



Animal &
Plant Health
Agency



GB small ruminant quarterly report

Disease surveillance and emerging threats

Volume 25: Quarter 2 – April to June 2022

Highlights

Mesenteric torsion and tapeworms in a lamb

Page 7

Unusual findings in Scottish Black face lambs

Page 10

Haemonchus testing in sheep

Page 12

Contents

Introduction and overview	2
Animal Health and Welfare Pathway	2
New and re-emerging diseases and threats	5
Unusual diagnoses	5
Changes in disease patterns and risk factors	12
Centre of Expertise for Extensively Managed Livestock (COEEML)	25
TSE	25
Horizon scanning	27
References	29
Publications of Interest	30

Editor: Amanda Carson, APHA Penrith

Phone: + 44 (0) 7909532229

Email: Amanda.carson@apha.gov.uk

Introduction and overview

This quarterly report reviews disease trends and disease threats for the second quarter of 2022, April to June. It contains analyses carried out on disease data gathered from APHA, SRUC Veterinary Services division of Scotland's Rural College (SRUC) and partner postmortem 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.

APHA's new Endemic Disease Alert System

This is a new component of the communications from our scanning surveillance network and a new system that the APHA will be using to keep you up to date with significant disease alerts and information, projects, publication of reports & other items.

This is independent of the notifiable disease alert system.

To receive these notifications please respond to siu@apha.gov.uk

Providing your preferred: -

- email address you would like us to use
- Mobile telephone number if you wish to receive text alerts

We hope that you find this new messaging system to be beneficial and any suggestions or feedback are welcome. Surveillance Intelligence Unit SIU@apha.gov.uk for more information.

Animal Health and Welfare Pathway

[The Animal Health and Welfare Pathway](#) (the Pathway) is to launch in 2022. As Direct Payments decline, government will reinvest some of the money to support the production of healthier, higher welfare animals. This will provide incentives for farmers to go above the regulatory baseline and reward higher animal health and welfare on the farm.

The priorities identified for sheep:

- provide a tailored health screening to address a range of endemic diseases, estimated to cost the sector around £85 million per year - initially this will focus on internal and external parasites (and associated anthelmintic efficacy), mastitis, 'iceberg' diseases and those inducing abortion
- reduce lameness as it is one of the most common signs of ill health and discomfort among sheep, affecting animals' mobility, productivity, and longevity
- improve ewe sustainability, optimising body condition so that ewes are less susceptible to disease, produce better quality milk and can rear a greater number of healthier lambs

- improve pain management during castration and tail docking - we want to support the licensing and uptake of pain relief to reduce the impact of these procedures

The first funding stream includes the [Annual Health and Welfare Review](#). It offers farmers funding for an annual visit, from a vet of their choice, to consider the health and welfare of their animals. This includes carrying out diagnostic testing, reviewing biosecurity and the use of medicines, and providing bespoke advice on actions and available support to improve the health and welfare of their animals. Specifically for sheep this includes testing to find out how effective the anthelmintic being used is in the sheep tested.

APHA will offer a Worming Treatment Check Test which comprises two composite worm egg counts. A Composite Worm Egg Count is used before and at a prescribed time (depending on the anthelmintic product used), after treatment. The result is expressed as a % reduction. The results may indicate a lack of efficacy of the anthelmintic product or potential problems at the time of administration.

To request this Worming Treatment Check Test email APHA VIC Carmarthen Carmarthen@apha.gov.uk and ask for the Worming Treatment Check Test and you will be sent sampling kits and submission forms with links to guidance provided on the SCOPS website.

Issues & Trends

Weather

Both April and May recorded monthly-mean temperatures above the normal average temperatures, which continued into June (Figure 1).

Most of April's rainfall came during the first half of the month, and, except for some northern parts of Scotland, it was a dry month with 68% of average UK rainfall in total. May was very wet in parts of western Scotland, but some parts of England and Wales were dry, with 107% of average rainfall overall. June recorded 76% of average rainfall for the UK overall (Figure 2). As early as April farmers were concerned about potential drought conditions occurring in the summer. The cost of fertiliser was exacerbated by the war in Ukraine and lack of rainfall in April meant fertiliser applications were not fully washed in and both grass and arable crops were anticipated to be less productive.

As temperatures increased over the summer APHA released an EDAS HOT WEATHER ALERT which described the associated livestock health, welfare and production problems that may arise during periods of hot weather and which may cause significant problems. Further information of these risks to Animal Health and Welfare can be found in our [Hot weather and potential risks to livestock](#) information note.

Further information on [Keeping farm animals and horses in extreme weather](#) can also be found on GOV.UK

2022

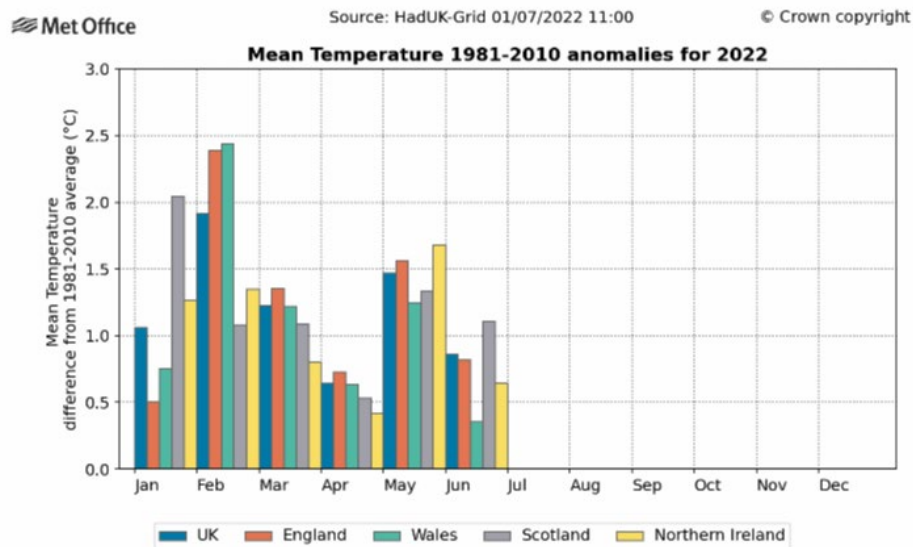


Figure 1: mean temperature 1981 to 2010 anomalies for 2022

2022

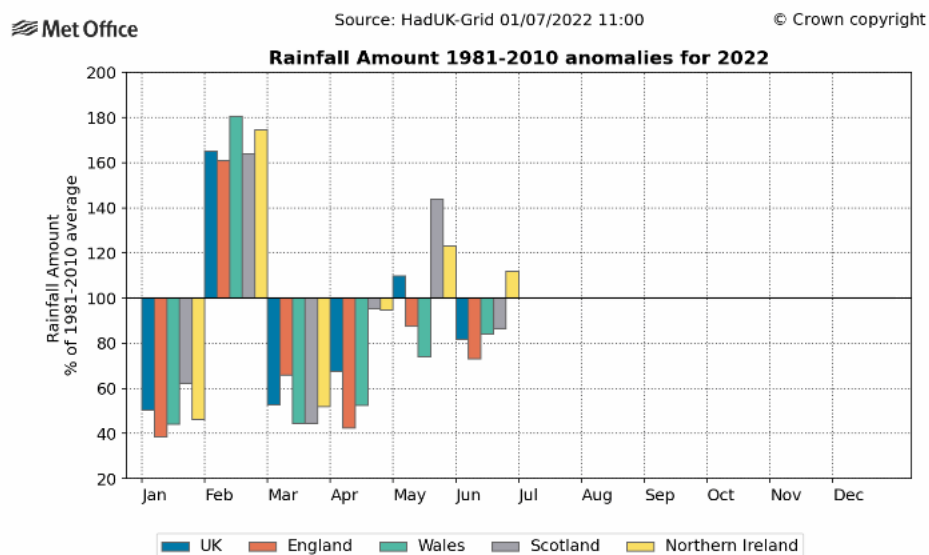


Figure 2: Rainfall amount 1981 to 2010 anomalies for 2022

Industry

[Lamb sector updated overview and forecast](#) (including demand commentary) -

Prices: Although the strong growth trend seen in prices earlier in the year has now flattened, prices still remain at record highs with new season liveweight lamb prices peaking at 340.6.9p/kg in the week ending 1 June [weekly finished auction markets](#) and [new season deadweight lamb prices](#) peaked at 692.9p/kg in the week ending 11 June.

