Animal & Plant Health Agency

SRUC

Great Britain small ruminant quarterly report

Disease surveillance and emerging threats

Volume 24: Quarter 3 – July to September 2021

Highlights

Contents

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the third quarter of 2021, July to September.

It contains analyses carried out on disease data gathered from APHA, SRUC Veterinary Services division of Scotland's Rural College (SRUC) and partner post-mortem providers and intelligence gathered through the Small Ruminant Species Expert networks.

In addition, links to other sources of information, including reports from other parts of the APHA and Defra agencies, are included.

A full explanation of how data is analysed is provided in the annexe available on GOV.UK.

Issues and trends

APHA's Scanning Surveillance Network in England and Wales

The APHA's post-mortem examination and diagnostic testing service provides a major component of the Great Britain scanning surveillance network. The network works closely with vets and farmers to detect and investigate new or re-emerging disease and diagnose endemic diseases in farm animals.

Key points about accessing PME in APHA's scanning surveillance network:

- each PME Provider has an assigned area as shown in colour on the APHA disease surveillance map
- within each assigned area, the hatched area shows where premises are eligible for free carcase collection delivery of animals to the PME site
- premises within non-hatched areas need to arrange to deliver animals themselves
- The postcode search tool on the Vetgateway identifies and provides contact details for the allocated PME provider and indicates if the premises is eligible for free carcase collection
- this is based on the postcode of the premises from where an animal is to be submitted rather than a veterinary practice
- to arrange a PME, the vet calls the relevant PME provider to speak to the duty vet

More information about APHA's scanning surveillance and diagnostic services is available on Vet Gateway.

Weather

In general the summer months have had lower than average rainfall (See figure 1) and it has been warmer than average (See figure 2).

In July 2021, the UK mean temperature was 16.6 °C, which is 1.5 °C above the 1981 to 2010 long-term average the fifth warmest July for the UK in a series from 1884.

In September 2021, the UK mean temperature was 14.7 °C, which is 2.1 °C above the 1981 to 2010 long-term average and ranks it as the second warmest September in a series from 1884.

With COP 26 convening in Glasgow during November, minds are focussing on climate change and the impacts of global warming. There is not only extensive debate about the role livestock play in methane emissions but also about the role livestock farming plays in carbon sequestration.

However, what is clear is that a healthy and efficient livestock industry is a vital part of sustainability in these changing times.

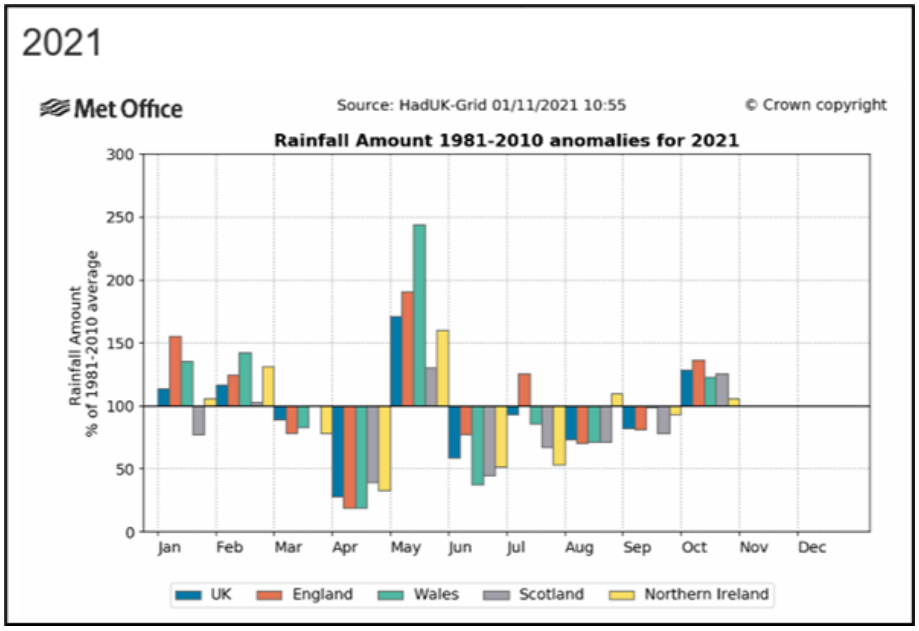

Figure 1: rainfall amount 1981 to 2010 anomalies for 2021

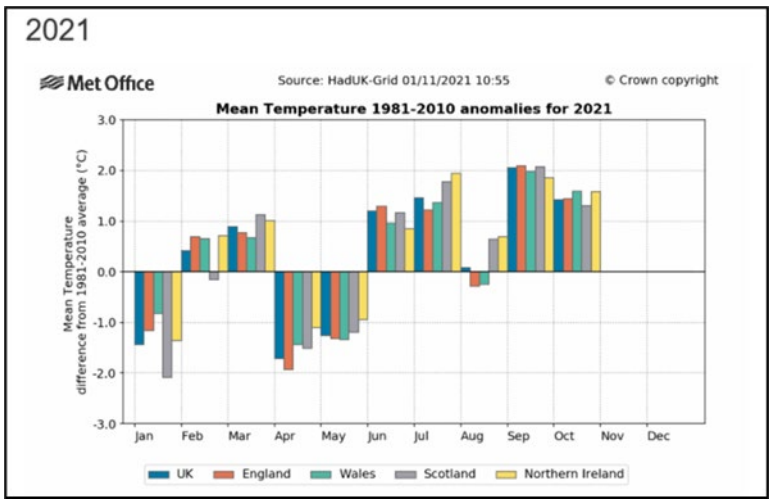

Figure 2: mean temperature 1981 to 2010 and anomalies for 2021

Industry

Through quarter three, farmgate prices continued to be strong, trending above comparisons to the same period in earlier years. Average liveweight prices stayed largely above the 200 pence per kg mark. Slaughter was significantly lower for both lambs and ewes.

Over 600,000 fewer lambs came forwards, while 75,000 fewer ewes were recorded in Defra's slaughter figures. This low kill level was somewhat surprising considering the size of the breeding flock in December 2020, and the fair lambing conditions.

Exports have continued to be hampered by the additional trade friction experienced post-Brexit. Just short of 19,000 tonnes of sheep meat was exported during quarter three, 20% less year-on-year.

Import volumes have continued to be lower too, driven by both the challenging freight market conditions and China continuing to offer an attractive market. Import volumes for the quarter totalled 10,000 tonnes.

Rebecca Wright, AHDB

Unusual diagnoses

Tuberculosis in sheep

Mycobacterium bovis (M. bovis) causes tuberculosis (TB) infection in cattle and other mammals.

Sheep can be infected with M. bovis, can develop lesions and clinical signs of TB and act as spillover hosts. In other words, sheep can become infected only when the challenge level is relatively high, and they do not usually sustain the infection within their own populations in the absence of infected cattle or a wildlife reservoir.

