

Sheep Health and Welfare Report

Third edition

2020/21



shawg.org.uk



Foreword

Support from the Chief Veterinary Officers

The Chief Veterinary Officers of England, Wales, Scotland and Northern Ireland, welcome the third and final biennial report of the United Kingdom Sheep Health and Welfare Group (SHAWG). We would like to mark the occasion by extending our thanks and gratitude for the superb work and exceptional commitment of all those involved in SHAWG. Over the years, coordinated effort and expertise from SHAWG have added great value in driving forward sheep health and welfare improvements; we look forward to the combined forces of SHAWG and CHAWG (Cattle Health and Welfare Group) leading to further far-reaching improvements across the ruminant sector via the new Ruminant Health and Welfare Group.

COVID-19 has emphasised the importance of food supply, and the role of those working farm to fork. Animal health and welfare have remained an important Government priority and we are grateful to the sheep industry for playing their part in meeting social distancing requirements while maintaining the supply chain.

The global COVID-19 pandemic has raised awareness and focused attention on the concept of 'One Health' (the interaction between human, animal and plant health). This concept has long been reflected in SHAWG activities and, more recently, in its subgroup, with the Sheep Antibiotic Guardian Group (SAGG) contributing to successful cross-sector initiatives such as 'Colostrum Is Gold' and 'Vaccines Work'. We are encouraged by the recent production of SAGG-coordinated industry guidance on benchmarking metrics for antibiotic use on sheep farms, and look forward to seeing outcomes from the development of a national electronic Medicine Hub (eMH) for sheep and cattle.

One Health has wider implications in improving productivity and reducing waste, and we applaud ongoing projects such as 'RamCompare', helping commercial farms select the most profitable terminal sires, and the new 'Challenge Sheep', helping farmers understand how managing replacement ewes affects lifetime productivity. The latter is an excellent example of using available technology, tracking and recording datasets from replacements over a range of sheep farms via electronic identification (EID).

As we move towards the end of the transition period, it is more important than ever that our sheep industry maintains high standards of animal health and welfare, and can provide assurances and evidence of this to the global community. We recognise the work of SHAWG in supporting farm assurance schemes such as the Farm Assured Welsh Livestock (FAWL) Beef and Lamb Scheme, Quality Meat Scotland (QMS) Cattle & Sheep Assurance Scheme and the Northern Ireland Beef and Lamb Farm Quality Assurance Scheme (NIBL FQAS). We are pleased to note updates to the schemes such as the inclusion of an annual vet review of livestock health plans by QMS, and the measurement of antibiotic usage in sheep for FAWL and NIBL FQAS.



We commend SHAWG on its ongoing work in support of national level activities, such as the future post-CAP Government financial support to animal health and welfare improvement schemes being developed across administrations in the sheep, cattle and pig sectors. The two priorities identified for this report, collating key data and the importance of understanding drivers for behavioural change, ensuring both large and small operators are engaged, are vital to this. The work of SHAWG in prioritising sheep endemic and ‘iceberg’ diseases, and steps toward developing a coordinated control strategy for these diseases, will have tremendous positive impacts for the sheep industry. Taking the next step from individual control and eradication schemes, it is important to gather UK-level data on endemic and ‘iceberg’ diseases, such as Johne’s and ovine pulmonary adenocarcinoma (OPA), that the industry can access and act upon.

Disease monitoring remains a priority across the UK; the UK Surveillance Forum continues to bring together the UK CVOs to steer the UK narrative, demonstrating and verifying our high standards of animal health. The SHAWG report collates key information on UK livestock monitoring and its significance to trade, such as our continued EU-recognised freedom from *Brucella melitensis*, showing the importance of surveillance to the UK sheep sector.

However, surveillance alone does not deliver high health status, it only demonstrates it. We need to work in partnership across government, industry, science and academia, using a sound evidence base to agree disease control and eradication strategies. The combined power of the Livestock Information System (soon to replace ARAMS), EID Cymru, Scot IED and the Animal and Public Health Information System (APHIS) in NI, will greatly assist in demonstrating traceability, but it will be the underpinning actions of the sheep sector that will provide the evidence of our high standards in sheep health and welfare.

In summary, we congratulate SHAWG and all of its participants on providing the bridge between individual farm management and the UK sheep health and welfare narrative that is so crucial to the future of the industry. We are optimistic we will see further advances in health and welfare from the new Ruminant Health and Welfare Group and we send our continued thanks to all of those who are transitioning across to the new group.



Christine Middlemiss
*Chief Veterinary Officer
for the UK*



Christianne Glossop
*Chief Veterinary Officer
for Wales*



Sheila Voas
*Chief Veterinary Officer
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SHAWG would like to thank the numerous individuals and organisations who kindly provided text, data and photos to make this report possible. Acknowledgements are provided on page 87.

Photo credit: Front cover (left) – John Eveson

Introduction

I am delighted to welcome the third report from the Sheep Health and Welfare Group (SHAWG). This biennial industry report would not be possible without the large number of individuals and organisations who freely and eagerly contribute towards content, and I would like to express my sincere thanks to all of them. The SHAWG report continues to be an extremely valuable source of data on the state of play of health and welfare for the UK sheep industry. Our third report highlights the areas of work the group see as important in encouraging best practice on sheep farms. This, when implemented, will undoubtedly reduce the impact of endemic disease on our farms, which will have the double benefit of improved welfare and increased production.

As we move into a time of ‘public money for public goods’, sheep farming will need to continue to demonstrate our ability to reduce the impact of climate change and enhance animal health and welfare. Change is one of the few constants in the world, and I have always embraced controlled change in my life and business, believing that this enables me to make improvements. As we enter an era of undoubted change, the sheep industry will be challenged in ways that we can only speculate as to their impact.

Working towards SHAWG’s vision of ‘a world class sheep industry that is inspired by and competing with the best’ will continue to put us in a position to exploit the opportunities I see coming, whether in new or existing markets. Healthier and more productive sheep will contribute to this. We must also continue with our efforts to reduce the use of antibiotics, even though we are a very low use sector. To this end, I fully support the formation of a national electronic medicine hub (eMH), and I would encourage all to use it, to provide us with the evidence to support our claims. Greater interaction with the veterinary profession, the desire to deliver proactive care rather than ‘fire brigade’ actions should be a goal for all involved in our industry.

This will be the last SHAWG report following the formation of a new group – Ruminant Health and Welfare (RH&W) – which will become the coordinator for ruminant health and welfare activity across the United Kingdom (UK). Sheep Health and Welfare Group has given a wide range of groups and organisations the ability to promote and deliver their activities. The group has been widely acclaimed throughout the wider industry and can take great pride in their achievements from its formation in 2009. The hard work of many should not be lost, the vision and activities of SHAWG must continue to have a positive impact on UK sheep farming. Having agreed to be part of the new RH&W steering group, I will do everything in my power to make sure the promises made to the sheep sector are delivered and the voices of the hardworking and enthusiastic people within our industry continue to be heard.

On behalf of SHAWG, I’d like to wish the new RH&W every success in delivering its aims through both the opportunities and challenges that lie ahead.



Photo credit: National Farmers Union

A handwritten signature in black ink, appearing to read 'C. Sercombe'. The signature is fluid and cursive, written on a white background.

Charles Sercombe
SHAWG Chair (2017–2020)

A vision for ruminant health and welfare

First, I must congratulate SHAWG on producing another superb report. Collating such wide-ranging information into a single document serves several crucial purposes. It is a reminder of what has been achieved through SHAWG. It is also a prompt for what we still have ahead of us to do. And it is an invaluable reference library of information to ensure we in the industry, as well as Government, media and the public, are accessing the same rigorously compiled facts and figures. The transparency of such a report shows we are not afraid to be accountable, and can own our challenges as well as our successes.

Where do we go from here? The new Ruminant Health and Welfare group has, by necessity, ambitious aims. We are facing the most radical changes to agriculture and the rural economy since the 1947 Agriculture Act, and the cattle and sheep sectors across our four nations need to be ready. At the same time, the coronavirus pandemic (COVID-19) that hit the UK in March 2020 has underlined the value of a secure supply of quality, domestically produced food. We are all of course aware of the challenges and opportunities Brexit presents in terms of competition and export trade. Furthermore, the issues of climate change, resource use and sustainability have only receded temporarily – these challenges will re-emerge post-pandemic to demand urgent attention.

Such unprecedented times demand healthier more productive animals, a strong and positive reputation, and a resilient industry. We have all benefited from the coordination and expertise SHAWG has brought sheep health and welfare activities. We now need to build on this with more resource and momentum so we can accelerate progress on endemic disease and the broader health and welfare challenges. In a country where animal health powers are devolved across the four nations, there is real value in sharing best practice and our priorities, to identify where collaboration can improve animal health and welfare.

One of the first steps is to consult with those working on the ground to identify the disease challenges they face. The survey will be designed to reach across the sheep and cattle sectors and recognise regional issues. That baseline work with the farming community will then be developed into a portfolio of priorities with the input of stakeholders, including farm vets, health advisers and assurance bodies, and the support of scientific expertise.

A key focus will be productivity, which means tackling endemic disease, suboptimal management practices, welfare challenges and waste. Genetics will play an increasing part in underpinning not only production goals but countering the risk of animal welfare being compromised. By improving production efficiency, we can also reduce our greenhouse gas emissions and improve our reputation. Considering endemic diseases and reputational challenges cost the UK cattle and sheep sectors at least £500 million per year, there has never been a more pressing need to address these.

Sheep, beef and dairy production share challenges, so it makes absolute sense to combine forces with each other to increase access to resources and provide a stronger voice. I remain committed to each sector retaining a strong, independent voice within RH&W. This is especially the case for the sheep sector, which brings important learnings and expertise to the table, and for other species such as goats and deer, which we hope to work with in the future.

A last point is around the benefits of adopting a UK-wide approach where that collaboration can add value. Many of our challenges respect neither country borders nor political boundaries. RH&W will work with partners across the four nations to bring industry and governments together to work collaboratively and speed up progress. I am committed to make this work for both sheep and cattle producers, and excited to lead a group that is focused on positive change.



Nigel Miller

Ruminant Health and Welfare Chair (2020–present)



Photo credit: Nigel Miller

About SHAWG

The Sheep Health and Welfare Group (SHAWG) was an independent UK body with membership reflecting the variety of organisations involved in the sheep industry. Established in 2009, originally as an England-only committee, it soon gathered representatives from across Great Britain. In 2017, membership was extended to include representatives from Northern Ireland, so SHAWG covered the whole UK. It also acted as an extremely useful link between representatives of the sheep industry, government departments and their agencies.



In 2016, a subgroup of SHAWG, now known as the Sheep Antibiotic Guardian Group (SAGG) was formed. Led by Fiona Lovatt, the group advises and supports sheep industry input into the Responsible Use of Medicines in Agriculture Alliance (RUMA) target task force and coordinates knowledge exchange activities to industry on responsible antibiotic use in sheep. Further details of the group's activities are detailed on page 11.

SHAWG received financial support from the Agriculture & Horticulture Development Board (AHDB), Quality Meat Scotland (QMS), Hybu Cig Cymru (HCC) and Ulster Farmer's Union (UFU), to cover the costs of the chair, vice chair and farmer representatives. AHDB provided the secretariat and the National Farmers' Union (NFU) hosted three face-to-face meetings per year.

Following an industry consultation in the autumn of 2019, SHAWG was incorporated into RH&W, with the SHAWG conference in November 2020 being the official handover. RH&W was established in June 2020, is chaired by Nigel Miller, and replaces both SHAWG and the Cattle Health and Welfare Group (CHAWG). It aims to coordinate a collaborative joined-up approach to reducing endemic disease in ruminant species across the UK and will engage with government and industry. Initially focusing on cattle and sheep, the group intends to incorporate additional ruminant species. RH&W has strong support from all four Chief Veterinary Officers (CVOs) and will receive financial support from both AHDB and private sector companies. The move provides a great opportunity to build and broaden the approaches developed by SHAWG and CHAWG, use resources more efficiently, improve ruminant health and welfare status, and benefit more farmers. Further details will be made available on the website – ruminanthw.org.uk



SHAWG's vision

To achieve 'a world-class sheep industry that is inspired by and competes with the best'.

SHAWG's objectives

1. To reduce the impact of endemic disease by acting on surveillance data and new knowledge.
2. To ensure the industry is aware of the threat of any new or re-emerging diseases.
3. To promote and encourage responsible use of medicines, including anthelmintics and antimicrobials.
4. To ensure welfare is maintained as a priority for the sheep industry.
5. To highlight the role of nutrition in good health and welfare.
6. To deliver an integrated approach with all stakeholders, allied support industries, retailers and Government.

The aims of the SHAWG report are to:



Inform and update the industry of current disease threats, control measures and disease incidence



Highlight potential areas for concerted efforts to help maintain a profitable sheep sector in the UK



Emphasise the need for proactive health planning and surveillance to protect our national flock, to maintain trade

The 2020/21 report provides an update on relevant health and welfare activity and uses information from a variety of sources (including industry, Government and peer-reviewed literature), to provide context. Careful interpretation of data sources is needed as they can vary in reliability or coverage, e.g. based on statutory surveillance or voluntary submissions. The report aims to encourage the identification and collection of additional data, particularly in relation to the priorities identified by SHAWG.

Biennial conference

SHAWG held its biennial conference attracting over 500 delegates including sheep farmers, registered animal medicine advisors (RAMAs), consultants and vets. The conference provided an opportunity to share knowledge and highlight priority areas for future activity. The fifth and final SHAWG conference – *working together for world leading health and welfare* – was held online on 24 November 2020 and brought together speakers covering its objectives and to reflect on what SHAWG has achieved. Presentations from the conference can be found at shawg.org.uk

SHAWG members

More than 35 organisations were members of SHAWG, including Government agencies, levy boards and trade associations. Members of SHAWG also include farmer representatives from England, Wales, Scotland and Northern Ireland. For further information, visit shawg.org.uk or contact lis.king@ahdb.org.uk. Several of these organisations will have representation on RH&W.

Agricultural Industries Confederation (AIC)
Agriculture and Horticulture Development Board (AHDB)
AgriSearch
Animal and Plant Health Agency (APHA)
Animal Health and Welfare Board for England (AHWBE)
Animal Health Surveillance Governance Board (AHSGB)
Animal Health Distributors Association (AHDA)
Animal Medicines Training Regulatory Authority (AMTRA)
Animal Welfare Committee (AWC)
Association of Independent Meat Suppliers (AIMS)
British Meat Processors Association (BMPA)
British Retail Consortium (BRC)
Department for Environment, Food and Rural Affairs (Defra)
FAI Farms
Farmers' Union of Wales (FUW)
Food Standards Agency (FSA)
Hybu Cig Cymru (HCC, Meat Promotion Wales)
Livestock and Meat Commission (LMC)
Livestock Auctioneers Association (LAA)
Moredun Research Institute

National Farmers' Union (NFU)
NFU Cymru
NFU Scotland (NFUS)
National Sheep Association (NSA)
National Office of Animal Health (NOAH)
Red Tractor Assurance (RTA)
Responsible Use of Medicines in Agriculture Alliance (RUMA) sheep target task force
Road Haulage Association (RHA)
Royal Society for the Prevention of Cruelty to Animals (RSPCA)
Scotland's Rural College (SRUC)
Scottish Government
Sheep Veterinary Society (SVS)
Soil Association
Sustainable Control of Parasites in Sheep (SCOPS)
Quality Meat Scotland (QMS)
Ulster Farmers' Union (UFU)
Veterinary Medicine Directorate (VMD)
Wales Animal Health and Welfare Framework (AHWF)
Welsh Assembly Government

Farmer representatives

Charles Sercombe (Chair, England); Crosby Cleland (Vice Chair, Northern Ireland); Will Rawling (England); Tim White (England); Ben Anthony (Wales); Nigel Miller (Scotland)

Priorities identified by SHAWG

In 2018, to discourage silo thinking, SHAWG moved away from highlighting single disease issues and instead encouraged the prioritisation of activities which embraced a more holistic view of farm management practices. The approach of identifying two priority areas has been retained from the last report, with priority one being updated to highlight the potential of the Livestock Information Programme (LIP). The linked activities have also been updated (see Figure 1). Welfare remains a fundamental aspect of the priorities, with the ambition that improvements in these areas will increase welfare. Whilst the focus of this report is sheep health and welfare in productive systems, in identifying its priorities SHAWG also emphasises the need to include sheep in non-productive systems (e.g. pets) within any opportunities for industry development.

The two priority areas are:

1. To highlight the potential of integrating datasets to improve on-farm decision-making to drive profitability and animal performance.
2. To investigate how to 'nudge' farmers and their advisers to adopt good practice guidelines by understanding the barriers and enablers to uptake.



Figure 1. Key research and development priorities of Sheep Health and Welfare Group

What has happened since the last report?

For SHAWG's six objectives, a summary of key activity or findings since 2018 is described in this section. More detailed information can be found later in the report.

Objective 1: To reduce the impact of endemic disease by acting on surveillance data and new knowledge

- Scanning surveillance has found that ovine pulmonary adenomatosis (OPA) appears to be on the increase in Scotland, but this could be linked to greater awareness of the disease and increased use of ultrasound scanning (Table 16, Appendix 1). It was also found in young sheep (four- and seven-month-old lambs (Table 19, Appendix 1)
 - AHDB (SHAWG member) worked with technical specialists (including Dr Peers Davies from University of Liverpool, Nicky Ogden from Summerleaze Veterinary Practice, Ben Strugnell from Farm Post Mortems Ltd. and Dr Fiona Lovatt from University of Nottingham), to produce a **technical manual for farmers and advisers on iceberg diseases**
 - AHDB, NSA (SHAWG members) and Moredun have provided a number of workshops, train the trainer events and webinars on iceberg diseases for both vets and farmers, to increase awareness, provide guidance on current control options and invite industry discussion on future direction
- Research update – work from Moredun Research Institute indicates that annual or biannual test-and-cull based on transthoracic ultrasound screening to look for lung changes associated with ovine pulmonary adenocarcinoma (OPA), is useful in reducing the number of OPA cases each year. A few vets are now offering this service. More information about OPA and a video on scanning can be found at moredun.org.uk/research/diseases/opa-jaagsiekte
- **A guide for veterinary surgeons** to getting the most out of on-farm post-mortems was produced by AHDB. Veterinary pathology, especially in farm animals, is a vulnerable skill, with no structured education scheme to introduce new talent into the area. In an ideal world, all post-mortems should be carried out in a fully equipped facility by a Veterinary Investigation Officer (VIO) or pathologist, but this isn't always an available or cost-effective option so this guide helps to support vets through the process
- Research update – from late 2018 until December 2021, AHDB, HCC and QMS are funding a project led by the University of Edinburgh, which seeks to improve neonatal survival of lambs and suckled calves. Using a similar approach to the AHDB Dairy Mastitis Control Plan, a large-scale epidemiological study will quantify and characterise sources of neonatal mortality and disease in lambs and suckled calves, and describe their key drivers. The results will be packaged so that the levy boards are able to launch and support a UK-wide neonatal survival and sustainable antibiotic plan. Interim results are available on the **AHDB web pages**

Objective 2: To ensure the industry is aware of the threat of any new or re-emerging diseases

- Scanning surveillance* found a confirmed case of scrapie in sheep for the first time since 2015, identified through the sheep fallen stock survey (Table 15, Appendix 1)
- An investigation was carried out for suspected Brucellosis in sheep presented at an abattoir with pyrexia and swollen testicles. The case was officially investigated and testing was negative (Table 15, Appendix 1)
- Due to the re-emerging Bluetongue virus (BTV) 8 strain in northern Europe in early 2019, APHA followed up Bluetongue virus (BTV) cases. In sheep, the main presenting signs that aroused suspicion were swelling of the head, discharge of nasal mucous, drooling and crusting around the mouth and nose, and fetal abortions with porencephaly or hydranencephaly. Free post-mortem examination (PME) of any animals that died with any of those symptoms was offered. No BTV was found (Table 15, Appendix 1)
- In May 2020, APHA produced a document highlighting an **increase in tick numbers and tick-borne diseases reported, particularly in sheep**

* Collection through regular contact between private veterinary practitioners and VIOs, and the analysis of samples submitted for diagnostic testing to APHA, SRUC Veterinary Services (SRUC VS) centres and non-APHA post-mortem examination (PME) sites, and collated by the Small Ruminant Expert Group

Objective 3: To promote and encourage responsible use of medicines, including anthelmintics and antimicrobials



- The Animal Medicines Best Practice (AMBP) farmer training programme was developed by NOAH in partnership with stakeholders from across the food supply chain including vets, farmers, RUMA and the VMD. This programme is supporting the responsible use of antibiotics and the work of the RUMA targets task force. Training can be accessed online or delivered by the farm vet. Online training for sheep farmers is available on the Lantra website. The sheep course covers core topics such as AMR, the responsible use of antibiotics and the handling, recording, and storing of medicines on farm with a supporting module on enzootic abortion in ewes (EAE), lameness, watery mouth disease and joint-ill

#ColostrumIsGold #VaccinesWork

- Led by SAGG, SHAWG contributed to two RUMA-coordinated cross-sector initiatives: Colostrum Is Gold and Vaccines Work. The **Colostrum is Gold** campaign highlights how the ‘liquid gold’ properties of colostrum can play a key role in reducing the need for antibiotics in farm animals and improving their lifetime performance. It promotes best practice, mainly based around achieving the three Qs – ‘quality, quantity and quickness’ – of colostrum delivery, and uses social media to help deliver the messages. **The Vaccines Work** campaign highlights the benefits of using vaccines as part of an integrated farm animal health programme. It promotes a ‘Plan Prevent Protect’ framework to reduce the unnecessary costs of disease, and ensures vaccines are handled and administered correctly to maximise return on investment. From 2020, the Colostrum is Gold and Vaccines Work campaigns have been led by AHDB and NOAH, respectively
 - In 2019, SAGG coordinated the production of industry guidance for vets on responsible antibiotic use in sheep. It also coordinated the production of benchmarking metrics for antibiotic use on sheep farms. These have been circulated widely for industry use and are being used within the development of the eMH (see also pages 14 and 44–45). These documents are available on the SHAWG and **RUMA websites**
 - AHDB also updated its **sheep antimicrobial usage tool** to include the new benchmarking metrics
- A publication – **Use of vaccines in cattle and sheep production** – was produced in 2019 by AHDB. The report, first produced in 2018, initially only covered cattle but was updated in 2019 to include both cattle and sheep, and provides data on vaccine uptake in the UK. It will be updated again in 2020 and will be available on the AHDB website in autumn 2020
- Research update – a recent study highlighted several concerns around the incorrect administration, timing and storage of the Orf vaccine in UK sheep flocks, which could reduce vaccine efficacy⁽¹⁾. It recommended providing this advice to farmers when prescribing this vaccine
- The Veterinary Antimicrobial Resistance and Sales Surveillance (VARRS) 2018 report identified a large increase in resistance to tetracyclines observed in *Mannheimia haemolytica* (involved in pneumonia) from both cattle and sheep in 2017 and 2018
 - This has been used within the SAGG activity to promote vaccination as a preventative approach, which will reduce the pressure on tetracyclines

- Scanning surveillance found an increase in enzootic abortion of ewes (EAE) caused by *Chlamydia abortus*. It is preventable by vaccination, although in the early stages of an abortion storm, the antibiotic tetracyclines has been used to control outbreaks. Only 36% of sheep flocks are vaccinated for enzootic abortion. Farmers and their vets need to develop strategies for reducing the need for whole flock antibiotic usage
- Monepantel (trade name Zolvix, 4-AD, orange) resistance was found in England for the first time, after over-use on a triple resistant farm
 - SCOPS issued **guidance on use of the new group of wormers**
- Sheep scab mites from Wales and South West England have been found to have variable levels of resistance to all three macrocyclic lactone (ML) therapeutic treatments – moxidectin, ivermectin and doramectin
 - APHA produced documents – **Sheep scab information note** and updated **Sheep scab - resistance**
- Several cases within the scanning surveillance data (Table 19, Appendix 1) show the damage of injection products in the wrong place. For example, an adverse reaction following injection of Moxidectin into the neck, and probably into a vein that caused death, and spinal cord compression due to administration of vaccines high on the neck
- AHDB updated its publication on **responsible use of medicines**



Photo credit: Chris Elkington

Objective 4: To ensure welfare is maintained as a priority for the sheep industry

- A useful summary of focus areas for welfare for the sheep industry was given at the 2018 SHAWG Conference by Liz Genever. The presentation ‘What do we need to focus on for welfare?’ from ‘Session two: Priority areas for the sheep industry’ can be found within the 2018 SHAWG conference material on the SHAWG website
- Charles Sercombe (Chair of SHAWG) has been leading the sheep working group for the Animal Health and Welfare Pathway activity (see page 22)
- There has been greater uptake of the AssureWel assessment protocol for sheep across the industry (see Table 1 for the measures). The tool was developed by the AssureWel project to provide an objective, accurate and direct picture of sheep welfare, and can be used for an individual animal, farming system or farm assurance scheme. It can be used by farmers to self-assess, or by farm assurance schemes, farmer groups or vets to formally assess, give feedback and provide benchmarks to improve animal welfare. For further details and to download the protocol, visit: assurewel.org



Table 1. Individual, flock and record measures for the AssureWel protocol

Measure	Protocol number	Assessment
Individual measure	1 (a)	Lameness
Flock measures	1 (b)	Lameness (severely lame)
	2	Body condition score (thin sheep)
	3	Dirtiness
	4	Fleece loss
	5	Sheep needing further care
	6 (a)	Tail docking (docked short)
Records measures	6 (b)	Castration, tail docking and ear notching
	7	Mortality

Source: AssureWel

Objective 5: To highlight the role of nutrition in good health and welfare

- Data collated by the scanning surveillance showed the impact of the ‘Beast from the East’* in the early spring of 2018 on forage availability and ewe condition, with more welfare reports of poor condition, which led to higher levels of liver fluke and sheep scab (Table 16, Appendix 1). The impact was also seen on causes of lamb mortality, with lack of colostrum being the main diagnoses for young lambs, alongside other conditions linked to poor immune response, such as colisepticaemia and watery mouth (see Figure 18)
 - AHDB’s **Feeding the Ewe publication** provides a useful reference guide for farmers and advisers to plan winter rations, and grass and forage supplies in the spring
- **Research update** – an AHDB, HCC and QMS jointly funded project on neonatal survival has shown that ewes with low protein levels (in blood samples) have a higher risk of losing lambs before scanning and birth. Poor long-term protein status is an important factor for newborn lamb survival, whether due to concurrent disease or poor dietary protein during pregnancy. This further highlights the importance of ensuring ewes are fed to meet their energy and protein requirements in late pregnancy

* A cold wave that hit between 24 February and 4 March 2018, the official name was Anticyclone Hartmut

Objective 6: To deliver an integrated approach with all stakeholders, allied support industries, retailers and Government

- A new company – Livestock Information Ltd. – was created in October 2019 from the Livestock Information Programme (see page 22), to develop a multispecies livestock information service, which will replace the Animal Reporting and Movement Service (ARAMS). It promises more effective collection and use of livestock movement data, which will lead to greater resilience and responsiveness to disease threats and improved food safety. It will also be an important part of future trade deals. The programme continues to be guided by the Traceability Design User Group (TDUG), an independent group of 25 industry and government stakeholders, which is chaired by Laura Ryan
 - See pages 24–25 for information on the traceability systems in Wales, Scotland and Northern Ireland

- Members of SHAWG have been engaged in the development of a national electronic Medicine Hub (eMH) for cattle and sheep, with the launch of this service expected at the start of 2021. It will provide dairy, beef and lamb producers with a convenient way to record and benchmark use of medicines and antibiotics on their farm, and review this in discussion with their vet, providing national sector-level reporting. AHDB is leading on the initiative and follows on from previous work on the development of eMB-pigs – a UK-wide service for the collection of data on antibiotic usage in the pig sector. Further details on the eMH for cattle and sheep can be found on the [AHDB website](#)

- **Research update** – the European Union (EU) funded Horizon 2020 project SheepNet was completed with significant technical guidance from a range of countries, available on their website. It is being followed by a new Horizon 2020 project called EuroSheep and is building on the network of sheep farmers, advisers and researchers across Europe, New Zealand and Australia brought together by SheepNet. Where SheepNet focused on increasing flock rearing rate, EuroSheep now focuses on growing lambs efficiently

- Research update – RamCompare, a joint levy-funded project involving a partnership of 16 organisations is currently in its fifth year. The project aims to help commercial farms select the most profitable terminal sires for their flock, irrespective of breed, by linking performance traits of their progeny to their predicted carcass trait EBVs. To date, the detailed performance of 19,000 lambs sired by 211 rams has been recorded from birth through to slaughter over nine farms. These data, including carcass information from the abattoirs, has been used to update existing estimated breeding values (EBVs) in terminal sire genetic evaluation schemes. In addition, a series of new EBVs enables the true genetic merit of the different rams to be compared



Funders



Supporters



Collaborators



- New EBVs have been developed for Carcass Weight, Carcass Conformation, Carcass Fat Class, Primal Yield and Shear Force, with these EBVs combined to form an Overall Carcass Merit Index for each sire on test. Collectively, they result in an increased number of lambs hitting target specification at the abattoir, resulting in higher value carcasses. In addition, the Days to Slaughter EBV predicts sires with faster growing progeny, which can work in harmony with carcass traits. RamCompare commercial farms showed that progeny by the highest genetic merit sires were easily worth an extra £4/lamb, a potential for an extra £800/ram over its lifetime

Coronavirus

The global coronavirus pandemic is predominantly a demand side story for the UK sheep sector, although farmers, auction markets, abattoirs and the wider supply chain has had to adapt to social distancing measures put in place by the Government.