Production: The UK produced 20,300 tonnes of sheep meat in June, 200 tonnes less than that in June 2021. This brings the total production of sheep meat in the first half of 2022 to 132,800 tonnes 11% more than at the same point last year, although throughput in Quarter 2 2021 was low due to Brexit. UK lamb kill for June totalled 895,200 head, a 2% decrease compared to last year and [the lowest June kill seen since 2018](#).

For the first half of 2022, clean sheep slaughter reached 5.64 million head, 8% more than last year.

Trade: The UK exported 5,300 tonnes of fresh and frozen sheep meat in May, down 27% from April but up 10% year-on-year. Imports of fresh and frozen sheep meat into the UK totalled 6,200 tonnes in May, similar to volumes seen in April and up 30% from last year. This means that [volumes of imported sheep meat outweighed exports in May](#) by 800 tonnes. (June data will be available later in August)

Demand: Overall lamb volumes for 2022 are expected to be down 18% versus 2021 and down 16% versus 2019. This is because of eating-out not returning to pre-COVID levels and retail sales of lamb coming under increased pressure as consumers react to the cost-of-living crisis.

Freya Shuttleworth AHDB

New and re-emerging diseases and threats

Unusual diagnoses

Acardius acephalus

A severely malformed lamb was submitted for examination to the Veterinary Pathology Service of the University of Nottingham. The submitting vet described the specimen as “half lamb” (Figure 3). On gross examination there was two hindlimbs with no structures suggestive of thorax (externally), no neck and no head and one unilateral very rudimentary appendix reminiscent of a thoracic limb. Following postmortem examination (PME) there were unremarkable long bones of the hind limbs, a rudimentary pelvis, a spinal column, and rudimentary ribs (Figure 4).



Figure 3: Ventral view of the half lamb.



Figure 4: Skeleton of the half lamb.

An outbreak of malformations was reported in a flock of 180 ewes during the lambing season 2022 (estimated prevalence 1.7%). An infectious aetiology was suspected on clinical grounds.

Given the very unusual appearance of the malformed animal, a multidisciplinary investigation was carried out. The APHA expert group was contacted to further discuss the case and additional clinical history was requested to the submitting vet. Infectious aetiology was then ruled out and other aetiologies such as genetic or toxic causes were considered.

Radiology and histopathology were carried out, which demonstrated agenesis of various organs and a diagnosis of Acardius acephalus or TRAP (Twin reversed arterial perfusion) syndrome was achieved. Acardius acephalus is a very particular malformation, well

described in human medicine but rarely reported in domestic animals. It is a unique complication of monochorionic twin pregnancy.

This case has been created as a poster for presentation to the European College of Veterinary Pathologists.

Mesenteric torsion and tapeworms in a lamb.

A six-week-old lamb was submitted to APHA Veterinary Investigation Centre (VIC) Carmarthen to investigate three sudden deaths in a group of 14 ewes and 33 lambs. The lambs were housed at night, with some receiving supplementary lamb milk from a bottle including the submitted lamb. The lambs had been treated for gastrointestinal parasites 10 days previously with ivermectin.

Significant PME findings included:

- Torsion of the mesentery of the distal small intestines affecting a 30cm length with dark red haemorrhages on the affected serosa and mesentery and fibrin strands on the serosa (Figure 5).
- A large number of tapeworms present in the small intestine (Figure 6).

The submitted lamb also had 200 *Teladorsagia/Ostertagia spp.* identified in the abomasum, indicating a light worm burden although no worm eggs were detected in the faeces likely resulting from the recent worming treatment.

A coccidial oocyst count of 2050 was also identified, of those that were successfully sporulated, 52% were of the pathogenic species *Eimeria ovinoidalis*. Coccidiosis disease due to *Eimeria* spp typically affects young lambs four to eight weeks of age, resulting in diarrhoea, ill thrift, and death. Further testing of lambs to assess coccidial oocyst burden in the lambs could be helpful.

But what is the significance of the large number of tapeworms within the small intestinal tract? Adult tapeworms (*Moniezia* spp.) are common parasites in the intestines of first season grazing lambs. The pathogenicity is yet to be conclusively demonstrated, although unthriftiness or diarrhoea has sometimes been attributed to *Moniezia* (Elliott 1986).

A report of a small intestinal torsion in a 5-week-old lamb (Kelly and others 2021) describes a similar case. Infection is likely to have occurred within the first 2 weeks of life. Intestinal torsions occurring in older lambs are usually associated with dietary changes including access to readily fermentable crops including lush pasture. Fermentation occurs in the large intestine and results in gas production. This causes the gut to shift in position, which can result in a twist. In both these cases access to a milk replacer diet could have predisposed the lambs to a small intestinal torsion. However, in both cases the presence of such a large *Moniezia* burden may have contributed to the occurrence of a torsion. In older, larger sheep large burdens are unlikely to physically block the intestines, but it has been anecdotally reported in young lambs (Burnell 2005). This case report suggests that

parasite attachment to the intestinal mucosa might cause altered local intestinal motility as described in cases of *A. perfoliata* infections inducing colic in horses. Clearly there is a need for further research into the epidemiology of *M. expansa*.

A review of the husbandry practice of keeping lambs in at night and out in the day, given that changes between feed types may have increased the risk of intestinal torsion in this case, and a review of gastrointestinal parasite control was recommended.



Figure 5: Distension of small intestines in a lamb with a mesenteric torsion.



Figure 6: Tapeworms removed from the small intestine of a lamb.

More information on parasite control in sheep can be obtained from [SCOPS](#) (sustainable control of parasites in sheep).

Congenital malformation and abortion associated with *Neospora*

An aborted ovine foetus submitted to APHA VIC Starcross showed gross deformity of the cervical and thoracic spine, with scoliosis and arthrogryposis of all four limbs. The brain appeared grossly unremarkable although histopathological examination of brain tissue showed striking changes. The main differential was Schmallerberg virus infection, but the virus was not detected by PCR testing of brain tissue. The malformations within the brain were non-specific and could have reflected a teratogenic viral infection (i.e., SBV, BDV, BVD), however testing for these gave negative results. Copper deficiency, pregnancy toxæmia and maternal hyperthermia could potentially result in similar changes. The presence of bradyzoites indicated a protozoal infection (most likely *Toxoplasma sp.*) but PCR testing for this organism was also negative. The changes were not acute, and it is possible that early stages of the infection may have resulted in the necrotising leukoencephalopathy, leukoencephalomalacia seen involving the rostral cerebral white matter. Motor nerve roots in the spinal cord appeared symmetrical and as such, there was insufficient evidence to support SBV infection. PCR testing for the presence of Neospora DNA gave a positive result. This is a very unusual cause of abortion in sheep. APHA have previously reported Neospora in sheep in the 2015 Emerging Threats Report Quarter 1 investigated one previous sheep case in which similar gross deformities were described in the affected lamb.

An additional frozen ovine foetus was submitted as part of follow up investigation to the previous case. These two submissions represent the two abortions recorded in this 100-ewe flock over the lambing season. Neospora DNA was again detected in brain stem material with no other abortion pathogens identified. No other reproductive issues were reported. The source of the Neospora infection remains unclear, however the ground now owned by the current occupiers was previously part of a dairy farm that reported unresolved abortion issues.

Neospora infection in sheep associated with reproductive problems has been recorded in Spain (González-Warleta and others 2014), Switzerland (Hässig and others 2003), the USA (Dubey and others 1990) and a global review of Neospora caninum infection in sheep and goats that had experienced an abortion was recently carried out (Nayeri and others 2022).

There are many possible causes of arthrogryposis in sheep and these cases illustrate the limitations of diagnosis of SBV-induced abnormalities by gross examination alone.

Intrauterine skeletal fragility

SRUC investigated a lowland flock of 250 Cheviot ewes that had reported ten lambs breathing heavily since birth. Four others were described as having “bendy legs” or a wide based stance from birth. One of these was euthanased at ten days of age after becoming dyspnoeic. PME found that the caudal rib cage had a concave appearance, and fracture calluses were present bilaterally on ribs 9 and 10. No abnormalities were detected in the long bones and analysis did not reveal any mineral deficiency. Histopathology of the rib

fractures revealed abundant deposition of collagen that was birefringent when viewed under polarised light. Extrapolating from cattle this finding indicated that the fractures had been present for at least three weeks confirming that they had occurred in utero. Genetic disorders that have previously been reported in association with intrauterine fractures include osteogenesis imperfecta, osteopetrosis, hypophosphatasia and Ehlers-Danlos syndrome involving a genetic mutation of type I collagen. Other acquired factors that may increase the risk of intrauterine skeletal fragility include vascular compromise of the fetal skeleton and maternal metabolic abnormalities. There was no histological evidence of osteoporosis or of rickets. Investigation into the genetic relationships is ongoing, however the other affected lambs improved and were reported to be growing normally.