This does not mean that, if infected, sheep cannot occasionally transmit the disease to other animals and humans, such as, some of them may act as amplifier hosts.

Sheep are generally identified as infected with TB at the slaughterhouse inspection. Food Standards Agency (FSA) Operations Group will collect and submit samples to the Animal and Plant Health Agency (APHA) laboratories if lesions suspected of being TB are detected in the carcass.

Sheep may also be suspected of being infected with M. bovis during a postmortem examination.

There is no statutory routine surveillance and control programme for TB in sheep in Great Britain at present.

However, APHA will make use of its statutory powers for the control of TB in non-bovine farmed animals under The Tuberculosis in Animals (England) Order 2021 (and equivalent statutory instruments in Scotland and Wales) to apply movement restrictions and require live testing of sheep if M. bovis infection is strongly suspected or confirmed in a sheep flock.

TB in sheep is a notifiable disease in Great Britain, consequently, there is a legal obligation on flock owners and veterinary practitioners to report suspected clinical cases of TB in sheep and any findings suggestive of TB in the carcasses of sheep to APHA as soon as possible.

If TB is suspected in a sheep flock, then the flock is subject to movement restrictions. If the disease is then confirmed, then the flock may be subjected to tuberculin skin testing at 60-day intervals, similar to cattle.

A risk assessment is performed and if the affected sheep were in a defined group then it may be deemed appropriate to only test the sheep in the affected group rather than the whole flock.

Find more information on how to deal with TB in non-bovine animals on GOV.UK.

A small number of sporadic cases of *M. bovis* infection are diagnosed and confirmed by bacteriological culture every year in sheep. Usually in regions of Great Britain, where bovine TB is endemic in cattle and wildlife reservoirs.

Defra routinely publish statistics on cases of TB in non-bovine species in Great Britain based on information collated by APHA (last updated on 27 September 2021)

During the first three quarters of 2021, there were nine incidents in sheep investigated two of which were following diagnostic postmortem examination. Six incidents were negated following cultures, one incident was positive, and two cases are awaiting culture results.

The TB Advisory Service (TBAS) exists to provide crucial support and advice to those affected by TB on their holdings. This has historically been for cattle holdings and only within the High and Edge areas of England.

Recently the TBAS remit has been extended to cover the whole of England and now also includes goat holdings.

Tuberculosis in a large sheep flock

Three ewes were submitted to Shrewsbury Veterinary Investigation Centre (VIC) for examination, following issues with acute onset respiratory disease and lethargy.

Approximately 40 sheep had been lost within the previous three-month period, from a flock of 1200 ewes.

Ewe 1 had four foci, approximately 1 to 2cm diameter of fibrotic capsules with a caseonecrotic centre in the liver, spleen (see figure 3), throughout the lungs and in the broncho-mediastinal lymph nodes.

Ewes 2 and 3 showed evidence of fatty liver, reduced feed intake and diffusely congested lungs, and biochemical testing confirmed hypocalcaemia.

Histopathology in Ewe 1 identified multifocal chronic granulomatous pneumonia, hepatitis, splenitis and lymphadenitis. Ziehl-Neelsen staining confirmed the presence of a suspected Mycobacterium species, and culture for Mycobacterium bovis was positive.

This case was referred to APHA field colleagues for further investigation.

Figure 3: lesions in spleen of sheep with TB

Tuberculosis in a pet sheep

In a second case, an adult wether was submitted to APHA VIC Starcross for investigation, following a month-long history of weight loss and a purulent abscess on right side of the neck, which had failed to resolve with antibiotic treatment.

A severe purulent abscess was found in the right neck area and in the soft tissues surrounding the larynx, which appeared to originate from infection of the tonsillar crypt. A previous drenching gun injury could have been the potential origin of infection.

However, there were no lesions or scarring on the laryngeal orpharyngeal mucosa or hard palate to suggest previous trauma.

Multifocal, variably sized, discrete pale lesions with a granular centre were scattered throughout the spleen, liver parenchyma and throughout the cortices of both kidneys. The bronchial lymph nodes were massively enlarged and firm. On the cut surface the lymph node parenchyma had been replaced by caseous to purulent gritty material.

These signs raised suspicion of TB and samples were submitted for TB culture.

No bacteria were isolated from routine cultures taken from the neck abscess, liver, lung or tonsil.

M. bovis is a slow growing bacterium and APHA use several different selective culture methods to maximise the chances of growing M. bovis and it will usually take a minimum of 6 to 8 weeks before the organism is isolated, followed by another two weeks to complete molecular fingerprinting (whole-genome sequencing).

Histopathology in this case subsequently identified neoplastic infiltration of all submitted tissues with cellular features characteristic of squamous cell carcinoma (SCC).

SCC is an uncommon neoplasm in sheep and widespread metastasis of SCC, as seen here, is uncommon generally. In this case the M. bovis culture continues as a routine and results are not expected until December 2021.

Ovine Herpesvirus 2 (OHV2) and Malignant Catarrhal Fever

APHA have recently seen three separate sheep cases, where histopathology has identified multisystemic vasculitis associated with ovine herpesvirus 2 (OHV2). Colleagues in Ireland have also reported two similar cases, which are undergoing further investigation.

Two of the APHA cases were lambs around three months of age and one was a shearling. One had been submitted as part of an investigation into respiratory disease in lambs and this lamb was pyretic and had crusting nasal discharge.

The shearling was in poor condition and had been ill for five days before dying and the other lamb was found dead.

All three had severe cranioventral bronchopneumonia and generalised lymphadenomegaly. Additionally, the shearling had multifocal haemorrhages in the abdomen and meninges.

Histopathology revealed vasculitis in multiple tissues examined, characterised by segmental to circumferential infiltration of the vessel walls by lymphocytes and macrophages and fibrinoid deposition.

OHV2 DNA was detected in spleen in all cases by Real Time Polymerase Chain Reaction (RT PCR), with a low cycle threshold value indicating a high viral load consistent with active viral replication. In-situ hybridisation (ISH), performed at the University of California, provided additional evidence that vasculitis was associated with OHV2 (Pesavento and others 2019a).

Pneumonic bacteria and mycoplasmas were detected in lung from each and RTPCR for Border disease virus was negative.

It is generally agreed that sheep are the adapted host for OHV2, and that the virus infects sheep sub clinically, with MCF occurring only in clinically susceptible species like cattle. Systemic necrotizing vasculitis, as seen here and reported elsewhere in sheep bears

resemblance to the vascular lesions characteristic of MCF in clinically susceptible species. However, in sheep, detection of OvHV-2 DNA by PCR can be difficult to interpret. A series of cases in sheep with vasculitis attributed to OHV2 have also been described (Pesavento and others 2019b).

It remains unclear as to what causes this otherwise endogenous, persistent, and clinically innocuous virus to produce clinical disease and vascular lesions in the adapted ovine host. All three of the cases here had severe bacterial bronchopneumonia.

