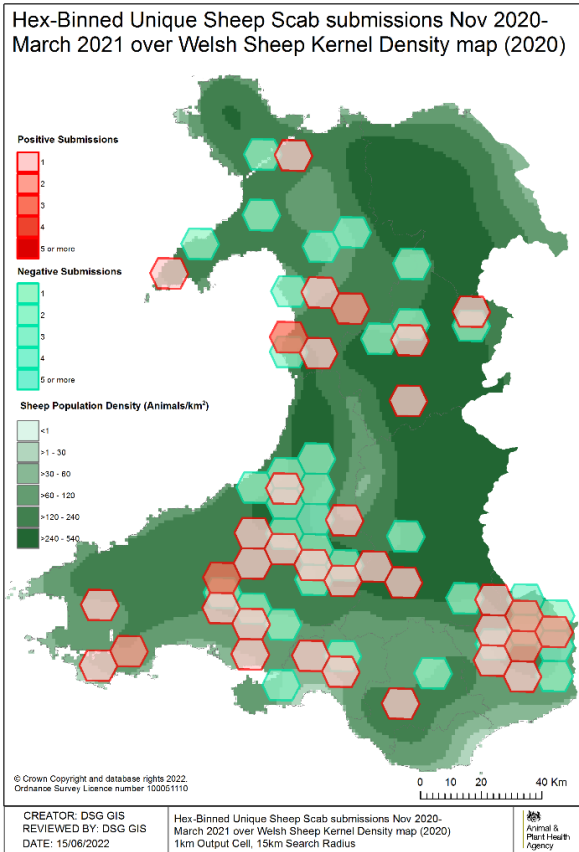
It is likely that the free testing resulted in more submissions being received for examination in the '17-'18 and '20-'21 projects as demonstrated by more hexagons displayed on the maps for these years, however this was not the case for the latest free testing initiative. The maps display the approximate location of submissions, both positive and negative for sheep scab, overlaid over sheep density. The red colour grading gets darker as the number of unique positive submissions increases within one hexagon (10km).



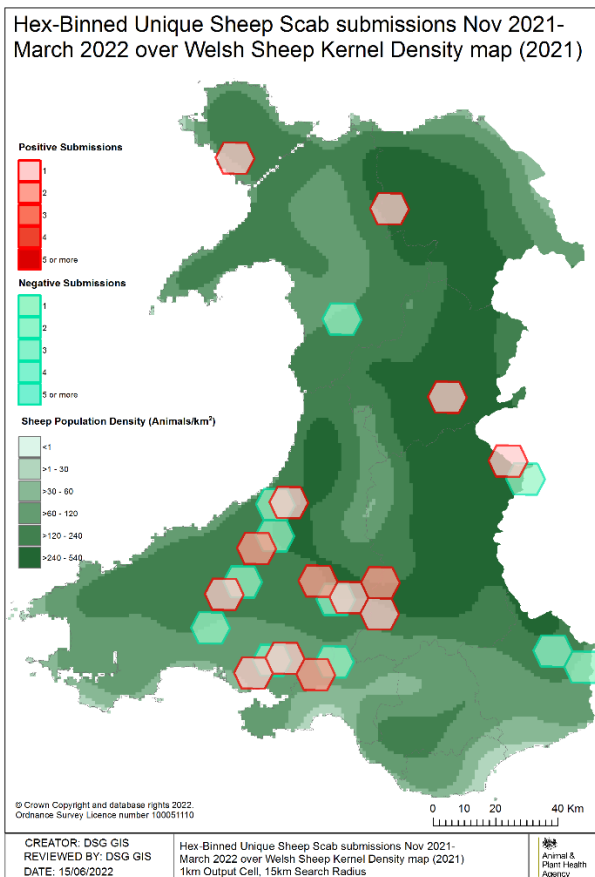
**Figure 1 - Sheep scab results for submissions received for ectoparasite examination between November 2017 – March 2018**



**Figure 2 - Sheep scab results for submissions received for ectoparasite examination between November 2019 – March 2020**



**Figure 3 - Sheep scab results for submissions received for ectoparasite examination between November 2020 – March 2021**



**Figure 4 - Sheep scab results for submissions received for ectoparasite examination between November 2021 – March 2022**

## Discussion

### Uptake of the project

The uptake of this free testing initiative was lower compared to previous years. Although projects ran over similar time periods, the total number of submissions received in this project was less than that received in 2020-21 and 2017-18 (Table 4). In the same period during the most recent winter when free testing was not offered (2019-20) there were 26 submissions from sheep holdings in Wales to APHA for ectoparasite examination.

