Animal & Plant Health Agency

SRUC

GB small ruminant quarterly report

Disease surveillance and emerging threats

Volume 23: Q2 – April - June 2020

Highlights

- **Endocarditis due to *Streptococcus suis* type 9 in an adult ewe – page 6**
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Introduction and overview

This quarterly report reviews disease trends and disease threats for the second quarter of 2020, January to 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

Weather

This spring was slightly warmer than average. In April Rainfall was well below normal and wild-fires were reported in a few places, until the rain arrived at the end of the month (Figure 1). Dry weather continued into May and brought reports of wildfires, grass fires and heathland fires from across the United Kingdom. It was the sunniest May in a series from 1929, with 143% of average sunshine, a maximum temperature of 28.3 °C was recorded at Cromdale, Morayshire (Figure 2). The very sunny and warm weather of late May continued into the start of June, around mid-month there was a spell of warm, humid, showery weather with thunderstorms and in the last few days there were cloudy and windy with showers and longer spells of rain, with especially persistent and heavy rain in parts of Cumbria.

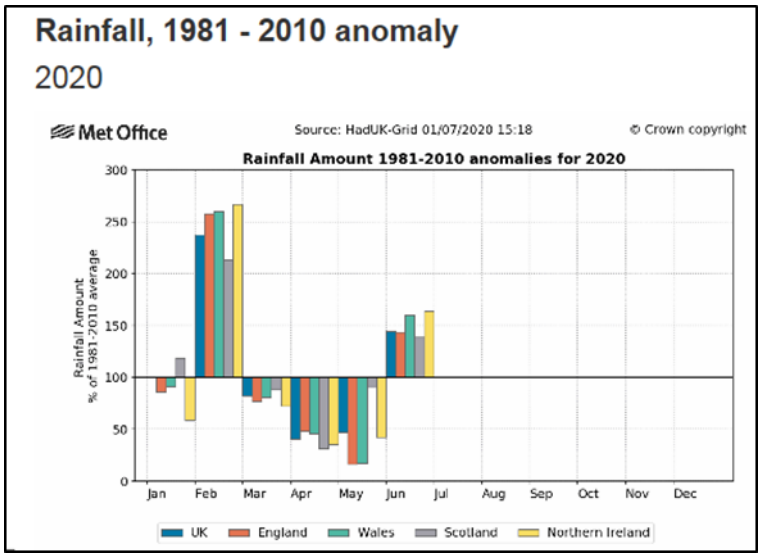

Figure 1 Rainfall amount 1981 – 2010 anomalies for 2020

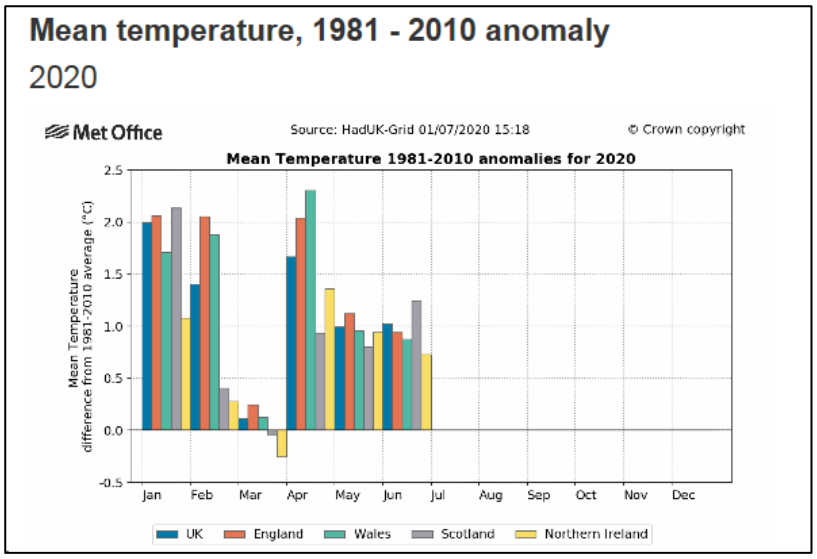

Figure 2 Mean temperature 1981 -2020 anomaly

This spring provided good lambing conditions for those lambing outside although the lack of rain reduced the grass growth for lambs subsequently turned out. In March SCOPS released the Nematodirus forecasting tool to assist farmer decisions on when to be alert to Nematodirus over the spring period. During last winter there had been a relatively low incidence of liver fluke, the winter had been mild, but generally below 10 degrees slowing the development of fluke on pastures. The dry April also slowed the development of liver fluke but farmers were urged to remain vigilant and to limit potential pasture contamination by testing stock before turn out after lambing. See page 10.

The dry weather also left worm eggs in faeces waiting for the rain to stimulate hatching which might then result in a worm spike. Alerts were issued through APHA newsletters and SRUC bulletins. See page 9.

The warmer weather appeared to favour a surge in tick numbers in the south of England with large numbers found on lambs on some farms. See page 11.

In June NADIS issued a medium alert for Blowfly strike warning that heavy summer rain can make sheep more susceptible to strike as fly eggs and maggots survive in wet wool. See page 27.

Industry

The COVID-19 pandemic has had a marked effect on the domestic lamb market. At the end of March the eating out sector closed in the UK and remained closed throughout Q2. This had an impact on consumer eating habits. Lamb was especially affected due to traditionally being a popular choice at pubs and independent restaurants. Equally the timing of the UK beginning social distancing measures limited family Easter celebrations, again negatively impacting demand.

Lamb prices were largely in-line with year earlier levels during Q2, having been trending high for the time of year through most of Q1. Production during the quarter was down 14% (9,900 tonnes), to 61,700 tonnes, with kill significantly down during April and May. During the quarter UK lamb kill was 360,000 head lower year-on-year. Reflecting this, exports were lower during both April and May, although industry reports suggest they have somewhat recovered during June.

Rebecca Wright, AHDB

New and re-emerging diseases and threats

Unusual diagnoses

Likely Clostridial hepatitis in an adult ewe

A three-year-old ewe lambed 6 weeks earlier and was unwell for 5 days before dying. The ewe was treated with calcium, meloxicam and oxytetracycline prior to death. Clostridial vaccination and treatment for worms and fluke were given in February.

Significant postmortem findings:

- There were adhesions between proximal duodenum/liver/pancreas/omentum
- Fibrinous plaques throughout omentum and increased red peritoneal fluid
- Right liver lobe irregular shaped lesion about 10cm diameter. Full thickness of lobe, pale parenchyma with pink/purple in the centre and dark red on the surface of the liver with pale margins (Figures 3 & 4)
- Proximal duodenum was oedematous and adhesed to omentum
- Urine was dark brown in colour

Clostridium novyi FAT (which detects *Clostridium noyvi* type B) on liver was negative. Histological changes in the liver and bacterial morphology were consistent with infectious necrotic hepatitis (black disease) caused by *Clostridium novyi.* No evidence of active or past liver fluke infection was seen in the sections examined or on gross examination. A single large liver lesion can be seen with bacillary haemoglobinuria caused by *Clostridium noyvi type D (C. haemolyticum)* which is indistinguishable from black disease on histopathology. Both these diseases depend on a focus of hepatic injury within which latent spores can germinate and are usually associated with liver fluke. It is likely the peritonitis was secondary to this liver lesion. There was not a definitive diagnosis but a review of vaccination protocols for clostridial disease was recommended.

Figure 3 Liver lesion in three-year-old ewe due to clostridial disease

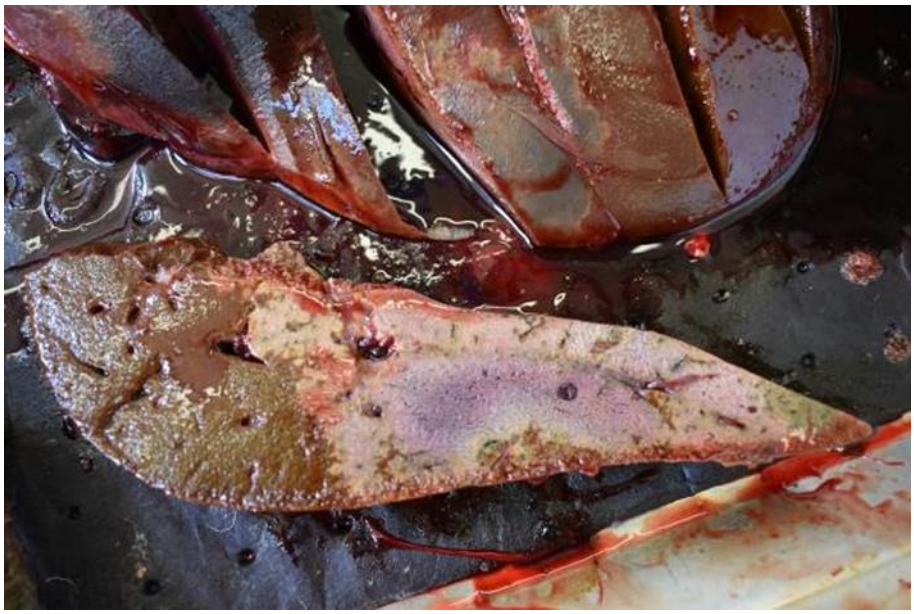

Figure 4 Cut surface of liver showing pale lesion with purple centre due to clostridial disease

Chondrodysplasia in Texel lambs

Three, six-to-twelve-week-old pedigree Texel lambs were submitted for postmortem examination to investigate the cause of suspected angular limb deformities; and abnormal gait which included knuckling of the forelimbs. Approximately seven lambs were born with angular limb deformities, which had worsened over time. All of the affected lambs were reported to have had variable difficulties suckling, and one of the affected lambs had died shortly after birth. There were no obvious macroscopic changes at postmortem

examination, however, the changes associated with this condition can be subtle and histopathological examination was actioned to investigate further. Bone histopathology of all three lambs found changes consistent with chondrodysplasia leading to aberrant growth and maturation of the physeal cartilage. These changes were different from those seen in Texel chondrodysplasia in New Zealand (an inherited genetic condition). The aetiology in these lambs remained unclear; although genetic faults in cartilage matrix production and maternal nutritional deficiencies during gestation were suggested. An assessment of breeding records and the nutritional status of the dams of the affected animals was recommended to identify any potential risk factors. In addition, two of the lambs had pneumonia and one also had a purulent joint. This was likely to be related to the fact that the animals could not suckle properly at birth and the consequent failure in colostrum intake. *Mannheimia haemolytica* was isolated from the affected lung tissue. All three lambs were negative on BDV PCR testing.