Illness or immune suppression might lead to uncontrolled viral replication in the ovine host and other unknown host, or viral genetic factors may be involved.

Regardless, it is important to consider OvHV-2 amongst the differential diagnoses in sheep presented with multisystemic vasculitis and cases have previously been described in Great Britain (Gaudy and others 2012).

Salmonella Typhimurium infection resulting in ewe deaths

Salmonella Typhimurium phage type 104 was identified in a 1000-ewe flock in Powys where ten ewes had died unexpectedly over two weeks. Some were reported to show neurological signs before they died.

A private veterinary surgeon (PVS) postmortem examination identified marked changes of the intestinal mucosa and greatly enlarged mesenteric lymph nodes. Ill thrift was reported in some of the lambs.

An advisory farm visit was carried out by an APHA Shrewsbury Veterinary Investigation Officer (VIO) and the investigation suggested purchased sheep as the probable source of infection. Cases have since declined and no further action was required.

Progressive ataxia in Beulah Speckled Face ewes

A three year old ewe was submitted to APHA Carmarthen VIC to investigate the cause of progressive ataxia affecting five out of 80 Beulah Speckled Face sheep over the last two years. Clinical signs were mainly noted when the affected sheep were moved.

The ewe submitted was unable to keep up with the flock, losing balance, falling to one side and then struggling to stand.

Ataxia was first noted 4 to 5 months previously and had progressively worsened. Affected ewes generally stayed in good body condition until the signs became more severe. All affected ewes were pure, homebred Beulah Speckled Face of various ages. It is currently unknown if they all shared a common sire.

On clinical examination the ewe was able to weight-bear unaided when standing still. During movement ataxia appeared to affect both front and hind legs. The ewe fell to the left, became recumbent and then struggled to stand. The cause of the neurological signs was not apparent on gross postmortem examination.

The ewe was in good body condition and had been eating well prior to submission. Serology for Maedi visna was negative.

Histopathology detected lesions in the spinal cord, all peripheral nerves and brain. Lesion distribution in the spinal cord raised the possibility of a focal compressive lesion (which may be intermittent) in the lower cervical region. The chronicity of the change had resulted in Wallerian degeneration within the peripheral nerves. Lesions at this site may be developmental, neoplastic, or inflammatory in nature.

Wobbler syndrome presents with very similar clinical and pathological changes and can be challenging to identify grossly. Changes within the cerebellum may have been associated with excitotoxic damage secondary to the spinal cord lesions. No references to Wobbler syndrome in Beulah Speckled Face ewes could be found in a literature search.

Compressive cervical myelopathy has been described in young Texel and Beltex sheep (Penny and others 2007) and there may be a hereditary component to this condition in these breeds.

Submission of further affected animals would be required to assess if the aetiology is similar. It was also advised to try and determine the lineage of the affected sheep if possible.

An unusual manifestation of Listerial infection

Following on from the case of listerial myelitis diagnosed by the University of Bristol last quarter, a similar case was diagnosed by APHA Penrith VIC.

On this occasion progressive hindlimb weakness, leading to paresis and the inability to stand, was reported in eight animals from group of 80 lambs. Clinical disease progressed over a two-week period in lambs both housed and at pasture.

Affected lambs had normal mentation and maintained a good appetite. A typical case was euthanased and submitted. Postmortem examination was grossly unremarkable.

Histopathology identified a severe, subacute to chronic, segmental, necrotising, pyogranulomatous meningomyelitis, and neuritis with gram-positive bacilli morphologically typical of Listeria monocytogenes within the swollen axons and degenerate neurons within the lumbar spinal cord.

This confirmed a diagnosis of listerial myelitis. As discussed last quarter this is an unusual presentation for listeriosis, with lesions focussed on the sacral spinal cord, rather than the brainstem as is more usually the case. Infection at this site would suggest the hindlimbs via skin abrasions, foot disease or the tail as the route of entry.

Suspect sarcocystosis

A five-week-old lamb from a small backyard flock was submitted for postmortem examination to investigate the cause of sudden death. The lamb had been tachypnoeic four days previously but appeared to recover and was unremarkable over the following 48 hours. The lamb was then found dead on the morning of submission.

The lamb had minimal gross changes on postmortem examination, with just generalised congestion of the lower respiratory tract found at necropsy. Routine diagnostic testing was unremarkable with no bacteriological growth, and border disease and mycoplasma were ruled out.

Histology however identified a moderate to severe, subacute, eosinophilic myocarditis, which was thought to have been the cause of death in this animal. There was also an eosinophilic pneumonia, nephritis and encephalitis. A sarcocystosis was thought the likely cause of these lesions.

The prevalence of this parasite in the UK is uncertain, however it is believed common but not usually associated with clinical signs or death, with perhaps suspect lesions noted at slaughter in occasional individuals.

The parasite infects sheep through the ingestion of contaminated dog faeces, therefore, infection can be prevented by avoiding sheep contact with dog faeces and preventing farm dogs access to uncooked sheep meat. This can be difficult if public access and dog walking activities occur around the farm.

Hepatocellular carcinoma in a 2 year old ewe

A two year old ewe was submitted to investigate sporadic deaths in ewes and some lambs. The ewe had lost weight over 2 to 3 weeks but had been bright with no signs of diarrhoea. The ewe had skin ulcers on the face and legs. A 20cm by 12cm superficial mass was found in the right lobe of the liver (See figure 4).

The mass had an irregular nodular surface, and on the cut surface there was a pale-yellow central area with friable tissue and red mottled tissue surrounding and a clear line of demarcation from the normal liver. Several one centimetre diameter foci in the lungs were suggestive of metastatic spread. The skin lesions may have occurred secondary to debilitation.

Histopathology of the mass identified cells consistent with a low-grade hepatocellular carcinoma. This is a relatively uncommon tumour, and the aetiology is unknown. Naturally occurring toxic compounds, such as aflatoxins, pyrrolizidines, and nitrosamines or non-specific inflammatory insults are thought to potentially induce hepatic carcinogenesis in some cases.

Figure 4: large liver mass identified as a hepatocellular carcinoma in a ewe

Oxalate toxicosis of unknown cause in a Suffolk cross ewe

A case of suspect toxicity, resulting in renal disease, was identified in a shearling Suffolk cross ewe. This was the third to die from a group of 12 grazing an orchard. Staggering and blindness was reported.

Postmortem examination identified diffusely reddened lungs with dark tissue at the periphery, oedema of the pericardial sac and increased pericardial fluid and swollen kidneys with superficial petechial haemorrhages.

The ewe had a raised aqueous humour urea of 62.3 mmol per litre and histopathology revealed widespread renal tubular coagulative necrosis. Some of the affected tubules contained protein-rich fluid and oxalate crystals.

Potential causes of renal oxalate crystals and kidney failure include ingestion of plants that contain large quantities of oxalate salts, such as rhubarb and docks.