Health and welfare

From a health and welfare perspective, Animal Welfare Council issued **an opinion on the impact of COVID-19**.

The main points relevant to the sheep sector were:

- The need to update contingency plans to ensure if there are any disruptions to supply chains, e.g. delay in sending animals to abattoirs or to store markets; welfare is not compromised by inadequate grass, forage or feed supplies
- Changes to abattoirs may be needed to ensure effective stunning and slaughter if personnel numbers are reduced due to social distancing rules or staff shortage
- Concerns about the availability of shearers, and the risk of a longer shearing period and increased risk of flystrike and lice, cast sheep and heat stress
- National Association of Agricultural Contractors (NAAC) and the National Sheep Association (NSA) set up a shearing register and produced guidelines to assist farmers and contractors
- COVID-19 situation is also likely to impact farmer mental health and resilience, potentially reducing their ability to care for their livestock
- COVID-19 (and poor weather from autumn 2019 to spring 2020) has disrupted the supply of domestically and internationally sourced products necessary for farm animal and nutrition, as well as increasing price volatility
- A rise in the incidence of uncontrolled dogs harming farm animals, notably sheep and lambs, has been reported
- The halal sheep trade has reduced as a result of loss of catering demand. This has resulted in a restricted market for cull ewes, meaning overstocking may develop on farm as lambs are weaned. This may be exacerbated if halal slaughter is limited owing to lack of slaughterhouse capacity. Some abattoirs may also stop offering a private kill service, and illegal slaughter may increase if this service is not provided to farmers
- Flock preventative health schemes to reduce future welfare problems have also temporarily been put on hold due to social distancing and self-isolation requirements
- Reduced laboratory capacity due to personnel availability may lead to less disease monitoring and potentially increased disease incidence affecting animal health
- In-person audits and inspections are in some cases being replaced by less rigorous remote methods (e.g. Red Tractor livestreamed farm audits), potentially impacting animal health and welfare

Their conclusion was that early concerns that COVID-19 restrictions would have a severe effect on animal welfare has not happened in the short term. However, many areas have been identified as requiring careful monitoring and will be the subject of AWC's follow-on opinion.

Wool

The pandemic had a significant impact on the global wool market, which slowed significantly in February and then shut completely at the beginning of March. February to May would normally be the busiest selling period of the year and, as a result, British Wool had an extra 9 million kilograms of unsold 2019 clip wool carried forward into the 2020 selling season.

COVID-19 impacted the wool market globally with demand and prices falling significantly. Given the situation in which British Wool found itself, a valuation had to be placed on the unsold stock, which was at a significant discount to the last prices sold. As a result, the average price paid to producers for the 2019/20 clip was 32p/kg.

Dairy sheep

The coronavirus outbreak had a serious effect on over 95% of sheep milk producers in the UK. Many farms had to stop milking altogether or reduce the numbers of milking ewes by a large proportion. Milk price was reduced from an average of £1.20 to £0.80 or less per litre, which is equal to or below cost of production. The dairy industry grants that were made available by the Government were aimed at the dairy cattle market, and no sheep dairy could qualify for them. New initiatives, such as drying sheep milk for powder to be exported and new sheep dairy farms, all had to be put on hold. Discussions with Defra are ongoing to identify capital grants and investment opportunities to help the sheep milk sector. One positive is that it has led to a marked increase of online sales and the level of local support seen by a few sheep dairies going online or developing their own new products.

What does the future bring?

SHAWG hands over its objectives and priorities to RH&W at an exciting time for sheep health and welfare as there are new initiatives that could make a significant impact on the sector. A few highlights are given below, with further examples in relevant later sections of the report.

Objective 1: To reduce the impact of endemic disease by acting on surveillance data and new knowledge

- An Invitation to Tender for a Rural Development Programme for England (RDPE) project to help tackle sheep scab in regions where controlling scab is difficult, such as common grazing areas, was issued in September 2020. The delivery of this project should have a major impact on the health and welfare of the national flock
- For English sheep farmers, more details of the opportunities from the Animal Health and Welfare Pathway will become available. It is likely to involve health planning visits and grants for equipment to improve animal health and welfare on farm
- Research updates: mastitis – the Scottish Government is currently funding a project at Moredun examining novel vaccine candidates and approaches for the protection of sheep against mastitis. In addition, a PhD at the University of Warwick, funded by BBSRC and AHDB, will provide further knowledge on the role of intramammary abscesses in acute mastitis
- Research updates: scab – Moredun is aiming to develop a pen-side test for sheep scab, with the aim of offering rapid diagnosis. If successful, it could offer benefits when selling and purchasing through livestock markets. Further work also continues at Moredun for a vaccine against sheep scab

Objective 2: To ensure the industry is aware of the threat of any new or re-emerging diseases

- Government-funded surveillance and horizon scanning will continue and will become more important as trade deals are developed, and requirements for moving sheep in and out of the EU change
- Research update – Hanne Nijs (University of Warwick), who presented at the 2018 SHAWG conference, recently completed her AHDB-funded PhD on developing a syndromic surveillance system for endemic diseases in beef cattle and sheep. Industry updates are expected shortly

Objective 3: To promote and encourage responsible use of medicines, including anthelmintics and antimicrobials

- The development of **eMH for cattle and sheep** will provide more information on medicine use for the sheep sector and will help drive improved practice
- Research update – A PhD at the University of Nottingham, funded by AHDB, exploring antimicrobial use on beef and sheep farms will complete in early 2021. The project uses social sciences to explore perceptions of antibiotic use, with interim results used to shape RUMA targets. Further information is expected in 2021 and will help inform messages that encourage responsible antibiotic use
- The launch of an accreditation scheme for mobile sheep dipping contractors should happen during 2021. It will be run along with an industry-wide campaign against the use of showers and jetters, to ensure organophosphate (OP) products are used effectively and safely

Objective 4: To ensure welfare is maintained as a priority for the sheep industry

- As part of the development of the Animal Health and Welfare Pathway, the Code of Recommendations for the Welfare of Livestock: Sheep, which was **last updated in 2003**, will be reviewed
- Research update – ‘Numnuts’ is the world’s first rubber ring applicator with a pain relief delivery mechanism for use in tail docking and castration procedures. It was developed by Moredun, CSIRO and 4c Design to create a practical on-farm solution developed and tested by farmers for farmers. Numnuts is currently only available in Australia but is expected to be launched in the UK in 2021. Further details can be found at **numnuts.store**

Objective 5: To highlight the role of nutrition in good health and welfare

- Research update – the outcome of two AHDB-funded projects on the impact of body condition score (BCS) on ewe and lamb performance will be communicated widely to the industry
 - A PhD at the University of Nottingham on the impact of scoring BC in commercial flocks will complete at the end of 2020 and results will be communicated during 2021
 - Challenge Sheep aims to understand how management of replacement ewes during their first breeding season affects lifetime productivity. The project began in 2017 and is set to take 7 years in total, with 11 farmers committed to recording data for the duration of the project. Covering both sheep bred as ewe lambs, and as shearlings, the project is tracking over 7,000 replacements from a range of English sheep farms up and down the country, which are recording data via electronic identification (EID) – weights, BCS, lambing data and lamb performance. The project aims to generate new knowledge and highlight existing information on managing ewe replacements. To find out more, visit the Challenge Sheep web page: **ahdb.org.uk/challenge-sheep**

Objective 6: To deliver an integrated approach with all stakeholders, allied support industries, retailers and Government

- The British Sheep Breed Survey has been carried out periodically since 1971, with the fifth and last survey describing the breed structure at mating being done in **2012**. This has been reported in the last two SHAWG reports. The survey will take place again in autumn 2020 for the sixth time, with results expected in 2021. The results will be useful in determining the impact of leaving the EU on the UK sheep industry

The impact of the United Kingdom leaving the European Union

Brexit will be incredibly challenging for the sheep sector. With the UK planning to leave the EU at the end of 2020, it is still unclear how the trading relationship will work. This could cause serious price reductions as currently the UK is dependent on the EU for most of its exports. There could be future opportunities for the UK for exporting products to non-EU countries, for example, lower value cuts into China.

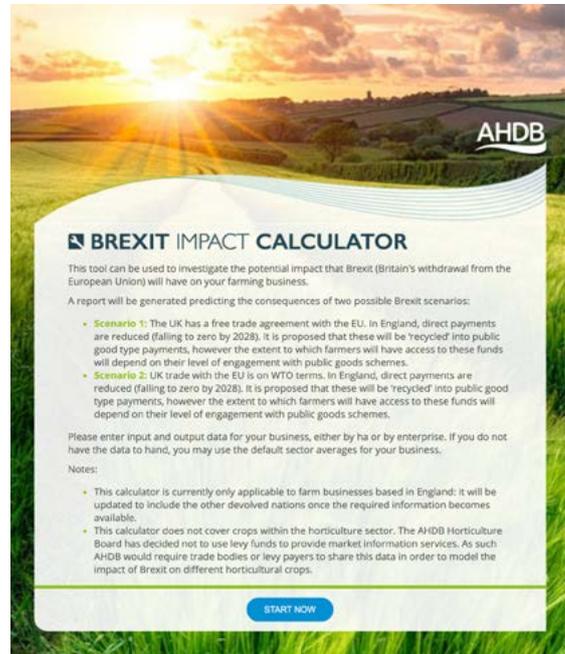
To be fit for the future post-Brexit, farmers are being strongly encouraged to analyse their businesses, plan their directions and act on informed business decisions now. The Brexit Impact Calculator is available at bic.ahdb.org.uk

The latest news, insights and government guidance and technical advice can be found on the AHDB website: ahdb.org.uk/brexit

In terms of health and welfare, new policy needs to be developed as the UK is now out of the Common Agricultural Policy (CAP). For England, the Animal Health and Welfare Pathway initiative being led by AHWBE (page 22) will be the approach.

Future activity of ruminant health and welfare on Brexit needs to be focused on:

- Demonstrating responsible use of medicines, particularly antibiotics (due to global pressure) and evidence to defend increased use where there are disease outbreaks
- Maintaining access to veterinary products and medicines during the transition period
- Demonstrating the welfare status in the UK as no measures are currently available



	Head	Yield Litre/head	Price per Litre Pence	Total Sales £
Milk			25 p	
Eggs		130	95 p	
Beef stores incl. compulsory sales and culls			£380	
Beef finishers incl. compulsory sales and culls			£1,100	
Lamb stores incl. compulsory sales and culls			£55	
Lamb finishers incl. compulsory sales and culls			£75	
Wethers incl. compulsory sales and culls			£35	
Fattened pigs incl. compulsory sales and culls			£120	
Dairy other income incl. cull, culls, compulsory and breeding sales (incl. dairy bulls)				
Breeding stock other income incl. wean, culls, compulsory and breeding sales (incl. rams)				
Breeding pigs other income incl. culls, compulsory and breeding sales (incl. boars)				
Broilers and other poultry				
All other livestock				

Policy updates from across the United Kingdom

The UK government has announced some of the biggest change to agricultural policy in 50 years. Agriculture is a devolved issue and while many of the challenges faced are identical, different policy arrangements and strategies are in place and in development for England, Scotland, Wales and Northern Ireland.

Agriculture Bill 2020

The new UK Agriculture Bill 2020 primarily focuses on England but contains provisions extending to the whole of the UK and specific parts of the UK. For England, the bill introduces:

1. The development of new farm support approaches in England as direct payments to farmers are currently based on how much land is farmed and these will be phased out, starting in 2021, over a seven-year period (see Figure 2). New schemes that pay farmers for producing ‘public goods’, such as environmental or animal welfare improvements will be introduced.
2. The powers to intervene in agricultural markets in exceptional conditions, such as to provide farmers with financial support or operate public intervention and private storage aid schemes.
3. Measures to increase transparency and fairness in the supply chain for farmers and food producers. It does this by: introducing new requirements on collection and sharing of data; placing fair dealing obligations on business purchasers of agricultural products; and introducing new measures on producer organisations.
4. Updates for measures on marketing standards and carcass classification. For example, to amend or revoke EU and domestic legislation or to set new standards tailored to suit UK agricultural sectors. New clauses are included in the Bill on certification of organic products.



Figure 2. A timescale for the changes associated with the Agriculture Bill in England

Source: AHDB, Defra

In England, farm support payments will be phased out between 2021 and 2027, with funding repositioned through the AHWBE Pathway for data and improvements in animal welfare, plus other activity on the environment. The challenge is that for some of grazing livestock business, direct payments are over 90% of the farm business income. The planned phase out of farm support payments for farmers in Scotland, Wales and Northern Ireland may differ from those proposed in England.

For Scotland, The Agriculture (Retained EU Law and Data) (Scotland) Bill was introduced in November 2019 and allows ministers to simplify and improve the operation of any part of Common Agriculture Policy including the continued operation of direct payments in Scotland post-2020. Following a consultation in the summer of 2018, the Scottish Government proposed a five-year period of ‘stability and simplicity’ followed by a new scheme from 2024. Several groups have been set up to gather opinions from stakeholders and make recommendations for future policy. The Simplification Task Force and the 2021–2024 Policy Delivery Coordination Group were set up to recommend policy during the transition period, and the Farming and Food Production Future Policy Group to recommend policy post-2024.

In Wales, a consultation in the summer of 2018 led the Welsh Government to propose a farm sustainability scheme targeted on outcomes, and then a second consultation in late 2019 – Sustainable Farming and our Land. While no decisions have been taken, further work is ongoing on the development of a Sustainable Land Management Framework. A third consultation – Sustainable Farming and our Land: Simplifying Agricultural Support from 2021 – proposing to deliver a multi-year structured transition, closed on 23 October 2020. A white paper publication on the future of Welsh farming is expected at the end of 2020, to provide ground work for an Agriculture (Wales) Bill.

In Northern Ireland, DAERA sought views on the future agricultural policy framework in summer 2018, which focused on resilience, productivity and environmental sustainability. They have also proposed a period of transition, with potential for a new scheme from 2022.

Environment Bill 2020

The UK Government has committed to delivering ‘the most ambitious environmental programme of any country on earth’ in order to tackle concerns over the impact of climate change, environmental risks and biodiversity loss on public health. It was the first major economy to pass net-zero emissions legislation, with a target of net-zero greenhouse gas emissions by 2050.

The new UK Environment Bill primarily focuses on England and Wales but contains provisions extending to the whole of the UK and specific parts of the UK. Due to the COVID-19 pandemic, the timeline for consideration of the Bill is currently unknown.

The Bill follows the publication of a ‘25 Year Environment Plan’ policy paper in 2018 and sets out an agenda for environmental reform and governance post-Brexit. It would give new powers to set environmental targets and create legislation on:

- Air quality
- Waste and resource efficiency
- Water management
- Nature and biodiversity
- Chemical regulation

It also creates a new independent non-departmental public body, the Office for Environmental Protection, to act as an environmental watchdog and to hold Government accountable.

The National Food Strategy

Each of the devolved administrations in the UK has its own food strategy. In England, an independent review is currently underway to examine the foundations of food production and food security including: food availability, sources, resilience, safety, affordability and consumer confidence. The review, led by Henry Dimbleby, aims to set out a vision for the future, a plan on how this can be achieved and will cover the entire food chain from farm to fork. The scope of the current review is England but includes consideration of connections with Wales, Scotland, Northern Ireland, the EU and trade partners. Unlike agriculture policy, trade policy is not devolved and any recommendations relating to trade would apply to the UK. The review includes active dialogue between the devolved administrations.

The National Food Strategy review aims to ensure our food system:

- Delivers safe, healthy, affordable food, regardless of where people live or how much they earn
- Is robust in the face of future shocks
- Restores and enhances the natural environment for the next generation in this country
- Is built upon a resilient, sustainable and humane agriculture sector
- Is a thriving contributor to our urban and rural economies, delivering well-paid jobs and supporting innovative producers and manufacturers across the country
- Delivers all this in an efficient and cost-effective way

A National Food Strategy white paper will be produced within six months of completion of the review and complements work on the Agriculture Bill, Environment Bill, Fisheries Bill, Industrial Strategy and Childhood Obesity Plan.

The original plan for an interim report from the review was reshaped by the COVID-19 pandemic. The **National Food Strategy** will be published in two parts. Part 1 – recommendations to support the country through the COVID-19 pandemic and EU exit, was published in June 2020. Part 2 – evidence based analysis of the current system is expected in early 2021.

Animal Health and Welfare Board for England



Department
for Environment
Food & Rural Affairs

The Animal Health and Welfare Board for England (AHWBE) has supported the UK's European Union exit and post-exit strategic policy objectives by providing support, advice and constructive challenge to Defra's Ministers and their officials.

The Board champions the ethos of partnership working between industry, animal keepers and Government. It summarises the viewpoints from the various sectors of industry, to ensure effective and relevant two-way engagement. The sheep industry is represented on AHWBE by Charles Sercombe.

The Board works collaboratively with policy and delivery teams across the Defra group to achieve this. It looks at strategy and policy development and its practical application, offering insight into which of the proposed interventions or initiatives may be most effective. Its areas of focus can be seen below.

Areas of focus

- Support and develop policy in the context of EU Exit
- Maintain and develop sector council and industry communications in the context of EU exit
- Support Defra to incentivise best practice in endemic disease control and in reducing antimicrobial resistance (AMR)
- Support and develop new models of regulation that provide a balance of effective legislation and sector responsibility, with an initial focus on livestock identification and movement
- Engage with the livestock information programme to ensure it is relevant for each sector
- Support and promote effective surveillance for animal diseases

The AHWBE also has oversight for other issues:

- Transport of animals
- Enforcement, generally and specifically, within abattoirs
- National welfare standards
- National biosecurity
- The six-day standstill
- COVID-19 impact
- Future industry training needs

Animal Health and Welfare Pathway (England)

As part of its overview on Future Farming, AHWBE proposed the concept of the Animal Health and Welfare Pathway to Ministers two years ago. This has been accepted by the Department and announced by Ministers in the February 2020 Policy Statement on future farming, and is in the Agriculture Bill.

The Pathway aims to be a delivery partnership between industry and Government. From April 2022, it is proposing a range of grants targeting businesses and productivity, to support on-farm welfare improvements. There will also be an animal health and welfare scheme that encourages farmers to engage with their vets and other health advisers to identify their priorities to improve the health and welfare of their flock.

The AHWBE established the Pathway Steering Group and species-based groups – pig, cattle and sheep – to design the format for future plans. Under the leadership of Charles Sercombe, the sheep group designed a future strategy for government-supported intervention for the sheep industry, to achieve greater health and welfare.

Traceability of animal movements

Livestock Information Programme

In October 2019, the Livestock Information Programme created a new company called Livestock Information Ltd. (LI Ltd.) to manage the creation and roll-out of a new multispecies Livestock Information Service (LIS) for England. LI Ltd. is a subsidiary of AHDB, which is the 51% shareholder, with Defra owning the remainder. This new service will replace the existing statutory livestock traceability services for cattle, sheep, goats, deer and pigs, (BCMS, ARAMS and eAML2, respectively). LIS will be conversant with traceability in the devolved administrations, to enable an overall UK view on disease traceability, food safety and international trade.

An industry-led Traceability Design Users Group (representing over 20 trade, education and government bodies in the meat and livestock sectors) continues to advise Defra on the vision and design principles necessary to deliver an integrated, digitally enabled, real-time, industry-facing traceability system. More effective collection and use of livestock movement data will lead to greater resilience and responsiveness to disease threats, and improved food safety.

LI Ltd. owns the underpinning software for the core application and will be responsible for operating and maintaining the service after launch. The main software platform has been supplied by Shearwell Data Ltd. Shearwell is working with software development company SCISYS, to adapt and develop the platform to meet current and future needs of the livestock sector. Data integration software is being supplied by Equine Register Ltd. which already manages the Central Equine Database and the National Chipchecker for Defra.

A premise in establishing LI Ltd. as a partnership is to be able to use government and industry-held data to drive improvements in productivity, animal health and welfare, environmental impact, and market opportunity. The Government is funding the statutory core element. Added-value features and benefits will require funding from industry sources, although some costs may be shared where there are clear benefits for both government and industry. The ability to connect data across the UK meat and livestock sector has the potential to produce on-farm and sector-wide productivity and efficiency improvements. Potential developments include functionality to enable knowledge-based trading for diseases such as bovine viral diarrhoea (BVD), more consistent flow of information from abattoirs back to producers, and production of performance metrics, dashboards and benchmarks based on information supplied for statutory purposes (see Figure 3). LIS will work to enable data sets to be joined more easily, for example, for genetic improvement, and will set out to complement software providers, commercial operators, and technology companies already providing services to industry, so they can continue to innovate. Ultimately, LIS could be an important facilitator of data and connectivity in support of future work by RH&W and the Animal Health and Welfare Pathway.

The programme has had to adjust its delivery approach due to the impact of COVID-19, but the vision and ambition remain undiminished. The new LIS will be brought online in a series of staged releases, which reflect increases in functionality and prospective changes in legislation. First release is expected during the first half of 2021.

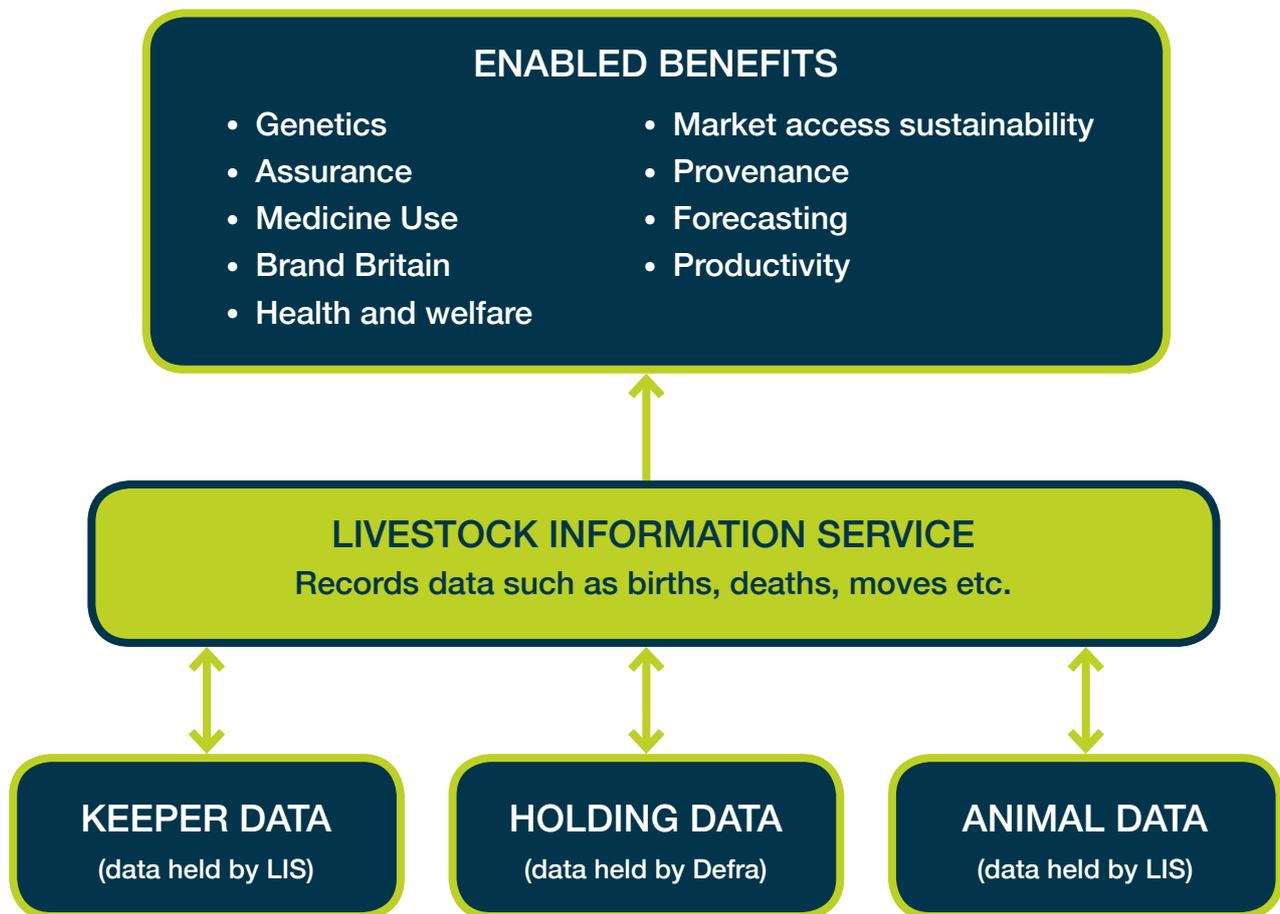


Figure 3. The aims of the Livestock Information Programme

Source: AHDB

Multispecies Wales – EIDCymru

Hybu Cig Cymru (Meat Promotion Wales) operates EIDCymru in partnership and on behalf of Welsh Government and currently enables sheep, goat and deer movements to be traced between farms, markets, abattoirs, collection and assembly centres. This provides Wales with a modern, robust, movement reporting and traceability system to respond quickly and effectively in any disease outbreak. Ensuring full traceability of individual animals and animal origin is essential to effective disease control, and contributes to the protection of public health. The system actively exchanges data with England's equivalent system (ARAMS) and reports all movement data to AMLS to ensure UK standstill and traceability requirements are managed.

All active livestock markets, abattoirs, collection and assembly centres in Wales are reporting sheep movements electronically to EIDCymru, and over 5,000 users have registered onto the system. These high throughput establishments account for approximately 80% of sheep movements in Wales.

The forthcoming extension of EIDCymru to allow multispecies reporting will include cattle initially and pigs further down the line, and will provide a single point of contact for farmers in Wales to report all their livestock movements, births and deaths. This move to a multispecies system for EIDCymru will allow Welsh Government and stakeholders to trace the movements and manage data for cattle, sheep, goats and pigs in a unified system, providing effective disease control, provenance and public health. The extension of the system will be developed in line with the current aspirations for the introduction of the electronic identification (EID) of cattle (Bovine EID), with a public consultation in 2021.

Wider benefits to the farming industry are currently delivered by EIDCymru as it supports the branding and marketing of Welsh Lamb in new, developing and established markets, these benefits will be extended to the additional species that are being introduced.

Livestock identification registration and movement in Scotland

Livestock identification, registration and movements (IRM) is a central component of disease prevention and control. National regulations and systems have been regularly assessed by audits and trade missions. ScotEID is the database system for IRM for sheep, goats and pigs in Scotland. ScotEID is a fully relational multispecies traceability system and is administered by the Scottish Agricultural Organisation Society (SAOS), an independent development organisation that works in partnership with Scottish Government, and various industry partners including auction markets, abattoirs and farmers.

The sheep tracing element of the system has been in operation since 2010. A major component of the sheep traceability system in Scotland is the automated reading of EID tags in Critical Control Points (CCPs) (markets, abattoirs and ferry terminals) using race readers. This system provides accurate, timely individual movement reporting for the majority of animal movements, while also reducing the recording burden from sheep keepers. The system exchanges cross-border sheep movements via eAML2.

Further development of the sheep system is planned after completion of the cattle side of the operation. A period of transition is underway to move away from the UK/GB Cattle Traceability System (CTS) to ScotEID for the registration of cattle births, deaths and movements. This bespoke multispecies livestock traceability system further strengthens traceability, disease prevention, control, eradication and the protection of public health. It will also deliver added-value projects for the livestock sector such as provenance checking, non-notifiable disease control and genotyping.

Northern Ireland's Animal and Public Health Information System

In Northern Ireland (NI), the Animal and Public Health Information System (APHIS) is an integrated, multispecies database operated by Department of Agriculture, Environment and Rural Affairs (DAERA), for traceability, disease control, food safety and trade assurance requirements.

Northern Ireland legislation requires all sheep to be uniquely identified with an EID tag before they reach nine months or before leaving their holding of origin, whichever is soonest. All tag numbers are generated by APHIS and printed by approved tag suppliers who access the keeper's APHIS record, through a web service, to generate the appropriate numbers. These individual sheep identification numbers are recorded on APHIS whenever movements from one holding to another occur.

Where movement occurs between ordinary holdings, the individual numbers must be recorded on the movement documents, which must accompany the sheep on the journey, and a copy of this document must be sent to DAERA by the receiving keeper.

All the markets, abattoirs and export assembly centres are designated as Central Points of Recording (CPRs) and use EID tag readers, linked to APHIS by web services, to confirm the animals to or from those premises. Where sheep move through these CPRs, the individual numbers do not have to be written out by the keepers, and the CPR operator notifies the move to DAERA.

Sheep imported to NI from GB are recorded on APHIS at the port of entry, and importers must confirm the import at their local DAERA office. The origin of the sheep is recorded only as 'GB' on APHIS, and any tracing of movements on the GB side prior to the import would be done by Defra/APHA. The test cycle for any necessary post-import testing is also managed entirely on APHIS.

There is a web service specifically for authorised private veterinarians, which allows them to generate the necessary paperwork to support export of sheep to GB or the Republic of Ireland (ROI) and to notify DAERA of the export. APHIS is pre-programmed with various rules, such as residency and standstill requirements, where necessary, which determine the eligibility of sheep for proposed moves, including export. The movement is recorded on APHIS simply to 'GB' or 'ROI', and any subsequent tracing required would be done by the competent authority in the region of destination.

Data from the statutory annual inventory return is uploaded to APHIS once a year and this can be quickly interrogated to provide basic data. A suite of reports has also been developed to report on a variety of other information. These details can be used, for example, to select flocks likely to be at a higher risk of non-compliances for sheep identity inspections.