See also SR Quarterly report Q3 2019 Chondrodysplasia and dwarfism in Welsh Mountain sheep:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/852568/pub-survrep-sr0319.pdf

Endocarditis due to *Streptococcus suis* type 9 in an adult ewe

Endocarditis was diagnosed in an adult ewe that was in a poor body condition. The ewe appeared blind and was panting and frothing at the mouth and died 2 days later. The left atrio-ventricular valve had multiple vegetative lesions attached to the chordae tendonae ranging from 3mm to 10mm diameter and changes in the lung indicated the ewe had died due to congestive heart failure. *Streptococcus suis* type 9 was cultured from the heart lesion. Subsequently this *Step suis* isolate was sent for 16s sequencing to confirm the ID. It returned as *Streptococcus ruminantium (Tohya and others 2018).* This is a newly characterised *Streptococcus* spp which is consistently found in ruminants. *Streptococcus suis* is not commonly found in sheep and is more usually considered to be a pathogen of pigs and is zoonotic. We do sporadically isolate *Streptococcus suis* cases from sheep as individual cases from flocks and endocarditis is a typical finding in these cases.

Unusual skin lesions in a newborn lamb

Unusual circular skin lesions (Figure 5) were detected on a set of newborn twin lambs from a 2500 ewe flock. They died at two days of age. Bacterial cultures from the affected skin identified *Bacillus licheniformis* and *Mucor* spp. Histopathology revealed severe, multifocal necrotising, suppurative dermatitis suggesting penetration of infection from the skin surface, this could suggest that the lesions were secondary to placentitis, possibly due to the *Bacillus* spp. *Bacillus licheniformis* can produce a marked placentitis in sheep and cattle which could then result in the observed lesions in these lambs. The typical source of this bacterium is via spoilt forage such as poorly preserved silage or haylage.

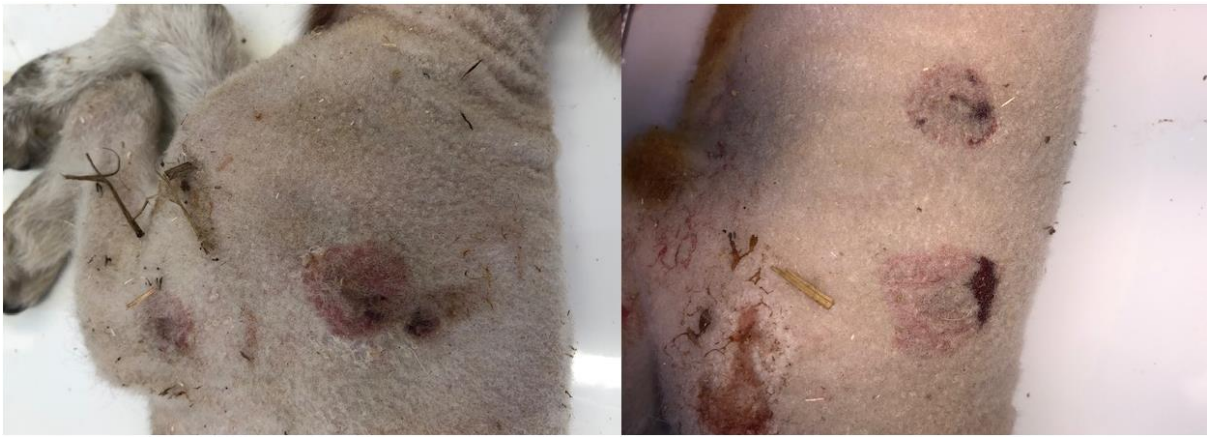

Figure 5 Circular skin lesions on a newborn lamb

Acknowledgement to Shires Vets for the pictures.

Changes in disease patterns and risk factors

Syndromic analysis

Most common diagnoses Q1 2020

During Q2 2020, 1064 diagnostic submissions were received in GB and the presenting signs of sheep and age category from which samples/carcases were submitted, with age group for submissions (Figure 6) and abortion the most common sign (Figure 7). Note that abortions are included in the adult category.

Adult	323
Mixed	18
Neonatal	52
Postwean	43
Prewean	291
Unknown/other	337

Figure 6 Age group of sheep in submissions Q2 2020

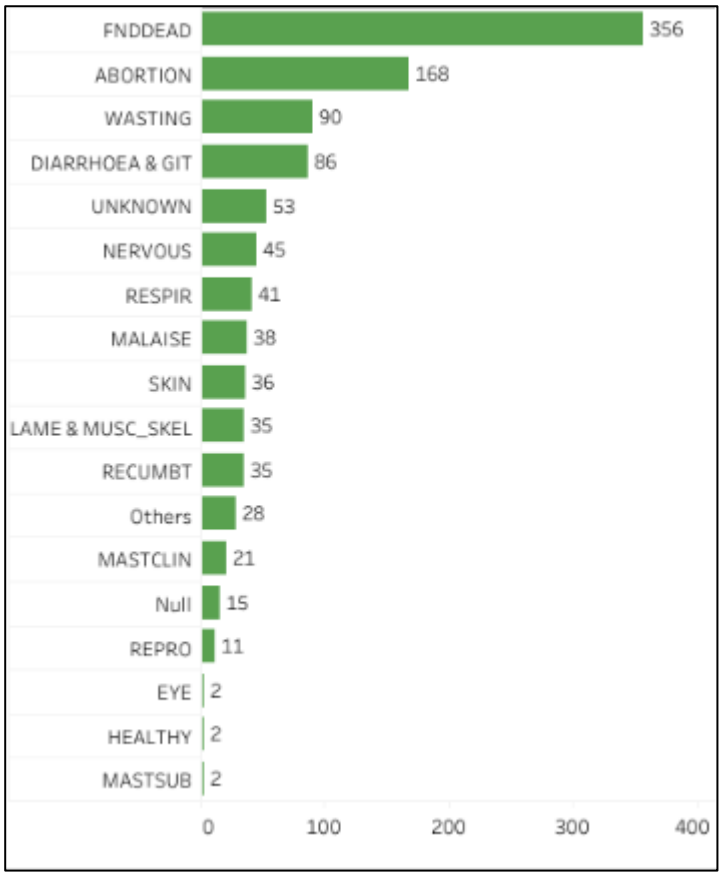

Figure 7 presenting signs of sheep in submissions Q2 2020

The most common VIDA diagnoses in pre-weaned lambs are shown in Figure 8.

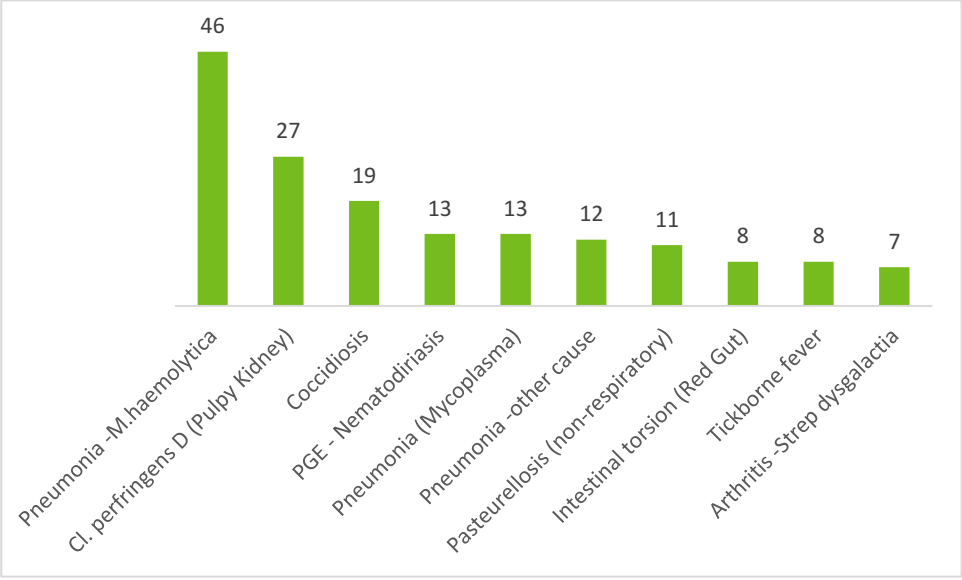

Figure 8 most common VIDA diagnoses in pre-weaned lambs Q2 2020

Syndromic alerts were raised this quarter for the following diseases:

Border disease, Cl. perfringens D infection, Intestinal Torsion NOS, Cl. perfringens B disease, Johne's Disease, OPA (Jaagsiekte), Pneumonia dt Mycoplasma ovipneumoniae, Tick-borne fever.