Previously, at APHA Shrewsbury VIC similar pathological findings were found in a group of sheep that had inadvertent access to antifreeze (ethylene glycol). Investigation by the PVS and farmer could not clearly determine the original toxic insult in this case.

A hereditary cause has also been postulated for severe oxalate nephropathy in Zwartbles sheep (Strugnell and others 2011) (Barley J. 2015).

Idiopathic vascular rupture in a Texel ram

Massive internal blood loss was diagnosed as the cause of death of a Texel shearling tup. This tup was in a group of 22, three of which had died suddenly during a ten day period.

All of the shearling tups had been together in the same group since January 2021 with no new additions to the group, all the shearlings had the same sire, and their dams were likely to be related through their sire.

At postmortem examination there was extensive free blood and large blood clots within the abdominal cavity, with extensive retroperitoneal blood clots from the caudal liver, surrounding the kidneys and into the caudal pelvic cavity (See figure 5).

The ram also had evidence of laryngeal chondritis, the right arytenoid cartilage had a creamy abscess, from which Bibersteinia trehalosi was cultured in a mixed bacterial flora.

Over the last few years, there have been reports of cases of diaphragmatic rupture and internal haemorrhage due to vascular rupture or dissecting aortic aneurysms in Texel sheep. To date, extensive investigations have been unable to link this with a connective tissue defect (Waine and others 2019).

Figure 5: extensive free blood and large blood clots within the abdominal cavity of a sheep

Changes in disease patterns and risk factors

Syndromic analysis: syndromic alerts were raised this quarter for the following diseases

Drenching gun injuries, Hypocupraemia, Maedi Visna (MV), Johnes, pneumonia not otherwise specified (NOS), Sheep Scab and Caseous Lymphadenitis.

Parasitology

Parasitic gastroenteritis (PGE)

Case reports during quarter three of 2021 continue to highlight the multi-factorial disease presentations which can be associated with trace element deficiency.

In most cases of parasitic gastroenteritis diagnosed by APHA VIC Starcross during August, trace element deficiencies were also concurrently identified. A typical submission involved poor condition and diarrhoea in a group of 60, homebred, weaned lambs. Four animals from the group had died.

Two typical cases were submitted for post-mortem examination which identified minimal carcase fat reserves, scabbing and crusting of the ears and watery intestinal contents.

Heavy worm burdens were detected on parasitology testing trichostrongyle-type egg counts (per gram) of 23,500 and 16,500 and biochemical analysis of liver tissue revealed low liver selenium levels of 0.31 mg per kg DM and 0.37 mg per kg DM (reference range more than 0.9 to 3.5 mg per kg DM).

PGE was diagnosed with concurrent cobalt deficiency in September. The carcases of three pre-weaned lambs were submitted to investigate scouring, poor condition and deaths in a group of 450 lambs at pasture with their dams. Approximately 50 lambs were affected and 10 had died.

They had been wormed one month previously with a white drench. Faecal parasitology confirmed PGE in all three lambs with trichostrongyle-type egg counts (per gram) of 450, 550 and 1,600, respectively.

Two out of the three lambs also had low liver cobalt levels of 0.04 mg per kg DM and 0.05 mg per kg DM (reference range more than0.06 mg per kg DM) indicating cobalt deficiency was also likely to be contributing to the clinical picture.

PGE Haemonchosis

Incidents of parasitic gastro-enteritis (PGE) due to Haemonchus contortus were prominent in monthly reports this quarter.

Haemonchus contortus is a parasite that is likley to be present on a large number of farms but it needs certain conditions to predominate.

The weather, and in particular warmer temperatures, can allow the larvae to survive in greater numbers than the other gastrointestinal parasites. It remains to be seen if this will become more common in Great Britain if summers become warmer. Disease can be seen in adults as well as lambs.

In the south of England and Wales this quarter, disease was diagnosed in adults, elsewhere it was diagnosed in lambs (see figure 6). It is important to assess, in the light of diagnosis in lambs, whether ewes on that holding need to be treated, as we have seen incidents followed by disease in adult ewes at lambing time.

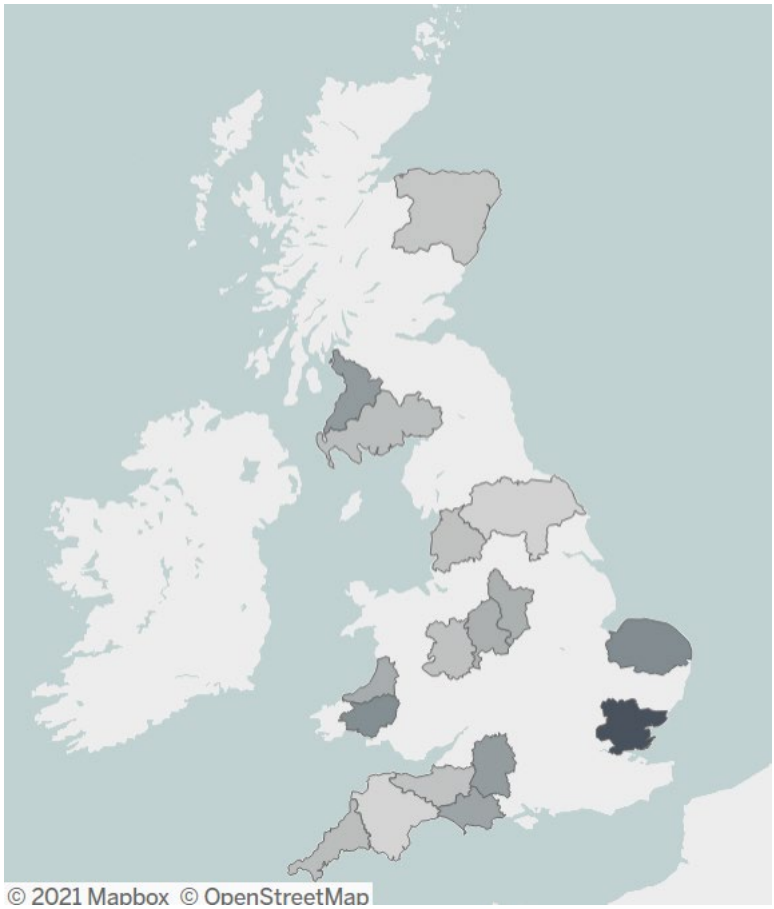

Figure 6: counties in Great Britain, where Haemonchus contortus was identified through VIDA diagnoses.

Liver Fluke

The prolonged dry hot weather at the start of the summer will have resulted in reduced snail numbers on pasture. As these are intermediate hosts for both liver and rumen fluke it is expected that the risk for disease this year will be low.

Tick-borne fever

Since spring of this year some farms in England and Wales have reported high numbers of ticks and in some cases, this has resulted in tick-borne disease issues.