Photo credit: AHDB



Photo credit: AHDB

The sheep industry structure

Sheep numbers and distribution

Defra figures for the UK sheep flock, which are based on the annual June census, show a decline in ewe numbers between 1998 and 2009. Since 2010, there has been a steady increase in ewe numbers each year, with an increase of 17% since 2010 (see Figure 4). The June 2019 census indicates a UK breeding flock of about 16 million ewes, with about 7.2 million in England⁽²⁾, 2.6 million in Scotland⁽³⁾ and 0.9 million in Northern Ireland⁽⁴⁾. Data from Wales was not available for 2019, but was estimated to be 4.8 million breeding ewes in 2018⁽⁵⁾. Data from 2020 was not available in time for the publication of this report.

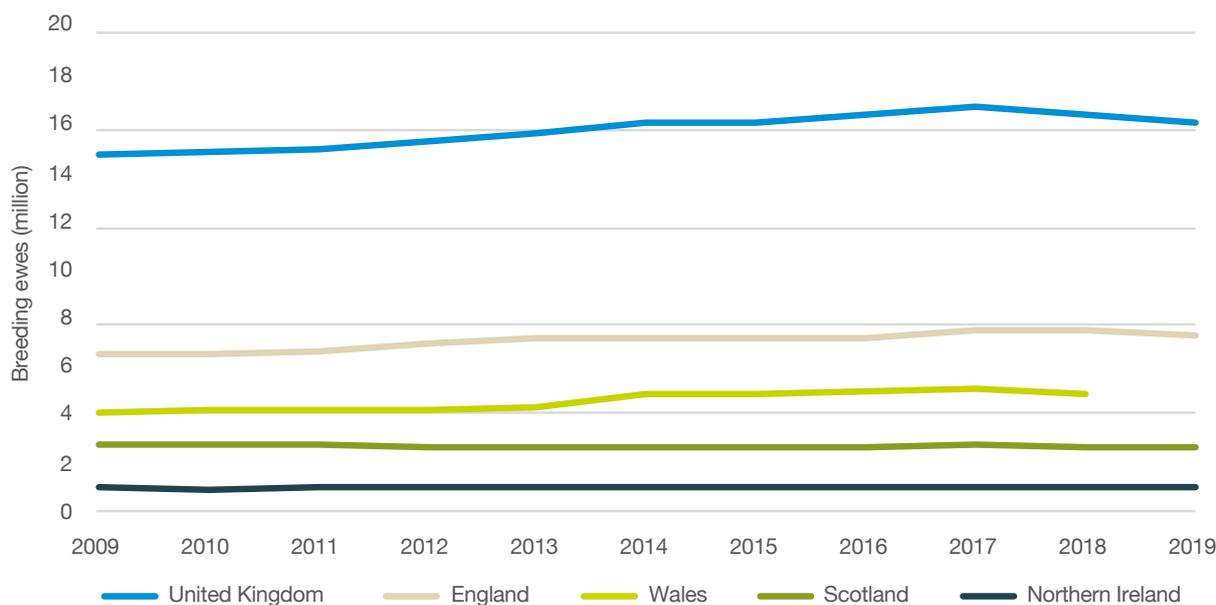


Figure 4. Ewe numbers by region in the United Kingdom, 2009–2019

Source: Defra, DAERA, Scottish Government and Welsh Government

The highest distribution of sheep tends to be in the west and north⁽⁶⁾ (see Figure 5).

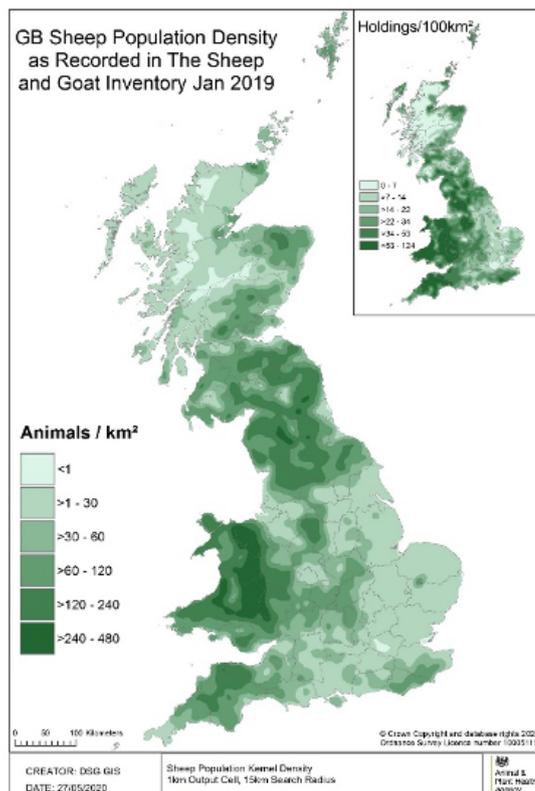


Figure 5. Sheep population density in Great Britain in 2019

Source: APHA

Lamb production

Each year, Defra calculates the lamb survival rate from ewes and ewe lambs put to the ram (see Figure 6), using slaughtering figures and assumptions about retention of replacements⁽⁷⁾. There has been an overall upward trend since 2005. The survival of lambs is highly dependent on weather conditions and this needs to be considered when interpreting year-on-year changes. Favourable weather conditions in 2011 led to a high survival rate, with peaks reached in 2014 (the highest level since 1990) and 2017. In 2018, lamb survival rates decreased due to the ‘Beast from the East’ during the main lambing season.

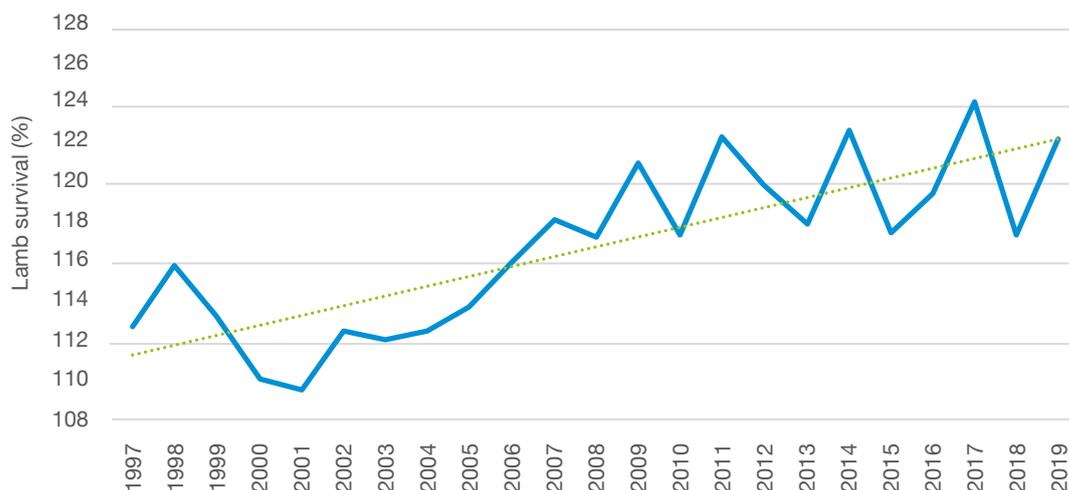


Figure 6. Surviving lamb percentage for the United Kingdom

Source: Defra, AHDB, LAA and IAAS

The opposing extremes of weather seen during spring (‘Beast from the East’) and summer (drought) 2018 resulted in a hard year for farmers, with poor conditions at lambing leading to reductions in the 2018 lamb crop, with estimates of the decline in number of lambs on farm at 1 June 2018 of 2% (400,000 head) to 16.9 million head from the 2017 estimate, though this figure may be underestimated⁽⁸⁾. While survey data on the size of the 2020 lamb crop is not yet available, it is forecast to be about 16.8 million head, marginally smaller than the 2019 lamb crop⁽⁹⁾. The weather at lambing 2020 was fair, although the winter leading up to lambing was wet. Lack of grass growth may be a problem for the 2020 lamb crop, since there has been limited rainfall throughout May and June 2020 in some regions of England and Wales. In the week ending 5 June, GB grass growth averaged 40.7 kg DM/ha, almost half of the long-term average (2010–19), according to the AHDB Forage for Knowledge Programme⁽¹⁰⁾. Longer term, the size of the lamb crop is forecast to reflect changes in the size of breeding flock, although any exceptional weather events would change this, due to the effect on lambing rates.



Photo credit: AHDB

In 2019, about 14 million sheep were slaughtered in the UK, and this figure has been reasonably consistent for several years (see Figure 7). Lamb and mutton made up approximately 14% of red meat production in the UK over the period 2012–2017 (see Table 21 in Appendix 2).

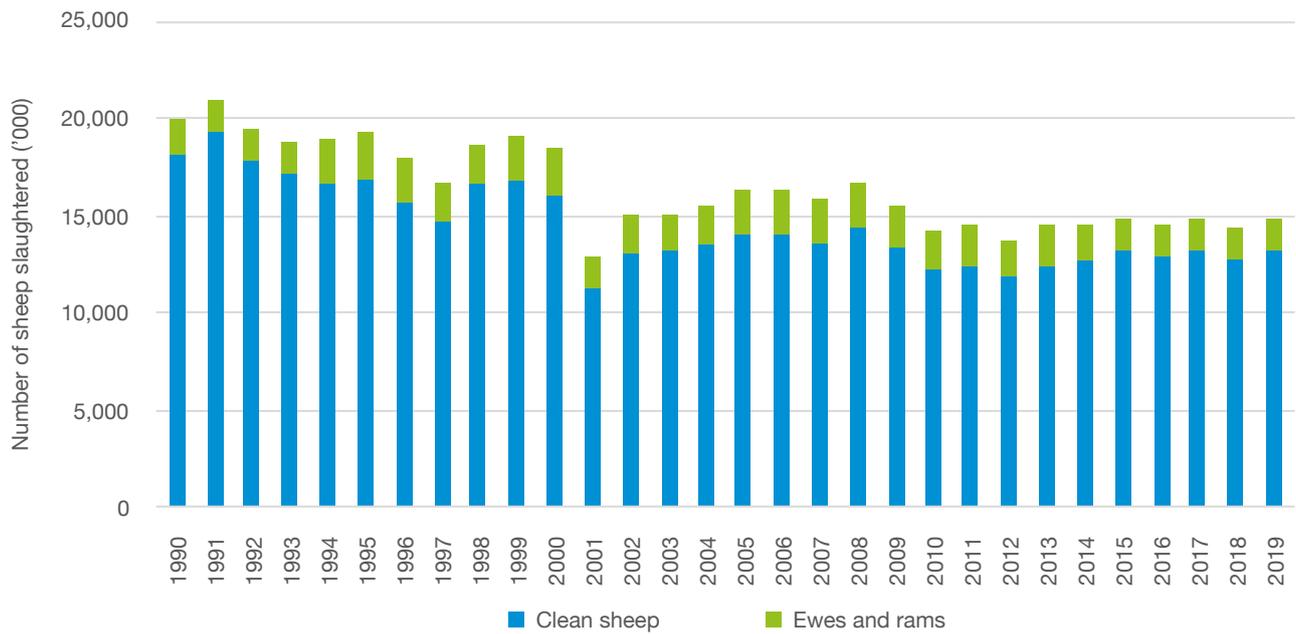


Figure 7. Sheep slaughterings in the United Kingdom, 1990–2019

Source: Defra, AHDB, LAA and IAAS



Photo credit: AHDB

Lamb prices

Lamb prices have shown volatility in spring and summer periods in the last few years in comparison with the five-year average (see Figures 8 and 9). The summer of 2020 had unseasonal high prices.

See AHDB website and newsletter for latest prices and market information:

ahdb.org.uk/lamb/ -markets

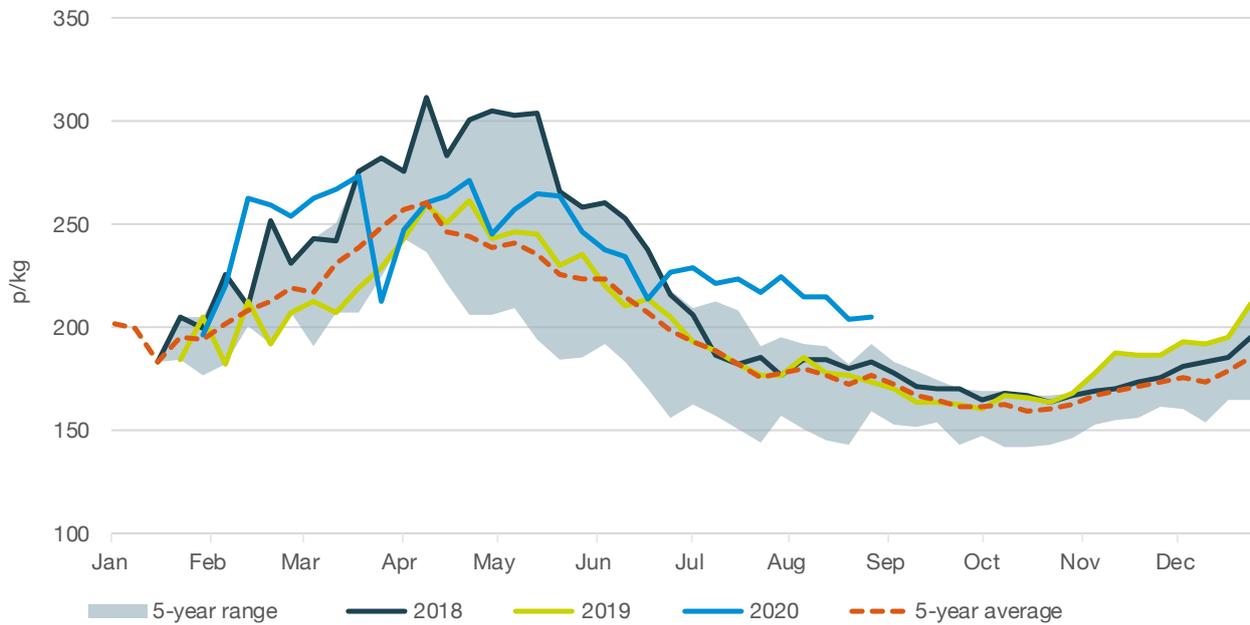


Figure 8. Lamb price (p/kg liveweight) for new season lamb for Great Britain

Source: AHDB, LAA and IAAS

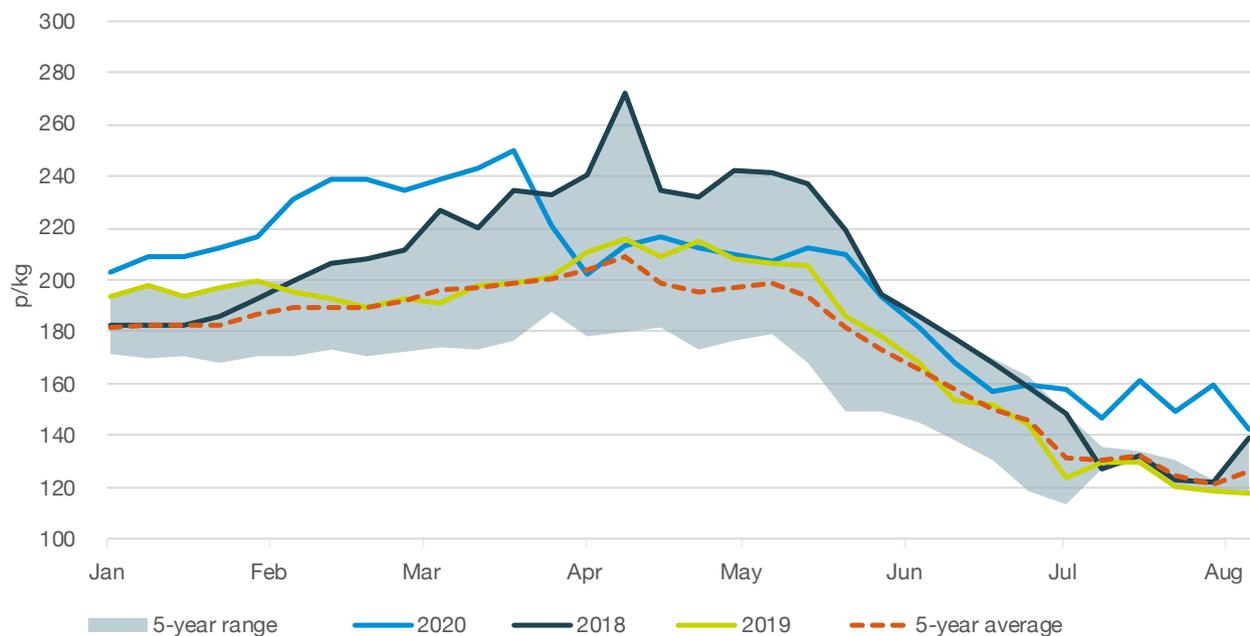


Figure 9. Lamb price (p/kg liveweight) for old season lamb for Great Britain

Source: AHDB, LAA and IAAS

Adult sheep slaughterings

Just under 1.7 million adult sheep are slaughtered per year (see Table 2). With an estimated breeding sheep population of 16 million in 2019⁽⁷⁾, this represents a culling rate of about 11%.

Table 2. Adult sheep slaughterings, '000 head

	2014	2015	2016	2017	2018	2019
Jan–Mar	461	364	426	373	380	417
Apr–Jun	411	366	389	379	362	379
Jul–Sept	457	455	478	424	426	465
Oct–Dec	455	424	419	398	433	436
Year	1,783	1,609	1,712	1,575	1,601	1,697

Source: Defra and AHDB

Abattoir data

The breakdown between live and deadweight sales for sheep (ewes and lambs) has remained relatively constant since 2010, with approximately 55–60% of finished sheep sold through livestock markets and the remaining 40–45% sold direct to abattoirs (see Table 22 in Appendix 2). There were 128 livestock markets selling over 5.3 million lambs in 2018, as shown in Table 3.

Table 3. Total lamb throughput at auction markets selling finished sheep in GB for 2018

Number of auction centres	New season lamb throughput (head)	Old season lamb throughput (head)	Cull ewe throughput (head)
128	3,105,365	2,268,968	1,954,554

Source: AHDB, LAA and IAAS

Table 4 shows the size distribution of abattoirs slaughtering sheep in England in 2019. Nearly 10 million sheep were slaughtered at 135 abattoirs. The figures highlight the relatively small number of high throughput abattoirs that slaughter the majority of sheep, with 21 abattoirs taking in 84% of sheep. Similar patterns are seen in Wales and Scotland, especially in Wales where total throughput is a third of the size of England's, but the number of abattoirs is seven times smaller (Table 5).

Table 4. Size profile of abattoirs slaughtering sheep, England 2019

Size group (head)	Number of abattoirs	Total throughput (head)	Share of throughput (%)
1–1,000	31	13,326	0.1
1,001–5,000	31	65,576	0.7
5,001–10,000	15	106,156	1.1
10,001–20,000	14	210,258	2.1
20,001–30,000	4	105,313	1.1
30,001–50,000	8	305,438	3.1
50,001–100,000	11	761,119	7.7
>100,000	21	8,316,870	84.1
Total	135	9,884,056	100.0

Source: AHDB

Table 5. Abattoirs slaughtering sheep in England, Wales, Scotland and Northern Ireland in 2019

Country	Number of abattoirs	Total throughput (head)	Share of throughput (%)
England	135	9,884,056	66.73
Wales	17	3,277,300	22.13
Scotland	15	1,265,327	8.54
Northern Ireland*	5	385,694	2.60
Total	172	14,812,377	100.00

* 97% of sheep slaughtered in Northern Ireland pass through three abattoirs only

Source: AHDB, HCC, QMS and LMC.

Sheep imports

Live sheep

Table 6 shows the total live sheep imports from EU countries and shows that most consignments were for breeding stock (about 90%).

Table 6. Live sheep imports from the European Union, 2014–2019

		2014	2015	2016	2017	2018	2019
Slaughter	Number of consignments	7	16	4	3	-	2
	Number of animals	2,137	3,287	552	968	-	19
Finishing	Number of consignments	5	10	8	5	4	6
	Number of animals	578	1,326	1,749	27	123	242
Breeding	Number of consignments	100	140	123	139	117	142
	Number of animals	680	1,014	813	1,170	832	963

Source: APHA

Meat imports

Imports of lamb and mutton are mainly from non-EU countries, approximately 65% of which is from New Zealand. A dashboard providing the value and volume of UK sheep meat and offal imports and exports is available on the AHDB website: ahdb.org.uk/lamb/sheep-meat-trade

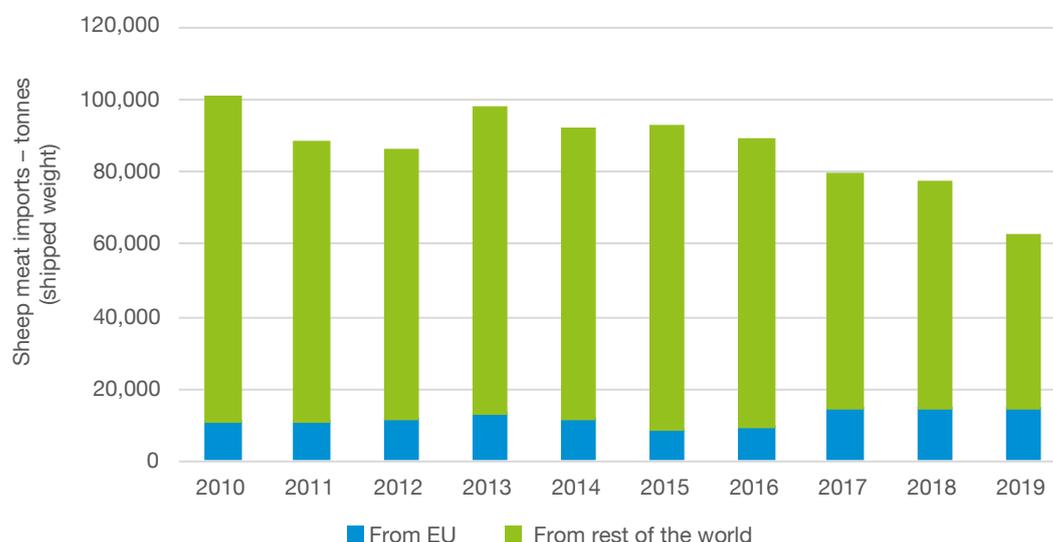


Figure 10. United Kingdom sheep meat imports in shipped weight (tonnes)

Source: AHDB, IHS Maritime and Trade – Global Trade Atlas®, HMRC

Sheep exports

In 2019, a total of 476,956 live animals were exported in 2,361 consignments from the UK to the EU (see Table 7). Of these, 1% of animals were destined for breeding, 17% for finishing and 82% for slaughter. Most sheep destined for slaughter (98.9%) were exported to Ireland. Ireland (58.9%) and France (24.6%) imported the largest numbers of breeding stock from the UK. Vets from APHA supervise loadings of consignments at places of departure to ensure the required health and welfare standards are met.

Table 7. Live sheep exports from the United Kingdom to European Countries in 2019

Destination Country	Slaughter		Finishing		Breeding	
	Number of consignments	Number of animals	Number of consignments	Number of animals	Number of consignments	Number of animals
Austria					1	10
Belgium			3	693	29	51
Bulgaria			3	738		
Denmark					1	5
France	6	2,030	6	1,448	15	1,145
Germany			2	13	23	153
Hungary			1	284	1	112
Ireland	1,296	387,234	349	66,809	497	2,747
Italy					10	45
Portugal					14	98
Spain					23	94
Switzerland					7	60
The Netherlands	8	2,101	32	10,943	34	143
Total	1,310	391,365	396	80,928	655	4,663

Source: APHA

Exports of sheep meat are recorded in Table 23 in Appendix 2.



Photo credit: John Eveson

Wool production

British Wool is a cooperative with its main function being to maximise the value of producers' wool. There are currently approximately 40,000 registered producers and 12 UK grading depots receiving wool⁽¹¹⁾.

In 2018, 27.2 million kilograms of wool was produced, with a value of £27.2 million. Clip values from 2015 to 2019 are shown in Table 24 in Appendix 2.

British Wool sells wool on the global market, which has been a difficult and challenging market since 2015. Many factors have contributed to this, including uncertainty around Brexit, which affected consumer confidence, the trade situation between the US and China, the increasing threat from oil-based synthetic fibres, plus COVID-19 (see page 15).

Future focus will be on marketing strategies, particularly carpets, which account for more than half of the use of British wool, and identifying new product opportunities with cloth, rug and knitwear manufacturers in China. British Wool will continue to develop the brand licensee scheme, which traces the origin of the wool from end product, right the way back to the wool merchant, and promotes the benefits of wool as a natural, sustainable, environmentally friendly fibre.



Photo credit: British Wool

Sheep milk production

The UK sheep milking sector is made up of about 200 flocks of which 30–45 are recognised, commercial dairy sheep flocks. Overall, an estimated 20,000 milking sheep are milked across the UK, producing 2.3–3 million litres annually. The body representing the sector is the British Sheep Dairying Association (BSDA), which currently has about 70 active members.



There is a wide variation in farm size and farming practices across the milking sector. Most farms lamb once a year, and milk between 200–400 ewes. Lactation period ranges between 200 and 250 days, and yields range from 250–600 litres per ewe. However, a few farms would have two and up to six lambing groups a year, and will milk over 2,000 ewes, pushing for higher yields and all-year-round milk supply.

The main milking breeds in the UK are the Friesland and its crosses (e.g. with polled Dorset) and the Lacaune sheep, which has been imported from France.

About 88% of sheep milk produced in the UK is made into cheese, 10% into yoghurt, and 2% is bottled or used to make ice cream or other products. Most producers are on an annual contract with small-scale processors, and a large proportion of products are sold to the food and hospitality industry or via delicatessens, farmers' markets or online.

Milk quality is not regulated centrally, and it is up to producers and processors to agree on milk quality assurance and milk sampling regime. The BSDA has published recommendations for raw milk standards including Bactoscan/Plate Count (for pasteurised and non-heat-treated milk),omatic cell counts (SCC), Acidity, Extraneous water, Enterobacteriaceae and Coagulase negative Staphylococci levels, antibiotic residues and solid levels. The Specialist Cheesemakers Association (SCA) also publishes its specific set of standards to be followed by milk producers and processors, where cheese is the end product.

Male lambs and surplus females are sold for meat, but milk breed lambs are slow to finish and are not in high demand. Some farms that are able to monitor and analyse production data would breed their top 25% producing ewes to a milking breed ram and the rest of the ewes would be bred to a terminal sire (Polled Dorset rams are often used for their conformation and ability to breed all year round) for better lamb carcase conformation.

Very few drugs have published sheep milk withholding times and are licensed for use in milking sheep. The prescribing cascade is often used to allow vets to prescribe products authorised for use in other species, to be used where no suitable licensed product is available.



Assurance schemes

Several farm assurance schemes applicable to the sheep sector operate in the UK, which have the aim of protecting the reputation of the sector and providing reassurance on health and welfare, food safety and traceability.

Red Tractor Assurance

Covering six farming sectors, Red Tractor is the UK's largest farm assurance scheme. Red Tractor Assurance covers beef and lamb farms in England and has a membership of approximately 24,500 farmers in the English beef and lamb sector. In 2017, Red Tractor Assurance (RTA) completed a review and, as a result, implemented a complete makeover of beef and lamb standards, with changes in force from 1 October 2017. These were revised in 2018 and updated again on 1 June 2018.



The changes include a requirement for farms to be visited by a vet at least annually and for the vet to undertake and write up an annual livestock health and performance review. The annual review includes identifying key issues and making recommendations, reviewing records and data, including the medicine records book and making recommendations to reduce antibiotic use without negatively impacting animal welfare. This includes an assessment of the quantity of antibiotics used on the farm by product name. Highest priority critically important antibiotics (HP-CIA) must only be used as a last resort under veterinary direction and must be supported with either sensitivity or diagnostic testing. It is also recommended that at least one member of staff responsible for administering medicines holds a certificate of competence or has attended a course on handling and administering medicines.

Red Tractor standards are always kept up to date and there is a formal three-year review schedule. New issues are emerging all the time, not only in the agriculture industry but also in the minds of consumers who buy Red Tractor branded products, and so the standards must reflect this. The next version of the Red Tractor Standards for Beef and Lamb producers is scheduled to launch in October 2021. Proposed changes to the existing standards will be widely published for industry consultation in winter 2020/21.

Farm Assured Welsh Livestock Beef and Lamb Scheme

The Farm Assured Welsh Livestock Beef and Lamb Scheme (FAWL) operates in Wales and is owned by Welsh Lamb and Beef Producers Ltd. a cooperative owned by over 7,200 Welsh farmers. Approximately 70% of the breeding livestock in Wales is covered by FAWL membership.



QMS Cattle and Sheep Assurance Scheme

The Cattle & Sheep Assurance Scheme is an essential element in Quality Meat Scotland's 'whole chain' consumer assurance programme and has over 9,500 scheme members, with 1,359 sheep only members and 4,945 members with both cattle and sheep.



To be eligible for the Scottish red meat industry's premium brands and carry the Scotch Beef Protected Geographical Indications (PGI) and Scotch Lamb PGI logos, cattle and sheep must have been born, reared and slaughtered in Scotland and spent their entire life on QMS Scotch Assured holdings.

QMS carries out a complete review of all standards every two years, with interim reviews held in between. The most recent review took place in November 2019, with the standards going live to members on 1 March 2020.