These alerts allow members of the SR SEG to review cases for these diagnoses and provide comment in the quarterly report.

Parasitology

Parasitic gastroenteritis (PGE)

Generally less PGE was reported this quarter due to the dry weather in April and May, but rains in June meant risk from larval challenge to lambs was high. Warning of this was circulated to VIOs, to be put in the monthly newsletter to veterinary practices and also in the fortnightly digest which includes distribution to partner PM providers.

PGE Haemonchosis

Four cases were diagnosed this quarter, including deaths of 4 ewes out of a group of 80, in June; however the peak in numbers is usually seen in third quarter of the year (July-September). Again warmer temperatures April to June this year may have aided the larval survival on pasture and the heavier rains in June facilitated release onto pastures.

This parasite is present on a large number of sheep farms throughout GB but we only see disease sporadically when weather in particular, or anthelmintic resistance, allow it to become predominant It will cause disease in lambs and in adults. If warmer temperatures become normal in the UK then this disease may become more common.

A warning to be alert for Haemonchosis was issued to veterinary surgeons in July 2020.

Coccidiosis

A number of VICs reported coccidiosis in lambs this quarter although the numbers of cases diagnosed in VIDA is not significantly altered from last year, and reduced from quarter 2 in 2018.

Disease was seen in young lambs 4-10 weeks old where pathogenic species of *E. ovinoidalis* and *E. crandallis* predominated. An unusual case was also reported where *E. bakuensis*, a polyp forming, low pathogenic species had actually caused the partial obstruction of the small intestine. This is likely to be a sporadic event due to an over-reactive response to infection in this individual, rather than a flock-level problem.

Liver Fluke

A low incidence of liver fluke over the winter period, continued into the second quarter. A single episode of clinical disease was reported in group of 26 lambing ewes from a petting zoo. They presented with wasting, diarrhoea, bottle jaw, pale mucus membranes and abortion. One died and was submitted for PME. There was severe liver fibrosis, bile duct stenosis and large numbers of adult fluke within the bile ducts and gall bladder, typical of chronic fluke. Triclabendazole resistance was suspected as they had been treated earlier in the season. A full investigation into date of treatment, product storage and dosing technique is required as well as checking for efficacy of flukicide product is required before resistance can be confirmed. Liver compromise due to fluke can present as increased incidence of twin lamb disease and reduced milk yield resulting in poor lamb growth.

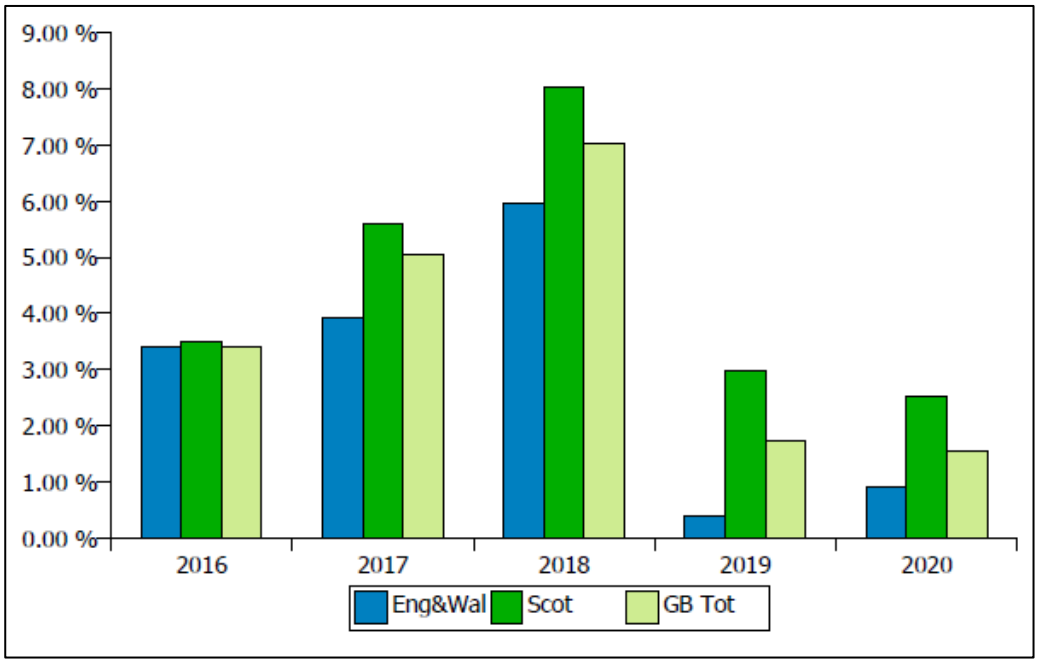

Figure 9 Q2 2020 GB Incidents of Chronic Fasciolosis in sheep as % of diagnosable submissions

The dry weather in April and May will have affected numbers of the intermediate host Galba truncatula and their infection with miracidia resulting in reduced risk to sheep this autumn. The impact of the rains that have followed, on both snail and fluke numbers, is yet to be revealed.

APHA contributed to the production of a liver fluke news release on the SCOPS website, reminding farmers that although fluke incidence was currently low, the priority was to reduce pasture contamination with eggs that could result in disease in the autumn.

https://www.scops.org.uk/news/7402/business-as-usual-for-liver-fluke/

Pruritus in goats due to *Bovicola* louse infestation

Bovicola species chewing lice (Figure 10) were identified as the cause of ongoing pruritus in a group of pygmy goats. Topical synthetic pyrethroid treatment had been given previously but had not cured the problem. The hair coat of these goats was long, which may have limited its effectiveness.

Figure 10 Microscopic view of Bovicola louse.

Subsequently, a macrocyclic lactone (ML) injection was given, which had little effect – injectable MLs are effective against sucking lice but may have reduced efficacy against chewing lice. An eprinomectin pour-on was advised to be used, as this is licensed for use in goats and for chewing lice. The pharmaceutical company advised a second treatment 10 days after the first.

The housing was cleaned and fresh bedding given at the time of treatment, even though survival of *Bovicola* species off the host is very limited. An immediate clinical response was seen after the first application of eprinomectin and hair growth subsequently resumed.

In another case, *Bovicola* species lice were identified on examination of a skin scrape from sheep where 205 of the flock of 500 ewes were showing signs suggestive of a previous ectoparasite episode where wool slip and regrowth was evident.

The clinical signs of chewing lice can be confused with those of sheep scab and getting a diagnosis is essential (Mitchell and Carson 2019). Treatment of chewing lice in sheep is by organophosphate dip or by topical synthetic pyrethroids.

Lice are more commonly seen during winter months and are often associated with sheep in poor condition. Shearing will reduce populations by 30 to 50 per cent. Topical pyrethroids will have limited efficacy against lice in full-fleeced sheep and could increase the risk that resistance to the product will develop in the lice; consequently, topical pour-on products are most effective when applied ‘off shears’.

Treatment options for lice can be found on the Sustainable Control of Parasites in Sheep website at www.scops.org.uk/external-parasites/lice/

Tick-associated disease

Theileria and Babesia infection caused by *Haemaphysalis punctata* ("Red Sheep Tick")

Multiple and more unusual tick-borne pathogens were identified in one sheep flock in the South East as a result of infestation with the less common tick, *Haemaphysalis punctata.*

Two three-week-old lambs were euthanised and submitted to investigate malaise, anaemia and the death of 23 lambs in a group of 200 which had not responded to treatment. Post-mortem findings were consistent with heavy tick infestation, anaemia, dehydration and focal abscessation in their vertebral columns with additional arthritis and pericarditis in one of the lambs. *Staphylococcus aureus* was recovered from multiple sites in both lambs confirming a diagnosis of tick pyaemia. This infection is normally associated with infestation by the tick *Ixodes ricinus,* which inhabits rough permanent grazing land, moorland and woodland edge but in this case the ectoparasites involved were identified as *Haemaphysalis punctata* ticks. Pan-piroplasm PCR detected *Babesia motasi* in one of the lambs and *Theileria luwenshuni* in the other. It was concluded that the flock mortality was due to a combination of tick pyaemia, and babesiosis/theileriosis exacerbated by the immunosuppressive effects of heavy tick burdens. To our knowledge this is the first report of tick pyaemia associated with *H. punctata* infestation. No other pathogens commonly associated with the presence of ticks such as *Anaplasma phagocytophilum* (the causative agent of tick-borne fever) or Louping ill virus were detected by laboratory testing.

There has been an increase in tick numbers and tick borne disease in certain parts of the country so far this year, most likely due to the mild, wet, winter/spring conditions facilitating high tick numbers early in the season. With a lack of vaccines to protect against either the ticks or tick borne disease, control relies on managing the exposure to ticks to allow lambs, and in some cases naïve ewes, to build immunity without resulting in actual clinical disease. This can be achieved by the using careful grazing management and acaricide treatments, but this has proved challenging for some farms this year due to the sheer scale of tick burdens on the pasture.

Tick Borne Fever / *Anaplasma phagocytophila*

We reported in Quarter 1 on early cases of tick borne disease and there were a high number of Tick borne Fever (TBF) disease diagnoses this quarter, with APHA diagnosing 13 cases and SRUC diagnosing 6 cases. 58% of the cases were pre-weaned lambs, with a wide range of ages affected. Most cases were found dead, a small number were described as having nervous signs or lameness. Losses were at between 2 and 5% and were described in some cases as occurring 2-3 weeks after animals had been turned onto affected pastures. In about half of cases (53%) there was a concurrent infection which was

the likely cause of death, the immunosuppressive effects of *Anaplasma phagocytophila* infection likely predisposing the sheep to other infections. *Mannheimia* pneumonia, *Bibersteinia* infection and systemic *Staphylococcus aureus* were all diagnosed as concurrent infections, and Louping Ill was diagnosed in one of the cases from ewes with abortions and nervous signs.