Unusual findings in Scottish Black face lambs

In 2016 SRUC examined three Scottish Black Face lambs from one flock that presented with severe orf. What was particularly striking was that in all three lambs, lymph nodes were not detectable either grossly or on histopathology. A genetic cause was suggested but the farmer declined further investigation. In the last 12 months SRUC have confirmed the same problem in three further flocks and suspect it in a fourth. Anecdotally farmers have reported awareness of this in other flocks.

In three cases, young lambs of 2 to 3 months old were affected but it has now been seen in a lamb of 14 months. In the cases examined some had received orf vaccine others not. However, viral typing has identified both wild and vaccinal orf strains in the lambs examined. Histology suggests a T cell deficiency and while antibodies have been detected to orf, there appears to be no cell mediated immune response.

Literature searches have not revealed evidence of similar conditions in humans, although it is recognised in mice. The alymphoplasia mutation of mice is autosomal recessive and characterized by the systemic absence of lymph nodes and Peyer's patches and disorganized splenic and thymic structures with immunodeficiency (Shinkura and others 1999). Further investigation is ongoing including collaboration with the Institute of Genetics in Switzerland to determine if a similar genetic mutation is present in these lambs.

Hypoglycaemia encephalopathy in lambs

Two neonatal lambs were submitted to APHA VIC Carmarthen to investigate hindlimb ataxia and inability to stand, affecting six lambs from a group of around 100. Signs were present from birth in both males and females. Singles and one or both of twin lambs were affected. Ewes were on sugar beet roots prior to housing when concentrates and silage were fed. The farmer reported that the concentrate ration was introduced later than usual this year. The ewes were in good condition and had been treated for liver fluke. Copper capsules had been administered in January due to a known copper deficiency on the farm.

Gross PME was unremarkable with no gross changes visible in the brain or spinal cord to suggest a cause for the neurological signs. Histopathological examination of the brains from both lambs identified acute, multifocal, segmental, cerebral, and cerebellar cortical neuronal necrosis, the distribution of the neuronal necrosis suggestive of *in utero* hypoglycaemic injury or hypoxia. Hypoxic injury was deemed unlikely as lamb weights were modest (approximately 2.8kg) and dystocia was not reported. It was advised that feeding and ewe condition be further investigated. It was suggested that the late introduction of the concentration ration may have resulted in an energy and/or protein deficiency in late gestation. Necrotising encephalopathy in lambs and the association with maternal nutrition, amongst other differentials, have been previously described (Scholes and Watson 2004) (Scholes and others 2009).

Cerebellar Abiotrophy in a neonatal Lleyn lamb

The carcase of a one-day-old Lleyn lamb was submitted to APHA VIC Starcross to investigate neurological signs from birth, including the inability to stand and a varying degree of weakness, paresis and incoordination of the limbs. From 150 ewes lambed, 11 lambs had been similarly affected. No gross changes were seen in the brain or spinal cord on PME to explain the signs described clinically. This is not unusual in neurological disease cases, and histopathology was required to reach a diagnosis of Cerebellar Abiotrophy (CA), an inherent neurodegenerative disorder. CA has been previously reported in several breeds of sheep, including Welsh Mountain lambs, with signs present from birth and in Charolais, Wiltshire, Merino, Corriedale, and Border Leicester sheep with a later onset. We think this is the first reported case in the Lleyn breed. The condition is thought to have a genetic basis and examination of breeding records was suggested. Screening tests for Border disease virus (BDV) and Schmollenberg virus (SBV) were negative.

Two cases of Swaledale encephalopathy

APHA VIC Penrith diagnosed two cases of Swaledale encephalopathy this quarter, another neurodegenerative disorder affecting young lambs.

The first case involved a three-week-old Rough Fell lamb. It had presented with progressive neurological signs over a period of 36 hours, which was best described as “appearing drunk” by the submitting farmer. It was the third lamb affected in this flock of 200 ewes. The affected lambs had been born inside with no complications reported and were turned out to pasture within 24 hours of birth. No significant gross findings were seen on PME. Histopathology again provided the diagnosis with a marked, multifocal, symmetrical, necrotising, polioencephalopathy identified on microscopic evaluation of the brain. After several possible differentials were excluded (sulphate toxicity, lead poisoning, listeriosis, “pulpy kidney”) and following consultation with colleagues, it was concluded that the changes in the brainstem were potentially consistent with ‘Swaledale encephalopathy’ - a neurodegenerative condition observed in young Swaledale lambs and some other British breeds of sheep (Scottish Blackface and Welsh Mountain Badger Face). Although the pattern of lesion distribution did not match that described for the

condition (Scholes and others 2007), the nature of the pathology (swelling and degeneration of astrocytes and rarefaction of neuropil, with relative sparing of neurons) was deemed consistent enough to confirm the diagnosis. To our knowledge this is the first case of Swaledale encephalopathy reported in a Rough Fell lamb, the Swaledale as a breed is related to Scottish Blackface and Rough Fell sheep.

The second diagnosis was more typical, with neurological signs reported in two to five week old Swaledale lambs, progressing from weakness of the hind legs to ataxia, recumbency and eventual death. The lambs were born outside and reported to be normal at birth. A typical case was euthanased and submitted for PME. The lamb had been unwell for around one week being dull and depressed and showing signs of a fine head tremor and head pressing. Gross examination was unremarkable. Brain cultures remained sterile and Border Disease testing gave a negative result. Brain histopathology confirmed a diagnosis of Swaledale encephalopathy.

Swaledale encephalopathy is a neurodegenerative disorder affecting young lambs typically in the first few weeks of life. Signs include ataxia, stiffness, and head tremors, progressing rapidly to recumbency and spasms. The aetiology is unknown, but comparison has been made to Leigh Syndrome in humans. Leigh syndrome has been linked to several genetic lesions influencing oxidative phosphorylation and other steps in production of ATP, but the expression of the condition is likely multifactorial.

Changes in disease patterns and risk factors

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

Border disease, Coccidiosis, Parasitic gastroenteritis, Haemonchosis, *Clostridium perfringens* type B.

Parasitology

Haemonchus testing in sheep

Sudden deaths due to Haemonchosis were confirmed in adult ewes and post-weaned sheep from eight flocks during quarter 2. The disease was also detected in Scotland in this quarter. The risk of haemonchus increases particularly after heavy rains, as this tropical/subtropical parasite is better able to survive in warmer temperatures in contrast to our more usual gastro intestinal parasites e.g., *Teladorsagia circumcincta*. Clinical signs are anaemia (Figures 7 and 8), with no diarrhoea, and sub-cutaneous oedema (bottle jaw). There is little immunity to this parasite, so disease can be seen in lambs and adults.



Figure 7: Pale oral mucous membranes in a sheep with Haemonchus



Figure 8: Pale conjunctiva in a sheep with Haemonchus

APHA VIC Carmarthen can carry out differential staining on Trichostrongyle- type eggs to detect *H. contortus* eggs (TC777).

At the end of June APHA issued an EDAS alert and offered (from July to October 2022), free testing for *Haemonchus* where sheep present with anaemia, with no diarrhoea, and sub-cutaneous oedema (bottle jaw) or where *Haemonchus* may be suspected for other reasons. Samples to be submitted using the Small Ruminant submission form to APHA VIC, Job's Well Road, Johnstown, Carmarthen SA31 3EZ. When submitting samples please write FREE HAEMONCHUS TESTING and include history of recent treatments.

All classes of anthelmintics have activity against *H. contortus*. In addition, Closantel will also kill *H. contortus* but not other gastro intestinal worms.

Coccidiosis

There were 53 diagnoses of coccidiosis making it the second most common diagnosis during quarter 2. Diarrhoea, wasting, and death were the main clinical signs associated with the diagnosis ovine coccidiosis. Although all ages of sheep are susceptible to infection, in Great Britain clinical coccidiosis most frequently occurs in three to nine week old lambs, with a subsequent peak at about three months. More information regarding ovine clinical coccidiosis can be found in the Vet Record Surveillance Focus article [Coccidiosis in sheep](#)

Tick-associated disease

Tick borne fever due to *Anaplasma phagocytophilum*

There were 17 cases of Tick borne fever (TBF) recorded by SRUC this quarter, when an average of 8.6 have been recorded during quarter 2 over the last 5 years. A more typical number of 8 cases were recorded by APHA. We may see increasing trends in tick-borne disease diagnosis due to extended seasons of tick activity and increased tick burdens because of milder winters and changing land management practices.