**Table 4 – Number of submissions and individual samples received into free ectoparasite examination projects for sheep in Wales.**

Project timeframe	No. of submissions	No. of individual samples
13th December 2021 – 31st March 2022	33	43
2 <sup>nd</sup> November 2020 – 31 <sup>st</sup> March 2021	109	144
December 2017 – 31 <sup>st</sup> March 2018	164	262

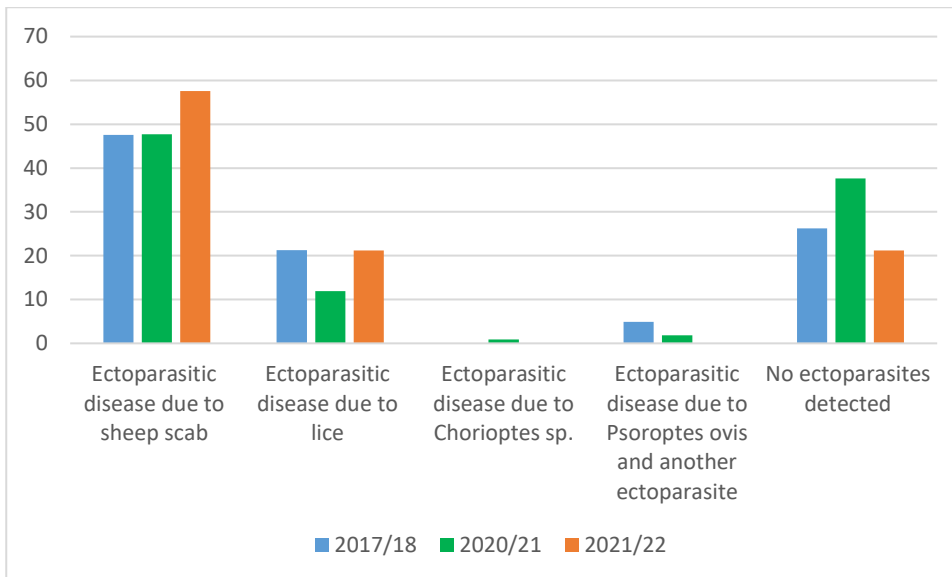
The reason for the reduced number of submissions during this free testing initiative was not clear. It is postulated that the additional requirement for the PVS to complete and submit a questionnaire in addition to the normal submission form to qualify for free testing may have discouraged submission of samples. However, this additional information is important for APHA to understand not only the cause of disease, but also the epidemiological factors surrounding this.

In addition, private veterinary labs, and some private veterinary practices, undertake testing for sheep scab, which may have reduced the number of submissions under this project. This may add bias, in particular when looking at the geographical distribution of positive scab cases. For example, if a veterinary practice covers a wide geographical area and chooses to do their sheep scab testing in-house, then positive cases in their client catchment area will not be represented on maps produced using results from this project.

Furthermore, this initiative offered free testing of samples from sheep with clinical signs of sheep scab. The project has therefore only identified flocks with clinical signs but not subclinical disease. Being able to identify sub-clinically infected flocks is an important area which needs to be addressed when designing control strategies for this disease.