Four new incidents of tick pyaemia were also diagnosed.

This is most likely to be associated with mild, wet, winter/spring conditions facilitating high tick numbers early in the season. Minimising the risk of disease relies on reducing tick exposure to allow lambs to build gradual immunity. This may be achieved by the use careful grazing management and acaricide treatments.

Further to the focus article we published in the Veterinary Record (2020) we also published an information note on the Vetgateway:
http://apha.defra.gov.uk/documents/surveillance/diseases/information-note-ticks.pdf

The carcase of a two-month-old lamb was received for post-mortem examination. Five lambs had died from this group of 100 over a one-week period. The adult ewes were unaffected. No premonitory clinical signs were seen in the affected lambs. The lambs had just completed their initial two dose course of Heptavac P. External examination of the carcase identified numerous, variably engorged ticks around the muzzle and within the axillae. Internally, multifocal 1mm pale lesions were scattered throughout the liver parenchyma and both lungs showed irregular areas of deep purple consolidation. A diagnosis of tick pyaemia was confirmed following the isolation of *Staphylococcus aureus* in septicaemic distribution from liver, lungs and heart blood. Samples collected during an on-farm post-mortem of another affected lamb were received. On this occasion, *Bibersteinia trehalosi* pneumonia was confirmed. In light of the above diagnoses, clinical history and farm location (close to Dartmoor) testing for tick borne disease was undertaken and in both cases PCR confirmed the presence of *Anaplasma phagocytophilum* the causative agent of tick borne fever (TBF). This is an immunosuppressive disease and was deemed the likely underlying factor in the recent lamb deaths on this farm.

A similar problem of lamb deaths was also reported in a 250-ewe flock grazing Bodmin moor. Seven, one-month-old lambs had been found dead over the last two weeks. A typical case was submitted for post-mortem examination. Gross findings in this case were consistent with bacterial pneumonia and cultures confirmed the involvement of *Mannheimia haemolytica.* As above, engorged ticks were found on the carcase and tick borne fever was diagnosed on PCR testing of spleen also indicating this disease as the underlying immunosuppressor in this case.

Wales Veterinary Science Centre diagnosed 4 cases of TBF with gross pathological signs of widespread ecchymoses (Figure 11) and arthritis in a lamb with TBF & *Streptococcus dysgalactiae* joint ill (Figure 12). WVSC provided a case report for the Veterinary Record

(Daniel and others 2020) on High mortality in a sheep flock caused by coinfection of louping ill virus and Anaplasma phagocytophilum.

Figure 11 widespread ecchymoses in the lung

Figure 12 Arthritis in a lamb with TBF and joint ill

Metabolic disease

Hypocalcaemia in ewes post-lambing

Two adult ewes were submitted for postmortem examination to investigate the cause of death. The ewes were managed in an extensive outdoor system, with paddock grazing. The flock had recently had issues with ewes becoming recumbent post-lambing, and these two ewes had been found dead on the morning of submission. Some of the affected ewes had responded to calcium injection. Ewe 1 had given birth to triplets three days prior to death, and Ewe 2 had given birth to twins three days prior to death. The flock had lambed outdoors in a tight block, and lambing had started the preceding week. The ewes had been kept indoors on haylage over winter, and had been outdoors for eight weeks. They were lambing in paddocks, with access to a mineral and energy buckets, but were not fed supplementary concentrates. It was reported that pig slurry had been applied to the pasture in January and that the grass was very lush. There were minimal significant changes seen at gross necropsy. Testing of ocular fluid found calcium concentrations to be at a level consistent with terminal hypocalcaemia in both ewes (0.5 mmol/l and 0.6 mmol/l). Magnesium and BHB levels were within normal limits. Bacteriology found no evidence of systemic infection. It was unusual that the farm was seeing hypocalcaemia in post-parturient ewes, as it is typically seen pre-lambing in sheep. Potential contributing factors considered included the age of the ewes and how this affected calcium mobilisation, and the lush pasture the ewes were grazing in the paddocks. The grazing of plants with high oxalate levels (such as sorrel) can also predispose to hypocalcaemia.

Skin disease

Corynebacterium pseudotuberculosis was isolated in three separate goat submissions, all using culture of swabs from abscesses to confirm. One farm had a history of animals previously diagnosed with caseous lymphadenitis (CLA). In another case, CLA was also suspected as the cause of a submandibular abscess in a three-month-old Boer goat kid. In this case a swab taken from the abscess cultured *Trueperella pyogenes*, a common organism found in purulent sites.

Corynebacterium pseudotuberculosis was first introduced into the UK in the late 1980s, and is now present in the majority of the county. CLA is mainly diagnosed in adult sheep and goats during June to October.

Respiratory disease

Mannheimia pneumonia and Pasteurellosis/Mannheimiosis

There was again a high number of diagnoses of *Mannheimia* pneumonia made by APHA this quarter (Figure 13), reflecting a year on year increasing trend for this diagnosis during

quarter 2, and during quarter 1 for the past 3 years. Last year overall there was an increase in diagnoses relative to previous years. SRUC diagnoses were at the upper end of the usual diagnostic rate. In some cases there was evidence of septicaemia/ systemic involvement also. The diagnoses numbered 12.58% as a percentage of diagnosable submissions compared to previous diagnoses of between 2.94% and 11.02%. The cases were almost all in preweaned lambs (92% of cases), with almost half of the cases in 4-6 week old lambs (age range was 2 weeks to 10 weeks). Although in many flocks the losses were between 1 and 8%, one flock had losses of up to 22%. In 53% of the submissions *Mannheimia* pneumonia only was diagnosed, the remaining cases had mixed disease diagnoses which included *Pasteurella multocida*, *Mycoplasma ovipneumoniae*, *Trueperella pyogenes*, Coccidia, Parasitic gastroenteritis, Tick borne fever, Cryptosporidia, Lungworm, Mastitis and Johne's. Most cases (75%) were found dead meaning case treatment hadn't been an option. The remaining cases, where signs were seen, were described as having respiratory signs, lameness, malaise and recumbency. Typical findings were described on post mortem examination consisting of lung consolidation and serofibrinous fluid within the thorax, and in some cases also in the abdomen. A number of cases were described as having weight loss or a lack of milk in the gastrointestinal tract, and a poor milk supply from the ewe may have contributed to an increased susceptibility to the disease, and to disease problems in general, in some of the lambs. Otherwise changing weather conditions this spring, which ranged from relatively cold to hot muggy weather is known to increase the risk of respiratory disease in young animals and has potentially influenced the number of cases during this quarter.

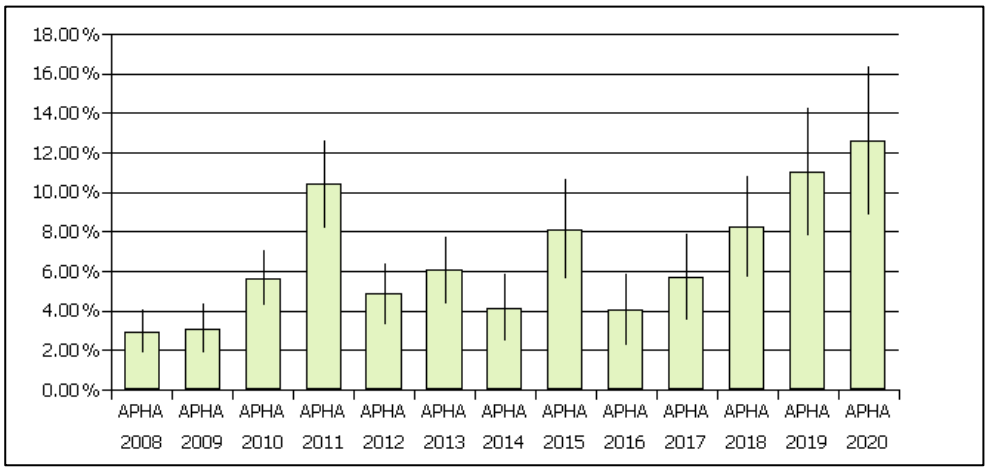

Figure 13 APHA incidents of Mannheimia haemolytica in sheep as % of diagnosable submissions Q2 2020

Consistent with the increase in Mannheimia pneumonia cases, Pasteurellosis/Mannheimiosis systemic infection diagnoses were also relatively high for both APHA and SRUC. APHA diagnoses were 4.95% of diagnosable submissions (6) compared to a usual rate of 1.5-4.68% and SRUC diagnosed 11 cases, which was 5.15% of diagnosable submissions (compared to a usual 1.17-4.98%).

Mycoplasma ovipneumonia

There was a notable increase in diagnoses of *Mycoplasma ovipneumoniae* pneumonia cases recorded this quarter by APHA. There were 15 diagnoses made by APHA when in previous years between 2 and 11 diagnoses have been made this quarter. SRUC recorded only 2 diagnoses. Most of the diagnoses (76%) were in lambs aged between 2 weeks and 8 weeks in age, and in two thirds of the cases there were concurrent infections consisting of other causes of pneumonia and *Mannheimia* in particular, and some with parasitic or chronic enteric infections. Just over half of the cases were found dead, likely as a result of the concurrent infections, otherwise weight loss, respiratory signs and lameness were described.