A large number of lambs presented with tick pyaemia joint infections on one farm, approximately 20 out of 60 lambs were lame, with multiple joints affected and large numbers of ticks were also reported.

PCR testing of blood samples detected DNA of Anaplasma phagocytophilum, confirming tick-borne fever (TBF). TBF had not previously been recognised on this farm.

Skin disease

Yersinia pseudotuberculosis in a goat

Yersinia pseudotuberculosis was identified in purity from an abscess on the flank of an adult male goat. The most common presentation of Y. pseudotuberculosis infection in goats is enteritis however, a review article (Giannitti and others 2014) found abscessation to be the second most reported syndrome, found in 14.3% of total cases.

It is thought that stressors (such as, transport, nutrition, weather, overcrowding and concomitant disease) may be predisposing factors for clinical presentation.

It is important to note that this organism is potentially zoonotic, and can cause severe illness including fever, diarrhoea, and abdominal pain in affected humans.

The route of human infection is generally via ingestion of contaminated products and if these abscesses are lanced, they pose a risk for human infection; unless very strict biosecurity and personal hygiene measures are in place. Additionally, the organism can survive for long periods in the environment.

Ocular disease

Conjunctival swabs were submitted to investigate an ongoing issue of ocular disease in a group of 130 store lambs. Keratoconjunctivitis had affected the majority of the group, with variable response to long-acting antibiotic treatment. The problem had worsened again following gathering for shearing.

Bacteriological and molecular analysis confirmed respectively the involvement of *Moraxella* spp and Mycoplasma conjunctivae. Mycoplasma conjunctivae is considered the major primary pathogen for ovine keratoconjunctivitis (OIKC). Moraxella ovis, like other pathogens, has also been implicated with OIKC, but its role is less clear.

Clinical and farmer experience suggests that outbreaks of ovine infectious keratoconjunctivitis are very frustrating to control in sheep flocks (Williams and others 2019). Medication does not always eliminate the organisms and repeat treatments are often necessary.

Sub-clinically infected, carrier animals of M. conjunctivae appear to be the cause of repeated outbreaks in flocks. Outbreaks may be triggered by tight stocking and close head-to-head and eye-to-eye contact between sheep, such as, at feed troughs or gathering for shearing, as in this case. Outbreaks will also be prolonged if different groups of sheep are frequently mixed together.

There is no current evidence available on the efficacy and effectiveness of autogenous vaccine to prevent, or control, OIKC due to M conjunctivae.

Respiratory disease

Sheep respiratory diseases

SRUC recorded an increase in Maedi visna (MV) diagnoses during this quarter, with cases occurring in several areas with high sheep populations. MV was recorded in 12.07% of diagnosable submissions, when typically, MV diagnoses represent between 0 and 4.22% of the diagnoses.

SRUC also recorded a marked increase in diagnoses of Pneumonia NOS (no organism specified), with 22 diagnoses recorded when there are typically between 3 and 15 diagnoses during this quarter. The diagnosis increase appeared to be mostly in lowland post weaned lambs.

Ewes with Maedi visna (MV)

Preliminary results from a survey (to be published) suggest that flock prevalence has increased from those recorded in a similar survey in 2010 from 2.8 to 9.4. MV was diagnosed in only 2% of flocks that submitted adult sheep for the APHA ‘thin ewe’ enhanced surveillance project (November 2020 to May 2021).

Cases with marked pathology due to MV are fortunately unusual in the UK, and it is thought this may be due to strain variations, or differing breed responses to the disease.

As MV is an insidious chronic immunosuppressant infection, by the time disease issues are recognised in a flock, infection levels are usually widespread, and the infection may have been present for as long as approximately 10 years.

Accreditation and disease monitoring schemes for MV offer some element of control and monitoring, although these schemes are usually not cost effective for the larger commercial flocks.

APHA Thirsk VIC received three, six year old ewes, from a commercial flock of 600 crossbred ewes, submitted for postmortem examination to investigate the cause of ill thrift. The flock routinely bought-in replacement ewes.

Gross and histological lesions typical of MV were found in all three ewes, the diagnosis was further supported with positive serology results in all three.

Grossly the lungs of all ewes were heavy (ranging from 3.1 to 3.9 kg) and the lung parenchyma was generally firm and rubbery, with a dark pink, mottled appearance.

Two of the ewes had fibrous, gritty mammary tissue, which included multiple 2 cm diameter cysts. The ewes were also positive for Johne’s disease.

Ovine pulmonary adenocarcinoma (OPA)

Two flocks were identified this quarter with unusually high numbers of suspect OPA cases. When OPA is first identified in a flock, it is not uncommon for approximately 10 to 15% of adult sheep to have suspect signs.

In some more extreme cases, this can be as high as 20% of a flock. Once the disease has been identified, measures can be taken to reduce case levels and losses by 5% or less, such as:

- culling hard on body condition
- maintaining a younger flock
- managing younger ewes separate to older ewes
- carefully managing trough feeding

A hill-breed ewe was submitted for examination following the loss of approximately 15 out of 80 in the group since lambing.

A dead ewe submitted for PME was in a good to fair condition, and necropsy revealed marked consolidation of over two-thirds of the lung lobes, which on incision were found to have firm white nodular tissue throughout. Histology confirmed OPA, with characteristic neoplastic lesions in the lung tissue.

There was also evidence of a secondary acute bacterial bronchopneumonia, probably due to Mannheimia sp. The losses in this case equated to almost 19% of the group, suggesting that there had been particularly high transmission rates at some point in this group. Interestingly other breed groups of sheep on the holding were not affected.

In a second case where OPA had been diagnosed the farmer reported 105 of the flock of 400 ewes, or 26% of the flock, had died with wasting and pneumonia.

Enteric disease

Clostridium perfringens D (Pulpy kidney) in goats

There was a significant decrease in incidents of pulpy kidney diagnosed in sheep this quarter for Great Britain across both APHA and SRUC data. Case histories suggest that positive cases are generally seen in flocks that don’t vaccinate against clostridial disease.

It is a common diagnosis in goats where development of solid immunity, even with regular vaccine use, remains a challenge. Details of three cases in goats:

Case 1

A yearling Toggenburg goat from a small herd of six died, after a 36 hour history of scouring, weakness and lethargy. The herd was vaccinated against clostridial disease and had received a booster five months previously.

Postmortem examination revealed a diphtheritic enteritis suggestive of clostridial enterotoxaemia and this was confirmed by the detection of epsilon toxin in intestinal contents.

Case 2

A 2 and half year old Boer cross Saanen nanny from an unvaccinated herd died after a per acute onset of grey scour. Two other adults from the same group had died with similar rapidly progressing diarrhoea a fortnight previously, with another goat having recovered following treatment with amoxicillin.

PME findings were non-specific but included low rumen pH, diarrhoea, lung oedema and fibrinous thoracic fluid.