The new standards have been revamped into a more user-friendly document, key changes relating to animal welfare are:

- Animal Health Plan – new requirement to be reviewed annually in conjunction with the member’s vet
- Recommendation added to use pain relief (analgesia) in addition to anaesthetic, for improved animal welfare when castrating, tail docking, disbudding or dehorning

QMS has a close working partnership with the Scottish Society for the Prevention of Cruelty to Animals (Scottish SPCA), Scotland’s independent animal welfare charity, to promote high welfare practices within Scotland’s livestock industry. Both organisations are committed to ensuring Scotland is recognised as having some of the highest welfare standards in the world, through:

- Farm assessors carrying out joint visits with Scottish SPCA inspectors on members’ farms
- Scottish SPCA inspectors visiting members’ abattoirs

The Northern Ireland Beef and Lamb Farm Quality Assurance Scheme (NIBL FQAS)

The Northern Ireland Beef and Lamb Farm Quality Assurance Scheme (NIBL FQAS) is owned by the Livestock and Meat Commission (LMC) on behalf of the beef and sheep meat industry in Northern Ireland. There are approximately 12,154 members in the scheme. Of these, 4,686 are approved for lamb.

Every three years, LMC undertakes an in-depth review of its scheme standards and rules. Standards can be amended at any point during the review cycle depending on industry needs,

retailer requirements, legislative or policy changes. The NIBL FQAS standard-setting committee meets at least twice each year and the key areas for development over the past two years have been:

- Antimicrobial resistance
- Bovine Viral Diarrhoea (BVD) eradication

The new standards amended to assist industry in tackling AMR are:

1. Mandatory training of NIBL FQAS members in the responsible use of antibiotics.
2. A veterinary-led review of on-farm antibiotic use.
3. Farmers must consult with their vet before using HP-CIAs.

The next review of standards is imminent and will look at how NIBL FQAS can help verify and strengthen the sustainability credentials of Northern Irish lamb and beef.



RSPCA Assured

RSPCA Assured has a low membership among sheep farmers. However, the influence of the RSPCA welfare standards for sheep is wide, as they are used by a number of industry stakeholders as a reference document.

In June 2020, the standards were updated and the key changes were:

- From September 2020, long-acting pain relief (such as a non-steroidal) must be provided when performing procedures such as castration and tail docking
- An antibiotic review must form a part of the Veterinary Health and Welfare Plan (VHWP)
- A welfare outcome assessment using the AssureWel protocol will form part of the audit process
- At least one permanent member of staff, named in the VHWP, must have undergone appropriate, verifiable training in sheep health care
- There are new and revised sections devoted to agricultural shows, livestock worrying and shearing

Soil Association Certification

Soil Association Certification is the UK's largest organic certification body, certifying thousands of farms across the UK including approximately 580 sheep farms.



A recent standards review has checked and strengthened the evidence behind the standards and the desired outcome, plus the presentation was simplified and practical guidance included. Some new standards have been introduced, for example, severely restricting the use of HP-CIAs and banning the use of colistin.

Some standards have been brought into line with the EU Organic Regulation where the regulation has improved, or with other legislation, scientific evidence or industry practice. By harmonising these standards, certification will become more straightforward.

Sheep welfare outcome assessments (as developed by AssureWel) are fully embedded into the inspection process. This has enabled inspectors to be equipped with information that helps them make compliance decisions and give feedback that supports farmers to identify actions, which could lead to welfare improvement. The AssureWel protocol has been successfully adopted by assurance schemes around the world.



Disease surveillance and horizon scanning

The governments of the UK fund disease surveillance, collecting information on diseases and infections in animals from a variety of sources. There are two main types of surveillance: scanning and targeted.

Scanning surveillance

Scanning (or passive) surveillance includes regular contact between private veterinary practitioners and VIOs, and the analysis of samples submitted for diagnostic testing to APHA, SRUC Veterinary Services (SRUC VS) centres and non-APHA post-mortem examination (PME) sites (see Figure 11). To facilitate access to the provision of PME in England and Wales, free carcass collection is offered in those areas shaded in yellow on the map – it is for pre-agreed surveillance PMEs only and is not a free disposal service.

Veterinary scanning surveillance enables early detection and investigation of new or re-emerging animal diseases and helps us all to understand disease patterns and trends.

Surveillance data is captured from carcass submissions and samples that are submitted for testing, e.g. blood or tissue samples (non-carcass submissions).

In Scotland, diagnoses reached (and not reached) from voluntary submissions to SRUC VS' eight disease surveillance centres have contributed to the GB-wide scanning surveillance system, as described previously.

Emerging issues are highlighted in 'On the Hoof', a bitesize news bulletin produced by SRUC Dumfries Veterinary Services for Scottish farmers and advisers. For example: a summary of thin hill ewe investigations (September 2018), a chronic proliferative rhinitis due to *Salmonella diarizonae* in a Beltex ram (November 2018), causes of blindness in lambs after housing (December 2018), detecting ewe undernutrition in late gestation (January 2019), nematodirus forecast for SW Scotland (April 2019), ovine abortion diagnoses (June 2019), liver fluke risk (September and October 2019). Cases are reported in the Veterinary Record and novel findings are published in the wider scientific literature.

Farm Advisory Service bulletins and newsletters provide wider industry context.

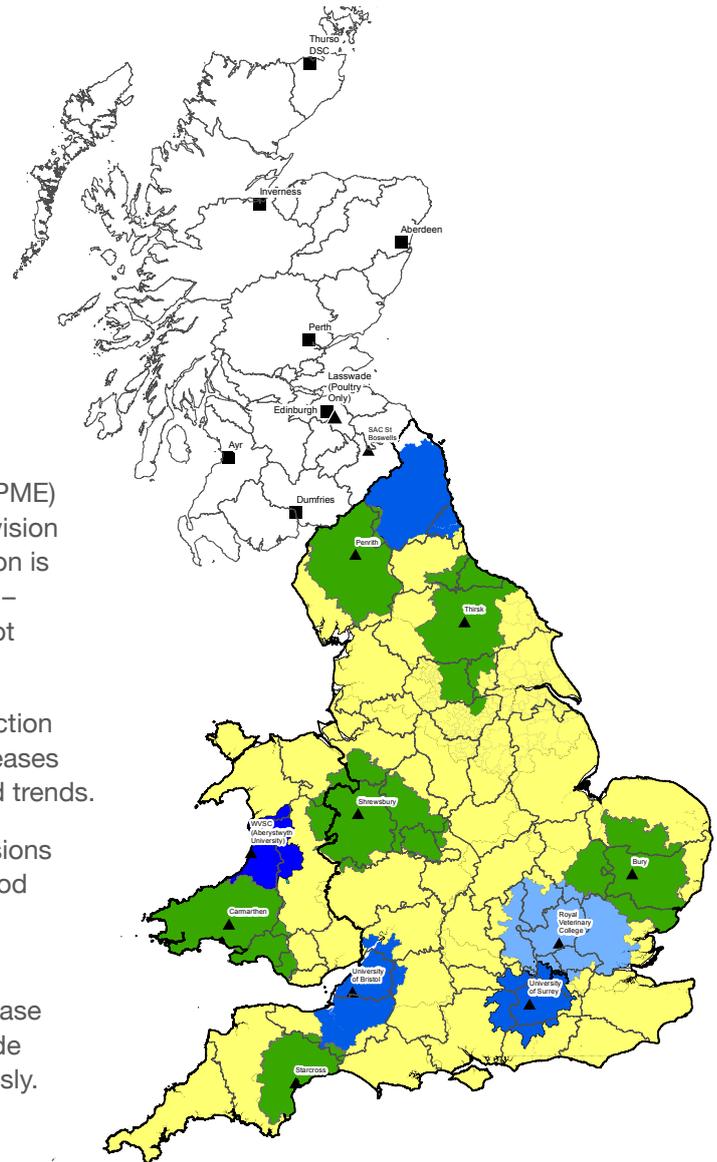


Figure 11. Location of disease surveillance sites across Great Britain

Source: APHA

Targeted surveillance

Targeted (or active) surveillance includes when specific surveys are carried out to measure the prevalence of certain diseases.

- EU law requires all member states to carry out active disease surveillance for bovine spongiform encephalopathy (BSE) in cattle and scrapie in sheep and goats. This information is used to determine the transmissible spongiform encephalopathy (TSE) disease status of each country. Statistics on the active and passive surveillance of TSE in sheep in GB can be seen in Table 20 in Appendix 2
- The United Kingdom is recognised by the European Commission as being free from *Brucella melitensis* (the highest status defined by the EU), and enables us to demand that any animals imported from the EU are of the same high status. If the UK was not recognised as free, or if the status was lost, then the importation of animals of lower health status could not be prevented. This would substantially increase the risk of importing *B. melitensis* from abroad. To maintain the national status as Brucellosis-free, annual random testing must be carried out to a specified level and this is achieved by the Annual Sheep and Goat survey for *B. melitensis*
- In Scotland, abattoir-based surveillance of antimicrobial resistance in *Escherichia coli* isolates from faecal samples of sheep has been ongoing since 2017. Testing is funded by Scottish Government through its Veterinary Advisory Services Programme, with samples provided by Food Standards Scotland. Results are published annually in the Scottish One Health Antimicrobial Use and Antimicrobial Resistance (SONAAR) report. Results from 2017 and 2018 **were published in November 2019**
- SRUC researchers investigated how Scottish sheep movement data could be used to describe the slaughter population to improve the design of surveillance programmes. This new approach was used for the AMR survey in 2017/18. This study was funded by the Scottish Government's Strategic Research Programme and Centre of Expertise for Animal Disease Outbreaks. More information can be found at www.frontiersin.org/articles/10.3389/fvets.2020.00205/full

Horizon scanning

The Government has a responsibility to maintain border security but, equally, the industry must be mindful of potential threats, especially due to their impact on trade, and surveillance for signs of disease is key.

Sheep disease-related threats identified through Government-funded scanning surveillance are reported in the 'Quarterly Small Ruminant GB Disease Surveillance and Emerging Threats' reports. The threats investigated in 2018–2019 can be found in Appendix 1. The highlights are captured on pages 10–13.



Dashboards

The Great Britain Disease Surveillance Dashboards have been developed to share the surveillance information gathered from submissions to the GB veterinary diagnostic network (see Figure 12).

In the dashboards, a geographic area, a time period and an age group of interest can be selected. Then the dashboard can be used to answer questions such as:

- What diagnoses have been made by the GB surveillance network in sheep from an area of interest?
- What is the GB surveillance network's most common diagnosis in adult sheep?
- Where in the country have specific diagnoses (e.g. liver fluke) been made in sheep by the GB surveillance network?
- How many diagnoses were made of a specific disease (e.g. enzootic abortion in ewes) in a particular year by the GB surveillance network?

To access the Sheep Disease Dashboard, go to public.tableau.com/profile/siu.apha#!/vizhome/SheepDashboard_/Overview

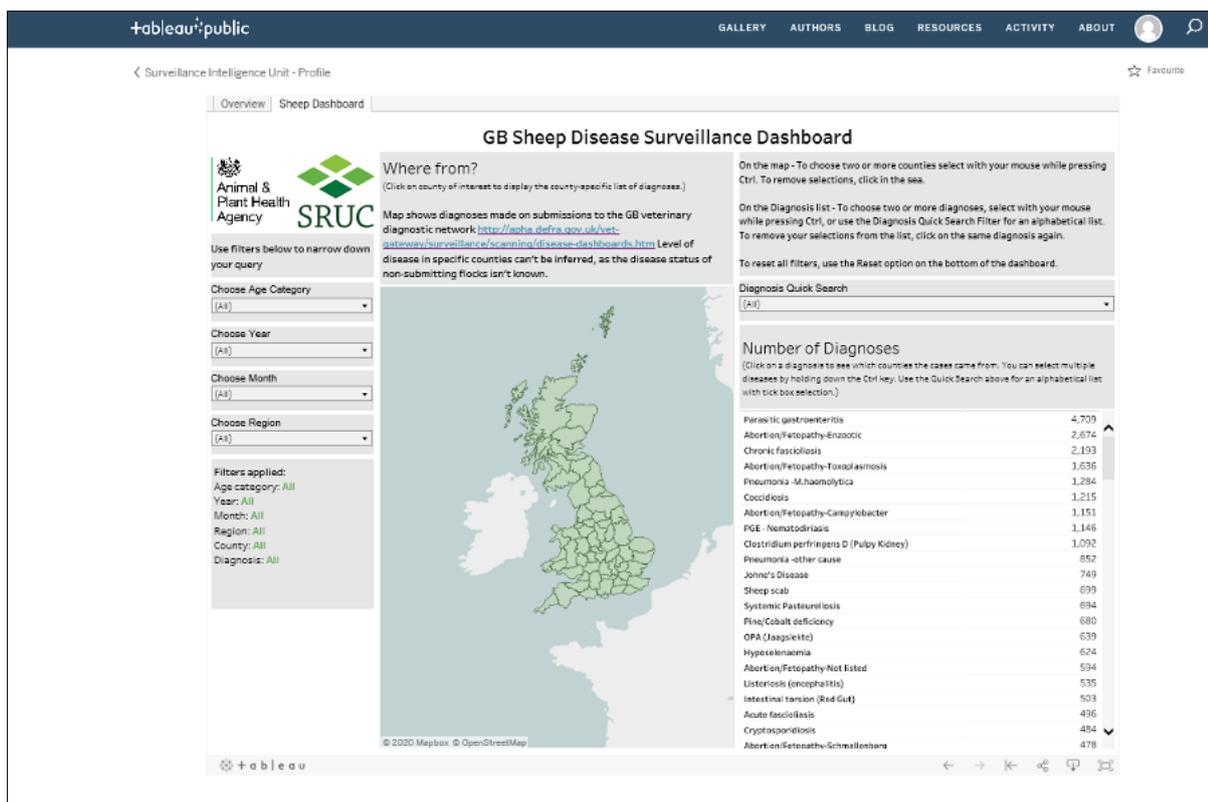


Figure 12. Sheep diagnostic surveillance dashboard

Source: APHA

Good practice guidelines

As part of its priorities, SHAWG has targeted behavioural change of sheep farmers and their advisers, to adopt good practice guidelines for animal health and welfare. This section of the report is structured to highlight good engagement, with improved health and welfare.

Monitoring antibiotic use

The vision of the Sheep Antibiotic Guardian Group is for the sheep sector to develop an enhanced reputation with respect to health and welfare with active veterinary involvement in flock health planning that enables farmers to realise their flock productivity potential and demonstrate responsible medicine use. The aim is to safeguard animal welfare by using antibiotics ‘as little as possible, but as much as necessary’ with the main emphasis being flock-level preventative measures – ‘Plan Prevent Protect’. The four hot-spot areas are the control of lameness, neonatal disease, enzootic abortion and pneumonia. The overall targets, which were revised in 2020, can be seen in Table 8 on page 46. Further details can be found on the RUMA website – ruma.org.uk

Plan Prevent Protect principles

By 2024, it is expected that every UK sheep farmer will be actively working with an engaged vet and will be able to demonstrate preventative flock health principles and responsible antibiotic use in their flock, particularly in the control of lameness, neonatal disease, enzootic abortion and pneumonia. There will be no routine prophylactic antibiotic use in the sheep sector by 2024.

Plan ahead, Prevent disease, and Protect the flock are principles used across all four of the hot-spot areas and details can be found in the RUMA Good Practice Guidelines⁽¹²⁾. The control of pneumonia is an additional hot-spot over those mentioned in previous sheep targets and specific ‘Plan Prevent Protect’ pneumonia control advice will be promoted over the autumn 2020 period.

Lameness

Lameness is one of the four hotspot areas targeted by RUMA for the responsible use of antibiotics in the sheep industry. Reduced lameness can be achieved by using existing lameness control strategies.

Lameness is detrimental to animal welfare and a significant economic challenge for the sheep industry, with the overall cost to the industry estimated at £24 million a year⁽¹³⁾. The average cost of lameness is £3.90 per ewe in the flock per year, but this increases to £6.35 in flocks with $\geq 10\%$ sheep lame⁽¹⁴⁾. In 2011, the Farm Animal Welfare Committee (FAWC) – now Animal Welfare Council (AWC) – set a national target for 2021 of $<2\%$ of sheep lame at any one time⁽¹⁵⁾, stating that this is already possible with existing knowledge of best management⁽¹⁶⁾. In 2014, a group of English stakeholders agreed that the Five-Point Plan⁽¹⁷⁾ (see Figure 13) should be adopted as a national protocol, to encourage better management of lameness to contribute to achieving the FAWC targets. About 14% of eligible sheep are vaccinated against footrot⁽¹⁸⁾ with vaccine sales being tracked as part of the RUMA targets activity.

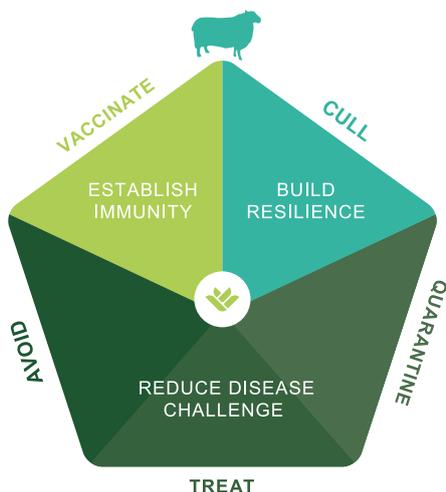


Figure 13. The Five-Point Plan to control lameness
Source: FAI Farms

The five points of the plan can be split into three areas:

- Cull to build resilience
- Treat, quarantine and avoid to reduce disease challenge
- Vaccinate to establish immunity

The latest estimate for the level of lameness in UK sheep flocks is 3.2%, for the period between November 2018 and February 2019⁽¹⁹⁾. Both footrot and contagious ovine digital dermatitis (CODD) drive high antibiotic usage on farm.

Research update – research from a number of PhDs at the universities of Warwick, Nottingham and the CODD project at the University of Liverpool, has been used to update the **AHDB reducing lameness in sheep publication**. Further updates from these projects are expected in 2021.

Footrot and foot trimming

The majority of lameness in sheep is attributed to footrot⁽²⁰⁾, an infectious bacterial disease caused by *Dichelobacter nodosus*. The prevalence of lameness in flocks is lowest when farmers treat lame sheep within three days of onset of lameness^(19,20,21,22), and recovery from footrot is fastest when sheep are treated with antibiotic injection and foot spray without foot trimming^(23,24). When farmers move away from individual treatment, the prevalence of lameness increases, indicating that treatment also prevents spread of disease⁽²²⁾. Trimming feet, both as a routine and as part of treatment, is consistently associated with a high prevalence of lameness^(19,20,22), and flocks where sheep feet are never trimmed have the lowest prevalence of lameness.

Foot trimming now accounts for about 30% of lameness⁽¹⁹⁾ and if all farmers stopped foot trimming the reduction in lameness would be significant because there would be fewer granulomas and repeat cases of footrot⁽²⁵⁾. Routine footbathing, especially using formalin, is linked to presence of foot granulomas in flocks, which again highlights that footbathing should only be used to treat outbreaks of scald.

Contagious ovine digital dermatitis

Contagious ovine digital dermatitis (CODD) was first reported in the UK in 1997 and is present in 35–50% of flocks in England and Wales⁽²⁶⁾. The cause of CODD is still unconfirmed, but the digital dermatitis (DD) causing treponemes are considered to play a substantial role. *D. nodosus* and *Fusobacterium necrophorum* are also found in CODD lesions, which suggests a link between footrot and CODD. During a recent BBSRC-funded project at the University of Liverpool, with industry partners AHDB and HCC, both scald and footrot have been identified as a requirement for progression to CODD development⁽²⁷⁾. One clear message is that good control of scald and footrot should lead to reducing the presence of CODD on farm.

During the project, studies into the presence of DD treponemes on gloves identified hands and gloves as an infection reservoir for CODD and described control measures⁽²⁸⁾. This is valuable knowledge for sheep and other livestock farmers, especially taken together with previous work demonstrating foot-trimming knives as an infection reservoir⁽²⁹⁾. Armed with more knowledge on the infection reservoirs of CODD-associated treponemes, it should be possible to better limit spread of CODD on farm. A similar disease to CODD exists in dairy goats, which means similar control methods could be used in sheep and goats⁽³⁰⁾. Most recently, novel leg lesions in yearling lambs were characterised that appear to have both *F. necrophorum* and *Streptococcus dysgalactiae* as key to aetiology⁽³¹⁾, which should help inform treatment and control in the future.

Research update – AHDB and HCC are involved as part of a BBSRC Industrial Partnership Award grant at the University of Liverpool that is looking at how the disease starts and progresses. Results are due in 2021 and more information can be found at www.liverpool.ac.uk/infection-and-global-health/research/codd/

Abortion

Abortion is the second hotspot area targeted for responsible medicine use as antibiotics can be used prophylactically or when an abortion storm happens. Reduced abortion can be achieved by improving the uptake of existing effective vaccination strategies.

Figure 14 shows the diagnoses for abortion recorded by APHA as a percentage of all abortion diagnoses made. The three main infectious causes of abortion have been consistent over the last five years. These are:

- Enzootic abortion in ewes (EAE) caused by *Chlamydia abortus*
- Toxoplasmosis
- *Campylobacter* spp.

These three infections often cause abortion storms, with more than 20% of ewes either aborting or producing weak lambs when the disease first appears in a flock. Effective vaccines against EAE and toxoplasmosis are available and estimates suggest that about 40% of replacement ewes are vaccinated against EAE⁽¹⁷⁾ and one fifth against toxoplasmosis⁽¹⁷⁾.

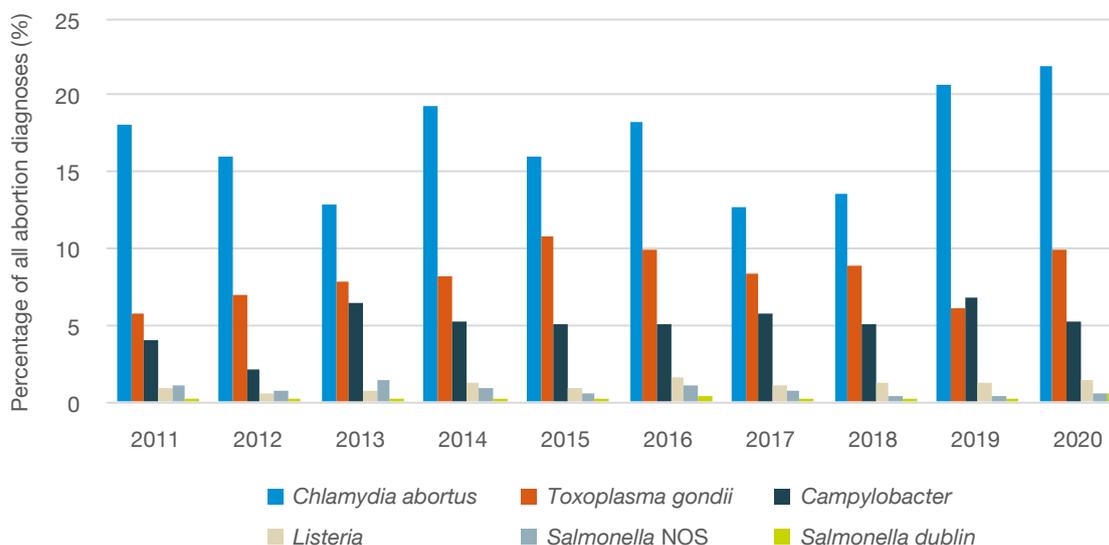


Figure 14. Ovine abortion diagnoses for APHA diagnostic submissions from January 2011–June 2020 as a percentage of all abortion diagnoses

Source: APHA

In 2019, abortion due to *Campylobacter* ranked second, ahead of *Toxoplasma*, for the first time.

Listeria generally causes sporadic abortions, usually in flocks in which ewes are being fed silage or root crops. *Salmonella* and *listeria* are less commonly diagnosed causes of abortion. Various *Salmonella* serotypes are isolated, but they are only rarely the same serotypes that are commonly associated with illness in people.

Both *C. abortus* and *Toxoplasma gondii* are zoonotic infections. Human infection with *C. abortus* is rare and there are no more than one or two human cases a year⁽³²⁾. However, toxoplasmosis has the highest human incidence of all parasitic zoonoses and is considered to be an under detected and under-reported disease in the EU⁽³³⁾. Since 2008, all EU countries have been required to enhance surveillance for toxoplasmosis in humans, sheep and goats.

Research update – two research projects at Moredun, funded by the Scottish Government are currently investigating control of Chlamydial abortion and Toxoplasmosis.

Neonatal disease

Neonatal disease is the third hotspot area targeted for responsible medicine use by the industry and includes watery mouth and joint-ill (see Figure 18). Reduced neonatal disease can be achieved through the use of effective vaccinations, good hygiene protocols at lambing, ewes having the correct nutrition and body condition for the type of farming system, and ensuring lambs receive an adequate supply of colostrum after birth. Industry campaigns such as #ColostrumIsGold and #VaccinesWork are being used to promote these messages widely across industry.

For the RUMA targets, the amount of oral antibiotics used is being tracked due to the concern in usage and the moderate levels of resistance found against the active ingredients within these oral antibiotics⁽⁴⁰⁾.

In June 2020, sheep farmers, vets, consultants and one of the flock software companies gathered to form a new industry initiative on joint-ill – **JIGSAW** (Joint Ill Group – Septic Arthritis Awareness). The initiative aims to collect robust commercial data on the impact of joint-ill on lamb performance, raise awareness, and compile top tips to avoid or reduce the impact on lambs. Further information will be made available to the industry as the initiative develops.

Research update – AHDB, University of Liverpool and Moredun Research Institute are funding a project to investigate joint-ill, with a survey to collect farmers' experiences distributed during 2020.

Pneumonia

Pneumonia is the fourth and newest hotspot area to be targeted for responsible medicine use, and challenges the use of antibiotics in store lambs in the autumn – a practice used to reduce the risk of pneumonia after movement to a new farm or change of diet. Table 14 shows the proportion of lungs affected by pneumonia in carcase records. It is an important area of focus for the sheep sector.

Pasteurellosis

Bacteria previously identified as *Pasteurella* species have been reclassified; the main species causing disease in sheep are now called *Mannheimia haemolytica* (previously *P. haemolytica*) and *Bibersteinia trehalosi* (previously *P. trehalosi*).

M. haemolytica commonly causes either septicaemia in young lambs or pneumonia in all ages, but especially in lambs. *B. trehalosi* is most commonly associated with septicaemia in older lambs. Pasteurellosis is one of the most common causes of death in growing lambs in Great Britain, despite there being effective vaccines that offer protection against disease caused by both *M. haemolytica* and *B. trehalosi*.

Uptake of vaccination varies between years, with just under half of eligible animals vaccinated against pastuerella between 2015 and 2018, with 51% vaccinated in 2018⁽¹⁷⁾. The use of this vaccine is being tracked as part of the RUMA targets activity. Recent work has shown that there is a trend for lower mortality in fully vaccinated lambs compared with unvaccinated and partially vaccinated lambs⁽⁴¹⁾.

Farm vet champions

Building on the work already happening in Wales through the Arwain Vet Cymru project, a UK network of Farm Vet Champions (FVC) will aim to ensure that practicing farm vets have the tools and support to set SMART goals. These goals will ensure that prescription and on-farm data are recorded and correctly interpreted, monitored and reviewed and vets have the confidence to enter difficult conversations with clients about antibiotic use.

There are approximately 5,574 farm vets working in practice in the UK at approximately 1,840 practices that report expecting to treat cattle, sheep, goats, pigs or poultry⁽³⁴⁾. In this project, engagement will be at the level of the individual vet, as well as at the practice or practice group level. To ensure maximum peer encouragement and accountability, there will be no restriction on the number of farm vets within a practice who can sign up to become a FVC. Additionally, the ability for an individual vet to sign up to become a FVC will ensure the project continues to engage with individuals who are changing jobs, working on temporary contracts or not currently working in practice.

Metrics

Data from 2019, from seven different industry and veterinary practices groups from about 950 flocks, suggested that mean usage was 2–16 mg/kgPCU with a minimum of zero and a maximum of 60 mg/kgPCU. HP-CIA use was negligible.

Due to challenges with data collection and the counterproductive impact of setting numerical targets without data⁽³⁵⁾, the sheep sector is not setting a numerical mg/kg target until a representative dataset has been established.

The new eMH will be launched in January 2021, with a view to it being the national platform for the sheep sector to calculate on-farm use and submit data for central collation. Once the agreed national platform is both functional and operational, we aim for it to become the norm for all UK sheep farmers to give permission for their annual antibiotic usage data (comprising the data required to calculate the core metric in mg/kg) to be submitted electronically, either by themselves or via the vet or another third party.

Currently, available data is limited but it indicates that the use of HP-CIA products (European Medicines Agency (EMA) category A and B) is negligible in sheep⁽³⁶⁾. It continues to be considered not appropriate to use these products except under direct veterinary supervision and following sensitivity testing which shows no other treatment option. As macrolides are EMA category C, it is proposed that the level of macrolide use is monitored separately on the eMH so that action can be taken if usage appears to rise.

The core metric that all sheep enterprises should use to measure their antibiotic use were defined by SAGG in 2019, and can be found on the SHAWG and RUMA websites⁽³⁷⁾.

Core sheep metric

$$\text{Total mass of antibiotic per unit of sheep weight (mg/kg)} = \frac{\text{Total mass antibiotic (mg)}}{[20 \times \text{total numbers of lambs (a + b)}] + [75 \times \text{number of ewes (c)}] \text{ (kg)}}$$

Total mass of antibiotic relates to the total amount used in the whole flock in the year.

a – the number of lambs that are finished from this flock in the year (note that this figure may include some lambs born in the previous year).

b – the number of lambs sold (as stores or for breeding) or retained for breeding in that year (note that this figure does not include the lambs retained on farm as stores at the end of the year).

c – the numbers of adult ewes put to the ram in that year (not including ewe lambs).

