



Animal &
Plant Health
Agency



GB small ruminant quarterly report

Disease surveillance and emerging threats

Volume 24: Q1 – January - March 2021

Highlights

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the first quarter of 2021, January - March. 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:

<https://www.gov.uk/government/publications/information-on-data-analysis>

Issues & Trends

New Post-Mortem Providers join APHA's Scanning Surveillance Network in England and Wales

The APHA Surveillance Intelligence Unit and Surveillance and Laboratory Services Department are very pleased to announce that during January and February 2021, three additional post-mortem examination (PME) providers have joined the scanning surveillance network. These are the Universities of Cambridge, Liverpool and Nottingham.

This broadens the expertise of, and contributors to, livestock disease surveillance in England and Wales and also brings livestock premises in the areas they cover closer to a post-mortem provider.

The PME Providers therefore comprise Royal Veterinary College, Universities of Surrey, Bristol, Cambridge, Nottingham and Liverpool, the Wales Veterinary Science Centre, and SRUC Veterinary Services St Boswells that work together with the six APHA Veterinary Investigation Centres, all of which will continue their valued contribution to scanning surveillance.

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

- Each PME Provider has an assigned area as shown in colour on the map on this link: <http://apha.defra.gov.uk/documents/surveillance/maps/england-wales-map20.pdf>
- Within each assigned area, the hatched area shows where premises are eligible for free carcass collection and delivery of animals to the PME Provider
- Premises within non-hatched areas need to arrange to deliver animals themselves
- The postcode search tool identifies and provides contact details for the allocated PME provider and indicates if the premises is eligible for free carcass collection. This is based on the postcode of the premises from where an animal is to be submitted rather than a veterinary practice: <http://apha.defra.gov.uk/postcode/pme.asp>

- To arrange a PME, the vet calls the relevant PME provider to speak to the duty VIO/vet
- There will be some livestock premises for which the allocated PME provider has changed, and the free carcass collection service may no longer be provided for some holdings. The APHA postcode search tool allows farmers and vets to see the situation for individual premises.

More information about APHA's scanning surveillance and diagnostic services is available on Vet Gateway (link) below and in the attached farmer and vet information leaflets which include a map showing the PME sites:

<http://apha.defra.gov.uk/vet-gateway/surveillance/index.htm>

Please do let me know if you have queries which are not addressed in this communication or, contact the APHA Surveillance Intelligence Unit SIU@apha.gov.uk for more information.

Weather

Wintry conditions occurred in the first week of January, with the high ground of northern England and Wales was affected by snow. Storm Christoph swept across the country on 20th to 21st, causing significant flooding problems. February was wetter with rainfall 116% of average overall (Figure 1) but followed by a warmer and dry March (Figure 2). While this was good for lambing, grass growth has been poor, with less available for early lambs.