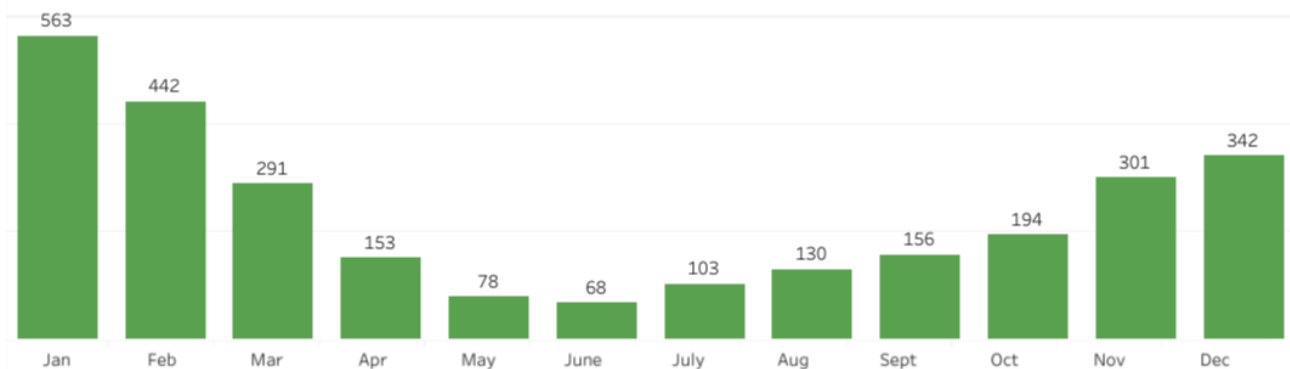
### Ectoparasite examination

Sheep scab due to *Psoroptes ovis* was the predominate diagnosis being detected in 57.6% of submissions to this project (19 submissions). This is similar to previous years with *P. ovis* being the most frequently detected ectoparasite (Figure 5).



**Figure 5 - Comparison of diagnoses made as a % of total submissions during free ectoparasite examination in Wales schemes over winter 2017/18, 2020/21 and 2021/22**

The results from this project are in accordance with the VIDA database that indicate *P. ovis* mites as the major cause of ectoparasitic disease in sheep on Welsh farms. Between January 2002 and May 2022 there were 2821 VIDA diagnoses made of sheep scab in Great Britain, 1437 of these were in Wales. The free testing initiatives over the last few years has likely resulted in a higher proportion of diagnoses being made in Wales compared to England and Scotland. The disease is more commonly identified during the winter months (Figure 6).



**Figure 6 – Seasonality of VIDA diagnoses of Sheep scab made in Great Britain between Jan 2002 – May 2022**

## Epidemiological questionnaire

When questionnaire responses between submissions which either tested positive or negative for sheep scab were compared, only two questions returned statistically significant outputs. These were question two which enquired if the sampled sheep had been treated with a product active against sheep scab, and question four which enquired whether OP dip had been used in the flock in the past 12 months.

Question two specifically asked for details about when the most recent treatment active against scab had been given to sampled sheep. The time between treatment administration and sample submission ranged from zero to five months.

Interestingly, of the 15 submissions in which the sampled sheep had been treated with a product active against sheep scab in the preceding five months, 13 (86.7%) were positive for scab. This was significantly different to the 18 submissions where sampled sheep had not been treated for scab, of which only six (33.3%) were positive for *P. ovis* mites.

A similar difference was also identified between submissions which had used OP dips in the past 12 months or not and whether they tested positive or negative for scab. Nine of the 10 submissions (90%) which used OP dips in the last 12 months tested positive for scab, compared to 43.5% of the submissions which had not used an OP dip in the past 12 months having *P. ovis* mites detected. A limitation of this question was that the time between OP dipping and sampling was not asked to be provided. This means that in cases where *P. ovis* mites were detected, information provided in question 2 was used to try to determine if an OP dip had been given recently enough to still expect persistency.

These results may indicate that in the majority of cases where sheep scab treatment had been used, it was probably correctly associated with a sheep scab infection in the flock. One of the main factors which may explain why the disease was still detected post-treatment is the time period between treatment and sampling. In many cases this time period was long enough that treatment persistence would have ended by the time of sampling, meaning the detection of *P. ovis* mites was likely due to reinfection.

In cases where the treatment would still be expected to be persisting at the time of sampling, other reasons for scab mites being detected may include incorrect application of treatment, the entire flock was not treated, or lack of treatment efficacy. Some injectable products do not claim any protection period against scab following treatment, and in these cases adequate biosecurity measures must be implemented post treatment to prevent re-infestation. Not enough management information was available to determine if the detection of sheep scab was due to re-infestation or lack of treatment efficacy. There have been no reports of sheep scab mite resistance to organophosphates in the literature and therefore lack of treatment efficacy is unlikely to be responsible for the difference identified in question 4, and other reasons given above are more likely to explain these results.