Vaccine sales data has been tracked from 2012 to 2019 and a second comprehensive document on sheep vaccine use will be published by AHDB in autumn 2020, with thanks to MSD Animal Health for working with Kynotec to supply sales data for all available vaccines. The data show;

- The proportion of first-time breeding ewes vaccinated against enzootic abortion increased marginally in 2019 from 41% to 42% and the proportion of eligible sheep vaccinated against footrot increased from 13% to 14%
- 35.8 million doses of vaccines were sold for use in UK sheep in 2019. This was lower than the previous three years and primarily indicates a decrease in sales of clostridial and pasteurilla vaccines where it was estimated that the percentage of eligible animals vaccinated fell from 68% to 62% and 51% to 46% respectively
- It has been suggested that the fall in vaccine sales, particularly in these areas, resulted from uncertainty within the sector due to doubt over future export markets and subsidy payments

Research has suggested that it is not necessarily appropriate to specifically use vaccine usage as a direct proxy to indicate the responsible use of antibiotics^(19,38), and indeed it has been shown that the uptake of the footrot vaccine is poorly associated with the uptake of other features of the Five-Point Plan⁽¹⁸⁾. It is accepted that vaccination is simply one of the tools in the box of preventative disease measures; vaccine use is not essential in every flock for every disease. However, it is still felt that it is appropriate to track vaccine uptake by the UK sheep sector, as one of the measures of good preventative medicine.

Industry data on the sales of oral antibiotics⁽³⁹⁾ licensed to be used in UK neonatal lambs has been tracked since 2016. These data include figures for the sales of both Orojet and Spectam Scourhalt for the whole of UK. There has been a 33.7% decrease in total sales of oral antibiotics licensed to be used in UK neonatal lambs from 2016 to 2020. The decrease from the 2018 lambing season to 2019 lambing season was 21.5%. The decrease from the 2019 lambing season to 2020 lambing season was 7.4%.

Table 8. The summary for Sheep Antibiotic Guardian Group targets on behalf of the sheep industry for RUMA

Target/indicator of progress	Measure	Description
Target 1	8,000 farms submit data to the eMH	Registration and contribution of data to the eMH by 1,000 sheep farms in 2021, doubling each year to reach 8,000 by 2024
Target 2	Create 600 Farm Vet Champions	Working with the other ruminant sectors, create a network of at least 600 Farm Vet Champions throughout the UK with progress tracked and monitored
Target 3	Increase training uptake by vets, farmers and amongst students	Vets to be motivated via the Farm Vet Champions scheme. Farmer medicine training to become a requirement of all farm assurance schemes. All agriculture and vet courses to include best practice antibiotic stewardship by 2024
Target 4	Bespoke farm vet plans on every farm with no routine prophylaxis by 2024	Improve vet and farmer communication, and the uptake of Plan Prevent Protect measures. Support flocks that have not previously been demonstrating best practice (e.g. using routine prophylaxis)
Indicator of progress 1	Responsible use of antibiotics	No numerical reduction target initially due to lack of robust baseline data Use of HP-CIA products to be monitored and reviewed via the eMH. Total levels in sheep industry to be below 0.05% of total antibiotic use Track annual usage of oral antibiotics licensed for lambs and aim for continuing reduction in use by 10% each year
Indicators of progress 2	Monitor possible health and welfare indicators	Key health and welfare indicators will be tracked with a particular emphasis on levels of sheep lameness and neonatal survivability
	Annual vaccine sales data	Track annual usage of sheep vaccines (especially vaccines against EAE and footrot), and aim for increased penetration of the market each year

Source: SAGG

Active health planning

Ongoing engagement with vets

All assurance schemes (see page 35) require the farmer to work with their vet to develop a health plan. This should help to identify priorities and prevention options, including biosecurity and quarantine, and it is a good opportunity to track performance through looking at records. The lack of perceived importance of good on-farm biosecurity remains a key challenge to the health status of the national sheep flock. This is a challenge for all diseases, but particularly for those with hidden or subclinical symptoms (i.e. iceberg diseases; see page 58).

A flock health plan should also cover vaccination timings, testing protocols for parasites, trace elements and forage and feed analysis, plus timings of body condition scoring, to ensure it provides a holistic view of the management of the farm.

See box below for a recent example from HCC and how they are engaging farmers in health planning.

Stoc+ aims to support beef and sheep farmers in Wales to work closely with their vets on proactive animal health planning. This project builds on the importance of animal health and welfare in improving production efficiency and sustainability.

It is part of HCC's Red Meat Development Programme (RMDP), a 5-year strategic initiative launched in 2018. The RMDP aims to equip the red meat sector for the future; promoting efficiency, profitability and sustainability throughout the supply chain, ensuring a high-quality traceable product that future consumers will want. It consists of three strategically important projects: Stoc+, the Hill Ram Scheme and Welsh Lamb Meat Quality.

From August 2020, 260 farmers and 38 veterinary practices from across Wales are engaging with Stoc+. Each participating farmer receives practical, expert advice and specialist support in planning animal health on their farm for up to three years. The project aims to use specific farm data (such as scanning/rearing information or anthelmintic/antibiotic use), to identify key animal health priorities for each farm, creating a bespoke action plan. This is a unique opportunity for farmers to make significant and lasting improvements to the health and productivity of their herds and flocks.

Data from the past year has shown that the top animal health priorities for sheep are lameness, worm control and fertility. By working with their vets, these animal health issues will be addressed on farm through bespoke animal health action plans, with progress monitored and evaluated annually.

A key part of the project is to increase awareness of proactive health planning and, as such, four Stoc+ vets and five farm ambassadors have been selected, to help promote and share their experiences with the project. Our latest Stoc+ animal health videos can be found on the website.

The RMDP is supported by the Welsh Government Rural Communities – Rural Development Programme 2014–2020 and funded by the European Agricultural Fund for Rural Development and the Welsh Government.

For more information on the RMDP, go to meatpromotion.wales/en/industry-projects/red-meat-development-programme



In England, improved farmer and vet engagement is a fundamental part of the Animal Health and Welfare Pathway. In the box below is an example of how flock health clubs, run by Flock Health Limited, are improving farmer and vet relationships.

Flock Health Clubs

A **Flock Health Club (FHC)** is a business group of sheep farmers brought together by their vet who facilitates discussions and arranges farm visits and practical sessions. As the trust and commitment builds between farmer members of the club, they work together to share experiences and benchmark key performance indicators.

Out of the 442 subscribers (predominantly veterinary practitioners) who have signed up to the Flock Health Club newsletter since May 2018, 115 reported that they were running a FHC and a further 58 vets reported having definite plans to set up an FHC. In a Sheep Veterinary Society webinar held in May 2020, 76 vets were asked what they considered the best way to improve engagement with sheep farmers. The most popular answer (at 41%) was ‘setting up a Flock Health Club or benchmarking group’. The next most popular answer (at 19%) was ‘offering a service to collect sheep farm data’.

In a recent report⁽⁴²⁾, the Innovation for Sustainable Sheep and Goat Production in Europe (iSAGE) project independently assessed the impact of FHCs by interviewing farmers and vets (see Table 9). The iSAGE project concluded on several levels that FHCs are a success, with farmer reports of improved veterinary engagement, a reduction in inappropriate medicine use and an improvement in the health of their sheep. A further study found that since joining a FHC, farmers significantly increased their use of evidence based preventative controls of lameness (such as implementing the Five-Point Plan, using footrot vaccination and reducing foot-trimming) and significantly reduced their inappropriate antibiotic use⁽⁴³⁾.

Case studies of successful FHCs are commonly reported in both farming and veterinary media⁽⁴⁴⁾ and, in February 2020, the initiative was shortlisted as a finalist for a Veterinary Record Innovation Award⁽⁴⁵⁾.

Table 9. Summary of the results from the assessment of flock health clubs by Innovation for Sustainable Sheep and Goat Production in Europe project

15 vets interviewed and 27 farmers from 4 clubs	FHCs vets	FHCs farmers
Farmer-vet relationship	100% highlight that members were more likely to contact them, actively sought advice, and were keen to improve and engage	66.7% reported improvements in their relationship with their vet and likelihood of calling for advice had increased
Membership pros/cons	100% agreed that charging for FHC had beneficial outcomes on member involvement Overall consensus for group size limitations of 25 congenial forward thinking individuals	85% felt fees were value for money 88% highlighted the ability to develop and exchange knowledge between other farmers and their club vet 100% could not identify disadvantage with their FHC membership
Knowledge improvements	100% agreed that they had seen improvements within members' flocks Most common improvements included reduced lambing losses, parasite and lameness management	85.2% said that FHCs facilitated knowledge improvements 77.8% noticed positive changes within their own management practices

 flockhealthclubs



 **ORGANIC**
RESEARCH CENTRE



Recognising the role of the Registered Animal Medicine Advisor (previously known as SQP)

Within the UK, we are in the fortunate position of having a number of ways in which the prescribing of veterinary medicines can be undertaken.

The categories and product abbreviations are as follows:

- Veterinarian – Prescription Only Medicine, abbreviated to POM-V
- Veterinarian, Pharmacist, Suitably Qualified Person (SQP); abbreviated to POM-VPS
- Non-Food Animal – Veterinarian, Pharmacist, Suitably Qualified Person (SQP); abbreviated to NFA-VPS

Within the UK, there are about 7,000 Registered Animal Medicine Advisors (RAMAs) who have studied and taken degree level exams that are industry approved and recognised. All RAMAs have to be on an approved UK register and undertake regular CPD to remain on that register. The main register for RAMAs that has been in place since 1986 is AMTRA with currently more than 99% of all RAMAs registered with them. More recently, the VMD has approved two more registration bodies: VetSkill and Vetpol.

In the majority of cases, RAMAs are employed by companies serving the animal health industry across the sectors of farm animals, companion animals and equine. These companies come together as the Animal Health Distributors Association (AHDA) with AHDA employing approximately 80% of RAMAs across the UK. As an example, in your local market town you are likely to find a large countryside retailer and large UK-wide pet's store, these typically will be members of AHDA.

Additionally, a growing number of veterinary practices now employ RAMAs, bringing the benefits to clients, and the practice of being able to advise on, prescribe and supply certain veterinary medicines that require specialist knowledge, especially anti-parasitics, and that have been given the legal classification POM-VPS to support this process.



Photo credit: OvertheCounter

For the farm animal sector and for sheep in particular, there are a range of products and services that are available through AHDA member outlets including POM-VPS products, for example, sheep wormers (anthelmintics). These are regularly prescribed without the need for a diagnosis but their supply does follow a prescribing process including, for sheep anthelmintics, the requirement to follow the guidance of SCOPS.

AHDA has recently developed an example prescribing protocol to aid RAMAs, particularly if newly qualified, to aid the step-by-step approach to detailed prescribing on each and every occasion.

Within the sheep sector and, in particular, for sheep worming, it is worthy of note that about 75% of anthelmintic product is prescribed through the RAMA network and this shows how important a role it is, carried out across the UK, often in places where vet practices are few and far between.

There is a growing understanding across the animal health and welfare sector about the important interaction between vets, RAMAs and other advisers, and the need for both joined-up thinking and the ability to work together, to help improve the overall health and welfare within the sheep sector. This further helps to build the role of a farm support team across the sector.

AHDA members not only employ RAMAs but also work to represent members' views on a wide range of subjects that are relevant and important to the sector, and this takes place throughout the year. One of the highpoints for AHDA is the annual two-day AHDA Conference and Exhibition that attracts about 500 delegates and has a full speaker programme, as well as highlighting the latest innovations and developments within the industry from the exhibitors who attend.

Looking ahead, AHDA is developing plans to ensure the increased work in partnership with others and to focus on responsible use of all prescribed veterinary medicines to help in the continuing battle with resistance issues.

In addition, AHDA is intending to build upon the foundation qualification exam that each RAMA achieves by adding additional skills and knowledge, to help ensure that they continue to be recognised and valued for the contribution they make to animal health and welfare across the UK.

Premium sheep and goat health schemes

SRUC VS offers keepers of sheep and goats, membership of nationally recognised schemes to screen for Maedi Visna, caprine arthritis encephalitis and enzootic abortion. The members of the scheme can be a useful source of stock for other farmers who have controlled the diseases in their flock or for those who want more guarantees.

Members of these schemes are awarded certificates of health status following successful testing programmes. In addition, SRUC VS provides the membership database for the Scrapie Monitoring Scheme (SMS). Table 10 shows the Premium Sheep and Goat Health Scheme (PSGHS) membership by disease and country. Flocks and herds that comply with the requirements of the SMS are able to demonstrate compliance with 'negligible risk' and 'controlled risk' status for classical scrapie. This is an international trade requirement for breeding and finishing sheep and goats, semen and embryos.

The MV accreditation scheme has continued to show a steady increase in member numbers, the majority of whom are pedigree breeders. In contrast, Enzootic Abortion Scheme member numbers continue to gradually decline. SMS member numbers have shown a slight increase in numbers, originating from more than doubling the number of Scottish flocks.

Table 10. Membership of PSGHS by administration in July 2020 (2018 figures in brackets for comparison)

	Maedi Visna	Enzootic abortion	Scrapie monitoring
England	1,668 (1,577)	17 (17)	104 (108)
Scotland	871 (849)	152 (224)	36 (16)
Wales	505 (472)	2 (0)	14 (16)
Great Britain	3,044 (2,898)	171 (241)	154 (140)

Source: SRUC VS (Julie McDiarmid)

Collection and benchmarking of records

All levy boards provide services for farmers to benchmark their physical and financial performance. Key Performance Indicators (KPIs) or metrics are well established for the sheep sector, but these figures are not readily available to evaluate the sector. In England, it is very likely that engagement with the Animal Health and Welfare Pathway will be dependent on farmers providing records, e.g. sheep census, lamb production and antibiotic use, and monitoring progress.

AHDB carries out benchmarking using its Farmbench programme. Ewe mortality, empty ewes and replacement rates are some of the performance indicators recorded (see Table 11). The average ewe replacement rate is estimated to be 20%. As with ewe mortality, farmers are required to record the number of ewes entering the flock, but the data is not used to generate national figures.

Table 11. Average empty ewes, ewe mortality and replacement rates for a selection of English flocks for 2018 lambing

	Lowland breeding flocks	Severely disadvantaged area breeding flock	Indoor lambing flocks	Outdoor lambing flocks
Number of flocks	69	28	56	37
Percentage of empty ewes (at scanning)	4.9	4.0	4.8	4.2
Ewe mortality (%)	4.1	5.8	4.8	4.5
Flock replacement rate (%)	22.1	27.1	22.8	24.5

Source: AHDB



Photo credit: NSA

Using feedback from abattoirs

All sheep sent to approved abattoirs are subject to inspection before the meat is sold for human consumption. These inspections are carried out by the Food Standards Agency (FSA) and aim to identify any conditions that may indicate a concern to animal health and welfare or public consumption. Findings from these inspections are reported back to farmers, as long as they have sold their animals deadweight. The information flow from the inspector to farmers is called the collection and communication of inspection results (CCIR).

The FSA maintains a list of post-mortem rejection condition that focuses on identifiable conditions with importance to public health, and animal health and welfare, and with clear actions.

At inspection, several conditions may be identified that cause rejection of organs (e.g. liver, heart) or part/whole carcasses, leading to lower returns to the producer and processor. Some of these, such as bruising and abscesses, can be controlled through careful handling of the live animal. This can be used by the farmer and their vet to improve their health plan and reduce production losses.

The top ten conditions recorded on ante-mortem, carcass and offal by the CCIR from January 2019 to March 2020 for England and Wales, are presented in Tables 12, 13 and 14.

Table 12. The top ten ante-mortem conditions recorded by the CCIR from January 2019–March 2020 for England and Wales*

Condition	Percentage of records (%)
Lameness	47.8
Abnormal respiratory signs	38.4
Skin condition	4.5
Eye condition	2.1
Localised swelling or lump	1.7
Orf	1.5
Mastitis	0.8
Dead in lairage	0.7
Emaciation	0.6
Other	0.5

*263,356 records

Source: data.gov.uk/dataset/ac8be1d5-ee8c-4f0e-9124-dbb44cb77962/sheep-goat-conditions

Lameness is the most common ante-mortem condition recorded. All of these cases should have been dealt with before animals were transported. Detailed advice on lameness control can be found in the AHDB manual **Reducing lameness for Better Returns**.

*Table 13. The top ten conditions of carcasses recorded by the CCIR from January 2019–March 2020** for England and Wales*

Condition	Percentage of records (%)
Contamination	46.0
Other	12.3
Abscess neck	10.1
Abscess forequarter	10.0
Joint lesions	8.6
Abscess hindquarters	4.9
Cysticercus ovis	4.8
Bruising (traumatic)	2.2
Bruising (wool pull)	0.9
Hydatid cyst	0.2

**970,290 records

Source: data.gov.uk/dataset/ac8be1d5-ee8c-4f0e-9124-dbb44cb77962/sheep-goat-conditions

Abscesses are among the most common carcase conditions found in sheep slaughtered in English and Welsh abattoirs. Many of these abscesses are avoidable if farmers follow best practice when administering injections. Detailed advice on injection best practice and minimising parasite infections can be found in the AHDB manual **Minimising carcase losses for Better Returns**.

Table 14. The top ten conditions of offal recorded by the CCIR from January 2019–March 2020* for England and Wales

Condition	Percentage of records (%)
<i>Cysticercus tenuicollis</i>	29.9
Lung worm	19.3
Fluke [mature and immature]	18.8 [14.8 and 4.0]
Pneumonia (mycoplasma like)	12.0
Contamination	5.5
Pneumonia (pasteurella like)	4.7
Other	3.0
<i>Cysticercus ovis</i>	2.4
Lung abscesses	2.3
Historic lung scarring	1.4

* 3,647,546 records

Source: data.gov.uk/dataset/ac8be1d5-ee8c-4f0e-9124-dbb44cb77962/sheep-goat-conditions

Damage caused by *Cysticercus tenuicollis* is the most common offal condition, with *Cysticercus ovis* being number eight. These parasites are linked to dog tapeworms; worming the sheep will have absolutely no effect, the solution is to reduce the risk of dogs eating contaminated carcasses and defecating on grazing land⁽⁴⁶⁾.

Lung worm and fluke are second and third most common and should be part of a sustainable parasite control plan. See www.scops.org.uk for more details or page 60.

Monitoring fallen stock

A range of services are offered through the UK to monitor fallen stock, including the services offered by APHA and SRUC Veterinary Services (see page 38). More farm vets are providing a service to their clients to evaluate fallen stock for common endemic diseases. Farmers are also being trained to do their own simple post-mortems on young lambs⁽⁴⁷⁾.

The data in Figures 15, 16 and 17 is derived from a carcase-based post-mortem service operating in North East England at a fallen stock collection centre (FSCC) and run by Farm Post Mortems Limited. Farmers request post-mortem examination at the time of carcase collection. Reports are sent to the farmer and their vet. Some bias may be introduced, as only carcasses for which a post-mortem examination is requested are included in the data. Diagnosis is generally based on gross findings as additional testing is at the cost of the farmer. Further, the data only covers North East England and may or may not reflect the frequency of diagnoses made in other parts of the UK.

Ewes

The records from 1,815 ewe carcasses submitted to Farm Post Mortems Ltd. from March 2014 to November 2019 were analysed. The 10 most common causes of death are shown in Figure 15. About 5% received no diagnoses. Two of the iceberg diseases – OPA and Johnes – were the top two diagnosed causes of death. Pneumonia from previous issues (chronic suppurative) or pasteurella was also an important issue to consider, with vaccination possible to reduce the risk of pasteurella.

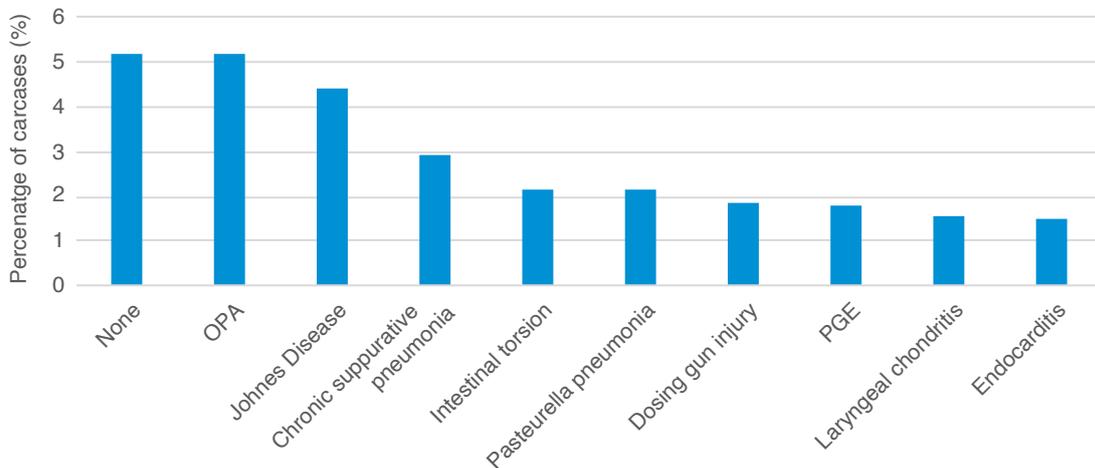


Figure 15. The ten most common causes of ewe death between March 2014–November 2019

PGE = Parasitic gastroenteritis, OPA = ovine pulmonary adenocarcinoma
Source: Farm Post Mortems Ltd.

Rams

The records from 215 ram carcasses submitted to Farm Post Mortems Ltd. from March 2014 to November 2019 were analysed. The 10 most common causes of death are shown in Figure 16. About 2% received no diagnoses. The main issue for rams is Laryngeal chondritis, also known as Texel throat. Lesions are found on the larynx (or other areas in the throat) and are possibly caused by dosing gun injuries, grass seeds or repeated trauma to the larynx when the rams are struggling to breathe⁽⁴⁹⁾. Recent work showed that the anatomy of the throat of Texel sheep, due to their short head and neck, appears to increase their risk of getting this problem⁽⁴⁹⁾.

Conditions of the lung and the chest lining are common problems for rams, with iceberg diseases also being represented in this data set.

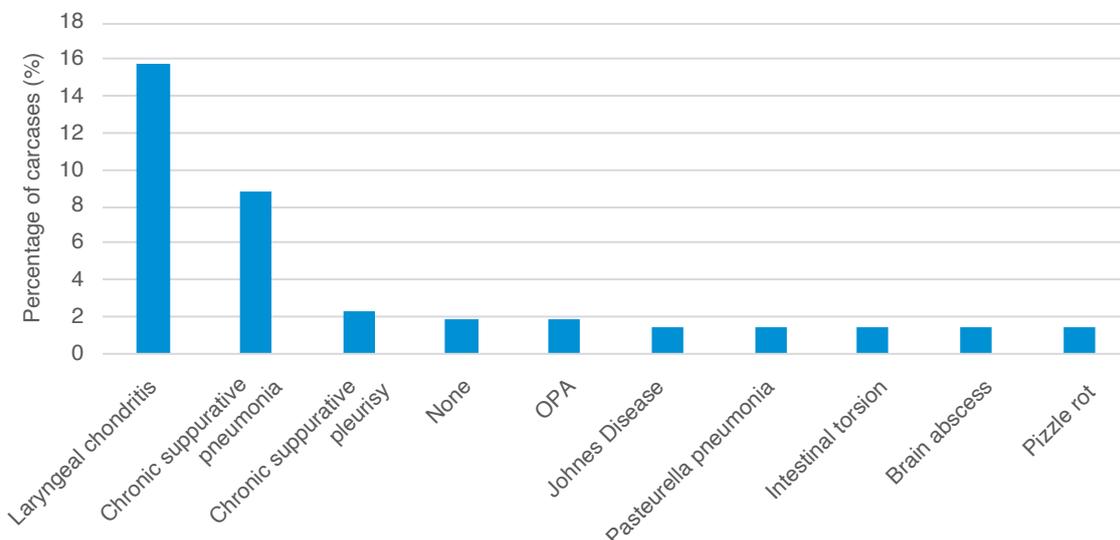


Figure 16. The ten most common causes of ram death between March 2014–November 2019

OPA = ovine pulmonary adenocarcinoma
Source: Farm Post Mortems Ltd.

Lambs

The records from 2,733 lamb carcasses submitted to Farm Post Mortems Ltd. from March 2014 to November 2019 were analysed. The 10 most common causes of death are shown in Figure 17. About 4% received no diagnoses. *Pasteurella* (both septicaemia and pneumonia) and parasitic gastroenteritis (PGE) were the most common conditions discovered in the dead lambs. Many of the causes of death were preventable through vaccination programmes or effective worm control.

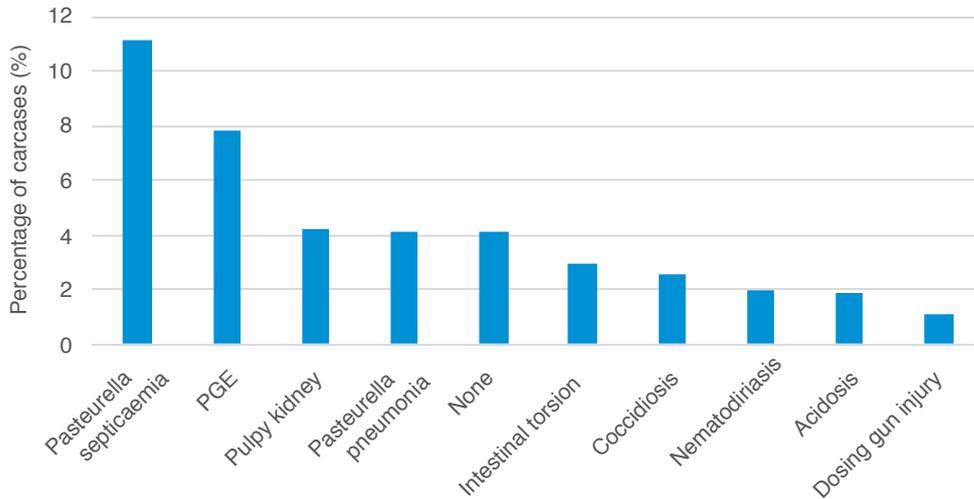


Figure 17. The ten most common causes of lamb death between March 2014–November 2019

PGE = Parasitic gastroenteritis

Source: Ben Strugnell, Farm Post Mortems Ltd.

APHA has reviewed the diagnoses for lambs up to seven days of age, shown in Figure 18. Over this time period, Hypogammaglobulinaemia was the most commonly diagnosed, and many of the other causes of neonatal death are predisposed by Hypogammaglobulinaemia in lambs including Colisepticaemia and watery mouth.

Other common diagnoses are associated with a lack of or improper vaccination of ewes for clostridial diseases and *Pasteurella*.

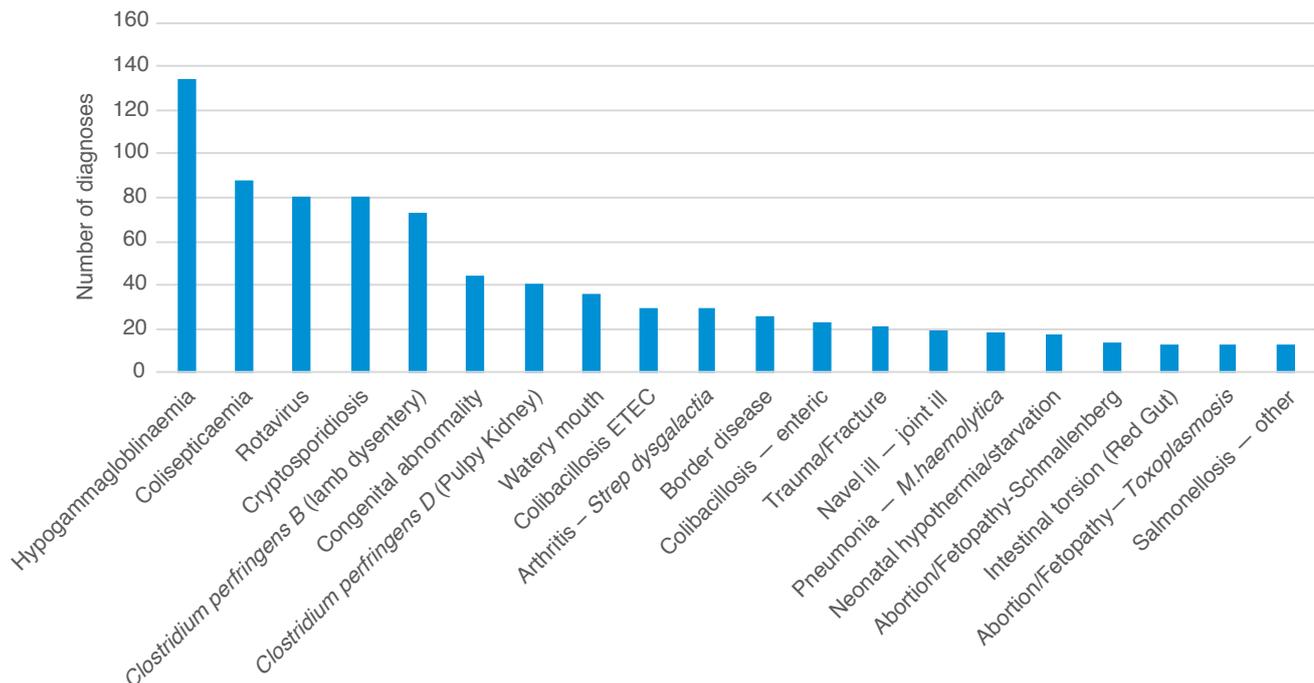


Figure 18. The 20 most common diagnoses in young lambs (up to seven days of age) between 2014–2019 (aggregated data)

Source: APHA

Research update – SRUC is investigating lamb losses on highland hill farms and crofts. Black loss is defined as the loss of lambs otherwise unaccounted for in the marking to weaning period. Due to the nature of hill sheep farming systems, quantification and identification of causes can be challenging.