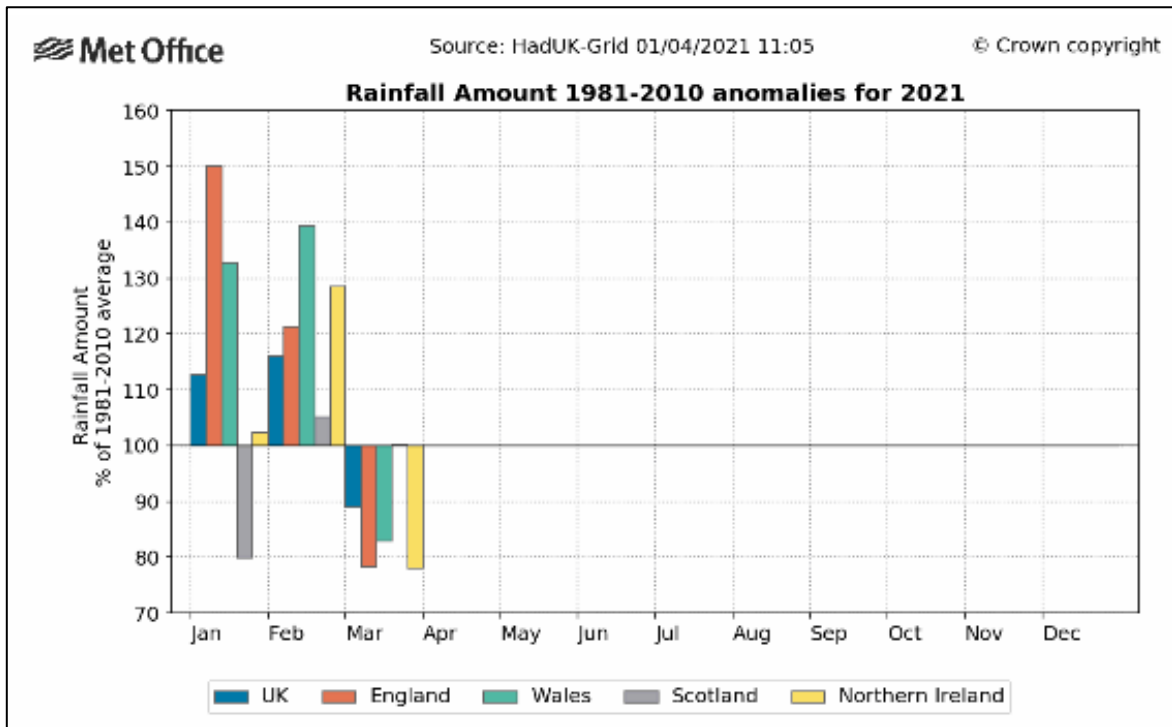


Figure 1 Rainfall amount 1981 -2010 anomalies for 2021

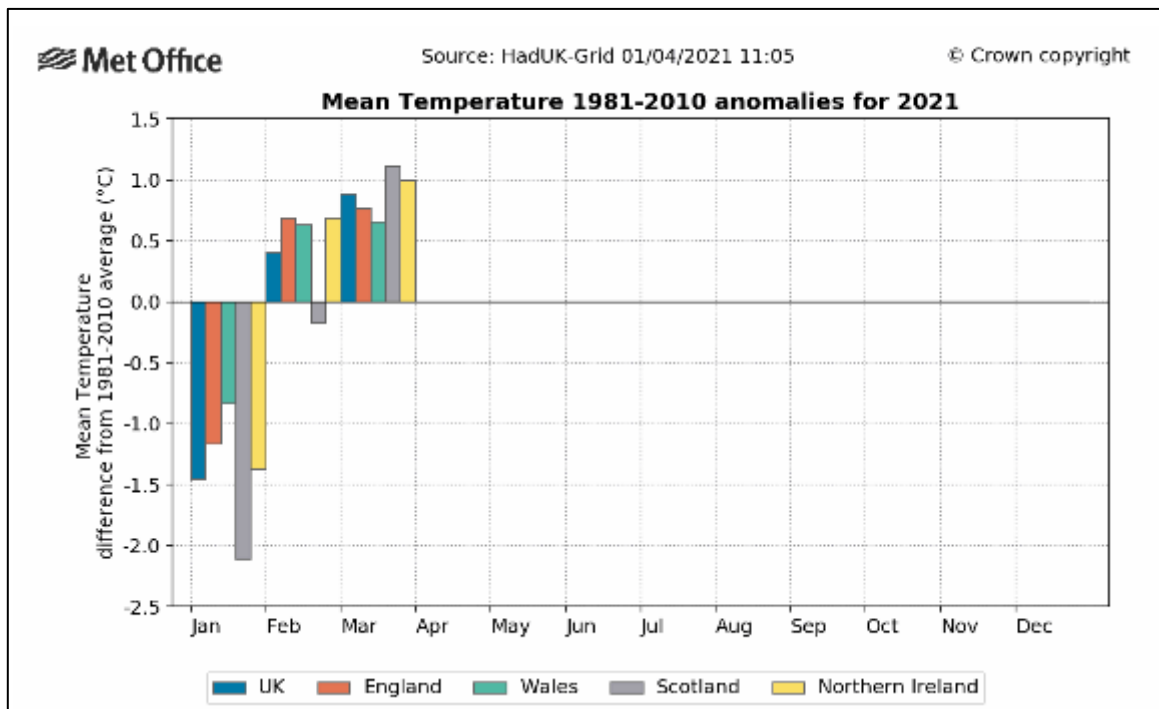


Figure 2 Mean temperature 1981 - 2010 anomalies for 2021

Industry

Lamb prices remained well supported throughout Q1 2021, with prices consistently trending above the previous year's levels and well above the five-year-average. Prices gradually increased during the quarter, due to a tightening supply of lamb in both domestic and global markets. Retail sales of have lamb increased year on year over the 12 week period ending on 18th April. Average retail prices of lamb have increased by 4%, whilst total spend and volumes have increased year on year by 18% and 14% respectively.

International lamb trade dropped back for both imports and exports during Q1 2021. The volume of total UK sheep meat exports during Q1 dropped back by 28% year on year, whilst import volumes declined by 13% during the same period. This reduction in trade volumes was initially caused by a combination of factors including post-Brexit trade friction around shipments into the EU, tight supplies of lamb and high GB lamb prices. January had the largest drop in export volumes following the UK's withdrawal from the EU. Export trade in February and March both increased volumes month on month to bringing it closer in line with year earlier levels.

Charlie Reeve, AHDB

New and re-emerging diseases and threats

Unusual diagnoses

Unidentified cause of encephalomyelitis in a lamb

A six-week-old lamb was affected with neurological signs for two weeks, which began with low head carriage, shaking and stiffness of the legs. The clinical picture deteriorated with time and failed to respond to antibiotics, anti-inflammatory and vitamin B12 administration. Ultimately the lamb became recumbent and was paddling, so was euthanased by a barbiturate injection before submission to APHA VIC Bury St Edmunds. It was the only one affected of 17 lambs and its twin sibling remained healthy. The gross findings at postmortem examination were unremarkable. Bacteriology was performed on the liver and the brain, to look for potential sepsis and/or meningitis, with special cultures for *Listeria* spp. Further testing for copper deficiency and histology to look for cerebrocortical necrosis was performed but these two conditions were ruled out. BDV PCR was also negative. Histopathology on brain detected severe, multifocal, acute, non-suppurative polio encephalomyelitis, changes consistent with a viral infection. Immunohistochemistry for louping ill was also negative. Enhanced specialist testing, Next Generation Sequencing, was also carried out but no viral genetic material could be detected from the brain or spinal cord.

Viruses commonly cause non-suppurative meningitis, encephalitis, and encephalomyelitis. Neuronotropic viruses – result in lesions mainly in grey matter (polio-) which include Rabies virus, Astrovirus, Picornaviruses, Coronaviruses, and Flaviviruses (Louping ill virus). Recently new viruses have been identified including an Ovine Astrovirus (Pfaff and others 2017) and a novel Picornavirus (Forth and others 2019). We are able to go back over many of our DNR (Diagnoses Not Reached) coded submissions, and as techniques improve can locate stored samples for inclusion in further novel testing.

A DNR VIDA code was applied in this case and while frustrating to the private vet and the farmer these cases are always of interest and sometimes may indicate a new disease manifestation which is why we undertake further detailed investigation. The additional costs for all the tests carried out are supported by the APHA scanning surveillance program and in this case came to over £1,000 whereas the cost to the farmer was £81.20. Other reasons for a DNR may be that the submitted carcass was not representative of the problem, autolysis may have affected sampling or we were unable to detect the cause despite extensive testing. Nevertheless we encourage the submission of further carcasses to enable us to explore in greater depth and are always keen to assist in difficult cases as these may lead to increased knowledge of a particular problem.

Spontaneous vaginal rupture in late gestation ewes

The carcasses of two adult ewes were submitted after being found dead. They were part of a group of 100 late gestation ewes that had been moved to different pasture three days previously. Four ewes in total had been found dead since they were moved. No clinical illness was reported and the group had access to ewe nuts and lick buckets. The gross findings in one ewe were consistent with spontaneous vaginal rupture. Loops of distended small and large intestine were protruding from the vulva and dissection of the pelvic area revealed a large rupture in the dorsolateral aspect of the vaginal wall with associated bruising and haemorrhage into the surrounding soft tissues. This condition has been reported in the literature typically affecting multiparous ewes in late gestation (Mosdøl 1999). Large lambs in utero are thought to cause stretching of the vaginal mucosa over the pelvic inlet leading to tearing in the absence of vaginal prolapse. Some reports suggest that over-conditioning of ewes may be a risk factor, with others hypothesise that previous inflammatory conditions or injury to the vagina may predispose to rupture.

Further reading

Flock and Herd Case Notes (2007) *Spontaneous vaginal rupture in multiparous late pregnant first cross ewes*. Available at:

<http://www.flockandherd.net.au/sheep/reader/vaginal-rupture.html>

Sudden death in 16 ewes, likely due to lightning strike

Sixteen ewes were found dead in the field in a group of 36 ewes with lambs at foot. The ewes were reported to be fine the previous day and were found scattered across the field following a night of heavy wind and rain, with reports of lightening in the area. Dead ewes appeared very bloated and had been scavenged. The group had lambed 10-14 days previously and had been grazing this pasture for 10 days. Three ewes were submitted for examination, two of the carcasses were severely autolysed.

There were no significant gross findings at postmortem examination. Magnesium levels in eye fluid were within normal limits and no *Salmonella* was cultured. Histopathology on tissues from the least autolysed carcass showed no microscopic signs to account for the sudden death.