Tick borne fever with concurrent septicaemia

There were also multiple diagnoses of TBF and concurrent *Bibersteinia trehalosi* septicaemia made at various centres during this quarter. TBF is caused by a rickettsial infection with *Anaplasma phagocytophilum*, transmitted by carrier *Ixodes ricinus* ticks. Clinical signs of TBF include an acute pyrexia, inappetence, dullness and depression. TBF is a risk for sheep and cattle grazing tick-infested pasture, and due to immunosuppression can predispose to, or exacerbate, other diseases for example tick pyaemia, pasteurellosis, listeriosis and other viral and bacterial infections. Abortion storms may result from exposure of naïve pregnant ewes. Initial thrombocytopaenia is followed by neutropenia and lymphocytopenia. The organism can be demonstrated in leukocytes during the acute stages of the disease. Carrier status is seen, even after treatment, for up to two years after recovering from primary TBF and relapses may occur. These animals are also thought to serve as reservoirs of infection. TBF is also a potential zoonosis. The SCOPS website gives guidance about control of ticks in sheep [Ticks | SCOPS](#).

APHA VIC Penrith diagnosed systemic pasteurellosis (*Bibersteinia trehalosi* septicaemia) and TBF in a hogg that was submitted to investigate the deaths of two 2021 born gimmers, within one week. The group of 100, homebred animals were on rough in bye grazing with hay being offered and a mineral lick available. A combined flukicide anthelmintic (containing Closantel) was administer in mid to late February. The vaccination history was

vague, but it was thought that combined, multivalent clostridial and Pasteurella vaccine was used in the flock. Moderate to severe autolysis hindered interpretation at PME, but the most significant findings were of variable mottled reddening throughout the lungs with the cranial lobes feeling rubbery and the spleen was enlarged. Bacteriology found *Bibersteinia trehalosi* in systemic distribution which would explain the death. PCR testing found *Anaplasma phagocytophilum* which would explain the splenomegaly and would have contributed to the death through immunosuppression. The detection of *A. phagocytophilum* demonstrated that TBF is present in the area, and this may need to be considered for the management of lambs (and any purchased stock) when they are turned out on to grazing, to reduce associated disease in them. Three to six week old lambs are particularly susceptible to disease associated with *A. phagocytophilum*, such as tick pyaemia. While no ticks were found on this animal, they would have been present previously for the infection to have been transmitted.

APHA VIC Starcross detected *Anaplasma phagocytophilum* DNA in the spleens of three ewe hoggets submitted for PME from the same farm confirming TBF. The history was of a brief period of severe disease, to the point of moribund, prior to death, with 10 cases from 400 animals. Gross findings in one animal were of a tan-coloured liver with pin-point haemorrhages on the surface, pinpoint haemorrhages on the surface of the lungs and subpleural areas of haemorrhage, and pinpoint haemorrhages on the surface of the spleen. *Bibersteinia trehalosi* was isolated in pure culture from the brain, liver, lungs, and spleen, confirming *Bibersteinia trehalosi* septicaemia as the cause of death in this animal.

APHA VIC Carmarthen diagnosed TBF and systemic *Bibersteinia trehalosi* infection in a four-year-old mule and a seven week old Texel cross lamb that were submitted to investigate ongoing illness and deaths of seven ewes and seven to eight lambs over 10 days in a group of 100 ewes plus 200 lambs. The group had been moved to newly rented rough ground three weeks previously. Most affected ewes appeared lethargic for a couple of days with their ears down, before becoming recumbent and then being found dead. All ewes in the group generally appeared quieter. The submitted lamb was not noted to be unwell before being found dead. At PME both the ewe and lamb had splenomegaly (Figure 9), lymphadenopathy and typhilitis, with liquid large intestinal contents and body cavity effusions in the ewe and lung consolidation in the lamb. Both animals had 8 ticks attached to the skin; identified as *Ixodes ricinus*. TBF was confirmed by detection of *Anaplasma phagocytophilum* DNA in splenic tissue by PCR testing. Treatment of the group with an acaricide to kill ticks was advised, and consideration given to moving sheep off this land. Ticks were sent to Weybridge and extracted RNA was tested using a panel of PCRs (pan-piroplasm, *Anaplasma phagocytophilum* and Louping ill virus). *Anaplasma phagocytophilum* was detected in every tick. The majority had blood fed, so the test was unable to discriminate between the pathogen in the tick or the bloodmeal, or both. Bacteriology demonstrated systemic pasteurellosis in both animals with *Bibersteinia trehalosi* being isolated from the liver and spleen of the ewe, and in very heavy pure growth from the liver, lung, and spleen of the lamb. These animals were most likely

predisposed to *B. trehalosi* septicaemia as a sequel to immunosuppression caused by TBF. This case demonstrated the risk of exposing naïve animals to tick-infested pastures.

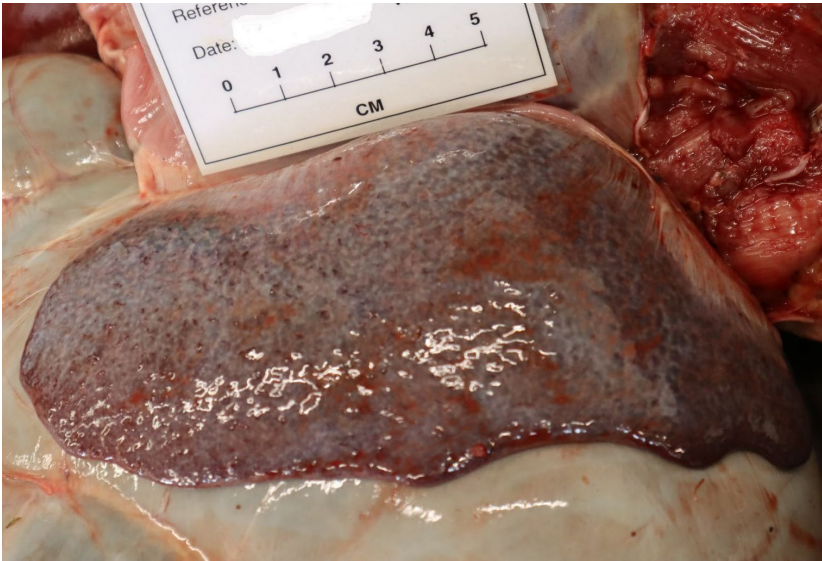


Figure 9: Splenomegaly in a lamb with tick-borne fever.

Respiratory disease

Mannheimia pneumonia and Mycoplasma ovipneumoniae

This quarter APHA recorded relatively large numbers of *Mannheimia pneumonia* cases, 33 cases were recorded, approaching 2019 and 2020 case numbers of 35 and 40 diagnoses respectively (Figure 10). Of the recorded cases this quarter 70% were in preweaned lambs aged anywhere between 7 days and 3 months of age, the remaining cases were recorded from neonatal lambs, post weaned lambs and adult sheep submissions.

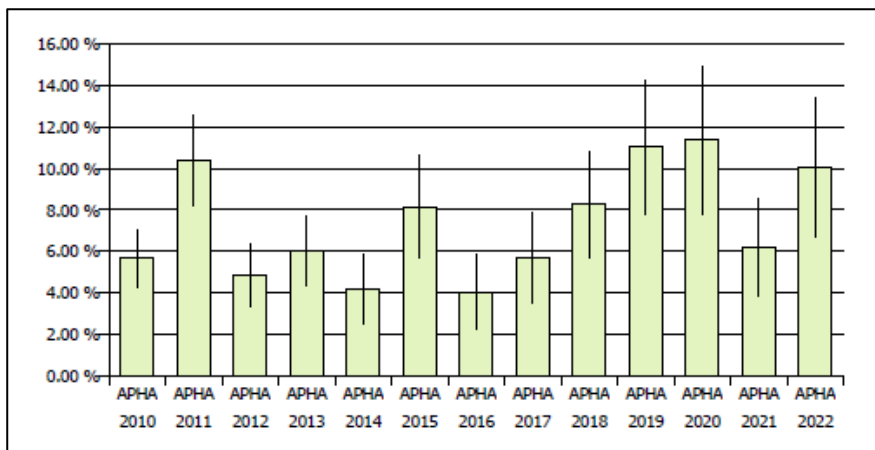


Figure 10: APHA incidents of *Mannheimia haemolytica* in sheep as % of diagnosable submissions 2022 quarter 2

The incidence of *Mannheimia* pneumonia can be very much influenced by concurrent disease issues, nutrition and other stressors, vaccination can provide some control but does not necessarily prevent all cases. Concurrent and predisposing infections in these cases can include *Mycoplasma ovipneumoniae* and this quarter 17 cases of *Mycoplasma ovipneumoniae* were recorded by APHA, where the annual average for this quarter over a 5 year period has been 11 per year. Cases of *Mycoplasma ovipneumoniae* were also predominantly recorded in preweaned lambs (76% of cases) in lowland flocks, the youngest case was 7 days of age.