National Fallen Stock Scheme

The National Fallen Stock Company (NFSCo) is a not-for-profit Community Interest Company run for the benefit of the farming community. It facilitates an efficient and competitive nationwide service for the collection and disposal of fallen farm animals and equine species by working with about 100 fallen stock collectors around the country.

The NFSCo collates data on fallen stock trends in the UK. However, assessing the exact number of fallen animals is impossible due to the way that collections are recorded, e.g. some collections are on a headage basis, while others are on a weight or a volume basis. Not all stock losses are accounted for on the NFSCo scheme as some collectors offer private collections. The number of collections via NFSCo compared with private collections also changes on an annual basis. With the knowledge of the possible collection errors, the trend data is used to track mortality rates and identify abnormal peaks, for example, during or after exceptionally bad weather such as the ‘Beast from the East’ in 2018.

Figure 19 shows the fallen stock trends for ‘all sheep’ over the calendar year and illustrates that, on average, 55% of losses are reported in March, April and May. The total UK sheep losses include headage and volume figures.

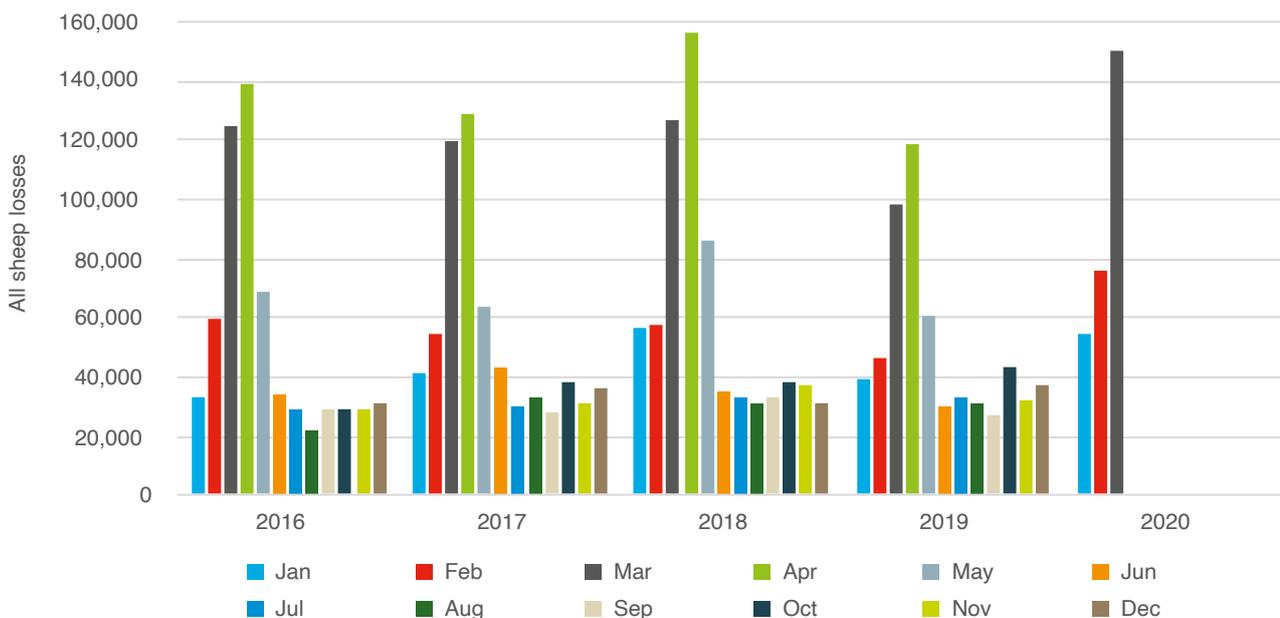


Figure 19. The timing of sheep losses from NFSCo data for the UK (January 2016–March 2020)

Source: NFSCo

For the NFSCo data, the percentage of lamb losses is recorded on a headage basis only. Most losses (4%) occur in the key lambing months of March and April, with over 40% of them occurring in March, April and May. July and August are the lowest months, with 5% of losses reported each month, showing the difference the warm weather makes (see Figure 20). The highest recorded losses were in April 2018, when the ‘Beast from the East’ struck (see Figure 19).

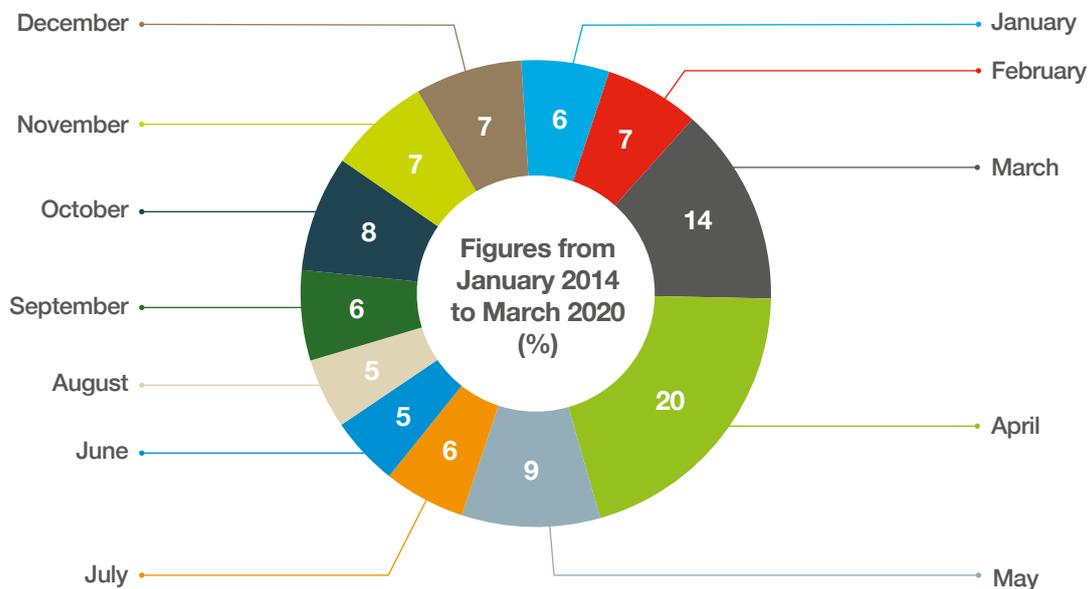


Figure 20. Proportion of lambs collected per month by the National Fallen Stock Scheme from January 2014–March 2020

Source: NFSCo

Monitoring body condition

The importance of ewe condition on sheep health and welfare is widely recognised, with well-nourished animals generally more able to mount an immune response against a disease challenge. Poor feeding is not solely under-feeding; a variety of nutrition-related problems arise from over-feeding too.

Body condition scoring (BCS) is a hugely important tool available to farmers and advisers, to assess and manage the nutrition of breeding sheep, with widely accepted guidelines for target scores at different stages of the production cycle.

The first step is to pull off thin ewes and manage them differently to ensure they gain condition, especially from weaning through the scanning. It is also important to carefully monitor young sheep, with some farmers choosing to manage them separately until their second tupping or lambing.

Monitoring lamb performance – 20 kg target for lamb weight at eight weeks and 30 kg target for lamb weight at weaning (12 weeks) – also helps to identify whether ewe condition and nutrition is appropriate. Look at the [Feeding the ewe guide](#) for more information.

Recent research work funded by AHDB – Challenge Sheep and the sheep KPI projects – are demonstrating the value of using electronic identification systems to record BCS on individual sheep at points during the year. Results will be communicated soon on ahdb.org.uk/challenge-sheep

It is important to consider the causes of thin ewes, which could be related to poor teeth or iceberg diseases.

Screening for production limiting or iceberg diseases

Border Disease (BD), Caseous Lymphadenitis (CLA), Maedi Visna (MV), Ovine Johne's Disease (OJD) and Ovine Pulmonary Adenocarcinoma (OPA) are classed as the production-limiting and iceberg diseases of interest in the UK. The most recent information about the diseases and levels in the UK are summarised in the [AHDB publication aimed at farmers and advisers](#).

There is clear guidance for all farmers to screen 8–10 of their thin cull ewes per year for MV and OJD, to understand the status of their flock. Control methods are summarised in the AHDB publication.

It is also important to check for the status of any incoming stock.

Border Disease

Border Disease (BD), also known as Hairy Shaker Disease, is a less commonly diagnosed cause of abortion and is closely related to Bovine Viral Diarrhoea (BVD) virus. Both diseases are caused by members of the Pestivirus family of viruses. Border Disease Virus (BDV) is present throughout the UK, with an estimated prevalence of between 30.4% and 37.4%^(50,51,52). Incidence has significantly increased in the last 40 years. The impact of BD infection is widespread as it affects both reproductive performance and lamb performance.

Sheep can be infected by both BDV and BVD virus. A survey of pestiviruses isolated from sheep by the Moredun Institute in 2006 confirmed 80% BDV and 20% BVD virus type 1^(51,53). Eradication programmes for BVD in cattle may be hampered by the presence of BDV in a significant proportion of mixed cattle and sheep farms. The unchecked presence of BDV in sheep will, therefore, be relevant to BVD eradication programmes in cattle. Further research in this area is needed.

Caseous lymphadenitis

Caseous lymphadenitis (CLA) is caused by the Gram-positive bacterium *Corynebacterium pseudotuberculosis* and was first diagnosed in the UK in goats in 1990, then in sheep in 1991. It is now classed as endemic. Initially thought to be found principally or exclusively in pedigree flocks producing terminal sires, it is now being seen in commercial UK flocks, usually introduced by infected rams⁽⁵⁵⁾. It has been proposed that feeding via troughs facilitates the spread of CLA within UK sheep systems. Experience from other countries shows that, if left uncontrolled, up to 60% of adults within a flock may become infected⁽⁵⁶⁾.

There are no published estimates of the cost of the disease in the UK. In 2000, a serological survey of samples from 745 flocks found 18% of flocks to have one or more CLA-positive animals, with an individual prevalence of 9.9%⁽⁵⁷⁾. Serological screening kits for CLA are available in the UK.

There is no licensed vaccine in the UK, but the Australian Glanvac vaccine is widely imported under license from the VMD. Between 2009 and 2014, licences were granted for the import of 20,000–30,000 doses each year. Alternatively, an autogenous vaccine can be prepared within the UK. A complication of the use of vaccinated animals is that serological tests cannot differentiate between vaccinated and infected animals. The photos below show external and internal appearance of CLA.



Photo credit: Fiona Lovatt, Flock Health Ltd.



Photo credit: Ben Strugnell, Farm Post Mortems Ltd

Maedi Visna

Maedi Visna (MV) is caused by a lentivirus, part of a group of viruses known as small ruminant lentiviruses (SRLV) that affect sheep and goats. The disease is highly contagious but has a long incubation period of several months to years. This leads eventually to pneumonia, progressive loss of condition, mastitis, reduced flock production and poor economic performance. The clinical signs are easy to confuse with other problems in sheep flocks, such as lungworm, and it is often not diagnosed until the flock prevalence is over 50%. Infected ewes have a 9% reduction in conception rate compared with similarly aged uninfected ewes within the same flock⁽⁵⁷⁾ and a 4.6% drop in milk production⁽⁵⁸⁾. The average longevity of MV-affected sheep is reduced by at least one year⁽⁵⁹⁾. The disease is incurable; infected sheep become life-long carriers because they are unable to eliminate the virus. Serological screening kits for MV are available in the UK, but there is currently no vaccine.

The prevalence within the national flock (including England, Scotland and Wales) is increasing and is estimated to be 2.8%. Significant regional variation exists and in counties such as Leicestershire and Gloucestershire, flock level prevalence is 15%⁽⁶⁰⁾. Members of the MV Accreditation Scheme are almost exclusively pedigree flocks, but a new MV monitored free scheme with less stringent requirements, demonstrating a low risk of MV and aimed at breeders of commercial replacement stocks, has recently been launched. The photo below shows normal lungs (left) and lungs from an MV-infected ram (right) at post-mortem. Lungs of the affected sheep are swollen, larger and heavier than their uninfected counterparts.

Research update – results from a PhD at the University of Nottingham examining the impact of MV on breeding flocks will be communicated to industry during 2021.

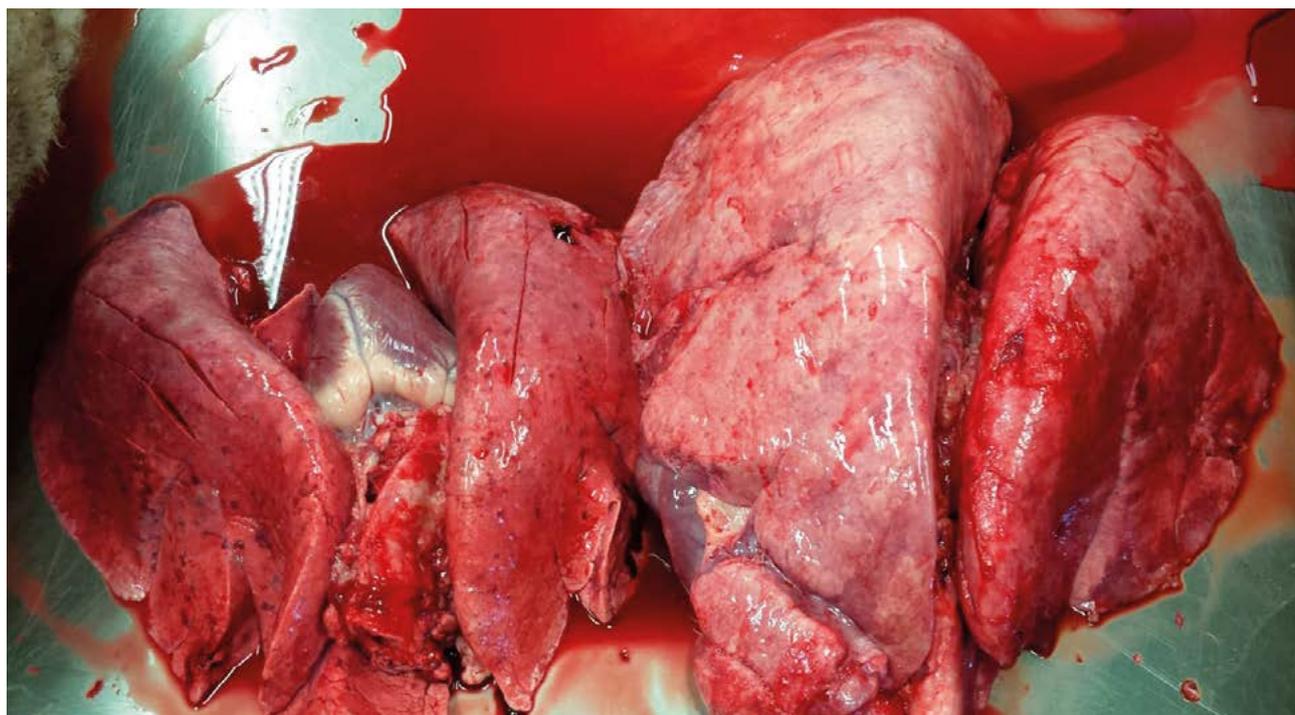


Photo credit: Ben Strugnell, Farm Post Mortems Ltd.

Ovine Johne's Disease

Ovine paratuberculosis (Ovine Johne's Disease; OJD) is an infectious, chronic, wasting disease caused by the bacteria *Mycobacterium avium subspecies paratuberculosis* (MAP). The disease has a worldwide distribution and is now well recognised in numerous countries as a significant production-limiting disease affecting multiple species. OJD is potentially the most significant of the five UK 'iceberg diseases' with regard to both prevalence and economic impact.

More work needs to be done specifically on UK farms to better understand the prevalence, risk factors and impact of OJD and also whether there is evidence of cross-species transmission between livestock species under UK farming conditions. The University of Liverpool is conducting research on this subject involving sheep, beef and mixed farms. Contact L.Taylor11@liverpool.ac.uk for further information.



Photo credit: Ben Strugnell, Farm Post Mortems Ltd.



Photo credit: Ben Strugnell, Farm Post Mortems Ltd.

Ovine pulmonary adenocarcinoma

Ovine pulmonary adenocarcinoma or adenomatosis (OPA), also known as Jaagsiekte is found globally, with the exception of Australia, New Zealand and Iceland. OPA is an infectious disease caused by Jaagsiekte sheep retrovirus (JSRV).

Diagnosis of advanced OPA can be made in the live animal from clinical signs but diagnosis of subclinical OPA is challenging. There are no commercially available serological or antigen assays for OPA. Definitive diagnosis is achieved by post-mortem examination, with gross pathology supported by histopathology. Recently, transthoracic ultrasound examination has been used to screen for subclinical OPA. Removing affected sheep has the potential to reduce transmission of JSRV within the flock. However, it is important to recognise the limitations of the technique; a negative scan result does not guarantee the sheep is free of JSRV infection or early OPA. Also, false positives may occur, especially when other lung disease is present. Recent research data indicates that annual or biannual test-and-cull based on transthoracic ultrasound screening is useful in reducing the number of OPA cases each year. A few vets are currently offering this service.

More information about OPA and a video on scanning can be found at www.moredun.org.uk/research/diseases/opa-jaagsiekte

Monitoring for parasites

Parasite management is a major factor in sheep health and welfare. Historically, there has been heavy reliance on the use of medicines in prevention and control programmes, and this has led to the development of parasites that are resistant to many of the products used by sheep farmers.

In sheep, parasitic gastroenteritis (PGE) is still consistently the most common Veterinary Investigation Diagnosis Analysis (VIDA) finding. Figure 21 shows the most commonly diagnosed diseases in all ages of sheep in Great Britain from 2014 to 2019, excluding abortion.

The SCOPS principles aim to slow the development of resistance. The emphasis is on reducing reliance on chemical controls and the potential of management and diagnostics to avoid challenge and to target treatments. In the longer term, breeding programmes are harnessing the genetic ability of sheep to mount a higher level of acquired immunity to internal parasites, and work continues towards the development of vaccines for both helminths and sheep scab.

A study published in 2016 has demonstrated that sheep farmers can implement SCOPS principles and significantly reduce anthelmintic use, without incurring an increase in worm burdens or loss of animal performance. For further information, visit www.scops.org.uk



Worms and parasitic gastroenteritis

PGE refers to infections of the stomach or intestines by nematode worm species, either singly or in combination, and is consistently the most common diagnosis in sheep, as shown by VIDA (see Figure 21). It was also shown to be important in the lamb data from Farm Post Mortems Limited (see Figure 17).

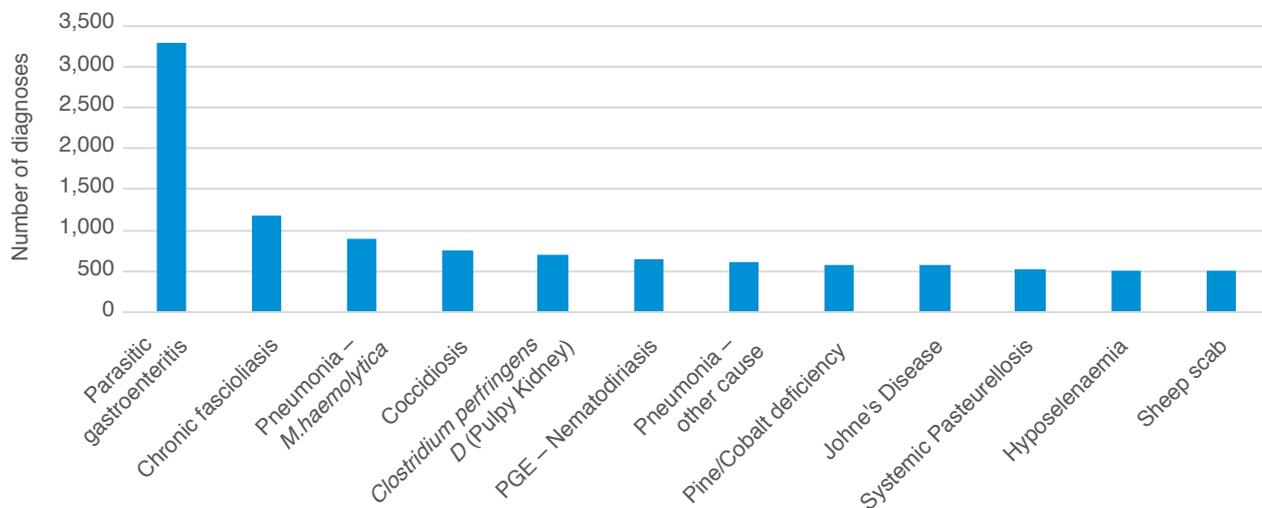


Figure 21. The most common VIDA diagnoses of disease in sheep of all ages (excluding abortion) in Great Britain, 2014–2019

Source: APHA

A recent study carried out across Europe⁽⁶¹⁾ estimates that in the UK the cost of PGE amounts to £43 million per year, of which £27.5 million is treatment cost. This is lower than the previous estimate of £84 million (range £48–£120 million in 2005⁽¹³⁾, which assumed a simple linear effect of worm burden on lamb growth rate across all lambs in the UK. The 2020 study includes differentiation of the effect of burden on lambs and the most recent agricultural and epidemiological data available, and is likely to be a more accurate reflection of the actual cost.

Haemonchosis

Haemonchus contortus is becoming a more widespread threat to UK sheep production as climatic conditions favour this species of nematode. Losses can be significant and outbreaks occur sporadically, often involving adult as well as immature sheep. Effective quarantine treatments will prevent importation onto a farm, but, once present, management strategies are more complex than for other worm species.

A vaccine was developed by Moredun Research Institute and has now been launched commercially in Australia and South Africa (Barbervax[®]) and is used as part of a monitored control programme. Its use in the UK is under Special Import Licence and, to date, there is little information on its use.

Nematodirus

This continues to be a significant threat to young lambs in the UK. The severity of the challenge is determined by weather conditions, age of lamb and management. The SCOPS Nematodirus forecast, which has been running since 2013, is now widely used across the industry. Resistance in Nematodirus to the 1-BZ wormers has been reported. However, while recent work⁽⁶²⁾ shows alleles for resistance are widely present, these are still at very low frequencies, allowing the 1-BZ to remain the product of choice for this worm species.

Anthelmintic resistance

Studies suggest that the prevalence of anthelmintic resistance (AR) in the UK has continued to increase over the last five years. Recent estimates put the cost of AR in the UK at £3.3M per year⁽⁶¹⁾.

Since 2012, five classes or groups of Broad Spectrum anthelmintic have been licensed for use in the UK. Resistance to benzimidazoles (1-BZ), levamisoles (2-LV) and macrocyclic lactones, including moxidectin (3-ML) is widespread, and three cases of resistance to monepantel (4-AD) have been reported since 2018^(63,64). Resistance to derquantel and abamectin (5-SI group) has not been recorded in the UK to date.

In 2015, a study of 47 Welsh farms found evidence of resistance to 1-BZ on 94% of farms, to 2-LV on 68% of farms and the 3-ML group on 51% of farms (IVM), and to moxidectin (MOX) on 19% of farms⁽⁶⁵⁾. Furthermore, 15% of farms showed resistance to all groups tested.

Glover *et al* (2017) surveyed 27 farms in North Devon and found resistance (<95% efficacy) to 1-BZ on 96% of farms; 44% of farms had resistance to two groups and 40% of farms had evidence of resistance to all three⁽⁶⁶⁾.

A meta-analysis of reports across the EU since 2010⁽⁶⁷⁾ (currently 'in-press'), supports an increase in the prevalence of AR in all the main contributing countries, including the UK.

VIDA also records when anthelmintic resistance is suspected for benzimidazole-, macrocyclic lactone- or levamisole-containing products. This is based on a history of previous repeated treatments and assurance that treatments were administered correctly. The map in Figure 22 shows regions where submissions to APHA have been recorded as suspicious of anthelmintic resistance.

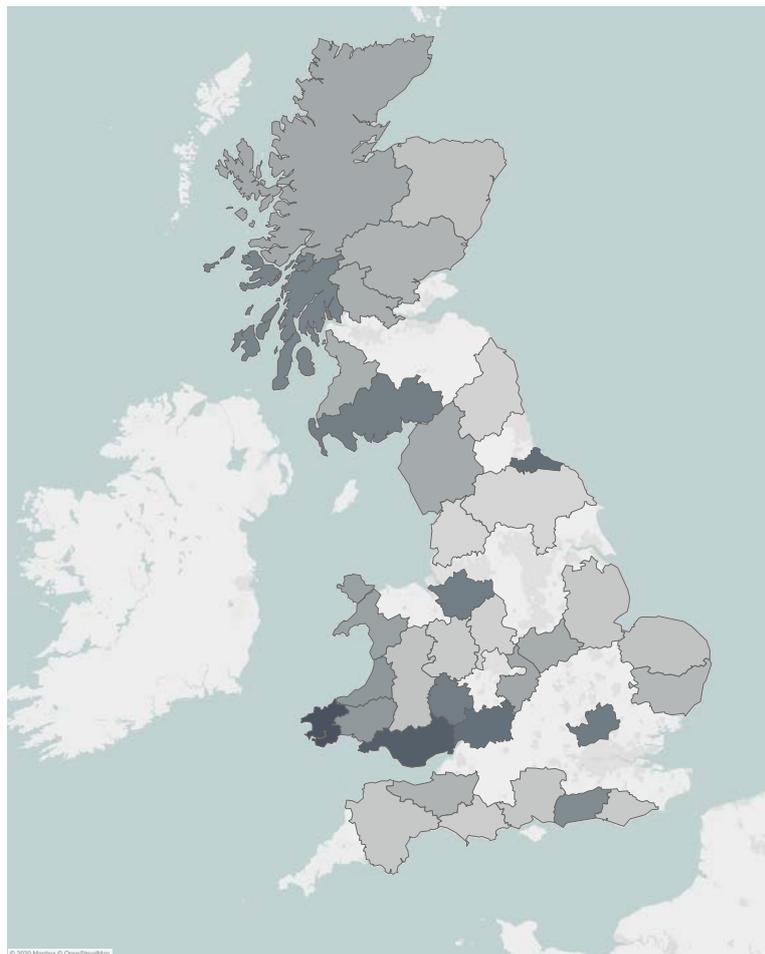


Figure 22. Map with regions in Great Britain where submissions to APHA have been recorded as suspicious of anthelmintic resistance.

Source: APHA

Liver fluke

Disease caused by liver fluke (fascioliasis) is responsible for considerable economic loss. This is estimated at £3–5 per infected sheep⁽⁶⁸⁾, caused by direct production losses, poor reproductive performance and livers rejected at slaughter. FSA data shows that, in 2017, 721,500 (7.8%) livers were rejected from abattoirs in England alone⁽⁶⁹⁾.

The extent of the challenge from liver fluke is largely dependent on weather patterns, with wet summers and mild wet winters posing the highest risk because this favours the life cycle of this parasite. This is demonstrated in the graphs below, highlighting the variable challenge from year to year, linked to weather. Figure 23 shows spikes in (a) acute, and (b) chronic fasciolosis in sheep, following the wet summer of 2012 and mild winter of 2013. Bars represent the number of samples tested (post-mortem and faecal egg count (FEC)), lines represent the percentage of submissions diagnosed as liver fluke.

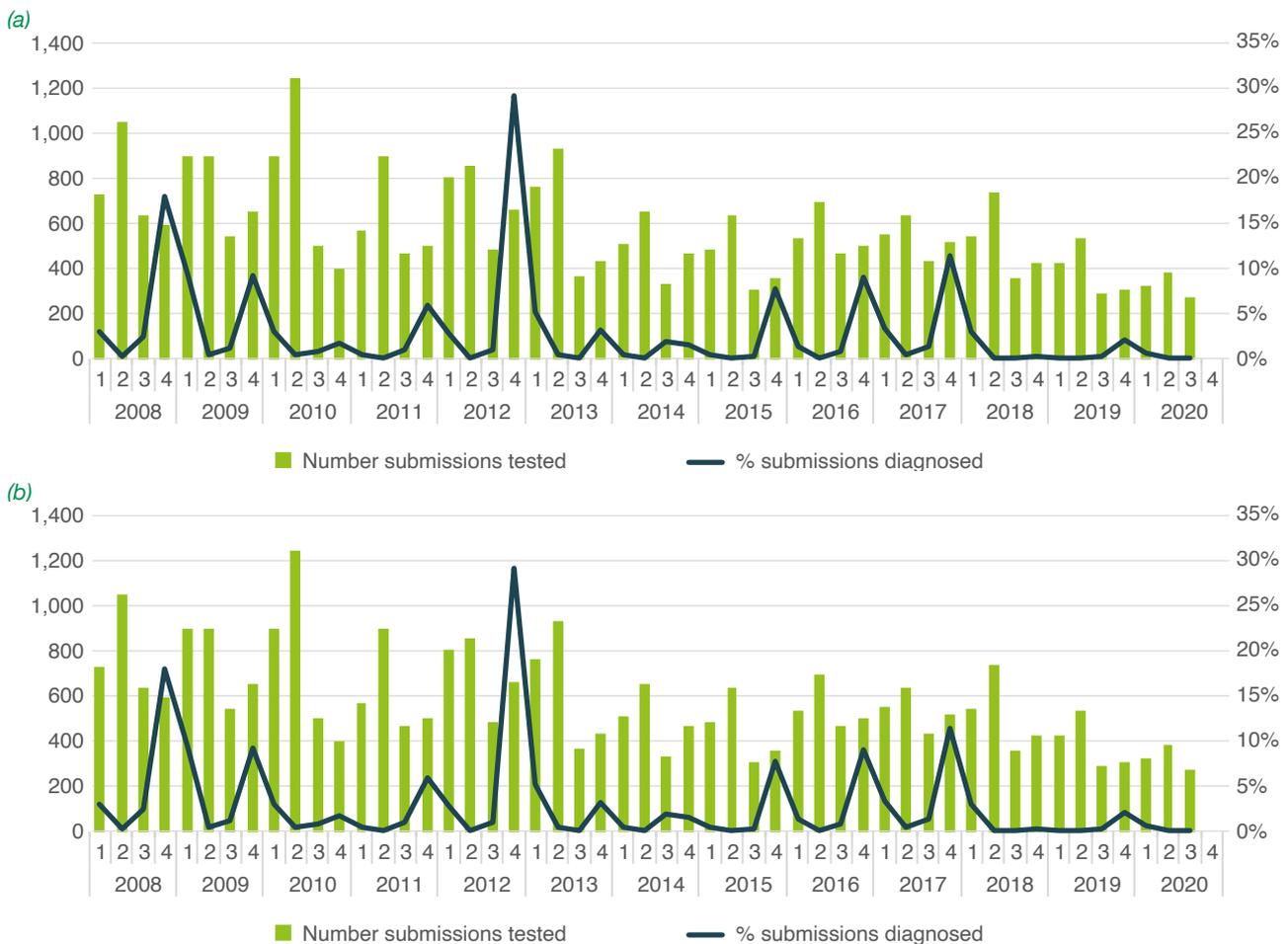


Figure 23. Seasonal patterns of liver fluke disease since 2008 in a) acute and b) chronic fasciolosis in sheep

Source: APHA

In recent years, a combination of some very wet years and animals grazing wetland areas for conservation purposes, has seen the parasite apparently spread into areas previously considered to be ‘fluke-free’.