Lightning strike was considered the most likely cause of death in these animals. Direct strikes will result in external lesions, however if death is due to ground currents, there are often no morphological changes seen.

Suspected poor injection technique causing spinal cord necrosis

Ten sudden deaths in a group of 260, April 2020 born Welsh lambs prompted the gathering of the group for anthelmintic treatment. Following gathering two lambs developed hind limb paresis. One was euthanased and submitted to Carmarthen VIC for post-mortem examination. On gross examination a large abscess (approximately 5 cm in diameter) containing green tinged purulent material was found within the longissimus muscle of the right mid-lumbar region. Just caudal to the abscess, the spinal column showed yellow discoloration and the spinal cord at this site was covered with very dark red material. Removal of this material revealed reddening of the spinal cord over 2-3 cms length, with yellowing at the edges of the darkened area. *Bibersteinia trehalosi* was cultured from the abscess. Histopathology of the grossly abnormal lumbar spinal cord confirmed the presence of spinal cord necrosis. The changes were consistent with compressive or ischaemic injury most likely related to the abscess near this site, either through direct compression, instability of the vertebral column or interference with the vascular supply to the spinal cord. The location of the abscess was deemed unusual, and it was suggested that records were checked to see if any injections had been given in this area. Advice on correct injection technique was provided.

Multifocal, necrotising encephalopathy in neonatal lambs

A diagnosis of multifocal, necrotising encephalopathy was made following postmortem examination of two lambs from a 70-ewe Lleyn flock. The flock was split into two breeding groups with ewes deemed not fit for producing replacements bred to a Suffolk tup. At the time of submission seven of this group had produced poor lambs, whilst 15 of the main flock had lambed without issue. All had allegedly been grouped together post tupping and

managed as one group. Affected lambs were small and in poor condition and clinical signs of fine tremor and ataxia were seen within 12 hours of birth. On gross examination both brains were flattened and collapsed upon removal from the cranium. Marked cavitation was noted when the brains were incised. *In utero* Blue Tongue Virus infection was considered and ruled out, as were Border Disease Virus and Schmollenberg Virus infection. Brain histopathology identified porencephaly, the differentials for which include teratogenic viruses, copper deficiency and other metabolic insults *in utero*, foetal hypoxia and maternal hyperthermia. The pathology bore a strong resemblance to that described by (Scholes and others 2009) in lambs born to ewes with recognised severe wasting due to prolonged energy deficit. Follow up with the client is being sought to establish the exact management of the ewe flock post tupping.

Schmollenberg virus infection associated deformities in a lamb

Schmollenberg virus associated fetopathy was diagnosed in a deformed lamb born from a shearling in a lambing group of 75 ewes. Another ewe had a triplet with one mummified and two similarly deformed lambs. This lamb died within few hours of birth and was submitted for examination. Gross findings were:

- arthrogryposis
- torticollis
- hydrocephaly

Hydrocephaly can also be a presentation of intrauterine BTV infection and suspicion of Blue Tongue, which is a notifiable disease, was reported to APHA field service. After this was ruled out by testing, diagnostic investigation resumed and SBV was detected by PCR on a brain sample confirming the diagnosis. Other differential aetiologies including EAE, toxoplasmosis, and Border Disease were ruled out by laboratory testing.

***Escherichia fergusonii* enteritis in a post-weaned ram lamb**

The carcase of a March-born ram lamb was received for investigation. It had developed scour one week previously. A sample was collected and submitted to Starcross and culture ruled out the involvement of *Salmonella* and *Campylobacter*. It was treated for worms and fluke and started on a course of antibiotics and seemed to improve, but was then found dead on the morning of submission. Two other ram lambs in the group were also scouring. On post-mortem examination there was evidence of an enteritis with watery brown-yellow contents throughout the small and large intestines and the small intestinal mucosa was visibly thickened with a florid, cobblestone-like appearance. Discrete, firm, well demarcated areas of dark-red consolidation were scattered throughout both lungs and there were patchy haemorrhages over the surface of the kidneys suggestive of a concurrent septicaemia/endotoxaemia. A pure growth of *Escherichia fergusonii* was isolated on culture of lung, liver and intestinal content. This is an unusual diagnosis.

Similar cases have been described in the literature, typically presenting with diarrhoea and as in this case being clinically suggestive of Salmonellosis (Bain and Green 1999).

***Salmonella* Dublin septicaemia in neonatal lambs**

Two one-week-old Texel-cross lambs were submitted from a flock where four lambs had recently died. Two of the lambs were found dead (one single, one a twin); and two were found collapsed (both one of twins, siblings healthy). The sheep were housed and bedded on straw. Booster vaccinations for clostridial disease and pasteurellosis were given to the ewes at one month pre-lambing. The affected lambs were healthy at birth, the navels were sprayed with iodine, and adequate colostrum intake was ensured. Neonatal lambs were with their dam in individual pens for 2 – 3 days, then were put into larger groups of 15 – 20. Two of the recent dead/ill lambs were submitted for postmortem investigation. The first lamb had mild atelectasis within the cranial lung lobes, the surface of the brain was diffusely reddened. The second lamb had yellow / cream fibrinopurulent exudate within the right carpal and right stifle joints, alongside thickened reddened synovial membranes. The lungs were markedly expanded, diffusely firm red, non-compressible. There was a cardiomegaly with thickened ventricular walls. There was no indication of umbilical infections in either lamb. The faeces were brown pasty to mucoid.

Escherichia coli was detected in pure growth from the right carpal joint of the septic arthritis lamb. *Salmonella* Dublin was cultured from brain swabs and large intestine contents from both lambs, and from the liver of the second lamb. The first lamb's serum was suitable for ZST testing and gave a result of 7 turbidity units which was indicative of hypogammaglobulinaemia. Histopathological examination of both lambs found systemic inflammation in multiple tissues (including meningoencephalitis) consistent with septicaemia. The cardiomegaly in the second lamb was considered a sporadic finding, and although the lungs appeared markedly abnormal, histopathological examination found an interstitial pneumonia which was attributed to the septicaemia.

Advice was provided on salmonellosis, including potential zoonotic risk, and care of the neonatal lamb. The farm was reported to be a well-run enterprise and the initial source of the *S. Dublin* infection could not be ascertained.

Changes in disease patterns and risk factors

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

Malnutrition, Navel /joint ill, laryngeal chondritis, Fetopathy Toxoplasma, Fetopathy *Salmonella* Montevideo, Metritis.

Parasitology

Liver Fluke

There were three cases of acute fluke, resulting in ewe deaths, diagnosed this quarter, with affected farms in Cumbria and Staffordshire. Although this might seem like a low number, it is greater than that seen in recent years and serves as a reminder that acute fluke, resulting in severe liver damage, is not just a disease of autumn.