Ovine pulmonary adenocarcinoma (OPA) Jaagsiekte

There has been an increasing trend in OPA diagnoses made by APHA and SRUC in previous quarters, an increase this quarter was only notable for SRUC, with 12 cases (Figure 11). This increasing trend may be continually influenced by a current greater awareness of the disease within the sheep industry and greater moves towards proactive management using scanning and culling.

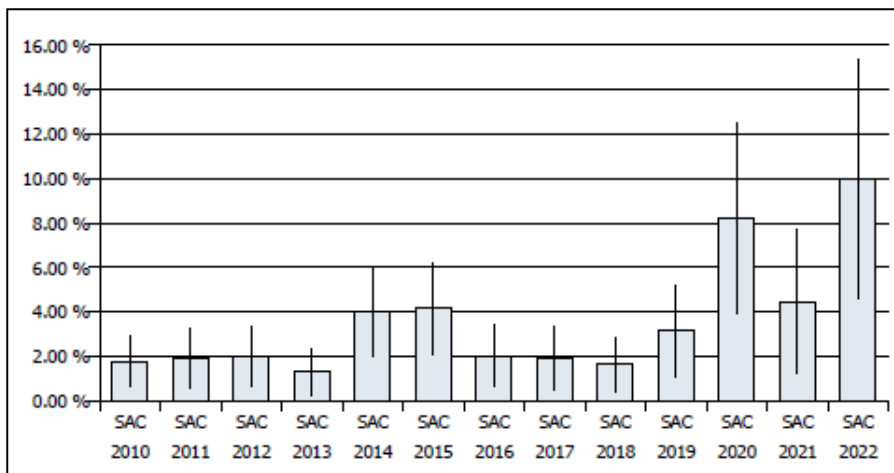


Figure 11: SRUC incidents of OPA in sheep as a % diagnosable submissions 2022 quarter 2

Enteric disease

C. perfringens type B enterotoxaemia

An increase in the number of *C. perfringens* type B enterotoxaemia (Lamb dysentery) diagnoses was seen during quarter 2, with 25 diagnoses being made in 2022 compared with 13 in 2021 (Figure 12). Over 75% of these cases have been in preweaned lambs (over 1 week of age) rather than neonates with which it is more classically associated. 17 cases were seen in Scotland compared to 8 in England and Wales .

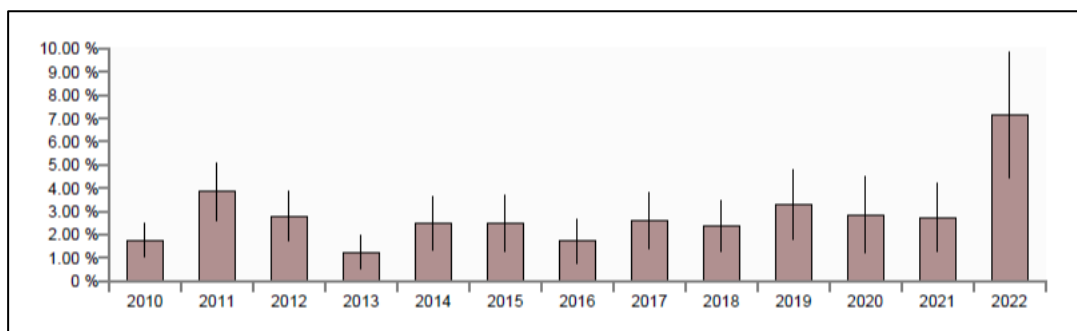


Figure 12: Great Britain incidents of *Cl. perfringens* B disease in Sheep as % of diagnosable submissions 2022 quarter 2

Nervous disease

Louping ill

Compared to the previous two years diagnoses of Louping ill this quarter were notably increased with 9 cases (2.47%) recorded in 2022 compared to 5 cases (1.01%) in 2021. SRUC recorded a marked increase in cases, their highest since 2019, with 7 incidents reported in 2022 compared to 3 in 2021 and 1 in 2020. Diagnoses recorded by APHA remained static.

The second quarter of the year is usually uneventful in terms of Louping ill diagnoses with very little in the way of variation in cases seen between previous years. The exception was 2019 where a significant increase in case numbers was also reported (Figure 13), most likely as a rebound effect from the hot dry summer in 2018. Trend analysis for Louping ill disease monitoring remains a challenge due to the small number of cases reported each year in addition to the effect of climate conditions on tick activity and tick numbers. The situation will continue to be monitored.

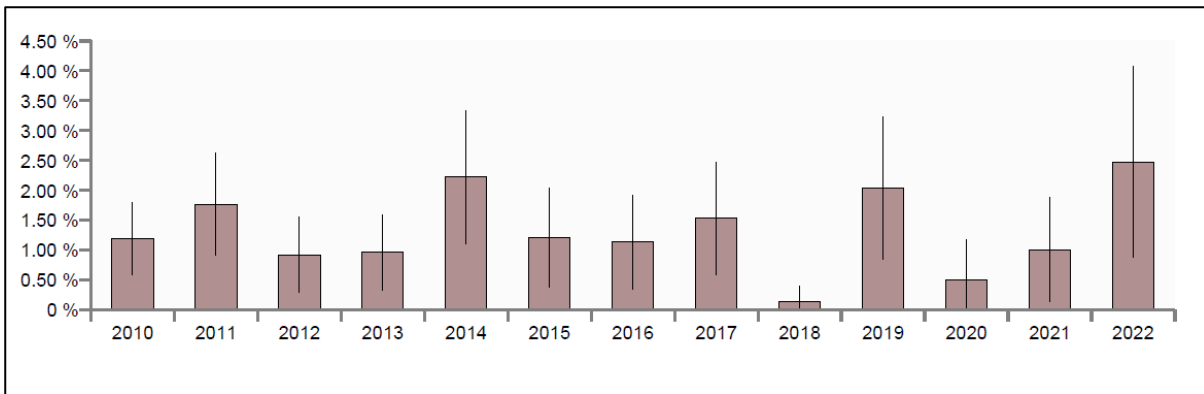


Figure 13: Great Britain incidents of Louping Ill in Sheep as % of diagnosable submissions 2022 quarter 2

Reproductive disease

Abortion overview for 2022

During the lambing period January 2022 to June 2022 there were 1, 022 diagnostic submissions with abortion listed as the presenting sign. The most common diagnoses in comparison to previous years (2011 to 2022), expressed as % tested and diagnosed is shown in Figure 14. There is little change in the trend, with abortion due to *Chlamydia abortus* as the most common diagnosis followed by *Toxoplasma*.

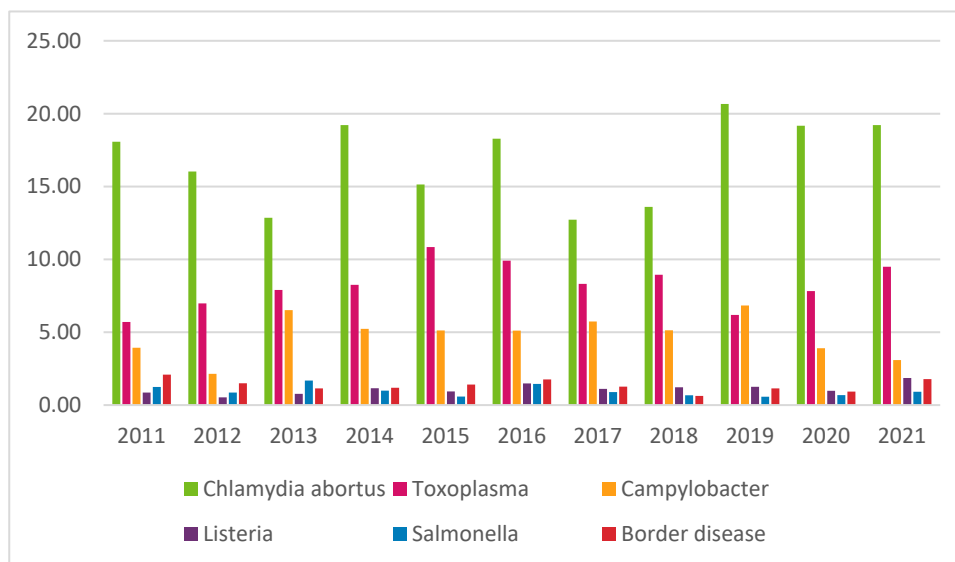


Figure 14: Incidents of sheep abortion as % of diagnosable submissions in Great Britain 2011 to 2022

Border Disease (BD)

Border disease virus was detected in 21 diagnostic submissions during the first two quarters, compared to 32 for the same period in 2021. Eleven of the cases were submitted to investigate abortions. Enhanced surveillance for BD virus was in place for sheep abortion submissions. In some of the abortion cases where it was diagnosed, BD virus infection was not suspected to have been present.