In one flock “snotty noses”, some nose bleeds and coughing were described in ewes, but deaths due to combined *Mycoplasma ovipneumoniae* and *Mannheimia pneumonia* were occurring in the preweaned lambs. Chronically infected ewes in the flock may in this case have provided a high challenge to the lambs.

The increase in *Mycoplasma ovipneumoniae* could have been induced also by the nutritional and climate related risk factors discussed for *Mannheimia* pneumonia above.

Mycobacterium bovis infection ewe

A ewe was submitted for post mortem examination to investigate the cause of multiple abortions followed by ewe death. During examination a 3cm diameter abscess containing thick gritty green-yellow purulent material was found in the left cranial lung lobe and the bronchial and mediastinal lymph nodes were massively enlarged, with the internal substance of the lymph nodes completely obliterated with gritty, caseous, yellow-green material. *Mycobacterium bovis* spoligotype 11 was isolated from this material, confirming tuberculosis. This finding was incidental in this particular ewe and would not have been the cause of death. Tuberculosis is sporadically identified in sheep and sheep are typically considered a “dead-end host” meaning transmission on from infected sheep is uncommon. Infection is likely to have originated from contact with infected cattle or with an infected wildlife host.

Ovine Pulmonary Adenocarcinoma

SRUC recorded an increase in Ovine pulmonary adenocarcinoma diagnoses, there were 13 diagnoses representing 8.67% of diagnosable submissions compared to 1.33-4.17% in previous years.

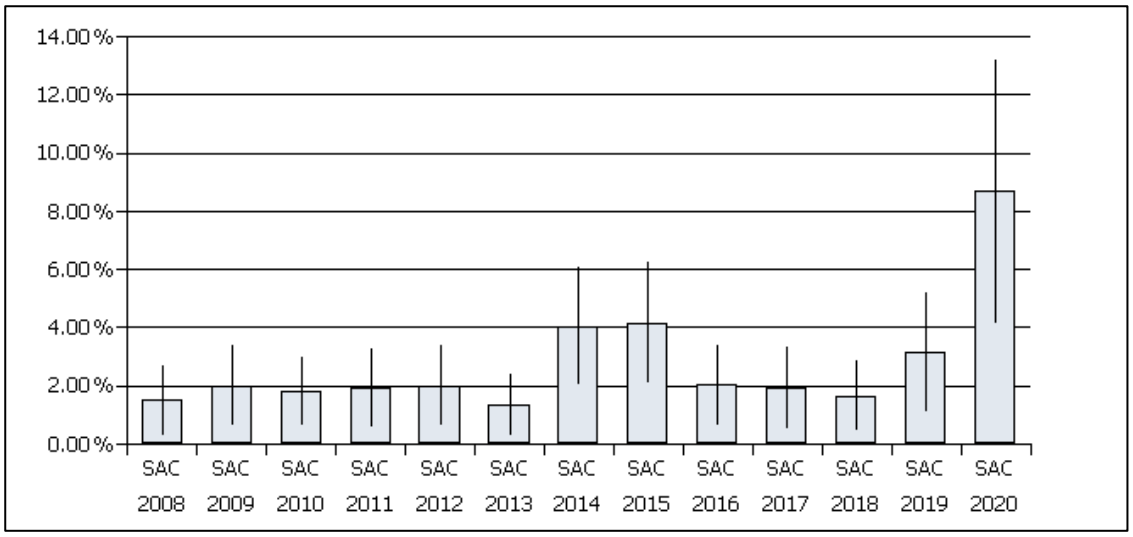

Figure 14 SRUC incidents of OPA/Jaagsiekte in sheep as a% of diagnosable submissions Q2 2020

Reproductive disease

During the lambing period January 2020 – June 2020 there were 874 diagnostic submissions with abortion listed as the presenting sign. The most common diagnoses are shown in Figure 15.

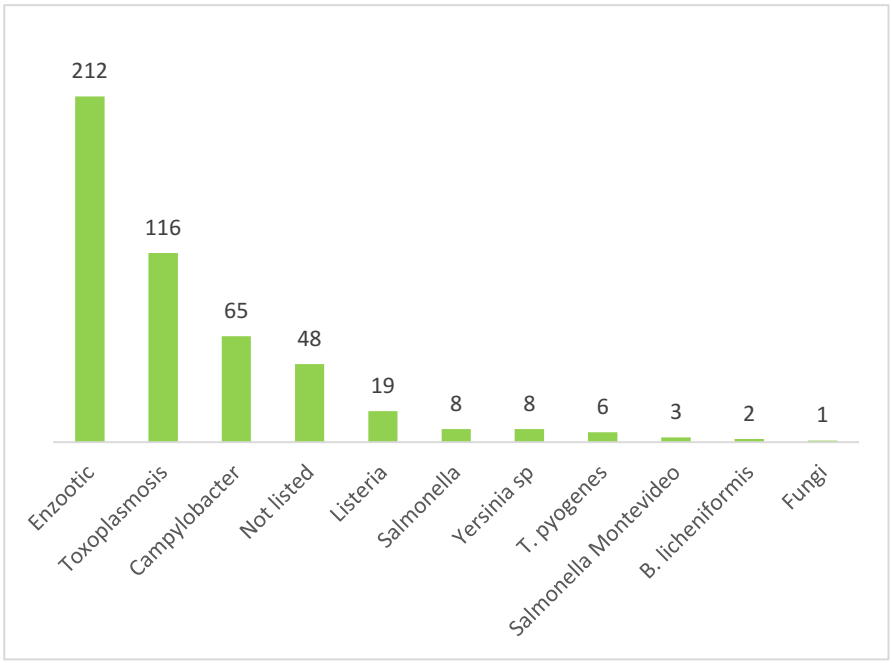

Figure 15 most common VIDA diagnoses for sheep abortion Jan-Jun 2020

No fetopathy due to *Salmonella* Typhimurium or *Coxiella burnetii* were recorded for this quarter (VIDA figures).

Salmonella infection resulting in ewe and lamb deaths -

A ewe was submitted for examination to APHA VIC Shrewsbury following the loss of 20 out of 250 pregnant ewes. Ewes were reported to die soon after lambing smelly lambs or died prior to lambing with the placenta visible at the vulva. Rapid autolysis was reported. Only one group of twin bearing ewes from the flock of 1000 was affected. In addition the lambs from this group were dull and there had been more losses than normal. The ewes, which were purchased from multiple sources in the autumn, were housed, fed grass silage and a home produced blend. The submitted ewe was in good condition, weighing 69kg, bloated and there was copious dark purple discharge at the vulva. The liver was orange and friable. The abomasal contents were liquid and there was reduced intestinal content. The heart and lungs were darkened. An enlarged uterus containing 12.5kg of severely autolysed lambs and placentae was present. Metabolic testing identified a slightly increased beta hydroxybutyrate concentration suggestive of negative energy balance. A *Salmonella* Typhimurium, which was sensitive to all antibiotics on the testing panel, was cultured from both the faeces and uterus. Further typing found it not to conform to a recognised type. Advice was given regarding protection of humans and other groups of sheep on the farm. A lamb submitted from the same holding also tested positive for an untypable salmonella and was positive for rotavirus.

Q fever

No incidents were VIDA coded for Q fever, but an abortion outbreak in a large dairy goat herd during June was most likely caused by *C. burnetii*. The incomplete range of submitted samples (often the case with goat abortions) could not satisfy the VIDA code criteria, but the PCR was positive on both submissions from the herd and no other abortifacient were detected or diagnosed. The case was notified to the Non-Statutory Zoonosis group and Public Health England.

Border Disease

Border disease virus was detected in six submissions submitted to investigate abortions during the first quarter. Additional surveillance was in place until COVID 19 lockdown restrictions curtailed this additional testing (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. Only one further case was diagnosed form abortion samples in the second quarter, suggesting that that the additional surveillance at the start of the abortion season did manage to detect the presence of BDV that would otherwise have been missed. When looking at all the presenting signs, 15 new incidents of Border disease were diagnosed in the first two quarters of this year.

Schmallenberg virus (SBV) infection

No confirmed SBV diagnoses were recorded for this quarter. There was a case from Starcross in the first quarter where a serology sample from a ewe that had malformed twin lambs tested positive. PCR testing on fetal samples were negative. However 50 % of fetuses may have cleared the virus, ewe serology might determine if SBV is circulating in the flock.

Mastitis

An adult ewe was submitted from a flock of 200 after becoming weak and recumbent, being the third animal to be affected with similar signs. The ewes lambed early in the season and they had lambs at foot which were now at the point of weaning. Severe, per-acute mastitis with localised swelling of the right side of the udder and haemorrhagic inflammation of the mammary tissue was observed at post-mortem. Milk expressed from the right teat was scant and haemorrhagic. Bacteriology of the abnormal milk secretion and udder tissue isolated *Staphylococcus aureus* in pure, profuse growth. The associated toxaemia was the deemed the most likely cause of the clinical signs. Reduced milk supply, leading to over-eager sucking and teat damage by the lambs were suggested as the possible aetiology.

Musculoskeletal disease

Arthritis due to Streptococcus dysgalactiae subsp dysgalactiae

Diagnoses of arthritis due to *Streptococcus dysgalactiae* subsp *dysgalactiae* were increased this quarter with 12 (2.53%) incidents recorded compared to 7 (1.03%) in 2019. This was due to an increase in cases reported by SRUC. No significant changes were seen by APHA. Quarter two often sees the peak in diagnoses of arthritis due to *Streptococcus dysgalactiae* subsp *dysgalactiae* as the environmental burden of the organism increases as lambing comes to an end.