The incidence of chronic fluke as a percentage of diagnosable submissions was greatly increased this quarter when compared to quarter 4 in 2020 and the first quarter of 2019 and 2020. The majority of the cases were identified from Scottish holdings (Figure 3). This could result in increased risk of disease this autumn, depending on weather conditions. Eggs shed onto the pasture at the start of the year can multiply in the intermediate snail host to produce large numbers of infective metacariae on the pasture by the end of the summer.

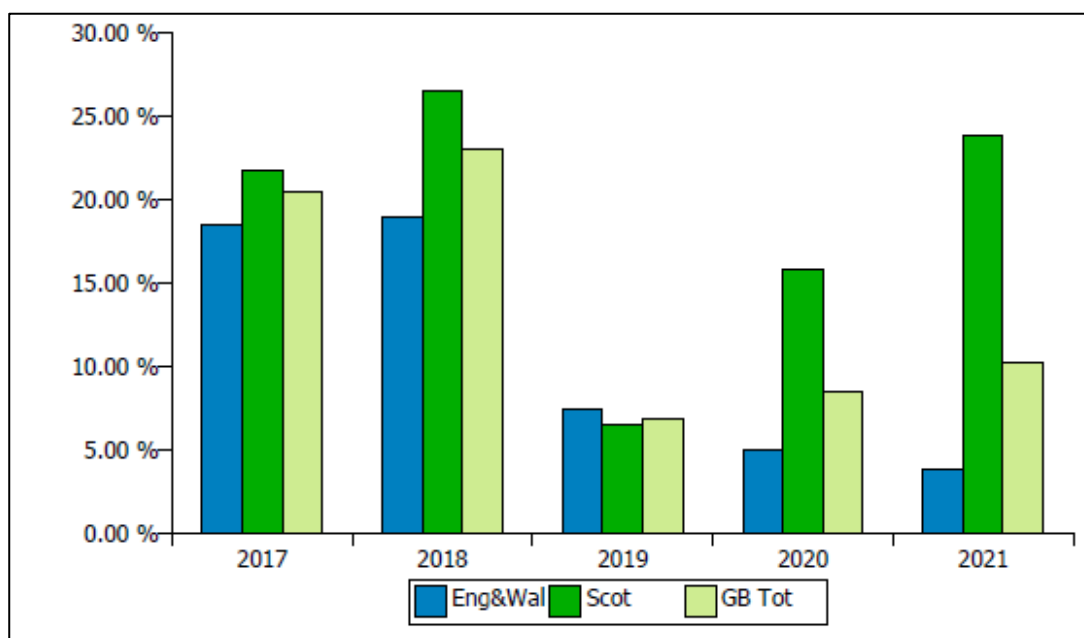


Figure 3 Q1 2021 GB Incidents of Chronic Fasciolosis in sheep as % of diagnosable submissions

Tick-associated disease

Outbreaks of ovine pasteurellosis secondary to infection with *Anaplasma phagocytophilum* (tick borne fever)

Deaths due to ovine pasteurellosis, secondary to infection with *Anaplasma phagocytophilum* (tick borne fever), following the movement of ewe replacements to hill pastures in spring, were reported by SRUC in January. Both bought in and homebred

animals may be affected including hogs that have returned from wintering. Significant losses are common. Limited supervision and the extensive nature of the grazing mean that good quality diagnostic material can be difficult to source. The need for tick prophylaxis should be considered in advance in these areas.

Skin disease

Sheep Scab testing in Wales

Examination of skin scrape samples from sheep showing suspect clinical signs of sheep scab was offered free of charge in Wales, between the beginning of November 2020 and the end of March 2021. This initiative was suggested and funded by the Welsh Government. It followed a similar project which ran between December 2017 and March 2018, the full report of which can be read at

<http://apha.defra.gov.uk/documents/surveillance/diseases/ectoparasite-report-1217-0318.pdf>

Its aims were to support accurate diagnosis of pruritic sheep in order to promote correct treatment and successful control of sheep scab. This is a priority of the Wales Animal Health and Welfare Framework: <https://gov.wales/sites/default/files/publications/2019-07/animal-health-and-welfare-framework-implementation-plan-2019-2020.pdf>

The project launched on 2nd November 2020 and 109 submissions were received. Some submissions had several separate samples submitted so 144 individual examinations were carried out in this project.

Table 1 Diagnoses made and the number of submissions involved

Ectoparasites detected	Count and (%)
Sheep scab due to <i>Psoroptes ovis</i>	52 (47.7%)
Ectoparasitic disease due to lice	13 (11.9%)
Ectoparasitic disease due to <i>Chorioptes sp.</i>	1 (0.9%)
Number of submissions diagnosed with both <i>Psoroptes ovis</i> and another ectoparasite*	2 (1.8%)
No ectoparasites detected	41 (37.6%)
Total submissions	109

* One submission had concurrent *Psoroptes ovis* and lice (*Bovicola sp.*) and one submission had concurrent *Psoroptes ovis* and *Sarcoptes scabiei*

Ectoparasites were detected in 68 (62.4%) submissions. No other tests were carried out for other potential skin pathogens (e.g. *Dermatophilus congolensis*, ringworm).

97 different holdings submitted samples to this project. Of these 11 (11.3%) had not previously submitted samples to APHA.

Sheep scab due to *Psoroptes ovis* was the predominate diagnosis (in 52 submissions) with a further one submission where both *P. ovis* and lice were detected, and one submission where both *P. ovis* and *Sarcoptes scabiei* mites were detected. *P. ovis* mites were therefore detected in 49.5% of submissions to this project. This figure is comparable to results from the previous project which offered free ectoparasite examination of samples from sheep in Wales over the winter of 2017-2018, when *P. ovis* mites were detected in 52.4% of total submissions.

The following information note highlights the importance of accurate diagnosis in suspect sheep scab cases [Mitchell, S. and Carson, A. \(2019\), Sheep scab – the importance of accurate diagnosis. Veterinary Record, 185: 105-106.](#)

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

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

Respiratory disease

SRUC recorded increased diagnoses of several different sheep respiratory diseases/disease categories during this quarter:

- There were 5 Maedi visna cases, which represented 7.04% of diagnosable submissions where usually 0-1.96% are recorded.
- There were 22 cases of Ovine pulmonary adenocarcinoma (OPA), representing 30.68% of the diagnosable submissions where there are usually 4.78-16.84% diagnosed.
- There were 16 cases recorded as Pneumonia NOS, 14.66% of diagnosable submissions, where usually diagnoses represent 0.88-6.68% of the diagnoses.

In contrast APHA sheep respiratory disease diagnoses were average to relatively low for all recorded diseases for this quarter.