Control

Historically, control of liver fluke has relied heavily on regular medicine treatments. Triclabendazole (TCBZ) is widely used flukicide in sheep and cattle because of its activity against early immature fluke. Lack of efficacy of TCBZ against liver fluke was first reported in 2010 and the presence of resistance was confirmed in a dose-and-slaughter trial in 2011⁽⁷⁰⁾. There is evidence that TCBZ resistance is now widespread; total or partial TCBZ resistance has been detected on sheep farms throughout England, Wales⁽⁷¹⁾ and Scotland⁽⁷²⁾, where liver fluke is endemic. An estimate for the cost of a case of TCBZ resistance on a farm is £8.73 per ewe⁽⁷²⁾. Tests for diagnosing TCBZ resistance are available, such as the composite faecal egg count reduction test (FECRT)⁽⁷³⁾ or the copro-antigen reduction test, used for individual sheep.

As a result of extensive reports of resistance to TCBZ, farmers are switching to other medicines, particularly closantel. Repeated use of closantel increases selection pressure and will, almost inevitably, result in resistance appearing to this medicine. It is, therefore, vital that TCBZ resistance is investigated and not assumed.

To reduce reliance on medicine treatments, industry advisers including SCOPS⁽⁷⁴⁾, the University of Liverpool and the Moredun Research Institute, advise adoption of strategic control programmes, based on diagnosis and targeted treatments, encapsulated, for example, in the Liverpool Control Plan. Pasture management strategies include strategic grazing and fencing to prevent livestock accessing snail habitats. A recent study carried out at the University of Liverpool⁽⁷⁵⁾ found that silage contaminated with fluke cysts posed no risk of infection to livestock if ensiled under strict anaerobic conditions for at least two weeks. However, if silages were exposed to oxygen (aerobic conditions), fluke cysts were able to survive for at least ten weeks (see Figure 24).



Figure 24. Fluke cysts recovered from aerobic silages can develop into juvenile parasites

Photo credit: Bethan John, University of Liverpool

Diagnostic tests available in the UK include Fecal Egg Counts (FEC), which detect infection 10–12 weeks after initial infection and a coproantigen test, which similarly detects mature fluke; neither are ideal for diagnosing cases of acute fasciolosis. Serology, using samples taken in the autumn from first year lambs, is useful in estimating when challenge occurs, but several sequential tests may be needed. See scops.org.uk/internal-parasites/liver-fluke for more information.

Research update – there are current research projects running at both Moredun and University of Liverpool on liver fluke.

Rumen fluke

Rumen fluke (stomach fluke, or paramphistomes) are trematode parasites that infect grazing animals. Their life cycle is similar to that of the liver fluke and it can be difficult to separate the effects of rumen fluke from liver fluke as animals are often infected with both parasites.

Clinical signs of rumen fluke disease (paramphistomosis) are relatively generic, e.g. ill-thrift, diarrhoea, poor body condition. There are no published reports of production effects in sheep, and recent abattoir studies in cattle in Belgium, the Netherlands and the UK found little association between rumen fluke infection in cattle and production effects, other than an association with diarrhoea and reduced carcass fat coverage.

Research update – industry messages from a recently completed project funded by BBSRC, AHDB and AgriSearch on 'Rumen fluke in cattle and sheep: measuring impact and improving diagnosis' led by Queens University Belfast, are expected in 2021.

Coccidiosis

Coccidiosis is one of the most common causes of production losses in lambs in Great Britain, second only to worms as a cause of scour and ill-thrift. Disease is usually caused by either *Eimeria ovinoidealis* or *E. crandallis*, which are the two most pathogenic species of Eimerians. Coccidiosis is most common in more intensive systems where stocking rates are high.

Levels can be monitored using FEC. Generally, a treatment plan is included in the health plan because once the farm has had an outbreak, the risk of another is high.

Hydatids – *C. ovis* and *C. tenuicollis*

In the year April 2019 to March 2020 (CCIR data), 0.1% cent of sheep slaughtered at licensed abattoirs in England and Wales were found to have hydatid cysts, the larval stage of the dog tapeworm *Echinococcus granulosus*. Hydatid cysts rarely cause disease in sheep but the disease is a zoonoses.

Cysticercus ovis and *C. tenuicollis* are the larval stages of the tapeworms *Taenia ovis* and *Taenia hydatigena*, respectively. Both of these parasites have similar life cycles to *E. granulosus*, with the adults residing in the intestines of dogs or foxes, and the intermediate stage being in sheep. These parasites rarely cause disease in sheep, but their presence leads to the rejection of affected tissues. In the same period in England and Wales, 7.5% of sheep livers were rejected because of *C. tenuicollis* and 0.3% of sheep carcasses were affected by *C. ovis*. Where *C. ovis* is detected in more than two sites, the whole carcass is rejected. These figures are similar to the ones in previous reports.

A 2015 study of *C. tenuicollis* and *C. ovis* on Welsh farms found that failure to worm dogs adequately and to prevent dogs from scavenging on sheep carcasses was common and was likely to account for the high incidence of these parasites⁽⁴⁶⁾.

Sheep scab

Historically, there have been many attempts to eradicate sheep scab from the UK, but all have ultimately failed and many other EU countries also struggle to control the disease. Currently, the sheep scab Order 1997 operates in England, Wales and Northern Ireland. Under this legislation, it is an offence not to treat animals visibly affected by sheep scab but the disease is not notifiable. In contrast, Scotland made scab notifiable again in 2010 under the sheep scab Order (Scotland) 2010⁽⁷⁶⁾.

Nieuwhof and Bishop (2005) estimated the annual cost of sheep scab in Great Britain to be £8.3 million⁽¹³⁾. The majority of this was attributed to the cost coming from that of controlling sheep scab, with just 10% due to reduced animal performance. Current prevalence of sheep scab is thought to be 8,000–10,000 cases/annum in the UK, with more in upland than lowland areas (13.9% and 5.2%) in a 2011 study⁽⁷⁷⁾. More recently in Wales, a 100-fold increase in incidence since deregulation in 1992 was reported, with 15.8% of flocks reporting an outbreak in 2015⁽⁷⁸⁾. Recent work (2020) using updated data suggests the current cost of sheep scab in GB is far higher, and within the range of £78–202 million per annum⁽⁷⁹⁾.

Treatments

Effective treatment options are limited to plunge dipping in organophosphate (OP) or injecting with 3-MLs (endectocides). In recent years, the use of the endectocides has increased significantly and this has now led to confirmation of resistance in sheep scab mites to these products⁽⁸⁰⁾. The 3-ML endectocides are also anthelmintics, which means their use in scab control is also thought to have contributed to the increase in anthelmintic resistance found in this group. There are no reported cases of resistance to the OP. However, the unlicensed use of this medicine through showers and jettors is a major concern and the industry is working with VMD to eliminate this practice.

An ELISA test for *Psoroptes ovis*, which detects serum antibodies to sheep scab from two weeks after infestation, has been commercially available since 2015. The test was developed by the Moredun Research Institute and it can be used in a number of ways, for example, quarantine testing of incoming sheep or as an early diagnostic test ahead of clinical signs. A current VMD-funded project aims to optimise the use and potential benefits of the test.

In January 2018, SCOPS organised an industry workshop to discuss an action plan for sheep scab in the light of scab mite resistance to the endectocides, and new developments such as the Elisa test. Among the outcomes was a proposal to obtain funding from the Rural Development Programme for England (RDPE), to help tackle sheep scab in regions where controlling scab is difficult, such as common grazing areas. Defra has now approved the project, and an Invitation to Tender is to be issued in September 2020.

Other outputs from this workshop are the launch of an accreditation scheme for mobile sheep dipping contractors (due autumn 2020), and an industry-wide campaign against the use of showers and jettors, to ensure OPs are used effectively and safely, as the use of OP is already rising in response to endectocide resistance.

Other external parasites

Lice

The prevalence of lice infestations (pediculosis) in sheep has increased in parallel with the decline in the use of OP dipping. The endectocides are not effective against biting lice, so diagnosis (to differentiate from sheep scab) is a major factor in avoiding unnecessary use of these products and the resultant selection pressure on the worm population.

Blowfly

The length of the risk period for Blowfly strike is extending due to the prevalence of warm, wet conditions over a more protracted period between early spring and late autumn. It is now common for cases to be reported between April and October; the earliest cases were in January, in 2020, and the latest in December, in recent years. In a recent survey⁽⁸¹⁾, 43% of farmers said they had a blowfly risk for 20 or more weeks of the year, and 85% carried out preventative treatments, which form the larger part of the cost of this parasite on sheep farms. The National Animal Disease Information Service (NADIS) has an **alerts system available**.

Ticks

The period of activity and distribution of ticks also appears to be extending, particularly in Southern England⁽⁸²⁾ in response to changing climate and suitable habitat. VIDA diagnoses of tick-borne disease in sheep though relatively low, have doubled in the last eight years. The zoonotic risk (Lyme disease) is a major concern and recently diagnosed cases of Babesiosis add weight to the potential threat that ticks pose to humans.

Improving biosecurity

Most of the transmission risk for diseases comes with the movement of live animals between farms; farm contractors, e.g. shearers and ultrasound scanners, pose only a small risk in comparison. On-farm foot dips provide part of the solution, alongside cleaning livestock trailers following animal transport. A well-designed plan for quarantine and screening of returning and replacement stock is a vital tool for effective disease prevention on farm.

The aim with most of the diseases discussed is to make sure they are not on farm, and then plan how to keep them out with effective biosecurity. This would include:

- Secure fencing (including around watercourses)
- Testing animals before purchase after a detailed conversation with the vendor on the treatments given and their disease screening work
- At least a three-week quarantine period for returning or replacement stock to ensure all treatments can be given, including for potential AR worms
- Being responsible and not selling animals without knowing their status

Quarantine periods for returning or replacement stock should depend upon the specific health planning priorities of the farm and should be considered in detail by farmers and their vets.

See fas.scot/downloads/tn713-flock-biosecurity-for-sheep for more details.

Breeding more resilient animals

Signet Breeding Services provides the genetic evaluation and support to most performance recording breeders in the UK. There are currently 462 flocks from 39 different breeds recording with breeds Charollais, Hampshire Down, Suffolk and Welsh Mountain, all recording over 30 flocks.

Ewe and lamb survival

The lamb survival Estimated Breeding Values (EBVs) continue to be recorded and reported for the Lleyn, and are now reported in the new hill analysis, which can calculate a breeding value even without a birth weight. The Lleyn analysis also contains ewe longevity and lambing interval EBVs. These EBVs are dependent on large volumes of accurate data being submitted, but play an important part in ram selection, to improve farm performance for both productivity and improved welfare on farm through reduced wastage.

Lambing ease and birth weights

In both the new terminal and hill analysis, sheep have two new EBVs calculated, a birth weight EBV and a lambing ease EBV. All breeders have the option to record this information, which will allow for selection of rams that produce easier lambing rams.

Worm resistance and resilience

Signet produces EBVs for FEC in several breeds; Lleyens, Exlana and Romney Marsh, which can be used as an indicator of resistance to gastrointestinal parasites. The Lleyn and Romney breeders also continue the work to collect IgA phenotypes, both to strengthen the current FEC EBV and for the Lleyens to calculate the saliva IgA EBV. As part of the new terminal sire analysis, FEC traits have been included as one of the new EBVs reported, although currently there is a limited number of breeders are collecting a phenotype.

Welsh hill sheep breeding index

In August 2020, a new Welsh Hill Sheep Breeding Index was announced. It has been developed in collaboration with HCC's Hill Ram Scheme, to identify animals that thrive in the hill environment and optimise the efficiency of economic performance of hill sheep.

Database updates

Signetdata.com was launched in 2019. This new platform means that breeders and commercial farmers can access more information to inform ram selection. Ram breeders' performance recording their flocks can record more information online and access their own data in flexible reports. A genetic trend tracker means changes in genetic merit and inbreeding can be tracked over time.

Breeders can now store ewe mature weights and body condition score data to build a data set for further evaluation. New 'sheep for sale' and 'flock finder' pages have been added, making the best genetics in terms of performance, health and welfare more accessible.

Recommendations

In the handover to RH&W, SHAWG takes this opportunity to re-emphasise its priorities and why these should be core to the new group's activity.

Coordinated central platform for disease and welfare monitoring and surveillance

The sheep industry needs more data, and the development of the eMH is crucial to help the defence of the sheep industry. The movement to LIS in England provides an opportunity to catch up with the other countries in GB on traceability and data flow.

Development and adoption of agreed indicators for measuring health and welfare

There is a need to develop welfare metrics that can be collected and used to highlight the good performance of the sector, but also identify opportunities for future improvement. With global pressure to reduce antibiotic use, the development of systems to monitor animal health and welfare could also assist in prioritising diseases and safeguarding welfare, while meeting potential future targets for responsible antibiotic use. This ideally requires a national approach but could sit alongside the development of opportunities within individual country programmes such as the Animal Health and Welfare Pathway and ultimately assist with future trade deals.

Target chronic wasting diseases

It is clear from data within this report that OPA and Johne's need to be controlled within the sheep population. This requires more research and knowledge transfer about the diseases and how screening can be done in commercial situations.



Photo credit: Madeleine Crawley

Tackle disease hot spots

The four hot spots – lameness, abortion, neonatal disease and pneumonia – identified by the activity of SAGG for the RUMA targets, should be the focus for future knowledge exchange activity. It is clear from data within this report that the inclusion of pneumonia as the fourth hot spot is timely.

Establish a sheep health declaration scheme

The establishment of such a scheme would help to tie up the various threads from the different initiatives. It could be done across all species and linked to livestock traceability schemes such as LIS and eMH.

Improve lamb survival and performance from scanning to sale

This priority encompasses a significant amount of activity, particularly around the ‘Plan Prevent Protect’ principles of proactive health management on farm. Improvements in this area will be fundamental to sheep farm profitability as direct payments are reduced through changes in policy.

Increase productive lifespan of ewes and rams

There are now breeding tools for this trait. However, there is also a need to keep these animals healthy to retain them in the breeding flock. More knowledge is being gathered on various diseases but there also needs to be a focus on how to increase industry engagement by using tools from the social sciences to help nudge behaviour change.

Breeding for resistance and resilience

Breeding for resistance and resilience to parasites is one tool within the toolbox that needs to be further explored as wormer options are reducing. Some breeds have already made good strides towards understanding how to select the best animals. Other breeds need to catch up, and more health traits need to be tackled.

Increase vet-farmer interactions and relationships

There are good examples within the report of what the industry is already doing to improve vet and farmer relationships. This will help the industry when the Animal Health and Welfare Pathway launches, as it will be a key element of that programme.

Improved farm productivity with reduced environmental footprint

Future agriculture policy and climate change is going to challenge the sheep industry in many ways. However, a profitable farm is more resilient through periods of change and also more open to adopt innovations. Working with farmers to improve the health and welfare of their stock and reduce losses caused by disease will not only improve profitability but will fundamentally also reduce the environmental impact of lamb production.

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Appendices

Appendix 1: Disease surveillance

Veterinary Investigation Diagnosis Analysis (VIDA) diagnoses and analyses referred to in the table below are recorded on the APHA FarmFile database and SRUC VS LIMS database, and comply with agreed diagnostic criteria against which regular validations and audits are undertaken.

More details on each threat are included in the relevant quarterly report cited for each threat. The quarterly reports are produced by the APHA Small Ruminant Species Expert Group and include actions taken to address identified threats.

The quarterly and monthly APHA surveillance reports and links to Focus Articles presented in the Veterinary Record are found through the following links:

- [gov.uk/government/publications/small-ruminant-disease-surveillance-reports-2018](https://www.gov.uk/government/publications/small-ruminant-disease-surveillance-reports-2018)
- [gov.uk/government/publications/small-ruminant-gb-disease-surveillance-and-emerging-threats-report-2019](https://www.gov.uk/government/publications/small-ruminant-gb-disease-surveillance-and-emerging-threats-report-2019)
- [gov.uk/government/collections/animal-disease-surveillance-reports#monthly-reports](https://www.gov.uk/government/collections/animal-disease-surveillance-reports#monthly-reports)
- [gov.uk/government/publications/apha-animal-disease-surveillance-focus-articles/apha-focus-articles-in-the-veterinary-record](https://www.gov.uk/government/publications/apha-animal-disease-surveillance-focus-articles/apha-focus-articles-in-the-veterinary-record)

Information notes are also provided and accessed via the Small Ruminant pages on Vetgateway

- apha.defra.gov.uk/vet-gateway/surveillance/seg/small-ruminant.htm

Table 15. Chronological update on activity on notifiable diseases in 2018/19

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Bluetongue (BTV) suspected	A case of suspected BTV was reported in lambs born with brain abnormalities during the course of an abortion storm. SBV and Border disease were ruled out and <i>campylobacter</i> identified as the cause of abortion. A Focus article was published Abortion in sheep – An Update	No	2018 Q1
Brucellosis	An investigation was carried out for suspected Brucellosis in sheep presented at an abattoir with pyrexia and swollen testicles. The case was officially investigated and testing was negative.	No	2018 Q1
Pest de petite ruminants (PPR)	Five new outbreaks of PPR have been reported in Bulgaria. While PPR has been reported in Turkey, this is the first report of PPR from a European country.	No	2018 Q2
Bluetongue (BTV) suspected	Parapoxvirus (orf) was considered the differential diagnosis in a case of suspected BTV, which was reported to APHA. Two sheep had swollen heads and one sheep had crusty lesions and nasal discharge, which triggered the suspicion of BTV.	No	2018 Q3
BTV-8 update	The re-emerging BTV-8 strain in Northern Europe may cause transplacental transmission and infection of foetuses in cattle, thus consideration of BTV-8 as a possible cause of abortion of small, blind or malformed calves, in addition to Schmallenberg virus.	No	2019 Q1
Scrapie in sheep	A confirmed case of scrapie in sheep for the first time since 2015, identified though the sheep Fallen Stock Survey.	Yes	2019 Q3
Bluetongue (BTV) surveillance	During 2019, APHA followed up BTV report cases in sheep. The main presenting signs that aroused suspicion were swelling of the head, discharge of nasal mucous, drooling and crusting around the mouth and nose, and fetal abortions with porencephaly or hydranencephaly. Free post-mortem examination (PME) of any animals that died with any of those symptoms has been offered.	No	2019 Q3

Table 16. Chronological update on activity on endemic diseases in 2018/19

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Effects of forage shortage and poor quality	Welfare reports of sheep in poor condition have increased over the winter, often in relation to sheep appearing in poor conditions or seen to be in muddy fields with no perceived access to dry lying. In part, these were due to recent bad weather, lack of conserved forage and lack of grazing (no new grass growth) and sheep hanging around feeders, increasing muddy areas in paddocks. In some cases, liver fluke and sheep scab have contributed to the poor condition of the sheep and, in many cases, a lack of engagement with the farmer and his vet has been cited. An information note was published Winter 2018: potential forage shortages in the UK - autumn/winter 2018/2019	Yes	2018 Q1
Sheep scab surveillance in Wales	The Welsh Government-funded free testing for sheep scab in Wales from December 2017 to March 2018 has ended. Its aims were to support accurate diagnosis and to promote correct treatment. This also provided samples to the University of Bristol for further research using in vitro tests into macrocyclic lactone resistance in <i>Psoroptes ovis</i> mites. Report into free ectoparasite examination for sheep in Wales: December 2017 to March 2018	Yes	2018 Q1
Chronic fasciolosis increase	There was an increase (not statistically significant) in the incidents of chronic fasciolosis diagnosed in Scotland. Warm wet summers and the inefficacy of Triclabendazole (can kill all stages of <i>Fasciola hepatica</i>) are likely to be the reasons for this increase. Both NADIS and SCOPS had issued alerts during the autumn of the risk of liver fluke in some regions including Scotland.	Yes	2018 Q1
Hot weather risks	APHA produced an information note on associated livestock health, welfare and production problems that may arise as a consequence of the hot weather. Summer 2018: Hot weather and potential risks to livestock health and welfare Potential impacts on ruminant health and welfare during hot weather	Yes	2018 Q2
Increase in coccidiosis	The cold spring, resulting in slow grass growth, plus inadequate ewe milk yields (secondary to poor body condition) may have predisposed to the increased number of cryptosporidium and coccidiosis cases in lambs. The drier conditions later in the second quarter, leading to greater congregation around drinking troughs and build-up in the surrounding mud/soil, and the resultant shorter grass may have led to a higher level of soil being ingested, with a resultant higher level of exposure to coccidial oocysts. A Focus article was produced Coccidiosis in sheep	Yes	2018 Q2
Listeriosis	There was a statistically significant increase in the diagnoses of Listerial encephalitis this quarter. The majority of cases were in adult animals from lowland flocks. The possibility of increased cases of this condition was anticipated by the Small Ruminant Expert Group in the 2018 Q1 report, due to the adverse weather conditions during the spring. This led to prolonged feeding of adult animals, often with poorer quality forage. Furthermore, the risk of soil ingestion was increased, due to the subsequent poor spring grass growth, and if supplementary concentrate was being fed directly from pasture.	Yes	2018 Q2
Malnutrition	Several Veterinary Investigation Centres carried out investigations into cases of ill-thrift and death in flocks where multiple ewes were affected. Significant worm burdens were detected in many cases but underlying malnutrition due to poor grazing conditions was suspected to be the primary problem. Poor ewe body condition impacted lamb survival in many flocks, with several submissions of lambs in which starvation, due to insufficient milk intake, was the likely cause of death.	Yes	2018 Q2

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Border disease (BD) and Bovine Viral Diarrhoea (BVD) in sheep	<p>Bovine Viral Diarrhoea was identified in sheep on a mixed holding. The antigenic similarity of bovine and ovine pestiviruses may be problematic in demonstrating freedom from BVD by serology in the cattle population. This will have increasing importance as the UK progresses towards BVD-free status in cattle. Border disease persistently infected cattle are occasionally identified, although the risk of spread of BD virus from sheep to cattle is thought to be less than BVD virus from cattle to sheep. Border disease virus does not spread within cattle herds to any great extent.</p> <p>A letter to the Vet record was published BVD in sheep flocks</p>	Yes	2018 Q2
Poor nutrition leading to Cerebrocortical Necrosis (CCN)	<p>The prolonged hot weather during July and August resulted in cases of CCN. In one case, a group of ewes had ingested excessive amounts of molasses, with a reduced intake of poor-quality grass. Ten ewes in a group of 180 had been affected. The ewes were hyperaesthetic and twitchy initially, and then the clinical signs progressed to ataxia, and then death. The ewes had started showing clinical signs one to two days after starting on a new batch of liquid molasses-based feed, which the ewes had ingested from a liquid feed dispenser.</p>	Yes	2018 Q3
<i>Mannheimia</i> pneumonia	<p>There was a significant increase this quarter in the diagnoses of <i>Mannheimia</i> pneumonia for GB. The UK Veterinary Antibiotic Resistance and Sales Surveillance (UK-VARSS) 2017 report has shown a marked change in the prevalence of resistance to tetracycline (by disc diffusion susceptibility testing) in ovine isolates of <i>M. haemolytica</i> from 3% and 4% in 2015 and 2016, to 48% in 2017. However, many of the isolates resistant to tetracyclines by disc diffusion have zones of inhibition lying very close to the current breakpoint, which means it is partial resistance.</p>	Yes	2018 Q3
Parasitic gastroenteritis (PGE)	<p>There was a significant increase in the diagnoses of PGE in sheep in the last quarter of 2018 compared with the same period in the previous three years in England, Wales and Scotland. This is highly likely to be due to the dry summer weather (which minimised exposure to parasites on pasture) being followed up by wet weather later.</p>	Yes	2018 Q4
<i>Mycoplasma ovipneumoniae</i>	<p>There has been a marked increase in the number of cases recorded with <i>Mycoplasma ovipneumoniae</i> during 2018, with increasing numbers diagnosed each quarter. There are a number of potential reasons for the increase in cases, and further investigation is needed to determine both the cause of the increase and the likely impact on sheep production, of an increasing trend in this disease.</p>	Yes	2018 Q4
<i>Bibersteinia trehalosi</i> septicaemia	<p>This disease continued to be a common diagnosis reported by all the centres in GB in vaccinated, partly vaccinated and unvaccinated lambs. Reported mortality in affected groups ranged from 5–10% and the main presenting sign is ‘found dead’. Many cases had concurrent PGE that may have contributed to the severity of the outbreaks. Systemic pasteurellosis is common in six-to-nine-month-old lambs in the autumn in GB, with a peak in November. The onset of disease frequently follows changes of diet, the feeding of root crops, handling, mixing of groups and other stressors. In vaccinated cases, it was advised to review the vaccination procedures, and consider reporting as an adverse event to Veterinary Medicines Directorate (VMD).</p> <p>There have been reports of cases with very similar history and pathology (including oesophageal ulceration) in which <i>Mannheimia haemolytica</i> was isolated instead of <i>Bibersteinia trehalosi</i>.</p>	Yes	2018 Q4
Parasitic gastroenteritis (PGE) in finishing lambs	<p>Parasitic gastroenteritis (PGE) in finishing lambs was a feature of the monthly reports in January and February 2019. This is likely a reflection of the mild winter following a dry summer, meaning exposure was later in these animals, and often farmers were unprepared for PGE at this time.</p>	Yes	2019 Q1

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Reduced cases of liver fluke	The positive effect of reduced cases of liver fluke diagnosed following the prolonged dry spell in the summer of 2018 continues to have a positive impact on sheep health. Liver fluke continues to be of low clinical significance in quarter 1, with no cases of acute fluke identified in GB and a much-reduced diagnostic rate for chronic fluke, when compared with previous years.	Yes	2019 Q1
Reduction in rotavirus	There has been a decrease in the number of submissions diagnosed with Rotavirus in this quarter. Over the previous years, there has been increased disease in some areas. However, this year has been generally dry, leading to less favourable conditions for the persistence of the virus in the environment and enabled early turnout of lambs.	Yes	2019 Q1
<i>Mannheimia</i> pneumonia	There has been an increasing trend in the annual diagnoses of <i>Mannheimia</i> pneumonia since 2016. During 2018, the increase in cases was particularly marked during the second and third quarters of the year. Diagnoses of <i>Mannheimia</i> pneumonia illustrate the continuing importance of this disease in sheep.	Yes	2019 Q1
Lungworm increase	APHA saw a marked and statistically significant increase in the diagnoses of lungworm during this quarter. All but one of the diagnosed cases were adult sheep, and only one case did not have concurrent disease. In the majority of the cases, the concurrent disease was PGE. High levels of lungworm pasture challenge, increased susceptibility due to concurrent infections and/or poor nutrition can result in an increased risk of infection. Wasting, recumbency and 'found dead' were the usual described clinical signs.	Yes	2019 Q1
Increase in ovine pulmonary adenomatosis (OPA) in Scotland	SRUC Veterinary Services recorded a significant increase in the number of diagnoses of OPA during this quarter. There has been increased awareness about this disease, with the introduction of new methods of screening within flocks using ultrasound, and an increase in diagnoses may reflect the success of these initiatives in Scotland.	Yes	2019 Q1
Increase in enzootic abortion of ewes (EAE)	There has been a significant increase in the number of abortion submissions diagnosed with <i>Chlamydia abortus</i> (causes EAE) in this quarter. The reason for this increase is unknown. <i>Chlamydia abortus</i> is preventable by vaccination, although, in the early stages of an abortion storm, the antibiotic tetracyclines has been used to control outbreaks. Responsible Use of Medicines in Agriculture (RUMA) has reported that only 36% of sheep flocks are vaccinating for enzootic abortion. Farmers and their vets need to develop strategies for reducing the need for whole flock antibiotic usage. A Focus article was published Enzootic abortion of ewes .	Yes	2019 Q1
Increase in cases of <i>Campylobacter</i> abortion	Cases of <i>Campylobacter</i> spp. abortion in ewes are thought to cyclically increase in frequency every three to five years. The reasons for this are uncertain, but waning immunity of older ewes, buying in of naive animals, and climatic conditions, may all play a part. <i>Campylobacter</i> was featured in the Monthly Veterinary Record Surveillance report.	Yes	2019 Q1
Increase in cobalt deficiency	The incidence of cobalt deficiency had significantly increased in GB Q4 2019 compared with Q4 2018. Concurrent PGE may be involved in growing lambs at this time of year.	Yes	2019 Q4
Increase in ruminal acidosis	Submissions this quarter included situations where concentrate feed had been introduced, or the quantity increased too quickly, in response to the poor condition of the lambs, and this had resulted in ruminal acidosis.	Yes	2019 Q4