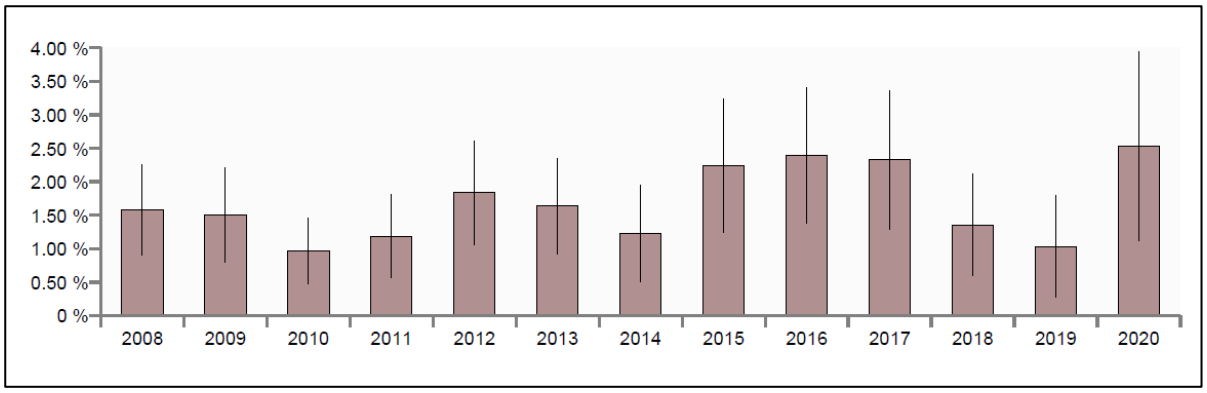

Figure 16 GB Incidents of Arthritis-Strep.dysgalactiae for Q2 as a % of diagnosable submissions 2008-2020

Enteric disease

Rotavirus

Following an increase in Q1 2020 we reported that we would re-evaluate the figures after the second quarter. The figures Q2 2020 showed a decrease compared to previous years.

Clostridium perfringens D

There was an increase in incidents diagnosed for GB (not statistically significant) for this quarter (Figure 17) and also reflected in increases in APHA and SRUC data. The SRUC increase is statistically significant.

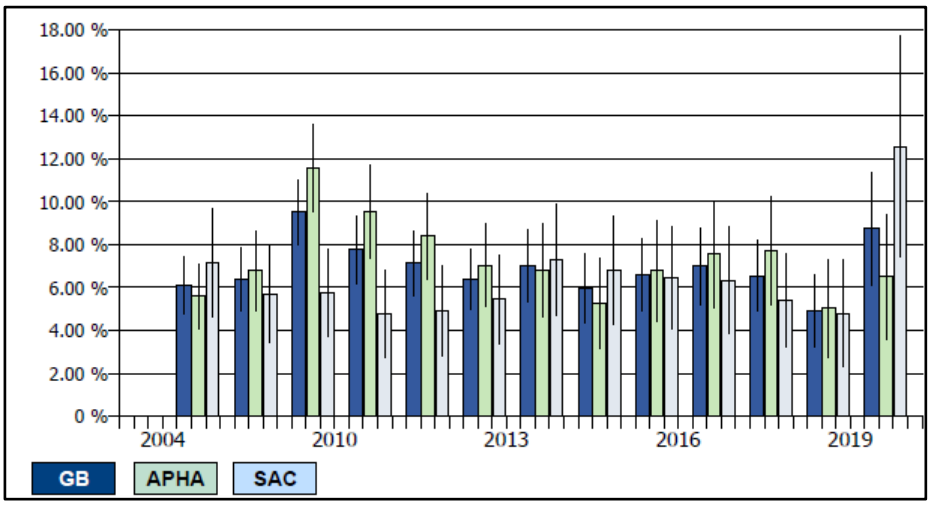

Figure 17 Q2 2020 Incidents of Clostridium perfringens D in Sheep as % of diagnosable submissions

Systemic disease

Copper deficiency (hypocupraemia) causing cerebral hypoplasia and brain oedema

Hypocupraemia was the cause of recumbency, weakness and ataxia in two neonatal lambs submitted for a postmortem examination (PME). Gross findings included excessive cerebrospinal fluid (CSF) within the skull and a brain that appeared to be too small for the skull (Figure 18). Leukenencephalopathy (oedema) was diagnosed with histology. The changes were most suggestive of a toxic or metabolic insult. Copper analysis of frozen liver gave a result of 114.00µmol/kg DM (ref range 314-7850µmol/kg DM) confirming copper deficiency. Copper supplementation was advised.

Figure 18 Hypoplasia of the cerebrum in a neonatal lamb

Nervous disease

Louping ill

Compared to 2019 diagnoses of Louping ill are considerably decreased this quarter. Only 2 cases (0.54%) were reported in 2020 compared to 11 cases (2.04%) in 2019. Both APHA and SRUC recorded a single case each. Over the last eighteen months there has been significant fluctuations in the number of Louping ill diagnoses, most likely a reflection of the climatic conditions and hence tick activity during this time. Tick numbers and host seeking behaviour does appear to have been increased this quarter with a large number of Tick Borne Fever (TBF) cases reported, but interestingly this has not resulted in a concomitant increase in Louping ill cases. The reasons for this are uncertain, but it may suggest there is a currently a level of GB flock immunity due to the high levels of tick activity and exposure of ewes to Louping ill virus during 2019.

Urinary disease – No significant trends were identified this Quarter.

Centre of Expertise for Extensively Managed Livestock

During Q2 2020, 204 diagnostic submissions were received from Hill/Upland sheep in GB and the age group for submissions (Figure 19) and presenting signs of hill sheep from which samples/carcases were submitted, with found dead the most common sign (Figure 20). Note that abortions are included in the adult category. The top ten VIDA diagnoses made for these are shown in Figure 21.

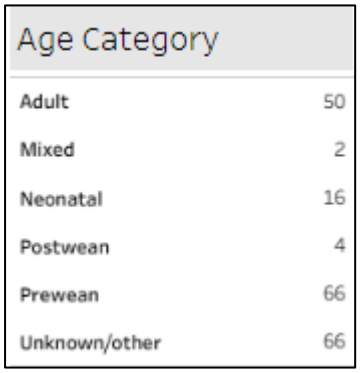

Figure 19 age group for hill sheep submissions

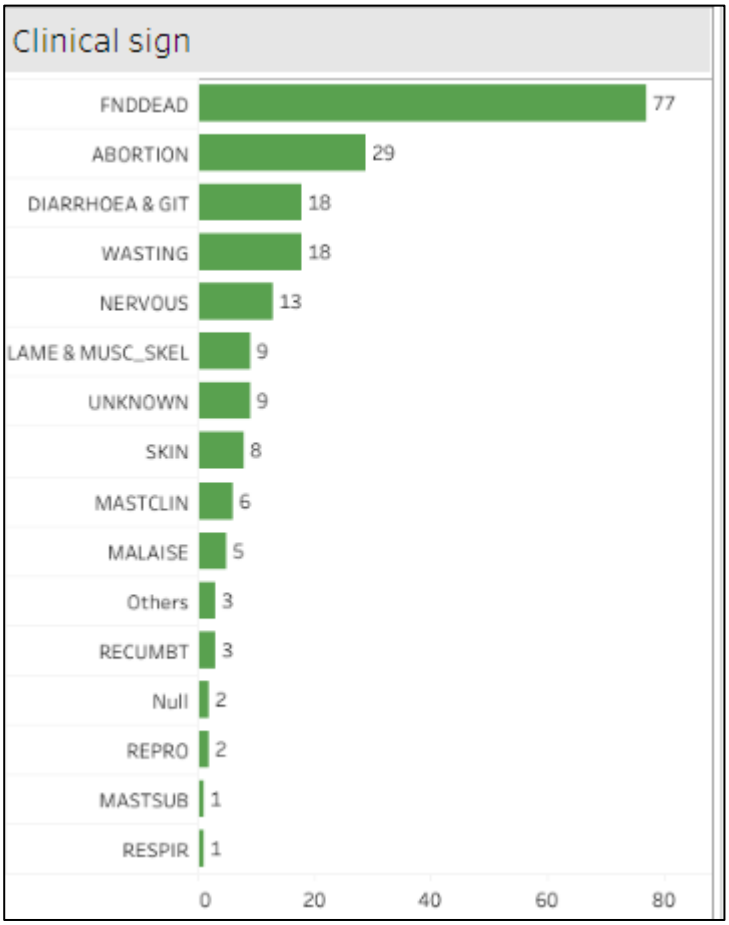

Figure 20 presenting signs of hill sheep

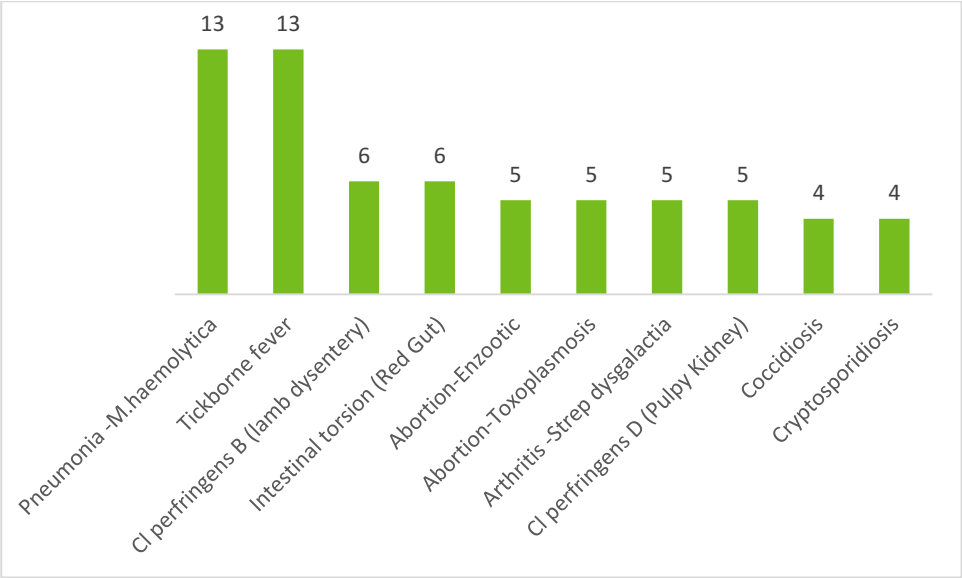

Figure 21 Top 10 VIDA diagnoses for Hill/Upland sheep Apr - Jun 2020GB

A map showing were submissions were received from in Q2 2020 is shown in Figure 22. It is worth noting that the purpose of the sheep might be defined as Hill/upland by the submitting vet but does not necessarily mean they are kept in extensively managed situations.