Mannheimia haemolytica mastitis

Mannheimia haemolytica was isolated from mastitic udder tissue along with a *Streptococcus* species, in a Cheviot ewe submitted to investigate five deaths from a group of 40 with twin lambs over a week. There was evidence of gangrenous mastitis and toxæmia. The ewes were moved to lush pasture approximately ten days previously and no supplementary feed, other than high magnesium buckets, had been offered. There was no creep on offer for the lambs. Pre lambing booster vaccination had only covered clostridial diseases due to supply issues with Heptavac-P. *Pasteurella* septicemia was also diagnosed in two lambs submitted from the same farm at the same time.

Toxoplasmosis

SRUC reported that six fetuses and placentae were submitted from a flock experiencing a 50 per cent abortion rate in a group of 100 homebred hogs. There were no similar issues in the lambing ewe group. The farmer commented that a cat was present on the farm for the first time and fetal fluids tested positive for antibodies to *Toxoplasma gondii* in all cases. In addition, acid-fast bacilli were detected on modified Ziehl Neelsen smears of two placentas. Morphologically these were considered suspicious of *Coxiella burnettii* in one case and more typical of *Chlamydia abortus* in the other. The possibility of Q fever was negated on PCR of placenta. Tissues from both fetuses were examined histologically. A non-suppurative encephalitis with foci of gliosis was described in both brains and there was an additional intercotyledonary placentitis typical of Enzootic Abortion of Ewes (EAE) confirming co-infection with *Toxoplasma gondii* and *C abortus*. Overall, the pathology relating to toxoplasmosis was most severe and this was considered the primary cause of the abortion storm. The hogs had received an EAE vaccine and the placentitis was not visible at PME. It was suggested that it may have resulted from infection with *C abortus* that had occurred pre-vaccination.

Systemic disease

Metabolic conditions

White Muscle Disease associated with Vitamin E deficiency, was found to be the cause of rapid deaths in five to seven day-old goat kits. Five from a group of 10 had died in a week and losses had also been seen the previous year.

PME revealed large volumes of pericardial, pleural, and abdominal fluid. The first kid examined had a dark liver with fibrin tags on the surface. In the second kid examined, there were white-coloured striations with areas of calcification in the myocardium of the left ventricle.

Extensive laboratory testing confirmed white muscle disease in both goat kids. Liver selenium levels were considered to be normal in both the kids examined, but low Vitamin E levels were confirmed by blood testing of the cohort group.

White muscle disease, or nutritional myopathy, is most commonly associated with Selenium deficiency, with or without concurrent vitamin E deficiency. Here there was only vitamin E deficiency found, so if the remaining kids were supplemented with a combined, Selenium and Vitamin E preparation, there could have been a risk of causing selenium toxicity.

Circulatory and Lymphatic disease

An adult pet goat was submitted to the University of Surrey after developing abdominal bloating, dyspnoea and seizures progressing rapidly to death. At PME, occupying approximately 50% of the thoracic cavity, was a 14x10x8.5cm, friable, pale pink to tan, multilobular and cystic mass (Figure 15).



Figure 15: Cystic mass found in the thoracic cavity of a goat.

Histological examination confirmed the diagnosis of thymoma (consistent with a type AB thymoma, the most common subtype in this species). In one survey of 102 tumours in goats (Löhr 2013), thymomas represent the third most common tumour, and dairy breeds seem to be predisposed (Hadlow 1978). Whilst these tumours tend to be benign, congestive heart

failure (e.g., hydrothorax and chronic congestion of the liver) as observed in this case and megaoesophagus are common sequelae.

Urinary disease

Nephritis in a Toggenburg goat

An 11 year old, lactating Toggenburg doe from a small herd of six, was submitted for PME having been unwell for 10 days before dying. Milk production had ceased, and appetite was minimal. Respiratory signs were seen with crackly chest noises and flaring nostrils. Faecal examination had detected a nematode egg count of 400 strongyle eggs per gram. Antibiotic and anti-inflammatory treatment had been administered for suspected pneumonia. Despite lactating, this doe had not kidded for five years.

At PME, the most significant findings were:

- scattered shallow, irregular erosions of the right caudal tongue and palate (Figure 16).
- large kidneys with pale and narrow cortices. The outer medulla was reddened while the inner medulla was well demarcated, very firm, and brown (Figure 17).
- The uterus contained a moderate amount of clear fluid.

Biochemistry found raised aqueous humour concentrations of urea and creatinine, consistent with a marked azotaemia. Histopathology confirmed a severe, necrotising, fibrinosuppurative nephritis. *Streptococcus gallolytica* was cultured from the kidney. This is a common component of rumen flora and of farm environments and may cause opportunistic infections following breaching of the epithelial mucosal barrier with injury or inflammation. The oral ulceration was likely due to uraemia.

Repeated faecal examination found a very high faecal Trichostrongyle-type egg count of 13950 eggs per gram, and treatment of other at risk goats with an appropriate anthelmintic was recommended.

The moderate amount of clear fluid in the uterus was likely to be due to a pseudopregnancy, a major cause of anoestrus in dairy goats.



Figure 16: Longitudinal section of a kidney from a goat with nephritis. The inner medulla is well demarcated, very firm, and discoloured brown.

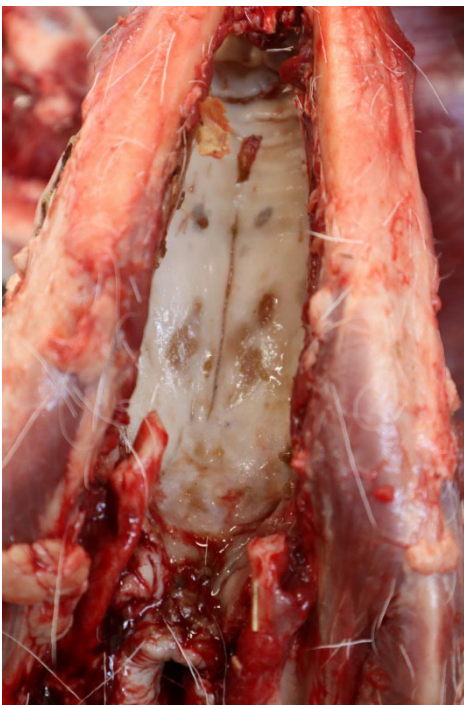


Figure 17: Scattered shallow, irregular erosions of the hard palate of a goat with nephritis.

Poisoning

The most recent [Chemical Food Safety Report](#) for the period April to June 2022 has been published.

Significantly reduced incidents have been recorded this quarter which is of concern as there is a possibility that this reflects a decrease of reporting rather than a real-time decrease of livestock exposures to potential hazards. This trend needs to be explored further to understand the reasons behind it. It has been noted that scanning surveillance submissions for postmortem examination have also dropped, which might reflect sector market forces and increasing costs. Within this area of work the main reduction reflects decreased lead poisoning incidents.

A very high liver copper concentration consistent with copper toxicity was confirmed in a shearling ram. The ram was one of 4 that died over a month from an original group of 10.

A PME of the ram identified a yellow liver raising the possibility of copper toxicity. Liver was sent for analysis and the copper concentration analysed to be 39,900µmol/kg DM (approx. 638.4 mg/kg WM). There was no specific source of copper identified but the ram was on a high plane of nutrition with concentrates fed to prepare it for showing and sales. APHA provided advice on animal health and welfare and food safety, stating that a 2 week restriction should ideally be applied following the withdrawal or reduction of the concentrate feed and an increase in forage fed. Since the rams were intended for breeding, there was no immediate risk to food safety.

Centre of Expertise for Extensively Managed Livestock (COEEML)

A European Innovation Partnership (EIP-AGRI) funded project Hill Sheep Health North was recently the subject of a Vet Record focus article [Managing liver fluke on hill farms](#) .