OP products must be used in plunge dips and are not authorised for use in showers, jettors or sprayers. It is vital that OP dips are used responsibly to ensure their effectiveness and ensure mites do not develop resistance to the treatment. Advice for prescribers, farmers and dippers can be found in the [Mobile dipping Code of Practice \(scops.org.uk\)](http://scops.org.uk). When asked if OP showers had been used on their farm in the previous 12 months, all farmers that provided an answer to this question (32/33 = 97%) had not used OP showers in the past year. This is encouraging as it indicates that farmers have a good understanding that OP must be used in plunge dips only.

Husbandry practices which have previously been identified as risk factors for sheep scab infestation include common grazing, direct contact with neighbours' sheep and having neighbours with scab (Rose and Wall 2012). Purchased animals can also introduce sheep scab into a flock (O'Brien 1992). Management and biosecurity practices related to these risk factors were investigated with our questionnaire. After statistical analysis there was no significant difference between farms which tested positive or negative for sheep scab and whether or not their management practices included any of these factors of risk. Although no significant difference was identified in this study, over half of the farms (61%) which submitted samples to this project reported the potential for contact between their sheep and sheep from another flock. Biosecurity measures to reduce this potential for contact, such as double-fencing and quarantine protocols for incoming stock, should be advocated. These measures are important for reducing the risk of introducing sheep scab into uninfected flocks (Rose and Wall 2012).

## Geographical distribution

Location mapping of positive results from this latest free testing project (Figure 4) demonstrates that sheep scab is distributed across Wales. As this was passive surveillance, and not all sheep in certain areas were tested, it is not possible to make any interpretations regarding the prevalence of sheep scab in Wales, nor to accurately identify 'clusters' of positive cases.

## Treatment resistance

Treatment options for sheep scab are limited to either injectable MLs or OP plunge dipping (containing diazinon). Since the first evidence of resistance to moxidectin in *Psoroptes ovis* sheep scab mites in the UK (Doherty and others 2018), multiple resistance to MLs has been demonstrated (Sturgess-Osborne and others 2019). MLs are also used to kill endoparasites in sheep, therefore care has to be taken when using this class of drug to treat sheep scab, to avoid developing anthelmintic resistance in gastrointestinal parasites.

When taking into account clinical history, questionnaire answers and skin scrape results from this project, there were some cases in which the possibility of a suspected lack of treatment efficacy was raised. However, further information would have been required to make a more accurate assessment as to whether recently treated sheep testing positive for scab was more likely the result of reinfection or lack of treatment efficacy. In these cases, the PVS was advised to follow-up with their client to check the exact dates of treatment, and that datasheets were followed to ensure correct treatment application, dosage, and requirement for repeat treatments / biosecurity measures were adhered to. Products involved where there was a potential suspected lack of treatment efficacy included the ML injectables (moxidectin, doramectin and ivermectin) but not OPs. All cases of suspected lack of efficacy should be reported to the Marketing Authorisation Holder (MAH) or VMD at [www.gov.uk/report-veterinary-medicine-problem](http://www.gov.uk/report-veterinary-medicine-problem).

Live mites from this project were forwarded to Fera Science Ltd. to assist with their resistance testing research.

## Future

As well as examination of skin scrapes as a diagnostic test, there is also a blood ELISA test that has high sensitivity and specificity and can detect infestation as early as two weeks post infestation (Nunn and others 2011). Research into the uptake of diagnostic tests by livestock farmers ([Mohr and others 2020](#)) looked specifically at the blood ELISA test which can be used to detect sheep scab infestation in sub-clinically infected animals. Findings of this research provides strong support for the new diagnostic test whilst also indicating that further benefits could be accrued through flock health schemes that encourage and facilitate cooperation between farmers. Another key finding was that adopting the new diagnostic ELISA test for subclinical sheep scab could significantly reduce prevalence of sheep scab and improve animal welfare in a cost-neutral way to the industry.