Musculoskeletal disease

Arthritis due to *Streptococcus dysgalactiae* subsp *dysgalactiae*

Diagnoses of arthritis due to *Streptococcus dysgalactiae* subsp *dysgalactiae* were increased this quarter with 11 (1.66%) incidents recorded compared to 7 (0.99%) in 2020 (Figure 4). All 11 cases were reported by APHA. No cases were reported by SRUC.

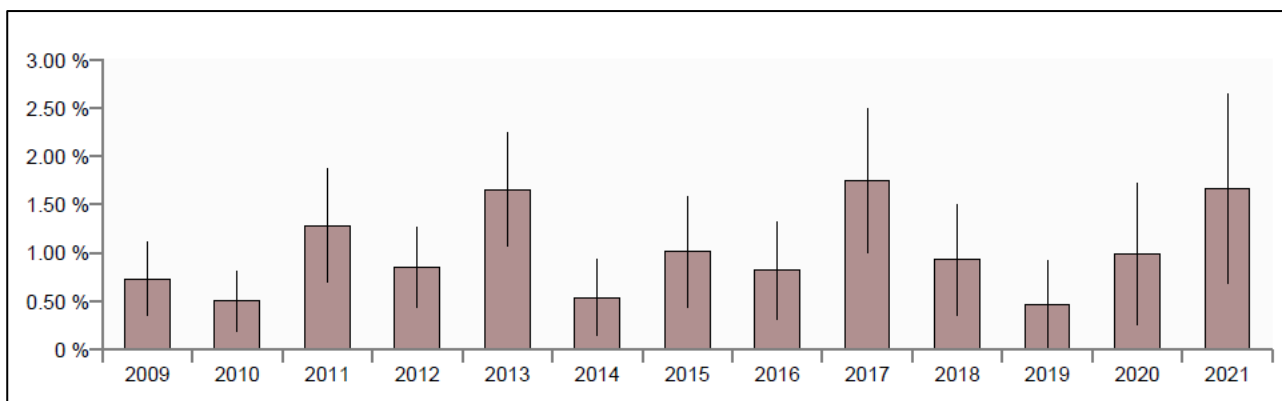


Figure 4 GB incidents of Arthritis-Strep.dysgalact in sheep as % of diagnosable submissions 2009 - 2021

Further reading Veterinary Record Focus Article: An update on joint ill in sheep by Vanessa Swinson <https://doi.org/10.1002/vetr.118>

Nervous disease

Listerial encephalitis

Increased diagnoses of Listerial encephalitis were recorded this quarter (Figure 5). 34 cases (4.91%) were reported in 2021 compared to 20 cases (2.76%) in 2020. This was a result of a marked increase in cases recorded by SRUC with 22 incidents reported in 2021 compared to 5 in 2020. Diagnoses recorded by APHA were relatively static with only minor changes in case numbers recorded.

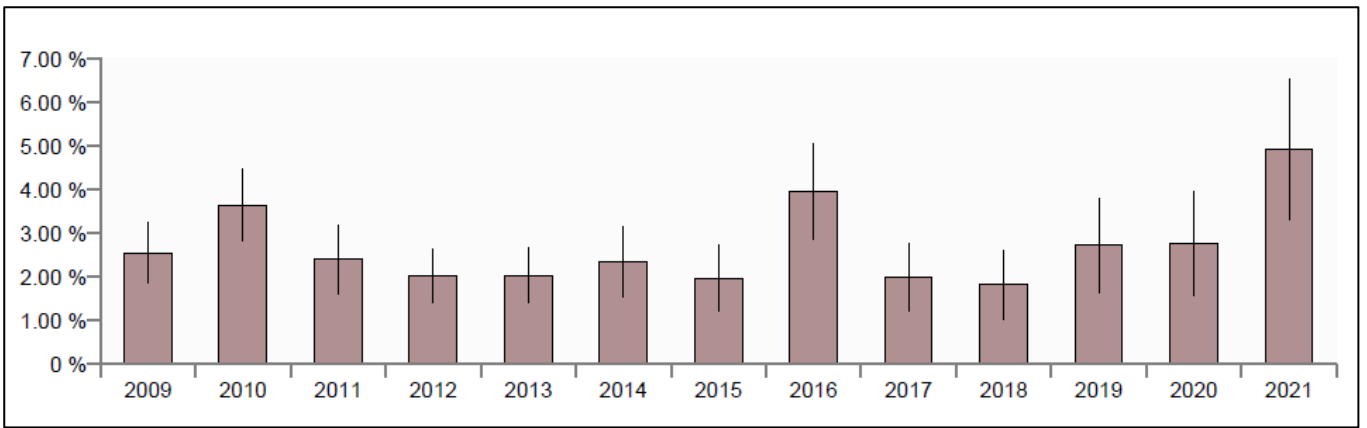


Figure 5 GB incidents of Encephalitis listeria in sheep as % of diagnosable submissions 2009 – 2021

Reproductive disease

No fetopathy due to *Salmonella* Typhimurium or *Coxiella burnetii* were recorded for this first quarter (VIDA figures). Significant increases were recorded for *Toxoplasma* and *Salmonella* Montevideo fetopathies. Fetopathy due to listeria (Figure 6) and toxoplasma (Figure 7) have seen an increase this quarter. Detailed analysis of all the fetopathy data will be done at the end of quarter two.

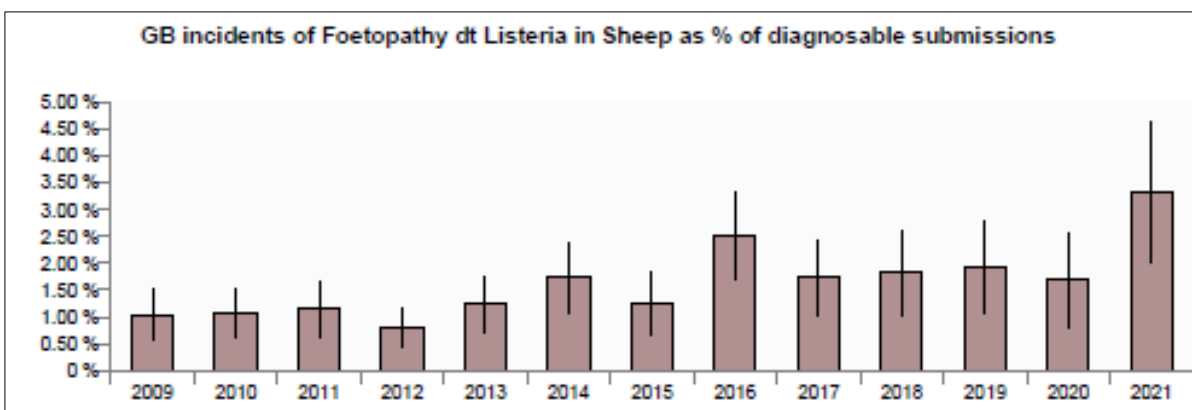


Figure 6 GB Incidents of Listeria fetopathy in sheep as % of diagnosable submissions 2009-2021