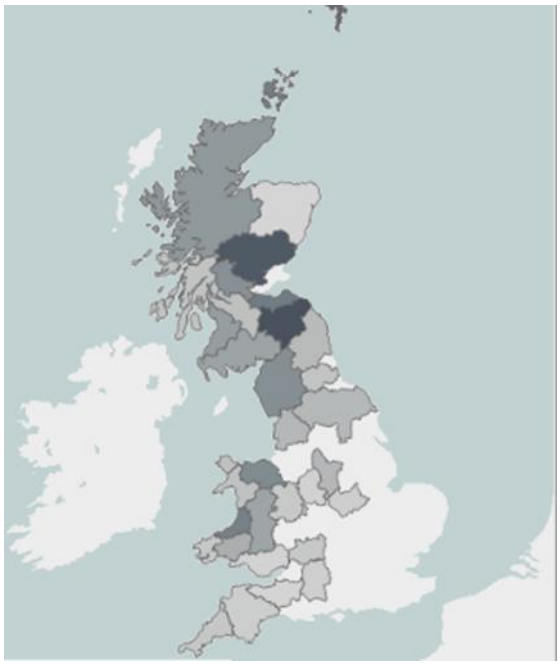

Figure 22 Map showing where submissions received from for sheep – purpose Hill/upland

Horizon scanning

Bluetongue (BTV) update

In North Macedonia, 30 outbreaks of BTV-4 have been reported in premises with sheep, one of which also had 3 goats. Of these outbreaks, fourteen were on premises with less than 200 sheep (between 43 and 197), thirteen had more than 200 (between 218 and 567), and 3 had over 2000 sheep (2,243, 2,650 and 2,729). These are the first outbreaks to be reported in North Macedonia since October 2014, when the country experienced a large number of BTV-4 cases affecting over 83,000 cattle, sheep and goats. The disease then, was epidemiologically linked to disease outbreaks in neighbouring Bulgaria and Greece. For this current outbreak, only sheep and goats have been reported as being affected. BTV-4 (as with most other BTV serotypes), seldom causes clinical signs in goats, but some meat producing sheep breeds can become seriously affected, with up to 30 percent mortality being reported during past outbreaks (ProMED, 2020). The Faculty of Veterinary Medicine for the National Laboratory, in Skopje, is sequencing this current strain to compare it to the virus strain that was circulating in 2014 (OIE, 2020).

For more information, see our Outbreak Assessment at:

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

Elsewhere in Europe, in southern **Italy**, sixteen outbreaks of BTV-4 have been reported since the beginning of the year. In addition, two outbreaks of BTV-1 were reported in Sardinia and Sicily in February and June. Seven new outbreaks of BTV-4 were reported in Italy in July, all in the south (compared with one report of BTV-1 in June). One of these affected cattle, on a small holding of nine, and another of the outbreaks was on a mixed sheep and goat premises (90 sheep and 372 goats). Four outbreaks affected premises with sheep only (41, 100, 152 and 165 sheep) and one outbreak was on a premises with 23 goats only. The whole of Italy is now a restricted zone for both serotypes 1 and 4. Following active surveillance in April, **Greece** reported an outbreak of BTV-4 in a sheep flock on Samos, an island close to the coast of Turkey. Greece is a restricted zone for BTV-4 only. Greece has also reported three outbreaks of BTV-16 in sheep and cattle on the island of Lesvos, and one on Samos between January and April. In February, Eight new outbreaks of BTV-4 were reported in Greece in July, following passive surveillance. All are in the north of the country, towards the borders with Albania and North Macedonia. Six of the outbreaks are on premises with sheep only (with 154 to 580 sheep). Two are on mixed sheep and goat farms (with 323 and 170 sheep, and 11 and 50 goats, respectively). This is the first time BTV-4 has been reported in Greece since December 2015. BTV-16 has been reported fairly regularly on Lesvos, Samos and the Dodecanese Islands since 2017. **Spain** reported BTV-4 in a captive Black wildebeest (*Connochaetes gnou*) in Malaga, which is a region of Spain within the restriction zone for BTV-4.

BTV-8 in cattle was reported in one outbreak in **France** at the end of January, five outbreaks in **Belgium** between January and March, and two outbreaks in **Switzerland** in January and March. A map of the BTV situation is shown in Figure 23.

The potential risk pathways for BTV-4 from southern Europe to the UK are through importation of infected livestock, rather than windborne incursion of infected midges. It remains to be seen how BTV-4 in southern Italy and Macedonia will spread over the summer months as the vector season takes off. There have been no recent imports from the affected areas of North Macedonia recorded on TRACES; however, albeit small, some risk always remains from illegal imports of animals or germplasm. The situation with respect to BTV8 on the continent remains the same. Thus, the risk of introduction of BTV-4 or BTV-8 to the UK is considered to be **LOW.**

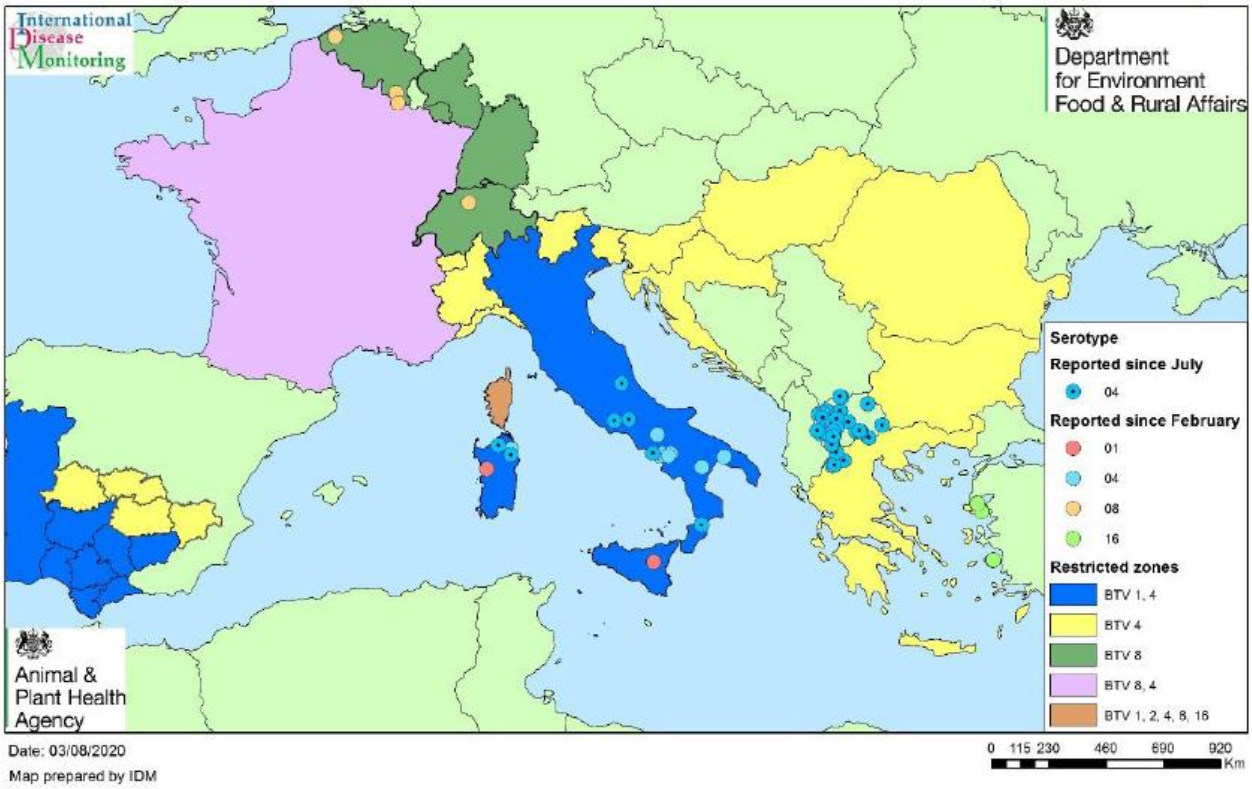

Figure 23 Bluetongue disease in Europe February 2020 – July 2020

Livestock owners and vets in the UK should note that an incursion of BTV-8 could result in trans-placental transmission and infection of foetuses in cattle and sheep. Bluetongue should therefore be considered as a possible differential when investigating poor fertility and offspring born with congenital brain malformations.