Clostridium perfringens alpha and epsilon toxins were identified in intestinal contents confirming clostridial enterotoxaemia, possibly predisposed by the low rumen pH. This goat also had a significant worm burden including Trichostrongylus, Teladorsagia and Haemonchus spp.

Case 3

A five month old male Boer kid which had been scouring for a few days. A previous faecal egg count had identified a significant worm burden and the animal was brought inside for treatment.

However, it continued to deteriorate and progressed from ataxia to recumbency, and it was euthanased and presented for PME. Gross findings showed enteritis and identification of alpha and epsilon toxins strongly suggested Clostridium perfringens enterotoxaemia to be the cause of the enteritis.

Visceral Listeria ivanovii infection in lambs with coccidiosis

Two, four month old finishers were submitted to investigate wasting with diarrhoea resulting in weakness and recumbency affecting 50 outdoor lambs with the loss of 30 within a week.

The animals were wormed but not vaccinated and were kept at grass supplemented with concentrates and mineral licks. The gross PME findings were consistent with wasting, dehydration and diarrhoea.

Parasitological investigation results were not significant although the recent anthelmintic treatment is likely to have played a role in this.

Histopathological examination on both lambs found mild enteric lesions and a few coccidia but their clinical significance remained unclear. Bacteriology culture isolated Listeria ivanovii from the faeces of one lamb. L ivanovii in small ruminants has been rarely detected in sites other than aborted foetuses through APHA's scanning surveillance activities.

Visceral L. ivanovii infection appears to occur in weaned lambs with gastrointestinal disease, contributing to diarrhoea and mortality (Dunnett and others 2020).

Dental disease as a cause of 'Thin Ewe' syndrome.

Several dental abnormalities were detected during the APHA Thin Ewe project and can be a cause of ill thrift and weight loss. Careful and thorough examination of affected ewes (especially at time of ewe selection) is recommended. If this does not reveal the cause then further testing, including PME should be considered**.** The following is an example of a typical case:

A three year old ewe that had been losing condition over a month was submitted. Six to seven deaths had occurred over the last year, in a group of 80 ewes, and 18 to 20 were in poor condition. The thin ewes were on creep feed and received an anthelmintic six weeks earlier. PME Findings:

- hair loss of the skin over left mandible and caudal ventral inter mandibular area
- there were three permanent incisor teeth present all on the left side surrounded by markedly retracted gums. the mid mandibles were thickened on both sides (See figure 7)
- on the left and right side, the gums were very retracted around the 2nd to 6th cheek teeth, there was feed retained between teeth (See figure 8) and some teeth were loose

It was recommended that other thin ewes in the group were examined (including watching them eating, examination of incisors and palpation of mandibles) to determine the presence or absence of dental disease.

Animals with weight loss due to dental disease should not be retained. In view of the high proportion of ewes affected by ill thrift in this group, further PME was recommended if the cause of ill thrift cannot be determined on clinical examination.

Figure 7: enlarged mandibles due to dental disease in a 3 year old ewe

Figure 8: molar teeth disease and feed retained between teeth

Reproductive disease

Border Disease Virus (BDV) and poor growth rates

Three live lambs were submitted as part of an ongoing investigation into a problem of poor growth rates in lambs born to a cohort of 37 ewes. The lambs were notably small, fine boned with domed heads and most had a patch of brown coloured fleece with ‘fluffy protruding hairs’ at the back of the neck.

Affected lambs were all born within the first 10 days of the lambing period and were from a batch of ewes that were housed during January.

Previous submissions from this farm had identified the possible involvement of Toxoplasmosis and PCR on placenta confirmed it in this group. Border disease was also suspected, but testing had so far been unrewarding. Gross examination was unremarkable in two lambs. The third lamb had focal, bilateral pink-grey consolidation of the cranial lung lobes affecting approximately 20% of the lung volume.

Infection with Border Disease Virus (BDV) was confirmed by PCR testing in two of the lambs. Histopathology of the area of ‘fluffy’ fleece of the PCR negative lamb found evidence of hypertrophy of the hair follicles consistent with those described following BDV infection in utero.

These results confirmed exposure of the ewes to BDV during pregnancy. The outcome of infection with BDV is highly dependent on the timing of infection relative to the stage of gestation and this was likely to account for the heterogeneity of the test results across all the submissions. Mannheimia haemolytica and Mycoplasma ovipneumoniae were confirmed as the cause of the pneumonia identified in the third lamb.

Systemic disease

Metabolic conditions

Hypocuprosis

Syndromic analysis indicates an increase in submissions diagnosed with hypocuprosis compared to the equivalent quarter for previous years. An increase in cases was seen in Northern England and Scotland specifically. Mainly adult sheep were involved.

Copper deficiency occurs when sheep graze pastures low in copper or high in iron, molybdenum, and sulphur. Deficiency can more typically result in swayback in the UK, poor wool quality and anaemia in Australia, and poor bone mineralization in New Zealand.

Sheep are also prone to copper toxicity with considerable breed variation with respect to copper absorption and therefore to copper deficiency and toxicity. Veterinary and nutritional advice is therefore essential before copper supplementation.

Hypocuprosis was detected in one of two live ewes submitted to Penrith to investigate the cause of weight loss. The farmer reported weight loss in up to five per cent of the flock during the last few years. Both ewes were in poor condition, had lungworm and mild to moderate parasitic gastroenteritis and one had adult liver flukes in the bile ducts.

One ewe had copper deficiency (2.2 µmol per litre, reference range 9 to 20 µmol per litre) and low levels of cobalt (0.08 mg per kg DM, reference range more than 0.6 mg per kg DM), while levels for the other ewe were within accepted range. Testing for Johne's, Maedi-Visna, Border disease and salmonellosis was negative.

It was recommended to use faecal egg counts in the rest of the group to assess the need for anthelmintic and flukicide treatment. Also, as only one of the animals was mineral deficient, to blood sample and test a cohort of animals to inform the decision of whether mineral supplementation is appropriate or not.

Injuries or illness associated with deficits in injection and dosing techniques

Whilst only low numbers of cases of injection and dosing related issues are detected every quarter some of them can be associated with significant impact**.** The suggested advice to the private veterinarian is to review the technique in question with the farmer and advise that they consider additional training.

Dosing gun injury

A four month old Texel cross lamb was presented for examination following a period of neurological disease. Five lambs were affected out of a group of 340 lambs from a 230 ewe flock. The lambs had been dosed with trace elements and anthelmintic within the previous two weeks.

Postmortem examination identified a large, elongated abscess, measuring approximately 15cm by 4cm, containing thick yellow material, which was surrounded by purulent exudate, adjacent to the oesophagus, extending from the oropharynx to the lower cervical region. The pathology was consistent with a dosing gun injury.

Advice was given including review of the drenching technique and potential euthanasia of other affected animals.