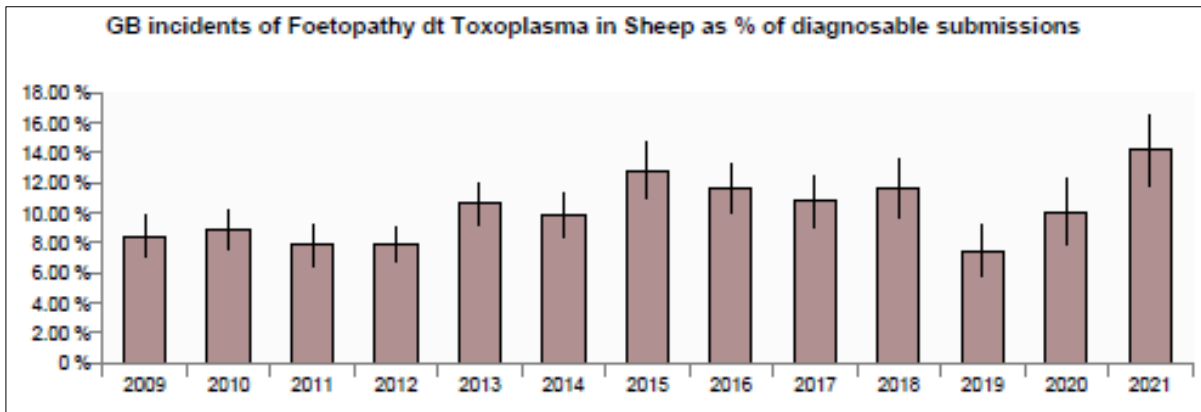


Figure 7 GB Incidents of Toxoplasma fetopathy in sheep as % of diagnosable submissions 2009-2021

Border Disease

Border disease virus was detected in at least five submissions submitted to investigate abortions this quarter. Additional surveillance was in place to test for Border Disease virus in every suitable abortion submission (BDV PCR testing on all sheep abortion samples were encouraged for APHA this season). A few of these were diagnosed with other concurrent abortifacients such as EAE and Toxoplasmosis.

Abortion due to *Salmonella* Dublin

Seven ewes aborted in one night in a group of 300 ewes due to start lambing imminently. Ewes that had aborted were reported to be unwell. This was the second group to lamb, the first group lambed in the same shed with no reported issues. The flock was vaccinated for EAE and toxoplasmosis. Six lambs and three placentas were submitted to Carmarthen for investigation.

Significant postmortem findings:

- Reddened intercotyledonary membranes and one placenta had thickened membranes
- Haemorrhagic viscera mostly affecting lungs, livers, kidneys and hearts.

Stomach contents were cultured from three of the freshest lambs and *Salmonella* Dublin was cultured in pure growth from two of them.

The zoonotic potential of *Salmonella* was highlighted and it was advised to adopt strict personal hygiene when handling affected animals. Isolation of affected animals is still worthwhile to limit contamination of the environment and further transmission.

Salmonella Dublin was implicated in abortions in a 700 ewe flock where 10 had aborted and there had been some ewe deaths. The submitted placenta had pale necrotic cotyledons. The fetuses had multifocal haemorrhages in the lungs (Figure 8). The flock had been housed for over seven weeks and ewes being fed silage, concentrate and fodder beet. We occasionally identify *Salmonella* Dublin in sheep abortion cases even though it is mostly considered to be a cow-adapted pathogen. As such it is unlikely to persist in a sheep flock, although it can cause significant losses over lambing.



Figure 8 Haemorrhagic lungs in a foetus with *Salmonella* Dublin infection

Abortion due to *Salmonella* Montevideo

This *Salmonella* was cultured from the fetal stomach contents of an aborted lamb submitted to APHA VIC Shrewsbury, from a group where 5 out of 75 purchased ewes had aborted in a flock of 600 housed ewes. They had been housed for 10-14 days and were being fed ad lib silage and fodder beet. They had been mixed with the home flock before tupping. The flock was vaccinated for EAE and no illness was reported. *S. Montevideo* is the second most commonly isolated salmonella from sheep, and is associated with causing abortions without other apparent illness. It can be a contaminant of feed as well as being endemic in some areas/flocks. More information on salmonella in the UK can be found in the link below:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/917011/salm-livestock-prod-gb19.pdf

Schmallenberg virus (SBV)

There were 9 diagnoses of SBV made from deformed lambs, which all had congenital deformities typical of this disease. This figure is likely an underestimate of the true number of cases as viral clearance from the fetus results in only about 45% of cases testing positive using PCR testing.

SBV is an orthobunyavirus and orthobunyavirus infections in populations tend to occur in “waves”, with peaks of infection occurring every 3-5 years. The timing of the peaks can vary according to the numbers of susceptible individuals in the population, and with weather and environmental factors that can influence the numbers of *Culicoides* midge vectors for the virus. By 3-5 years immunity will start to wane in previously exposed animals and the increasing numbers of new, unexposed younger breeding stock allows for escalating levels of the virus in the susceptible ruminant populations.

Incidents were reported by APHA VICs Bristol, Bury St Edmunds and Thirsk in sheep flocks in Northern Somerset & South Gloucestershire, Suffolk, Devon, East Riding & North Lincolnshire and North Yorkshire. APHA offered free PCR testing of fresh brain tissue in suspected cases and free serology in up to five ewes which had aborted during this quarter. This is likely to have increased the detection of this condition, which was expected to be detected this year.

APHA VIC Bury St Edmunds diagnosed Schmallenberg virus associated fetopathy in a deformed lamb born from a shearling in a lambing group of 75 ewes. Another ewe recently had a triplet with one mummified and two similarly deformed lambs. This lamb died within few hours of birth and was submitted for examination. Gross findings were:

- arthrogryposis
- torticollis
- hydrocephaly

Hydrocephaly can also be a presentation of intrauterine Blue Tongue Virus (BTV) infection, which is a notifiable disease and therefore this case was reported to APHA field service. After this was ruled out by testing, diagnostic investigation resumed and SBV was detected by PCR on a brain sample confirming the diagnosis, whilst other differential aetiologies to include EAE, toxoplasmosis and Border Disease were ruled out by laboratory testing.

Systemic disease

Malnutrition

A syndromic alert was raised this quarter for Malnutrition NOS, which was diagnosed in 7% of submissions for this syndrome (19 incidents) in Q1 of 2021, compared to 4% in Q1 of the previous 5 years (2016 – 2020).