Livestock owners are strongly advised to source replacement stock responsibly and consult with their private veterinarians to put in place controls preventing the introduction of Bluetongue. Assurances should be sought from traders to ensure BTV-susceptible animals are fully protected prior to travel. This means that additional guarantees should be obtained certifying that the purchased animals have been correctly vaccinated and/or have

built up sufficient immunity to protect them against the relevant BTV serotypes infections circulating in their region of origin.

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

Wohlfahrtia magnifica

The risk of blow fly strike affecting sheep increases during warm, wet weather, which is ideal for flies and maggots. In the UK, this is caused by *Lucilia sericata* (greenbottle flies), *Phormia terraenovae* (blackbottle flies) and *Calliphora erythrocephala* (bluebottle flies) laying their eggs on areas of soiled fleece or open wounds. The Surveillance Intelligence Unit has been alerted by colleagues in France to a new threat that has recently arrived in France and has previously been recognised in other Mediterranean countries.

Wohlfahrtia magnifica, the spotted flesh fly (Figure 24), is a Dipteran fly whose larvae attack mainly sheep and goats, causing traumatic myiasis, but may also affect cattle, horses, camels and other mammals, occasionally humans and poultry as well. It is present in Italy, Greece and Spain (Bonacci and others 2013; Giangaspero and others 2011).

Figure 24 Wohlfahrtia magnifica

The flies are most active between May and October and prefer hot and dry conditions. Adult females are **larviparous**, i.e. they do not deposit eggs but larvae that have already hatched inside the uterus. Sheep are most at risk and flies lay their larvae in moist areas on the sheep targeting the interdigital clefts (Figure 25), vulva, and open wounds or around ear tags. The larvae feed and mature in five to seven days burrowing deep into the hosts tissues and can be missed at inspection. Mature larvae are up to 20 mm long compared to 10 – 14 mm for blowfly larvae of the genus *Lucilia* found in the UK. The larvae fall to the

ground to pupate (underground) with adults emerging 4 to 12 days later. Animals experience significant pain when infested, wounds may become secondarily infected by bacteria and necrosis of the tissues occurs.

Figure 25 Wohlfahrtia magnifica larvae in the interdigtial cleft of a sheep (images courtesy of Emmanuel Garin GDS France)

Control is achieved through the use of dipping or spraying using synthetic pyrethroids (e.g. cypermethrin, deltamethrin, permethrin, etc.) and organophosphates. Pour on's are less effective as they do not ensure sufficient protective cover of the animal.

Wohlfahrtia magnifica is found mainly around the Mediterranean, in Russia and in China. La Fédération Nationale des Groupements de Défense Sanitaire (GDS France) reported in June an increased incidence of myiasis due to *Wohlfahrtia* in the Limousin area of France, since it was first reported in 2012. A further case was confirmed in the Pyrénées Orientales region at an altitude of 1000 m in 2019.

Enhanced surveillance is in place in the Limousin area of France in order to prevent spread, with farmers encouraged to submit larvae for differentiation and confirmation of *Wohlfahrtia*. Guidance has been provided on preventing and controlling the disease including quarantine of new arrivals on farm with daily close inspection of all orifices and feet and observation for changes in gait or behaviour. Prophylactic treatments are encouraged and effective disposal of any larvae found to prevent spread.

https://www.reussir.fr/bovins-viande/sites/bovins-viande/files/2020-06/GDS%20France%202020%20_Recommandations_wohlfahrtia_eleveurs_0.pdf

Wohlfahrtia magnifica has not been found in the UK but there are a number of groups who monitor for a wide variety of insects that are not currently found in the UK. With this potential new threat in mind, we would be interested to hear from colleagues if they hear of any reports of unusual or particularly severe cases of struck sheep.

Welfare

The AWC opinion on the welfare of goats at the time of killing has recently been published.

This opinion discusses recent changes in the goat industry. It reviews slaughterhouse processes and killing practices applied on-farm. It also assesses the animal welfare issues relating to the killing of goats and makes recommendations for improvement.

https://www.gov.uk/government/publications/awc-opinion-on-the-welfare-of-goats-at-the-time-of-killing

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/908317/pub-chemfood0220.pdf

Lead Toxicity

A raised tissue lead concentration was detected following post mortem of an adult breeding ewe which presented with nervous signs and died. The liver lead concentration was 0.8 mg/kg WM. In total 12 of a group of 260 were affected and died. Post mortem examination of two affected ewes confirmed a diagnosis of listeriosis. The lead detected in the liver was consistent with a residue due to above background exposure to lead. Blood lead concentrations were analysed in two of the other affected ewes prior to death and blood lead concentration of 0.12 and 0.14 µmol/l detected. These results suggested that the liver residue was unlikely to be due to a current exposure to lead. The source of lead was considered to be due to the fact that the ewes had been placed on post flooded ground. Once the flood had subsided a fine silt could be seen. It is likely that the river flood water contained geochemical lead in the silt. The silt and exposed areas of mud in the post flooded field were suspected to have predisposed the ewes to listeriosis. The flock were moved and no further clinical cases occurred. APHA recommended a withdrawal period of 16 weeks was observed but since the blood lead concentrations were below background APHA have not requested further blood sampling. The ewes are breeding ewes and not intended for the food chain in the near future.

Laurel poisoning

One two-year-old ewe was submitted for post mortem following a period of recumbency and death. The ewe was part of a group of 15 ewes that had all lambed recently. Gross examination suggested the ewe to be septicaemic/toxaemic with increased prominence of subcutaneous blood vessels. Multiple leaf fragments were found in the rumen which were identified as laurel leaves. It was uncertain why the exposure occurred.

Botulism in sheep

APHA VIC Thirsk investigated an incident where 40 of 100 lambs had shown variable clinical signs including wasting, swollen joints, hunched backs and 30 had died or been euthanaised. Three 2 to 3-week-old lambs were submitted for post mortem examination (PME). Gross pathology was suggestive of joint ill in one lamb and pneumonia in the other two with *Mannheimia haemolytica* and *Mycoplasma ovipneumoniae* isolated. Border disease testing was negative. Poor colostrum and milk intake, and/or suboptimal lambing shed hygiene were considered possible contributors.

The remaining lambs continued to deteriorate and developed neurological signs of dragging of hind limbs, some ewes also appeared to have a dropped jaw and difficulty swallowing.

A ewe and a lamb were submitted for PME. Bacteriology testing, including specific selective culture for Listeria, was unrewarding. There were no specific microscopic changes in the central nervous system (CNS) of either animal, and inflammatory CNS diseases, cerebrocortical necrosis and copper deficiency were ruled out. Laboratory testing for Anaplasma phagocytophilium (Tick Borne Fever) and botulism PCR were negative. Clinical chemistry on tissues for Copper, Lead and Molybdenum was unremarkable. Botulism was considered and testing was carried out at Wageningen University & Research, Lelystad but no botulinum toxins were detected.

The sheep were moved off the area and improvements were noted. However fifteen suckler cows and calves were then turned out onto the same area and after 8 weeks they presented with similar clinical signs of ill-thrift, recumbency and flaccid paralysis. A three-month-old calf was submitted to investigate the cause of death. There was no significant gross pathology observed but further testing for botulism was carried out with the following results:

Sample	Test description	Result
Faeces	Botulism PCR (B)	Negative
	Botulism PCR (C,D)	CbotD/C
	Botulism toxin & typing	Toxin type D
Intestinal contents	Botulism PCR (B)	CbotB
	Botulism PCR (C,D)	CbotD/C
	Botulism toxin & typing	Toxin type D

The sheep had moved onto this holding in December 2019, the land had previously been used for broiler chickens and pigs. The calf results confirmed suspicions that botulism was likely to be the underlying cause of the clinical disease in sheep and cattle. It seems most likely that the land was contaminated as a result of its previous use as a broiler unit.

APHA gave advice on animal health and welfare and discussed causes of botulism and prevention and advised that affected animals should not be presented to the food chain and should any recover that there is a further 18 day restriction following cessation of clinical signs.

It is of interest and unusual that C.Botulinum type B was detected by PCR. In soil in Britain type B is considered the most common type found in the environment. However outbreaks of botulism in cattle and sheep are in general only types C and D.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2133922/

The Advisory Committee on the Microbiological Safety of Food (ACMSF) reported on botulism in Cattle and later in Sheep and Goats.

https://acmsf.food.gov.uk/sites/default/files/mnt/drupal_data/sources/files/multimedia/pdfs/botulisminsheepgoats.pdf

They concluded that the incidence of the toxin types A, B and E, those that can be associated with disease in humans, needed to be kept under review during outbreaks of botulism in livestock.

Other Government reports

Zoonoses and Veterinary Public Health Quarterly report Q2 – April to June 2020 summarise the surveillance activities of the Animal and Plant Health Agency (APHA) and SRUC Veterinary Services, (operating within Scotland's Rural College – SRUC) for zoonoses and infections shared between man and animals in Great Britain, using data gathered by the network of Veterinary Investigation Centres.

https://www.gov.uk/government/publications/non-statutory-zoonoses-disease-surveillance-reports

The Zoonoses and Veterinary Public Health Annual report 2019 was published in February 2020

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/864666/fz2100-2019-annual-report.pdf

TSE

The latest statistics for Active TSE surveillance in Great Britain were published on Gov.UK website in July 2020. The statistics show that during 2019 under Scrapie Surveys (Sheep and Goats) and the Compulsory Scrapie Flock Scheme (Sheep & Goats) there were cases of classical scrapie recorded in sheep & goats.

https://www.gov.uk/government/publications/active-tse-surveillance-statistics

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