Poor injection technique causing spinal cord compression

Two freshly euthanased four-month old lambs were submitted to APHA Penrith VIC to investigate a possible adverse reaction to a foot rot vaccine. The lambs had become recumbent following vaccination ten days previously.

Vaccine was administered to 750 sheep over a period of three days. Four animals were found dead five days later at which time six recumbent sheep were housed. Treatments were attempted with amoxicillin and meloxicam. A range of ages from 2021 born lambs to older ewes were affected.

On gross post-mortem examination of both lambs there was no evidence of subcutaneous vaccine. Instead, in both lambs, there were deep paravertebral muscle lesions and focal cervical spinal cord compromise deep within the upper right neck and thick purulent material in the atlanto–axial joint of one lamb and the atlanto-occipital joint of the other.

Histopathological examination found significant changes in the paravertebral tissue and spinal cord of both lambs. There was a marked, focal, chronic, pyogranulomatous myositis and evidence of pyogranulomatous inflammation extending into the vertebral canal causing compression of the spinal cord.

Within the inflammatory lesions there were pockets of clear space, which was consistent with exogenous lipid material (such as, injected material) which had washed out during processing. These findings were consistent with suspect inadvertent deep injections of the Foot rot vaccine.

A welfare concern was raised with the submitting veterinary surgeon and a review of vaccination technique including further stockperson training was advised. Any suspect adverse reactions to medicines should be promptly reported to the Veterinary Medicine Directorate (VMD).

Urinary disease, musculoskeletal disease, nervous disease

No significant trends were identified this quarter.

Poisoning

The most recent chemical food safety newsletter has been published on GOV.UK.

For investigation of copper poisoning by the Food Standards Agency (FSA) and APHA the incident trigger is when the liver copper concentration exceeds 500 mg per kg wet matter (WM). In sheep, chronic copper poisoning can also occur when liver concentrations of copper are well below this incident trigger value. The same food safety advice is still provided.

The APHA normal reference range for liver copper concentrations in cattle and sheep is approximately 300 to 8000 µmol per kg dry matter (DM), equivalent to approximately 5 to 125 mg per kg WM.

Advice given is that copper supplementation is withdrawn from sheep where possible and additional forage provided and that a two week withdrawal period is observed. Other diagnoses of copper poisoning may be confirmed following PME but often do not meet the incident trigger criteria as stated above.

Copper toxicity was diagnosed in a two year old ram, one of six rams in a commercial lowland flock. No other rams developed clinical signs. The ram was found dead and submitted for PME.

Gross findings were typical of copper toxicity. The tissue copper concentrations were kidney 500 µmol per kg DM (reference range 0 to 787 µmol per kg DM) and liver 31,900 µmol per kg DM (reference range 314 to 7850 µmol per kg DM) and equivalent to 594 mg per kg WM.

The ram had been purchased just over a year previously and had been out at pasture prior to death. There had been no recent minerals introduced and so the source of copper was unclear but most likely related to previous concentrate feeding with liver copper loading. Copper poisoning associated with grazing clover pastures was also considered.

Centre of Expertise for Extensively Managed Livestock (COEEML)

The COEEML was developed by APHA to address potential surveillance gaps for extensively managed animals. Extensive management of livestock potentially makes regular or close inspection for disease detection more challenging.

The Centre is based at the APHA Veterinary Investigation Centre in Carmarthen, however, it is a Great Britain wide resource and forms part of the wider veterinary surveillance system operated by APHA.

Veterinary Investigation Officers from APHA VIC Carmarthen attended the Winter Fair at Royal Welsh Showground on the 29 and 30 November 2021 to promote the work of the COEEML.

Planning is underway for a COEEML conference to be held in Wales in 2022.

Transmissible spongiform encephalopathies (TSEs)

Surveillance for TSEs is carried out in the United Kingdom in animals susceptible to the disease. This includes cattle, sheep and goats. The main aim is to monitor trends in disease incidence and prevalence to evaluate the effectiveness of TSE disease controls.

There are two categories of surveillance:

Passive surveillance

This is when an animal with clinical signs suspicious of BSE or scrapie is reported to an APHA Office to be investigated. Such cases are slaughtered, and the examination of the brain determines whether the animal was affected by BSE or scrapie.

APHA has been recording and analyzing data from reported cases in cattle since the start of the BSE epidemic in 1986, and for scrapie in sheep and goats since this disease became notifiable in 1993.

Active surveillance

The UK carries out active surveillance for TSEs. The UK has:

- tested cattle since July 2001
- tested sheep and goats since January 2002
- conducted a survey in 2007 and 2008 of farmed and wild deer

Updated TSE statistics were published in October 2021:

- Goat TSE surveillance statistics
- Sheep TSE surveillance statistics

The Scrapie Monitoring Scheme rules have recently been amended temporarily to allow new members to the scheme to export to Northern Ireland. This should allow around 8,000 sheep to move the NI, currently held up due to Brexit changes. For details see our information the scrapie qualifying status.

Antimicrobial Resistance (AMR) related

Veterinary Antibiotic Resistance Sales and Surveillance (UK-VARRS) report 2020 has been published by the Veterinary Medicines Directorate (VMD)

This shows that sales of veterinary antibiotics for use in food-producing animals, adjusted for animal population, have shown a 52% decrease since 2014 and sales of Highest Priority Critically Important Antibiotics (HP-CIAs) have decreased 79% since 2014.

While usage data for sheep is not currently available there is an ambition that the Medicine Hub (launched in January 2021) will provide an independent, central repository to collate, report and compare antibiotic use at farm level for both cattle and sheep.

Further the 'Farm Vet Champions' initiative with a training and engagement programme delivered by RCVS Knowledge has the potential to embed antimicrobial stewardship into practices across the country.

In terms of resistance the results for 2020 concentrate on respiratory pathogens and include the following bacterial species: Mannheimia haemolytica, Pasteurella multocida, and Bibersteinia trehalosi from sheep.

It is however worth noting that this report has moved from reporting results as disc diffusion to the gold standard mean inhibitory concentration (MIC). MIC allows the ability to distinguish between high-level and low-level resistance.

Salmonella

The Salmonella in Livestock Production in Great Britain 2020 has been published on GOV.UK.

This annual publication provides data on reports of salmonella in livestock species in Great Britain (England, Wales and Scotland) which was collected and collated by the Department for Environment, Food and Rural Affairs (Defra).

There were 77 Salmonella isolations from sheep in 2020. Figure 9 shows the most common serovars isolated.

The most common *Salmonella* serovar to be isolated from sheep in 2020 was *S. enterica* subspecies *diarizonae* 61:k:1,5,(7) 45 times, the next most common serovars isolated were *S.* Dublin (10 isolations) and S. Typhimurium (8 isolations). The number of S. Montevideo isolations from sheep was relatively low (3 isolations).

There were single isolations of Salmonella Agama and Salmonella Newport during 2020. Prior to 2019, S. Newport, which is often associated with badgers, had not been isolated from British sheep since 2015.