It was the second most commonly diagnosed disease (alongside congenital abnormalities) in this syndrome during Q1 2021 for APHA submissions with pregnancy toxemia being the most commonly diagnosed disease in this syndrome for APHA submissions.

Cases of malnutrition in pre wean lambs in Q 1 commonly involved insufficient milk or mis-mothering, as would be expected in this age category. In some cases other conditions

were diagnosed concurrently with malnutrition, highlighting the importance of adequate nutrition in prevention of disease.

Coccidiosis was identified in young lambs with signs of ill thrift leading to death. In each case it was the twin lambs that were affected, being still housed with their dams, and creep feed had been available since one week of age. It was suggested that as well as coccidiosis there might be some mis-mothering in the group as there was no milk in the abomasum and the lambs had consumed more forage than would have been expected for their age.

Lack of milk was also thought to be an issue in a one-month-old Dorset lamb which died. It was in poor condition, with no carcass fat, and the abomasum contained concentrate-like material and no milk. There were brown intestinal contents with a small portion containing haemorrhagic content. A moderate coccidial burden was present and *Salmonella* *Diarizonae* was cultured. These were considered to be secondary to insufficient milk.

Issues with poor milk supply and mastitis were thought to be underlying the deaths of recently turned out 3-week-old lambs. Four ewes were also reported to have died in the 350 ewe flock. The submitted lambs had extensive lung consolidation in one with cranial lung consolidation and multifocal small pale foci in the second. There was evidence of inadequate milk intakes. The older lamb's rumen contained macerated grass-like material, there was limited milk in both lambs and they were in poor body condition. Both *Mannheimia haemolytica* and *Pasteurella multocida* were cultured from the lungs, although it was thought that this was secondary to the malnutrition.

Pregnancy toxemia in a small flock of ewes

In a small flock with twenty ewes due to lamb in the following two weeks, four became weak and lethargic and did not respond to calcium, magnesium and propylene glycol treatment. Three ewes died. One of these was submitted and at gross examination it appeared in good condition with abundant fat deposits but there was evidence of anorexia for the days prior to death which likely resulted in the establishment of a negative energy status, with rapid fat mobilisation and metabolic imbalance. Laboratory testing results on the aqueous humour (AH) from this ewe and bloods from this and another similarly affected ewe supported a diagnosis of pregnancy toxemia (AH BHB were 2.7mmol/l with concentration > 2.5 mmol/l being clinically significant; blood BHB: 6.7mmol/l with ref > 1.2 mmol/l). Sepsis, meningitis, Cerebro-cortical necrosis and calcium/magnesium deficiency were excluded by laboratory testing.

Metabolic crisis in overfat ewes

There were several cases of pregnancy toxemia and metabolic crisis in overfat ewes carrying twins.

One ewe was submitted following the deaths of 10 out of 300 in a week. They had been housed for two and a half months and were due to lamb in one week. Hay and concentrate were provided. Postmortem examination confirmed that the ewe was in very fat condition. The liver was friable. The rumen was reduced in size and contained a small amount of forage. Scant green liquid contents were in the abomasum, and there was reduced intestinal content. The lungs felt 'rubbery' on palpation. There were twin lambs in the uterus, weighing in total 11.8kg, with a large volume of amniotic fluid and the placenta in the uterus. A metabolic cause was confirmed by testing aqueous humour with a beta hydroxyl butyrate concentration of 10.4 mmol/l identified. Calcium and magnesium concentrations were within normal limits. An immediate review of the feed management, both amount and access, was advised. The prolonged housing and limited exercise were likely contributing factors.

There were two other similar cases with similar gross postmortem findings, although in one only a low calcium concentration was detected on metabolic testing. These ewes had been recently housed which was thought to have triggered the hypocalcaemia.

Urinary disease, Enteric disease

No significant trends were identified this Quarter.

Poisoning

The latest Chemical Food Safety report can be found at this link:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/987719/pub-chemfood0121.pdf

Copper toxicity was confirmed as the cause of death of an adult ewe which was close to lambing. The gross postmortem findings were typical of copper toxicity with a pale orange liver, gun-metal grey kidneys and yellow subcutaneous tissues consistent with jaundice. There was also evidence of chronic liver pathology associated with fluke although the group had all recently received a flukicide. The liver copper concentration was 39,500 µmol/ Kg DM (Reference range 314-7850µmol/kg DM) and kidney 1730 µmol/ Kg DM (reference 0-787 µmol/kg DM). The liver concentration is equivalent to 632 mg/kg wet weight. This was the only confirmed case in a group of 10 ewes but blood monitoring for liver function in the rest of the ewes confirmed raised liver enzymes consistent with hepatopathy. The influencing source of copper was thought likely to be from camelid /alpaca course-mix feed which was being fed at the time. Chronic liver damage associated with fluke and a twin pregnancy in over conditioned ewes probably also contributed as precipitating factors. Advice was to stop feeding camel/alpaca mix and in the longer term to monitor blood copper concentrations and the liver status of any culls.

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.

On 9th December 2020, expert speakers from the fields of animal and human health came together to talk about tick-borne diseases, via a webinar organised by the APHA Centre of Expertise for Extensively Managed Livestock.

Suzi Bell - APHA Shrewsbury – ‘Tick borne diseases of livestock – Diagnosis and treatment’

<https://www.youtube.com/watch?v=pG5cYmaBwpg>

Bev Hopkins - Wales Veterinary Science Centre – Case study – ‘High mortality in a sheep flock caused by coinfection with Louping ill virus and Tick Borne Fever’

<https://www.youtube.com/watch?v=6ahYJ0U1Nnk>

Katie Lihou – PHD Student – University of Bristol - ‘The distribution and prevalence of ticks and tick-borne disease in cattle’

<https://www.youtube.com/watch?v=FrSAxXTBoRw>

Paul Phipps - Virology APHA Weybridge – ‘Tick borne diseases in livestock in the UK’

https://www.youtube.com/watch?v=4AmfltYs_Aw

Harriet McFadzean - APHA Starcross – Case study – ‘A tale of two tickborne diseases’

<https://www.youtube.com/watch?v=vtC1ElvX6dl>

Further information can be found in previous APHA Science Blogs:

- Centre of Expertise for Extensively Managed Livestock
<https://aphascience.blog.gov.uk/2018/09/07/caring-for-extensively-managed-livestock/>
- Ticks as vectors of disease
<https://aphascience.blog.gov.uk/2019/06/11/ticks/>

Horizon scanning

Bluetongue (BTV) update

BTV in Europe October 2020 – March 2021 are shown in Figure 9.

In March, in Europe, there were cases of BTV-8 in Belgium (1) and of BTV-16 in Greece (13) and BTV-4 in Greece (11). Elsewhere, there were no other reports of BTV.