A [pilot study](#) undertaken in Wales by Paton and others (2022) used the approach of diagnosing sheep scab positive 'index' farms using skin scrape examination, and then using the ELISA blood test to determine the scab status within flocks contiguous to the index farms. Treatment using either injectable ML or OP dip was then administered to all index and contiguous farms which had been diagnosed as infested. This approach was commended, and the project suggested that local cooperation can be an effective way of dealing with sheep scab in the local community. It was recognised that external input from veterinary surgeons and possibly other coordinating groups are required to achieve results.

There is also a Defra-funded initiative via the Rural Development Programme for England (RDPE) in England known as 'For Flock's Sake Let's Stop Scab Together'. The objective of this initiative is to demonstrate the effectiveness of a community-led approach to improve the control of sheep scab in three hotspot areas in England; the North, the Midlands and the South West. In the hotspots clusters of farms were identified and, in each cluster, farm vets worked directly with their farmer clients and with regional coordinators. The ELISA blood test was used to determine sheep scab status on farms within the clusters, and to also assess response to treatment following a co-ordinated treatment approach by contiguous farms.

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# Annex 1

## Epidemiological questionnaire answers

### Q1. Why are you submitting samples?

All but one of the 33 submissions recorded animals displaying clinical signs as a reason for submitting samples. Twenty-five submissions recorded both 'itchiness' and 'wool pulling' as clinical signs, five recorded 'itchiness' only and one recorded 'wool pulling' only. One submission described an atypical wool appearance, this submission was negative for scab. Checking for treatment efficacy was recorded as a reason for submission in six cases, and screening check for scab recorded in four cases.

### Q2. Have the sampled sheep been treated with a product active against sheep scab?

This question asked for details about the *most recent* treatment that had been given, including month of treatment. In 45% (n=15) of total submissions the sampled sheep had been treated with a product active against sheep scab, with the time between treatment administration and month of sample submission ranging from zero to five months.

68% (n=13) (13/19) of the animals that tested positive for sheep scab had been treated within the preceding five months. The products used for treatment are shown in table five. 32% (n=6) (6/19) of the sheep that tested positive were untreated. Eighteen submissions were received from untreated animals, of these 33% (n=6) were positive for *P. ovis* mites.

There was a significant difference between positive and negative submissions when comparing their previous treatment status, with a p-value of 0.01.

**Table 5 – Products used for prior treatment of sampled sheep for sheep scab**

Product type	No. of submissions
Macrocyclic lactone (ML) injection	9
Organophosphates (OP)	3
ML injection + OP	1
Unknown	2

In cases where treatment had been administered to the affected sheep, four reported a resolution of clinical signs, four reported no resolution, four described a partial resolution and three were non-applicable or not answered.

In 80% of cases the treatment was administered to the entire flock. In only 13% of cases microscopical examination or the ELISA test was used to determine the presence of *P. ovis* prior to treatment.

Q3. Have injectable macrocyclic lactones (MLs) been used in your flock in the past 12 months?

Eleven out of 33 (33%) submissions had used injectable MLs in the past 12 months; six for scab treatment, one for scab prevention, two for the treatment of other parasites, and one for both scab treatment and prevention.

There was no significant difference between submissions which were positive or negative for scab and how they answered this question.

Q4. Have organophosphate (OP) dips been used in your flock in the past 12 months?

Ten out of 33 (30%) submissions had used OP dips in their flocks in the past 12 months. When this product was administered it was used either for scab treatment (three), or for scab prevention (three), or for both scab treatment and prevention (one). Three did not answer this sub-question. When the OP dip was administered four used contract dippers, three used their own dipping facilities and three did not answer this sub-question.

Nine out of 10 submissions (90%) which used OP dips in the past 12 months tested positive for scab. This was statistically significant (p-value 0.04) when compared to the submissions which had not used an OP dip in the past 12 months, where only 43.5% of these were positive for scab.

Q5. Have organophosphate showers been used in your flock in the past 12 months?

Thirty-two submissions answered 'no' that OP showers had not been used in their flock in the past 12 months; one submission did not answer this question.

There was no significant difference between submissions which were positive or negative for scab and how they answered this question.