Table 17. Chronological update on activity on or emerging antimicrobial resistance in 2018/19

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Hypogammaglobulinaemia in neonates	<p>Hypogammaglobulinaemia is the second most common diagnosis in neonatal lambs. Many of the other causes of neonatal death are predisposed by hypogammaglobulinaemia in lambs including Colisepticaemia and watery mouth.</p> <p>A focus article was published Hypogammaglobulinaemia and other causes of death in neonatal lambs</p>	Yes	2019 Q1
Watery mouth	<p>APHA offered free culture and sensitivity during March and April 2019 on small intestinal samples collected from lambs suspected to have died from watery mouth. Findings from this small study will be presented to the Sheep Veterinary Society autumn conference. Antibiotic resistance was identified in 36 isolates and multidrug resistance (resistance to three or more antimicrobial classes) was detected in 18 isolates, one of which showed resistance to a total of 7 antimicrobials.</p> <p>A farmer survey was also carried out and further investigations using whole genome sequencing of the <i>E. coli</i> isolates is planned.</p>	Yes	2019 Q2
Sheep scab macrocyclic lactone (ML) resistant	<p>A paper (Sturgess-Osborne and others (2019)) described multiple resistance to macrocyclic lactones in the sheep scab mite, <i>Psoroptes ovis</i>. This study compared the toxicity of three of the commonly administered macrocyclic lactone (ML) therapeutic treatments – moxidectin, ivermectin and doramectin to <i>P. ovis</i> from outbreak populations that had appeared unresponsive to treatment. These outbreak populations were from Wales and South West England. Variable levels of resistance to all three MLs were detected.</p> <p>An information note was published Sheep Scab information note and updated Sheep Scab - Resistance</p>	Yes	2019 Q2
<i>Campylobacter</i> abortion rise but no new tetracycline-resistant <i>C. jejuni</i> clone found	<p><i>Campylobacter</i> infection is one of the most prevalent causes of ovine abortion. Historically, <i>Campylobacter fetus subsp. fetus</i> accounted for the majority of the <i>Campylobacter</i>-linked ovine abortion worldwide. Recent studies have indicated a trend for <i>C. jejuni</i> to be the cause of abortion in some parts of the world. Since 2003, a highly pathogenic, tetracycline-resistant <i>C. jejuni</i> clone (named SA) has become the predominant cause of sheep abortions in the USA. The use of tetracyclines may have facilitated selection of this highly pathogenic clone. As part of APHA's surveillance, our experts in the bacteriology team at Weybridge have sequenced <i>Campylobacter</i> isolates and, to date, have found no evidence of the tetracycline-resistant <i>C. jejuni</i> clone.</p>	No	2019 Q2
Sheep scab macrocyclic lactone (ML) resistant	<p>The incidence of scab has increased year-on-year since its reintroduction in 1972, and the recent identification of resistance to one of the two main classes of licensed treatments means that management will become increasingly difficult in the future. National eradication is unlikely to be feasible on economic, logistic, or political grounds. As a result, more coherent approaches to sustainable scab management must be adopted. Sustainable management means adopting a range of practices that reduce and maintain the incidence at 'acceptably' low levels, plus tackling hotspots.</p>	Yes	2019 Q3
Increase in tetracycline-resistant <i>Mannheimia haemolytica</i>	<p>The VARRS 2018 report identified a large increase in resistance to tetracyclines observed in <i>M. haemolytica</i> from both cattle and sheep in 2017 and 2018, compared with 2016. See also Disease surveillance in England and Wales, July 2019. Veterinary Record 185, 132–136</p>	Yes	2019 Q4

Table 18. Chronological update on activity of public health queries in 2018/19

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Poisoning in sheep	The Chemical Food Safety quarterly report April to June 2018 has been published: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/732614/pub-chemfood0418.pdf Three incidents of lead poisoning in sheep and one incident of copper toxicity were reported.	Yes	2018 Q2
Lambing ears	'Lambing ears' has been described as a transient inflammation of the ear with blister formation and crusting that occurs in an estimated 1–11% of sheep farmers who carry out lambing. Skin inflammation might arise from lambing through an allergic or irritant response to amniotic fluid, placental tissues or chemicals.	Yes	2019 Q1
Deaths in neonatal lambs due to incorrect use of a copper supplement	Two pedigree Suffolk lambs died of a severe haemorrhagic abomasitis, which was very likely due to inadvertent administration of a copper supplement. Five had died after being tubed with colostrum and given what was thought to be oral antibiotic but which turned out to be a copper supplement for older lambs, stored in an old bottle. Due to the age of the lambs, there were no food safety risks associated with this incident.		2019 Q1
Copper poisoning	The suspected source of excess dietary copper was the use of hot tap water to make up the milk replacer. The private water supply was known to be acidic, and leaching of copper from the hot water tank and pipes was likely to have occurred; corrosion of the pipes supported this hypothesis. Water samples were sent for analysis and the copper levels in the hot water were significantly higher than in the cold water supply. Since the surviving lambs were not yet weaned, there was no immediate risk to the food chain, provided the source of copper was removed.	Yes	2019 Q2
Metaldehyde poisoning	Metaldehyde poisoning was confirmed at post-mortem examination to be the cause of clinical nervous signs and death of five 10-month old store lambs from a group of 40. Clinical signs including recumbency, fitting, tremor and severe depression, and all died despite treatment. Large quantities of blue pellets were found in the rumens of all lambs. A large bucket containing slug pellets was found in the lambs' field and, as the lid was unfastened, the lambs could access the pellets. The lambs were not destined for the food chain in the near future.	Yes	2019 Q2

Table 19. Chronological update on unusual diagnoses or presentations in 2018/19

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Neurological disease associated with chronic liver fluke damage	Hepatic encephalopathy as a consequence of severe hepatic dysfunction due to liver fluke infection was diagnosed on two occasions by VIC Penrith.	Yes	2018 Q1
Type II atresia ani and rectovaginal fistula	Post-mortem examination revealed a distended colon with a large volume of meconium and faeces present in the terminal colon, which was ending in a blind rectal pouch. A very small volume of faeces could pass into the vagina through a very fine fistula; the vulva was stained by yellow pasty faeces. The faecal staining of the vulva must have misled the farmer into thinking faeces were being passed through the anus, which did not exist.	Yes	2018 Q1
Multiple diagnoses identified from a ewe	Concurrent colisepticaemia, pneumonia, chronic fasciolosis and mastitis were diagnosed in a four-year-old Texel ewe.	Yes	2018 Q1

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Developmental Cerebellar Defect in a Texel Lamb	A two-week-old lamb was presented for post-mortem examination to APHA VIC Shrewsbury following increased incidents of lambs that reportedly struggled to stand from birth. Gross examination of the brain identified a fluid pocket at the caudal brain on the right-hand side. Histopathology confirmed segmental hypoplasia and dysplasia of the right hemisphere of the cerebellum. Testing for Border disease was negative. Other possible differential diagnoses considered included exposure to teratogenic toxins during gestation or an inherited or spontaneous genetic fault. It was unclear whether this finding was reflective of the problem across the group, and further submissions of typically affected lambs were recommended.	Yes	2018 Q1
Dandy Walker Malformation	A neonatal Suffolk lamb unable to stand since birth was examined by post-mortem. The spectrum of changes present in the brain confirmed Dandy Walker malformation, which has been previously reported in the UK in both sheep and cattle. Teratogenic exposure could not be ruled out, but, as there had been two cases, an inherited genetic aetiology remained a possibility.	Yes	2018 Q2
Rhombencephalic malformation	SRUC Veterinary Services noted that the large majority of this type of rhombencephalic malformation occur as sporadic events and are not associated with a teratogenic viral insult or exposure to other teratogens, but the presence of multiple malformation cases in the flock raised the possibility of a genetic component.	Yes	2018 Q2
Neurological disease associated with suspected Closantel toxicity	About 12 out of 158 recently weaned ewes showed sudden onset blindness, loss of condition and an abnormal gait. In total, eight died over a week. The brain of one sheep had evidence of marked multifocal symmetrical vacuolar and necrotising leukoencephalopathy targeting the white matter. These changes were consistent with a toxic or metabolic cause, including Closantel toxicity. Further discussions with the farmer were made, who reported that the animals may have accidentally gained access to Closantel pour-on product while they were housed.	Yes	2018 Q3
Post-vaccination cellulitis	A 6-month-old lamb died due to extensive cellulitis, post-vaccination. Bacterial culture produced a mixed growth of bacteria including non-haemolytic <i>Staphylococcus</i> , which is a likely skin commensal. It is likely that bacteria were introduced at the time of recent vaccination. It was recommended that procedures were reviewed and the incident reported to VMD as an adverse event.	Yes	2018 Q3
Water Hemlock Poisoning	Over a two-day period, a one-year-old sheep and a two-year-old heifer on different farms were found dead. At post-mortem examination, 86.3 g of Hemlock Water Dropwort were discovered in the rumen of the sheep, and smaller quantities were found in the rumen of the heifer. It was thought that, since grass growth was poor due to the dry weather conditions the area had been experiencing, livestock were showing an increased tendency to eat unusual plants. Hemlock Water Dropwort, also known as Dead Man's Fingers, contains a neurotoxin called oenanthotoxin, which causes seizures and death. Cattle appear more sensitive to the toxin than sheep and low doses will cause fatalities. The plant is found in damp, marshy ground typically in ditches. The roots are more toxic than the stems and leaves but all parts of the plant can cause toxicity. Links to dry weather information note.	Yes	2018 Q3
Nasal lesions	There were two cases of nasal lesions investigated in sheep this quarter, with varying findings. There may be an initial insult, as yet unidentified, involved in these cases, with the following potentially representing the secondary stages of disease. Further investigation into the potential initiator has been considered.	Yes	2018 Q4
Spinal cord compression	Ongoing reports of complications following administration of vaccines high on the neck of sheep – reported to VMD	Yes	2018 Q4

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Arthritis due to <i>Streptococcus dysgalactiae</i> subsp <i>dysgalactiae</i> in weaned lambs	An unusual case of <i>Streptococcus dysgalactiae</i> arthritis was reported in spring-born lambs by APHA VIC Starcross. This organism is classically associated with joint-ill in lambs during the neonatal period. In addition, <i>Anaplasma phagocytophilum</i> DNA (the causative agent of tick-borne fever) was detected by PCR in the spleens of both lambs. It was, therefore, likely that the immunosuppression as a result of infection with this organism had contributed to the outbreak of joint-ill, and may explain why older lambs were affected in this case.	Yes	2018 Q4
Ovine Pulmonary Adenomatosis in young sheep	Ovine Pulmonary Adenomatosis (OPA) has recently been diagnosed in 4- and 7-month-old sheep.	Yes	2018 Q4
Adverse reaction following injection of moxidectin	A macrocyclic lactone injection had been administered into the neck and within five minutes of injection, the ewe developed respiratory distress, became recumbent and died. While similar changes are seen with pulpy kidney disease, the lesion distribution was very different, and a key feature in this case is the history, and the pathological pattern of change is identical to that seen previously in animals found collapsing and dying, associated with inadvertent intra-vascular (arterial) macrocyclic lactone injection.	Yes	2019 Q1
Systemic Mannheimiosis with emphysematous abomasitis	An emphysematous abomasitis was found in a one-month-old lamb, which also had fibrinous peritonitis and pneumonia. <i>Mannheimia haemolytica</i> was isolated from the lungs, peritoneum and the abomasum, and histological examination confirmed <i>M. haemolytica</i> involvement in the abomasitis. <i>Clostridium perfringens</i> was also isolated and was likely contributing to the emphysema seen.	Yes	2019 Q1
Diaphragmatic lesions and fatal haemorrhage in Texel sheep	A published Veterinary Record case report involved a collaboration between five different post-mortem providers in England and Scotland, who worked together on the publication based on 12 Texel sheep presented for PME between July 2015 and December 2017. All of the animals had diaphragmatic lesions, with or without thoracic haemorrhage.	Yes	2019 Q1
Lameness due to rickets	SRUC Veterinary Services investigated a number of flocks in South West Scotland experiencing lameness, swollen joints, stiffness of the limbs and angular deformities in large numbers of Scottish Blackface lambs between 7 and 12 months of age. This was diagnosed as rickets due to hypovitaminosis D. Rickets may be an under-recognised welfare and production problem in Scottish sheep, particularly in growing lambs that receive no supplementary food and receive little natural UVB radiation during winter months. vetrecordcasereports.bmj.com/content/8/1/e001008	Yes	2019 Q1 See link
Inhalation of copper-containing drench	SRUC Veterinary Services investigated two flocks experiencing deaths in young lambs soon after handling for routine drenching and vaccination. In both cases, histopathology detected multifocal airway necrosis, typical of acute chemical injury, and consistent with inhalation of a copper-containing drench. Mineral drench inhalation is an increasingly recognised complication of dosing young lambs. A small number of cases are reported each year, which highlights the importance of using the correct technique. Consideration should be given to planning management tasks carefully. In many of these cases, lambs have undergone multiple procedures, suggesting that this increases the risk of inhalation. veterinaryrecord.bmj.com/content/185/10/296.full	Yes	2019 Q2 See link

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Outbreaks of unusual skin lesions in sheep	Unusual skin lesions affecting approximately 50% of a group of 400 yearling Romney rams were reported in July. No bacteria of the genus <i>Treponema</i> , <i>Dichelobacter</i> or dermatophilosis were identified by laboratory testing; bacterial cultures yielded staphylococcal and streptococcal organisms; testing for poxvirus infection was negative. The cause of these skin lesions was unclear, although all of the affected rams had been held on ground with stemmy ryegrass. The affected rams were separated and their skin lesions improved over several weeks.	Yes	2019 Q2
Texel cervical myelopathy	Cervical myelopathy was diagnosed by Bristol University in a yearling Texel ram submitted with a one-week history of ataxia and weakness in all four limbs. No gross lesions were seen in the brain or spinal cord but histopathology identified changes typical of the condition, including Wallerian degeneration of the lumbar spinal cord. This condition occurs typically as a result of a compressive spinal cord lesion caused by fatty projections into the spinal canal.	Yes	2019 Q2
Adverse reaction moxidectin	A ewe developed respiratory difficulty soon after receiving 2% moxidectin injection into the neck, and then became recumbent and died. Other ewes were reported to become slightly ataxic following injection. Histopathology of the brain revealed acute cerebral vasculopathy, associated with oedema, which is identical to the pattern of change seen previously, following inadvertent intravascular moxidectin injection. The data sheet states that moxidectin 2% should be injected to the subcutaneous tissues of the ear, which had not occurred in this case.	Yes	2019 Q2
Monepantel resistance in sheep	Monepantel resistance has been confirmed on a mixed livestock and arable farm in Cornwall. Resistance was confirmed in all four classes of wormer on this farm. Heavy reliance on anthelmintic treatments appears to have been the reason behind the rapid development of resistance to a novel molecule on this farm. Land management has also played a part, with lambs weaned onto the same block of land in repeated batches throughout the season, and the use of the 'dose and move' strategy will have accelerated the development of resistance in the worms on this farm.	Yes	2019 Q3
Angular limb deformities	A nutritional issue and/or endoparasitism leading to abnormal bone development were considered as the most likely differentials for the angular limb deformities. Advice was given on future monitoring of parasitic challenge, anthelmintic use, stocking density, nutrition of ewes and growing lambs.	Yes	2019 Q3
Skin lesions on the heads of sheep	There were five cases this quarter of sheep with swollen heads or with skin lesions on the ears, caused by photosensitisation or cellulitis as a result of a hepatopathy, cobalt deficiency or with an undetermined cause. In cases with head swelling, Bluetongue is an important differential and should be reported to APHA.	Yes	2019 Q3
Abomasal emptying defect in ewes	The aetiology of this generally fatal disease is still unknown. It has been observed predominantly in Suffolk sheep. There has been speculation about possible dysautonomia associated with unknown environmental toxins similar to grass sickness in horses but no cause has so far been identified. Interestingly, the affected farm has not had any similar cases in previous years.	Yes	2019 Q3
Compressive cervical myelopathy of Texel sheep	This condition has previously been described and continues to be identified by APHA sporadically. To date, the aetiology and pathogenesis have not been fully elucidated.	Yes	2019 Q4

Disease threat	Brief summary	Confirmed in GB	Quarterly report
Footrot vaccination reaction in a ewe	<p>The most likely explanation for the clinical signs and post-mortem findings was a 'reactivation' of the previous year's vaccine reaction, and infection tracking around the spinal cord. The enteritis seen in both necropsies may have been 'shock gut' in response to the vaccine reaction and infection. The case was reported to the VMD by the private vet as a suspect adverse reaction, and a review of vaccination technique was undertaken.</p>	Yes	2019 Q4
Poisoning by <i>Pieris</i>	<p><i>Pieris</i> sp. are toxic to both animals and humans, due to grayanotoxins that bind to sodium channels of cardiac and skeletal muscle and nerve cells. The toxic dose of fresh leaves is reported to be 0.1–0.6% of body weight for ruminants, equating to about 30–180 grams of fresh leaves for a 30 kg lamb. Advice was given to check field margins for these plants or for dumping of garden waste. Since the lamb also had a very high worm egg count, indicating a significant gastrointestinal worm burden, worming of the rest of the group with an appropriate anthelmintic was recommended.</p>		2019 Q4

Appendix 2: Industry data

Table 20. Summary of the number of confirmed cases of transmissible spongiform encephalopathy (TSE) in sheep each year in Great Britain

Year	Passive		Active	
	Classical	Atypical	Classical	Atypical
1993	325	0	0	0
1994	235	0	0	0
1995	253	0	0	0
1996	459	0	0	0
1997	507	0	0	0
1998	499	0	0	0
1999	597	0	0	0
2000	568	0	0	0
2001	296	0	0	0
2002	403	0	23	18
2003	379	0	63	52
2004	307	0	28	16
2005	178	3	43	22
2006	97	3	44	47
2007	10	2	23	31
2008	1	0	7	10
2009	3	0	5	25
2010	0	0	1	19
2011*	44	0	5	22
2012	0	0	2	28
2013	0	1	3	16
2014	0	0	0	10
2015	0	0	2	15
2016	0	0	0	13
2017	0	0	0	12
2018	0	0	0	16
2019	0	0	1	6
2020	0	0	0	8

The number of animals tested by active surveillance varies each year according to EU requirement; this in turn affects the number of positive cases detected.

*42 out of the 44 classical positive passive cases were from a single flock.

Source: PHE. Data valid to 31 May 2020

Table 21. UK red meat production, 2015–2019 ('000 tonnes)

Year	Beef and veal	Mutton and lamb	Pork	Total red meat production	% of production sheep meat
2015	885	302	900	2,087	14.4
2016	915	291	919	2,125	13.7
2017	905	299	903	2,107	14.2
2018	898	289	928	2,116	13.7
2019	914	307	960	2,182	14.1

Source: Defra

Table 22. Proportion of liveweight and deadweight sheep marketing, Great Britain

Year	Liveweight (%)	Deadweight (%)
1997	66.1	33.9
1998	60.3	39.7
1999	55	45
2000	56.2	43.8
2001	12.6	87.4
2002	29.8	70.2
2003	47	53
2004	51.6	48.4
2005	47.3	52.7
2006	45.3	54.7
2007	45.8	54.2
2008	54.7	45.3
2009	57.1	42.9
2010	58	42
2011	57.9	42.1
2012	57.8	42.2
2013	57.7	42.3
2014	57.4	42.6
2015	55.7	44.3
2016	56.5	43.5
2017	54.1	45.9
2018	52.4	47.6

NB: 2019 data not available at the time of writing

Source: AHDB

Table 23. Lamb exports (tonnes – shipped weight)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total mutton and lamb	8,9057	96,386	94,734	103,710	101,954	793,72	78,108	89,821	83,164	95,052
From EU	84,915	90,552	82,464	86,073	86,315	75,338	74,855	84,383	79,105	89,540
From the rest of the world	4,142	5,834	12,270	17,637	15,639	4,034	3,253	5,438	4,059	5,512
France	57,495	57,643	52,335	53,634	50,634	42,682	40,332	40,848	35,573	37,443
Germany	5,188	8,396	8,923	10,157	9,847	9,662	10,880	14,086	15,248	19,395
Ireland	4,735	7,949	5,642	4,917	8,125	7,311	7,695	9,208	9,341	10,930
Belgium	8,491	6,208	6,203	6,357	7,311	6,523	6,569	7,677	7,674	8,500
Netherlands	1,273	1,808	1,927	3,524	2,447	2,468	3,397	5,348	5,125	6,440
Italy	5,043	6,199	4,867	4,418	4,726	4,063	3,296	3,729	3,397	4,179
Hong Kong	379	1,527	7,337	13,062	11,442	1,846	2,093	3,725	2,701	1,834
Jordan									383	1,328
Austria	725	722	758	833	877	790	649	824	585	800
Portugal	1,119	663	848	648	512	552	595	1,166	1,010	770
Ghana	524	156	459	1,073	708	639	216	537	395	406
Spain	678	496	403	654	777	493	484	487	472	406
Kuwait									24	330
Denmark	69	289	417	627	566	374	359	406	259	239

Source: AHDB, IHS Maritime & Trade- Global Trade Atlas®, HMRC

Table 24. British wool production 2015–2019

Clip year	Total production (million kg)	Average clip value (p/kg)	Average sale value (p/kg)	Sale value (£ million)
2015	29.0	85	129.4	37.5
2016	29.3	72	115.3	33.8
2017	28.9	60	101.4	29.3
2018	27.2	60	100.1	27.2
2019	26.7	32	Unknown	Unknown

Source: British Wool

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Glossary

AD	AD, anthelmintic class 4
AFBNI	Agrifood and Biosciences Institute of Northern Ireland
AHDA	Animal Health Distributors Association
AHDB	Agriculture and Horticulture Development Board
AHSGB	Animal Health Surveillance Governance Board
AHWBE	Animal Health and Welfare Board for England
AHWF	Wales Animal Health and Welfare Framework
AIC	Agricultural Industries Confederation
AIMS	Association of Independent Meat Suppliers
AMBP	Animal Medicines Best Practice
AMR	Antimicrobial resistance
AMTRA	Animal Medicines Training Regulatory Authority
APHA	Animal and Plant Health Agency, formerly AHVLA and VLA
APHIS	Animal and Public Health Information System
ARAMS	Animal Reporting and Movement Service
AWC	Animal Welfare Council, formerly Farm Animal Welfare Committee
BBSRC	Biotechnology and Biological Sciences Research Council
BCMS	British Cattle Movement Service
BCS	Body Condition Scoring
BD	Border Disease
BMPA	British Meat Processors Association
BRC	British Retail Consortium
BSDA	British Sheep Dairying Association
BSE	Bovine Spongiform Encephalopathy
BTV	Bluetongue Virus
BVA	British Veterinary Association
BVD	Bovine Viral Disease
BZ	Benzimidazoles, anthelmintic class 1
CAP	Common Agricultural Policy
CCIR	Collection and communication of inspection results
CCN	Cerebrocortical Necrosis
CCPs	Critical Control Points
CCR	Central Points of Recording
CHAWG	Cattle Health and Welfare Group
CLA	Caseous Lymphadenitis

CODD	Contagious Ovine Digital Dermatitis
COVID-19	Coronavirus disease 2019
CPR	Central Points of Recording
CTS	Cattle Traceability System
CVO	Chief Veterinary Officer
Defra	Department for Environment, Food and Rural Affairs
DAERA	Department of Agriculture Environment and Rural Affairs
DD	Digital Dermatitis
DM/ha	Dry Matter per Hectare
EAE	Enzootic Abortion of Ewes
eAML2	Electronic pig movement licence service
EBV	Estimated Breeding Value
EID	Electronic Identification
EMA	European Medicines Agency
EMA category A	European Medicines Agency Category A (“Avoid”) includes antibiotics that are currently not authorised in veterinary medicine in the EU. These medicines may not be used in food-producing animals and may be given to individual companion animals only under exceptional circumstances
EMA category B	European Medicines Agency Category B (“Restrict”) refers to quinolones, 3rd- and 4th-generation cephalosporins and polymyxins. Antibiotics in this category are critically important in human medicine and their use in animals should be restricted to mitigate the risk to public health
EMA category C	European Medicines Agency Category C (“Caution”) covers antibiotics for which alternatives in human medicine generally exist in the EU, but only few alternatives are available in certain veterinary indications. These antibiotics should only be used when there are no antimicrobial substances in Category D that would be clinically effective
eMB	Electronic Medicine Book
eMH	Electronic Medicine Hub (for cattle and sheep)
EU	European Union
FAWC	Farm Animal Welfare Committee (renamed the Animal Welfare Committee in 2019)
FAWL	Farm Assured Welsh Livestock
FEC	Faecal Egg Count
FECRT	Faecal Egg Count Reduction Test
FHC	Flock Health Club
FSA	Food Standards Agency
FSCC	Fallen Stock Collection Centre
FUW	Farmers Union of Wales
GB	Great Britain
HCC	Hybu Cig Cymru – Meat Promotion Wales, levy board representing the red meat industry in Wales
HP-CIA	Highest Priority Critically Important Antibiotics
IAAS	Institute of Auctioneers and Appraisers for Scotland
IRM	Livestock Identification Registration and Movement, ScotEID Database System

IVM	Ivermectin
iSAGE	Innovation for Sustainable Sheep and Goat Production in Europe
JSRV	Jaagsiekte Sheep Retrovirus
KPI	Key Performance Indicators
LAA	Livestock Auctioneers Association
LIP	Livestock Information Programme
LIS	Livestock Information Service
LMC	Livestock and Meat Commission
LV	Levamisole, anthelmintic class 2
MAP	<i>Mycobacterium avium subspecies paratuberculosis</i>
ML	Macrocyclic Lactose, anthelmintic class 3
MOX	Moxidectin
MV	Maedi Visna
NAAC	National Association of Agricultural Contractors
NADIS	National Animal Disease Information Service
NIBL FQAS	Northern Ireland Beef and Lamb Farm Quality Assurance Scheme
NSA	National Sheep Association
NFSCo	National Fallen Stock Company
NFU	National Farmers Union of England
NFUS	National Farmers Union of Scotland
NI	Northern Ireland
NOAH	National Office of Animal Health
NSA	National Sheep Association
OJD	Ovine Johne's Disease
OP	Organophosphate
OPA	Ovine Pulmonary Adenocarcinoma
PCU	Population Corrective Unit, a unit of measure which takes into account the animal population as well as the estimated weight of each particular animal at the time of treatment with antibiotics
PGE	Parasitic Gastroenteritis
PGI	Protected Geographical Indications
PHE	Public Health England
p/kg	Pence per kilogram
PME	Post-Mortem Examination
PPR	Peste des Petits Ruminants
PSGHS	Premium Sheep and Goat Health Scheme
QMS	Quality Meat Scotland, levy board representing the red meat industry in Scotland
RDPE	Rural Development Programme for England
RAMA	Registered Animal Medicines Advisor (previously called Specifically Qualified Persons – SQPs)

RHA	Road Haulage Association
RH&W	Ruminant Health and Welfare, established in 2020 replacing both SHAWG and CHAWG
ROI	Republic of Ireland
RMDP	Red Meat Development Programme
RTA	Red Tractor Assurance
RSPCA	Royal Society for the Prevention of Cruelty to Animals
RUMA	Responsible Use of Medicines in Agriculture Alliance
SAGG	Sheep Antibiotic Guardian Group
SAOS	Scottish Agricultural Organisation Society
SBV	Schmallenberg Virus
SCA	Specialist Cheesemakers Association
SCC	Somatic Cell Counts
SCOPS	Sustainable Control of Parasites in Sheep
Scottish SPCA	Scottish Society for the Prevention of Cruelty to Animals
SHAWG	Sheep Health and Welfare Group
SI	SI, anthelmintic class 5
SMART	Specific, Measurable, Achievable, Realistic and Timebound objectives
SMS	Scrapie Monitoring Scheme
SONAAR	Scottish One Health Antimicrobial Use and Antimicrobial Resistance
SQP	Specifically Qualified Person, recently renamed to Registered Animal Medicines Advisors (RAMA)
SRLV	Small Ruminant Lentiviruses
SRUC	Scotland's Rural University
SRUC VS	Scotland's Rural University Veterinary Services
SVS	Sheep Veterinary Society
TCBZ	Triclabendazole
TDUG	Traceability Designer User Group, an independent industry group guiding the development of the Livestock Information Programme
TSE	Transmissible Spongiform Encephalopathy
UFU	Ulster Farmer's Union
UK	United Kingdom
VARRS	Veterinary Antimicrobial Resistance and Sales Surveillance
VIC	Veterinary Investigation Centre
VHWP	Veterinary Health and Welfare Plan
VIDA	Veterinary Investigation Diagnosis Analysis
VIO	Veterinary Investigation Officer
VMD	Veterinary Medicines Directorate



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