More information about this project which explored liver fluke management in hill sheep can be found at <https://www.hillsheephealthnorth.co.uk/> and will be one of the topics presented at the COEEML conference in November 2022 in Aberystwyth. For more detail on the conference please see the [COEEML](#) pages on Vetgateway .

TSE

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

APHA also provides summary statistics on the number of submissions tested and cases confirmed through the Compulsory Scrapie Flocks Scheme.

Table 1 provides a summary for sheep for the years 2012 to 2022 taken from the published [Sheep: TSE surveillance statistics](#)

Table 1: summary for scrapie in sheep for the years 2012 to 2022

Year	Passive Classical	Passive Atypical	Active Classical	Active Atypical
2012	0	0	2	28
2013	0	1	3	16
2014	0	0	0	10
2015	0	0	2	15
2016	0	0	0	13
2017	0	0	0	12
2018	0	0	0	16
2019	0	0	1	6
2020	0	0	0	13
2021	0	0	0	11
2022	0	1	0	8

Table 2 provides a summary for goats for the years 2012 - 2022 taken from published statistics [Goats: TSE surveillance statistics](#)

Table 2: summary for scrapie in goats for the years 2012 to 2022

Year	Passive Classical - All Cases	Passive Classical - Index Case	Active Classical - All Cases
2012	8	0	1
2013	2	0	0
2014	2	0	0
2015	4	0	0
2016	2	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	1
2020	0	0	1
2021	0	0	0
2022	0	0	0

<https://www.gov.uk/government/publications/goats-tse-surveillance-statistics>

Horizon scanning

Bluetongue (BTV) update

APHA no longer has access to the EU's Animal Disease Notification System (ADNS), hence we are now using World Organisation for Animal Health (WOAH) data instead.

Amongst countries in northern and western Europe, the following areas are currently classified by the European Commission as containing circulating BTV 8 (see Figure 18)

- Mainland France (since 01 January 2018).
- Belgium (since 01 April 2019).
- Luxembourg (since 17 September 2020).
- Switzerland (since 20 April 2021).
- Germany (only the states of Saarland and Rhineland-Palatinate since 14 July 2022).

Amongst these, mainland France is also considered to contain circulating BTV-4.

Despite the presence of BTV Restricted Zones in France and Belgium, the lack of any recent reports of infection to either WOAH or ADIS, our knowledge of the exact extent of BTV infection in these countries – and particularly the level of infection in the “high risk” areas along the coast of the English Channel and the North Sea – remains very low. However, it is plausible based on the distribution of previous reports and the lack of any recent reports of infection in either Belgium or the Channel Islands that BTV is not

currently circulating at high levels in either northern France or Belgium. We will continue to monitor this situation.

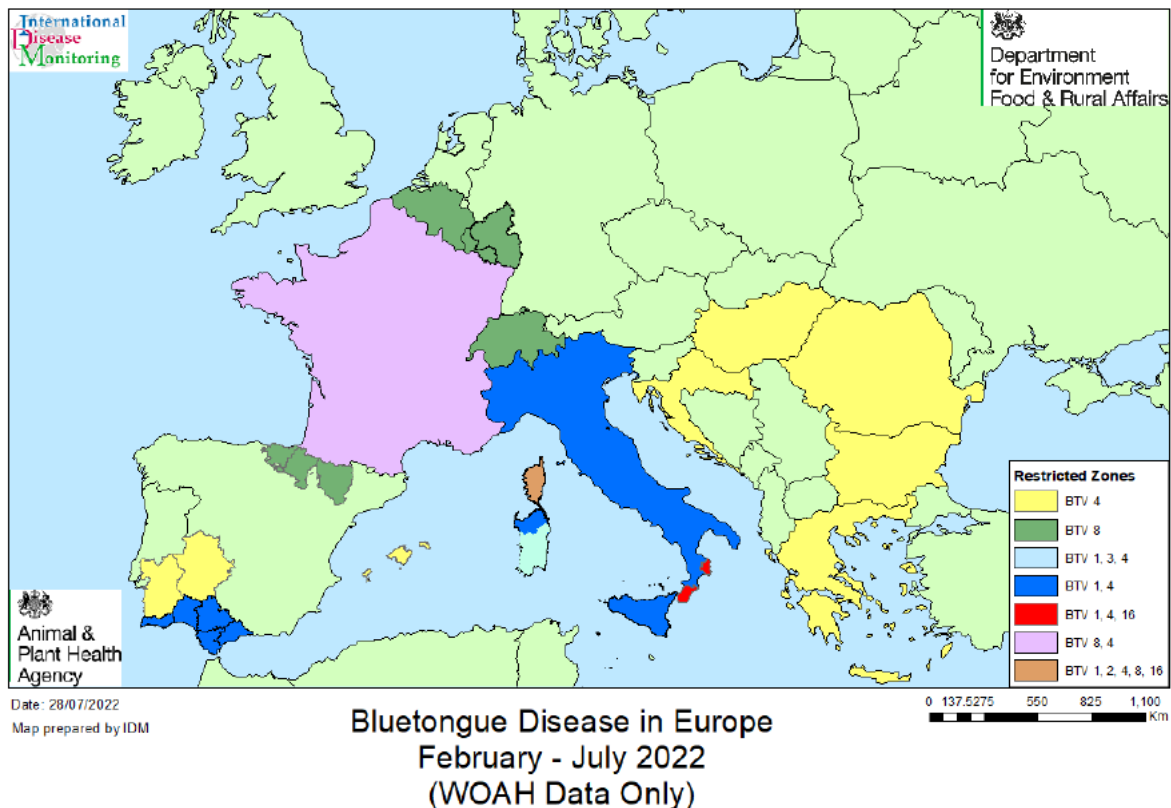


Figure 18: Map of Europe showing BTV restriction zones February 2022 to July 2022

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. <https://www.facebook.com/APHAGov/>

Foot and Mouth Disease (FMD)

In June, FMD outbreaks were reported: serotype O in China (2), Indonesia (17) and Israel (21); serotype SAT 2 in South Africa (5); serotype SAT 3 in South Africa (6).

Of particular concern are the outbreaks reported in Indonesia. In June, Indonesia reported 17 outbreaks of FMD (serotype O). All outbreaks were reported on village premises. Four premises contained cattle only, the largest of which contained over 2,000 animals. The remaining outbreaks were on mixed species premises containing cattle, goats, sheep, and buffalo (one mixed species premises also contained pigs). One mixed species premises contained over 20,000 animals, two contained over 10,000 animals and three contained over 2,000 animals.

With FMD recently found in the tourist hotspot of Bali, Australia and New Zealand have increased their biosecurity arrangements

Recent measures to protect against FMD in New Zealand, include:

- A new wide-reaching awareness campaign targeting travellers before they travel to Indonesia, through in-flight announcements and on arrival at international airports.
- An on the ground audit of the palm kernel supply chain in Indonesia.
- Biosecurity New Zealand is launching an FMD Readiness Taskforce to ensure all preparedness work is refreshed.
- Providing regular updates to primary sector partners and the country's veterinary network and working with primary sector partners to ensure their farmers remain vigilant.
- Providing personal protective equipment, disinfectant, backpack sprayers and other tools to Indonesia to help on the ground, as well as technical expertise.

In Australia legislation has been brought in to strengthened border activities and new measures have been imposed to help prevent an incursion and include:

- Assistance offered to Indonesian authorities to combat and contain the outbreak. offered advice from Australian technical experts, supply of vaccines and offers of financial support. This is in addition to assistance already being provided to combat lumpy skin disease, which was recently detected in Sumatra.
- Reviewed import permits for animal products from Indonesia that may carry FMD and have suspended those of concern.
- Awareness campaigns to Australia's livestock producers and agriculture industries, travellers, and a range of other stakeholders. They are closely engaged with their livestock industries, which they continue to brief on both FMD and lumpy skin disease.
- Stronger clearance requirements for travellers entering through our airports.
- Increased screening for risk goods coming through our international mail centres.
- Increased disease surveillance across Australia's Top End (Western Australia, Northern Territory, and north Queensland).