Q6. Has sheep scab been diagnosed or suspected in your flock in the past two years?

Eleven out of 33 (33%) of submissions had scab diagnosed or suspected in their flock in the past two years; only three of these had had scab diagnosed by skin scrape, six had had scab suspected, two did not answer this sub-question. None reported that scab had been diagnosed using the ELISA blood test.

Of the 11 submissions which reported to have had scab diagnosed or suspected in the past two years, 63.6% were positive for scab. Of the 22 submissions which reported not to have had scab diagnosed or suspected in the past two years, 54.5% were positive for scab.

There was no significant difference between submissions which were positive or negative for scab and how they answered this question.

Q7. Do your sheep have any potential contact with sheep from another flock?

Twenty out of 33 (61%) submissions reported potential contact with sheep from another flock with reasons given being; boundaries (10), strays (three), both boundaries and strays (five), not given (two). Of these 20 submissions, 55% were positive for scab.

Twelve out of 33 (36%) submissions reported no potential contact with sheep from another flock, 66.7% of these submissions were positive for scab.

No submissions reported common grazing as a potential for contact with sheep from another flock.

One submission did not answer.

There was no significant difference between submissions which were positive or negative for scab and how they answered this question.

Q8. Do you carry out any of the following management practices; contract shearers, contract dippers, contract scanners, shared gathering facilities, shared livestock trailers?

Eighteen out of 33 (55%) submissions reported using contract shearers, 17 (52%) reported using contract scanners, six (18%) reported using contract dippers, one (3%) reported using shared gathering facilities and one (3%) reported using shared livestock trailers.

Ten out of 33 (30%) submissions did not report using any of the above management practices.

There was no significant difference between submissions testing positive or negative for scab when looking at each of these management practices separately.

Q9. For sheep adding or returning to your flock what quarantine procedures are used?

### **Purchased sheep**

When an isolation period was implemented for purchased sheep (17 out of 22), in the majority cases this was longer than two weeks (12 out of 17, 71%).

Nine submissions answered non-applicable and two did not answer.

**Table 6 - Isolation periods given for submissions which answered 'yes' to having purchased sheep:**

<b>Isolation period (days)</b>	<b>No. of submissions</b>
None	5
<14 days	1
14-20 days	5
21-27 days	4
>= 28 days	3

Unspecified	4
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Only five out of 22 (23%) submissions which purchased sheep used a quarantine treatment. The products administered were reported as: fluke + wormer (non-ML), fluke + wormer, dip + dose with wormer, moxidectin 1%, product not known.

No quarantine treatment was administered to purchased sheep in 17 submissions.

Eight answered non-applicable, three did not answer.

### **Sheep returning from tack**

For submissions from flocks which had sheep returning from tack, five out of 10 (50%) implemented an isolation period.

Seventeen submissions answered non-applicable and six did not answer.

**Table 7 - Isolation periods given for submissions which answered 'yes' to having sheep returning from tack:**

<b>Isolation period (days)</b>	<b>No. of submissions</b>
None	5
14-20 days	1
21-27 days	1
>= 28 days	1
Unspecified	2

Only one farm reported using a quarantine treatment for sheep returning from tack, the product administered was recorded as 'dipping'.

Eight reported sheep returning from tack did not receive a quarantine treatment.

Seventeen answered non-applicable, seven did not answer.

### **Sheep returning from shows**

In cases where sheep were returning from shows, only one out of six (17%) implemented an isolation period, the length of isolation was not specified.

Twenty-two submissions answered non-applicable and five did not answer.

None of the six administered a quarantine treatment to sheep returning from shows.

Twenty-one answered non-applicable, six did not answer.

There was no significant difference between submissions testing positive or negative for scab when looking at biosecurity practices for either purchased sheep, sheep returning from tack or sheep returning from shows separately.

Q10. Would you consider all, or part of your flock to be extensively managed?

Three out of 33 (9%) submissions were from flocks which were partially or completely extensively managed. That is, kept in such a way that they are not easily regularly and closely inspected – such as kept on common land, uplands, mountains or moors.

There was no significant difference between submissions which were positive or negative for scab and how they answered this question.