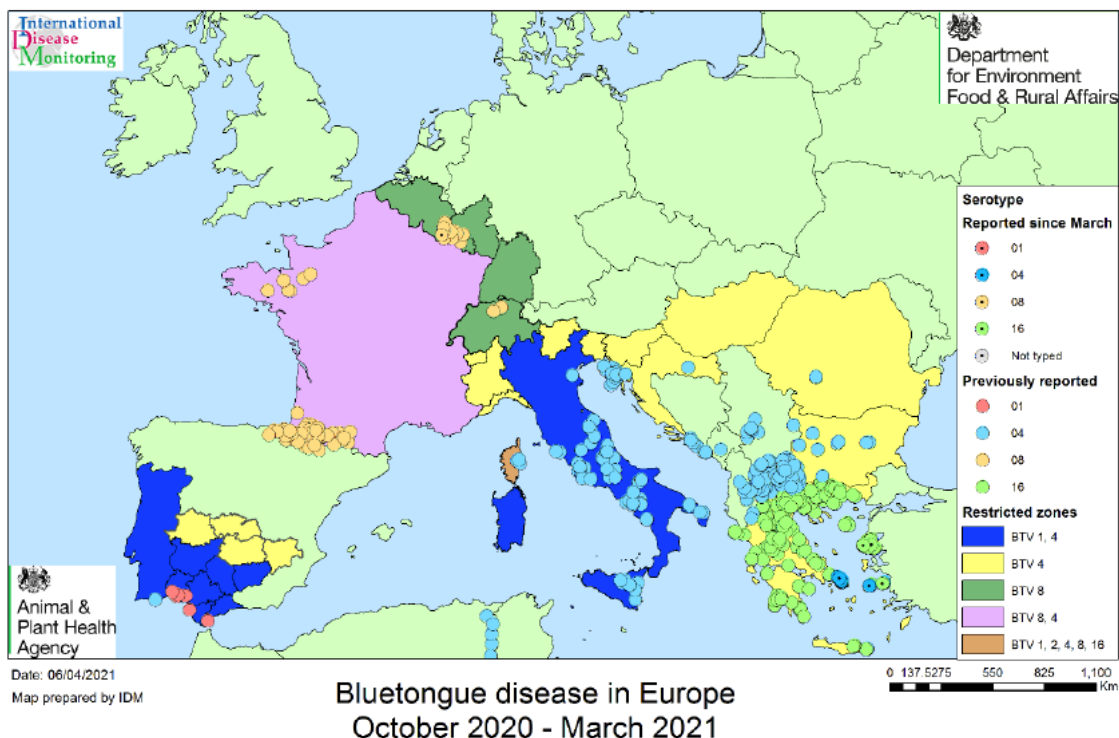


Figure 9 BTV in Europe October 2020 - March 2021

For more information, see our Outbreak Assessment at:

<https://www.gov.uk/government/publications/bluetongue-virus-in-europe>

APHA have released a series of animations on Facebook and Twitter to inform keepers of BTV. <https://www.facebook.com/APHAGov/>

For more information, see the updated situation assessment, at:

<https://www.gov.uk/government/publications/bluetongue-virus-in-europe>

Peste De Petits Ruminants (PPR)

Algeria There was one outbreak reported to OIE. This was among a herd of goats.

Publications

APHA Staff

FENEMORE, C., FLOYD, T. & MITCHELL, S. (2021) Rumen Fluke in Great Britain. *Journal of Comparative Pathology* 184, 31-36

TEALE, C. & BORRIELLO, P. A proposed scheme for the monitoring of antibiotic resistance in veterinary pathogens of food animals in the UK. *Veterinary Record*, e201

Wernike K; Reimann I; BANYARD AC; Kraatz F; LA ROCCA SA; Hoffmann B; MCGOWAN S; Herchinger S; CHOUDHURY B; Aebischer A; STEINBACH F; Beer M (2021) High genetic variability of Schmallenberg virus M-segment leads to efficient immune escape from neutralizing antibodies. *PLoS Pathogens* 17(1) e1009247

Other publications of interest

Veterinary Sciences Division of the Agri-Food and Biosciences Institute of Northern Ireland (AFBI) (2021) Ovine pulmonary adenocarcinoma in ewes and lambs in Northern Ireland. *Vet Rec* 188,

Best, C. M., Roden, J., Phillips, K., Pyatt, A. Z., Cogan, T., Grogono-Thomas, R. & Behnke, M. C. (2021) Characterisation of *Dichelobacter nodosus* on Misshapen and Damaged Ovine Feet: A Longitudinal Study of Four UK Sheep Flocks. *Animals* 11, 1312

Cassmann ED; Mammadova N; Jo Moore S; Benestad S; Greenlee JJ (2021) Transmission of the atypical/Nor98 scrapie agent to Suffolk sheep with VRQ/ARQ, ARQ/ARQ, and ARQ/ARR genotypes. *PloS one* 16

Graham-Brown J; Vineer H; Hopkinson A; Morgan E; Armstrong D; Stubbings L; Howe M (2021) Forecasting the timing of *N. battus* eggs hatching (letter) *Veterinary Record* 188 (7) 270

Hopkinson A; Vineer HR; Armstrong D; Stubbings L; Howe M; Morgan ER; Graham-Brown J (2021) Comparing two predictive risk models for nematodiosis in Great Britain. *Veterinary Record* 188

Kahl, A., Samson-Himmelstjerna, G., Krücken, J. & Ganter, M. (2021) Chronic Wasting Due to Liver and Rumen Flukes in Sheep. *Animals* 11, 549

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Nixon, E., Brooks-Pollock, E. & Wall, R. (2021) Sheep scab transmission: a spatially explicit dynamic metapopulation model. *Veterinary Research* 52, 54

Reigate, C., Williams, H. W., Denwood, M. J., Morphew, R. M., Thomas, E. R. & Brophy, P. M. (2021) Evaluation of two *Fasciola hepatica* faecal egg counting protocols in sheep and cattle. *Veterinary Parasitology* 294, 109435

Willis RS; Fleming PA; Dunston-Clarke EJ; Barnes AL; Miller DW; Collins T (2021) Animal welfare indicators for sheep during sea transport: The effect of voyage day and time of day. *Applied Animal Behaviour Science* 238

Yaxley, K. J., Joiner, K. F. & Abbass, H. (2021) Drone approach parameters leading to lower stress sheep flocking and movement: sky shepherding. *Scientific Reports* 11, 7803

Zanolari, P., Dürr, S., Jores, J., Steiner, A. & Kuhnert, P. (2021) Ovine footrot: A review of current knowledge. *Veterinary Journal* 271

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SCHOLES, S. F., STRUGNELL, B. W. & WATSON, P. J. (2009) Necrotising encephalopathy and porencephaly in lambs. *Vet Rec* 165, 31-32



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