Salmonella Berta was also isolated from sheep on one occasion in 2020. The main presenting sign was abortion, with 'found dead' recorded as a secondary sign.

Salmonella Berta was last recorded in sheep in Great Britain in 2004, in samples collected during an advisory farm visit following earlier detection of Salmonella.

There was also one isolation of *S.* Ohio in 2020 from a preweaned animal, with diarrhoea recorded as the primary clinical sign. Salmonella Ohio has not previously been reported from sheep in Great Britain.

There were no isolations of Salmonella reported from goats during 2020. Salmonella is infrequently isolated from goats.

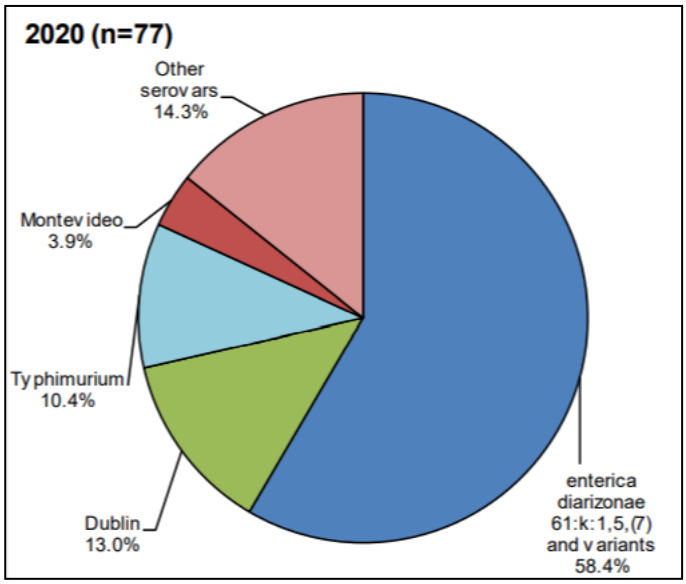

Figure 9: isolations of the most common serovars in sheep in Great Britain 2020.

Horizon scanning

Bluetongue (BTV) update

APHA no longer has access to the EU's Animal Disease Notification System (ADNS), hence we are now only using World Organisation for Animal Health (OIE) data (for mapping), and the weekly outbreak summary data published by the new EU Animal Diseases Information System (ADIS). The current BTV restricted zones are shown on the map in figure 10.

The most recent outbreaks reported in October were all in sheep with BTV 4 outbreaks in Corsica (2), Sardinia (17), Ibiza (2). Portugal reported eight outbreaks and Bulgaria reported one outbreak of BTV in sheep, but no further details are available at this point.

Canada reported one outbreak of BTV in British Columbia, with a rise in sheep mortalities around Vaseaux Lake and Okanagan Falls.

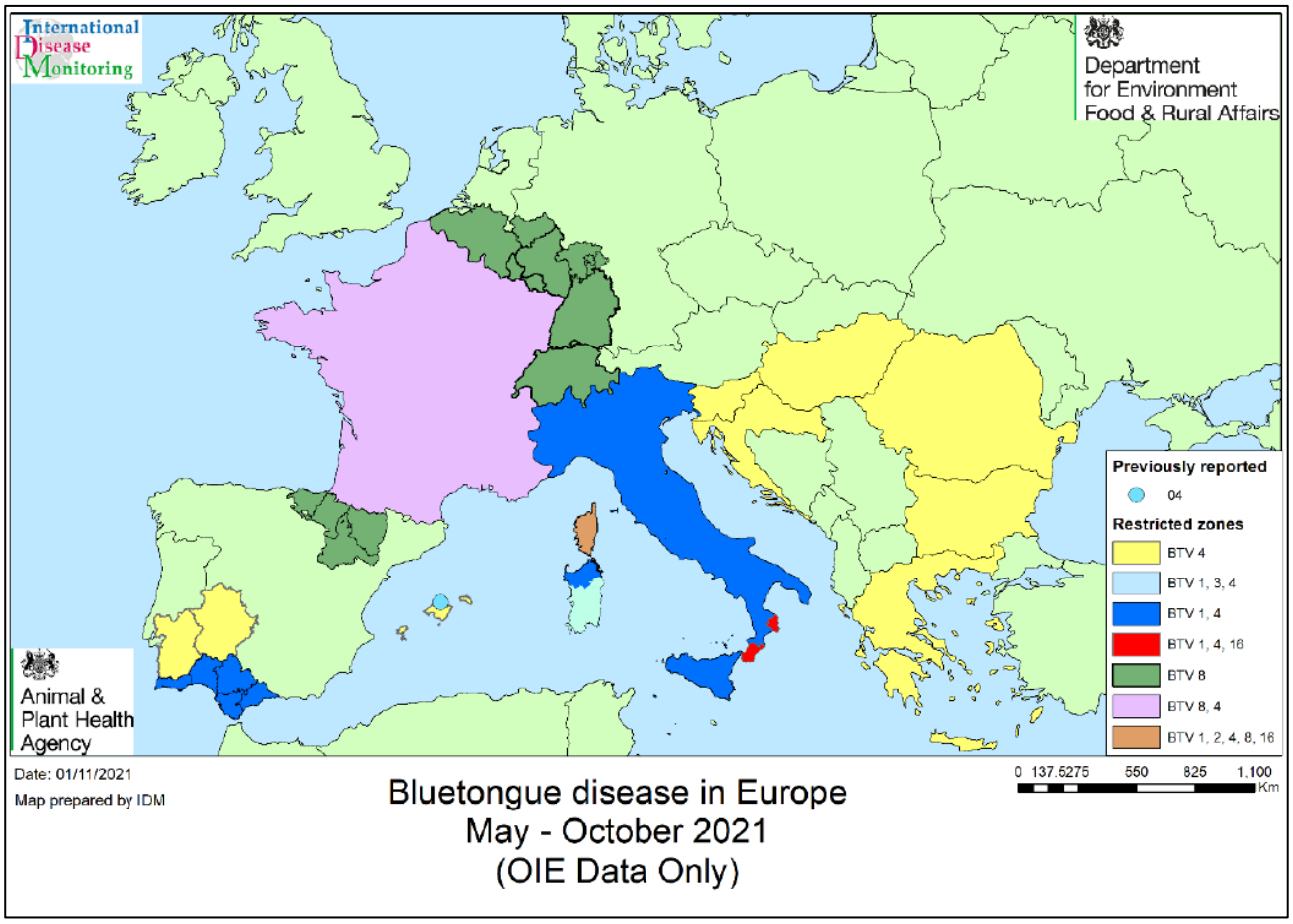

Figure 10: Bluetongue disease in Europe May to October 2021

For more information, see our BTV Outbreak Assessment on GOV.UK.

APHA have released a series of animations on Facebook and Twitter to inform keepers of BTV.

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APHA Staff

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