For more details on the situation in Southeast Asia, please see our latest [Outbreak Assessment](#)

References

- BURNELL, M. (2005) Tapeworm control in sheep. Veterinary Record 157, 180 - 180
- DUBEY, J. P., HARTLEY, W. J., LINDSAY, D. S. & TOPPER, M. J. (1990) Fatal congenital Neospora caninum infection in a lamb. J Parasitol 76, 127-130

- ELLIOTT, D. C. (1986) Tapeworm (*Moniezia expansa*) and its effect on sheep production: The evidence reviewed. *New Zealand Veterinary Journal* 34, 61-65
- GONZÁLEZ-WARLETA, M., CASTRO-HERMIDA, J. A., REGIDOR-CERRILLO, J., BENAVIDES, J. A., ÁLVAREZ-GARCÍA, G., FUERTES, M., ORTEGA-MORA, L. M. & MEZO, M. (2014) *Neospora caninum* infection as a cause of reproductive failure in a sheep flock. *Veterinary Research* 45
- HADLOW, W. J. (1978) High prevalence of thymoma in the dairy goat. Report of seventeen cases. *Vet Pathol* 15, 153-169
- HÄSSIG, M., SAGER, H., REITT, K., ZIEGLER, D., STRABEL, D. & GOTTSTEIN, B. (2003) *Neospora caninum* in sheep: a herd case report. *Vet Parasitol* 117, 213-220
- KELLY, R. F., EVANS, M. & SARGISON, N. D. (2021) Identifying knowledge gaps in *Moniezia expansa* epidemiology: a report of a small intestinal torsion in a 5-week-old lamb. *New Zealand Veterinary Journal* 69, 186-189
- LÖHR, C. V. (2013) One hundred two tumors in 100 goats (1987-2011). *Vet Pathol* 50, 668-675
- NAYERI, T., SARVI, S., MOOSAZADEH, M. & DARYANI, A. (2022) The Global Prevalence of *Neospora caninum* Infection in Sheep and Goats That Had an Abortion and Aborted Fetuses: A Systematic Review and Meta-Analysis. *Frontiers in Veterinary Science* 9
- SCHOLES, S. F., HIGGINS, R. J., HOLLIMAN, A., WATSON, P. J., HUTCHINSON, J. P. & DANIEL, R. (2007) Subacute symmetrical necrotising encephalopathy in young lambs. *Vet Rec* 160, 775
- SCHOLES, S. F., STRUGNELL, B. W. & WATSON, P. J. (2009) Necrotising encephalopathy and porencephaly in lambs. *Vet Rec* 165, 31-32
- SCHOLES, S. F. & WATSON, P. J. (2004) Congenital necrotizing encephalopathy in lambs. *Vet Rec* 154, 32
- SHINKURA, R., KITADA, K., MATSUDA, F., TASHIRO, K., IKUTA, K., SUZUKI, M., KOGISHI, K., SERIKAWA, T. & HONJO, T. (1999) Alymphoplasia is caused by a point mutation in the mouse gene encoding Nf-kb-inducing kinase. *Nature Genetics* 22, 74-77

Publications of Interest

Bull K; Glover MJ; Vineer HR; Morgan ER (2022) **Increasing resistance to multiple anthelmintic classes in gastrointestinal nematodes on sheep farms in southwest England.** *Veterinary Record* 190 (11) 00e1531

<https://doi.org/10.1002/vetr.1531>

- Crawford, P. E., Hamer, K., Lovatt, F. & Robinson, P. A. (2022) **Sheep scab in Northern Ireland: Its distribution, costs and farmer knowledge about prevention and control.** Preventive Veterinary Medicine 205, 105682
- Cousens, C., Ewing, D. A., Mckendrick, I. J., Todd, H., Dagleish, M. P. & Scott, P. R. (2022) **Efficacy of high-throughput transthoracic ultrasonographic screening for on-farm detection of ovine pulmonary adenocarcinoma.** Veterinary Record n/a, e1797
- Dastjerdi, A., Strong, R., La Rocca, S. A., Wessels, M., Wessels, J., Whitaker, K., Strugnell, B. & Williamson, S. (2022) **Investigation into an outbreak of Border disease virus in pigs in England.** Transbound Emerg Dis
- Davies, P., Strugnell, B., Waine, K., Wessels, M., Cousens, C. & Willison, I. (2022) **To scan or not to scan? Efficacy of transthoracic ultrasonography for ovine pulmonary adenocarcinoma screening in a large commercial UK sheep flock.** Veterinary Record n/a, e1578
- Folly A. J.; Mcelhinney L.M.; Johnson N (2022) JMM Profile: **Louping ill virus.** *Journal of Medical Microbiology* 71 (5) 001502.
<https://dx.doi.org/10.1099/jmm.0.001502>
- Johnson N; Phipps L.P.; Hansford KM; FOLLY AJ; FOOKS AR; Medlock JM; MANSFIELD KL (2022) **One Health approach to tick and tick-borne disease surveillance in the United Kingdom.** *International Journal of Environmental Research and Public Health* 19 (10) 5833.
<https://doi.org/10.3390/ijerph19105833>
- Johnson, T., Jacobson, B. T., Jones, K., Mosdal, C., Jones, S., Vitkovic, M., Kruppenbacher, S., Sebrell, A. & Bimczok, D. **Transfer and persistence of bovine immunoglobulins in lambs fed a colostrum replacer.** Veterinary Record n/a, e1974
- Martínez GM; Suárez VH; Hempstead M; Alfaro E; Caro LC; Alfaro J (2022) **Effect of flunixin meglumine on pain-related behaviours following cautery disbudding in dairy goat kids.** Veterinary Research Communications
<https://doi.org/10.1007/s11259-022-09938-z>
- Moloney BJ; Evers JV (2022) **Clostridial panophthalmitis – An unusual case of localised malignant oedema in Merino lambs associated with Clostridium chauvoei.** *Australian Veterinary Journal*
<https://doi.org/10.1111/avj.13191>
- Ohlsen, S., Ganter, M., Wohlsein, P., Reckels, B., Huckauf, A., Lenzewski, N. & Aboling, S. (2022) **Grazing Ecology of Sheep and Its Impact on Vegetation and Animal Health**

in Pastures Dominated by Common Ragwort (*Senecio jacobaea* L.)-Part 1: Vegetation. Animals (Basel) 12

Paton, N., Burgess, S., Bartley, K., Griffiths, J. & Jones, E. (2022) **Piloting an approach to scab control on Welsh sheep farms**. Vet Rec Open 9, e30

Phipps L.P; Johnson N (2022) JMM Profile: tick-borne encephalitis virus. *Journal of Medical Microbiology* 71 (5) 001492.
<https://dx.doi.org/10.1099/jmm.0.001492>

Reukers, D., de Boer, P. T., Loohuis, A. O., Wever, P. C., Bleeker-Rovers, C. P.,

van Gageldonk-Lafeber, A. B., Timen, A. (2022). **Targeted Screening for Chronic Q Fever, the Netherlands**. *Emerging Infectious Diseases*, 28(7), 1403-1409.

<https://doi.org/10.3201/eid2807.212273>.

Vezina B; Rosa MN; Canu A; Tola S (2022) **Genomic surveillance reveals antibiotic resistance gene transmission via phage recombinases within sheep mastitis-associated *Streptococcus uberis***. *BMC Veterinary Research* 18 (1)

<https://doi.org/10.1186/s12917-022-03341-1>

Weber M; Zanolari P; Ardüser F; Stucki D; Akarsu H; Overesch G (2022) **Prevalence and antimicrobial resistance of *Salmonella enterica* subsp. *diarizonae* serovar 61:k:1,5,(7) in Swiss sheep flocks**. *Preventive Veterinary Medicine* 206

<https://doi.org/10.1016/j.prevetmed.2022.105697>



© Crown copyright 2022

Statement regarding use of this material

The material in this report has been compiled by the Animal and Plant Health Agency (APHA) Surveillance Intelligence Unit in collaboration with the APHA Surveillance and Laboratory Services Department. Images are governed by Crown Copyright except where specifically acknowledged to have been provided by others external to APHA. Use of material directly from the report is acceptable provided APHA (or others where specifically indicated) is acknowledged as the owner of the material. This does not include use of the APHA logo which should be excluded or used only after permission has been obtained from APHA Corporate Communications (apha.corporatecommunications@apha.gsi.gov.uk).

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v.3. To view this licence visit www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ or email PSI@nationalarchives.gsi.gov.uk

This publication is available at <https://www.gov.uk/government/collections/animal-disease-surveillance-reports>

Any enquiries regarding this publication should be sent to us at SIU@apha.gov.uk
<http://apha.defra.gov.uk/vet-gateway/surveillance/index.htm>

The Animal and Plant Health Agency (APHA) is an executive agency of the Department for Environment, Food & Rural Affairs, and works on behalf of the Scottish Government and Welsh Government.