

OVERVIEW

- ***Salmonella enterica* serovar Bredeney as a cause of milk drop in a dairy herd.**
- **Deaths due to urolithiasis following diet change in lambs.**
- **Spotty liver disease in a flock of layers.**

GENERAL INTRODUCTION

July was a dull, cool month with only 84 per cent of average sunshine and a mean temperature 1.1 °C below the long-term average. Rainfall was 137 per cent of average and it was wettest in the south-west and north-east. Sunshine was below normal in central and western counties, near normal in the east, and above normal in Shetland.

DISEASE ALERTS

The following conditions were reported by SRUC VS disease surveillance centres in November 2019. Given similar climatic and production conditions, they could also be important this year.

- **Postweaning encephalopathy in lambs**
This presentation is most common in newly housed lambs in association with lack of familiarity with the water source, the water is difficult to access or there is an interruption to supply. Lambs that are otherwise healthy present as blind in the first few days following housing. A combination of history and brain histopathology is required to confirm the diagnosis. Serum sodium levels may be elevated.
- **Cobalt deficiency causing ill thrift in lambs**

Dietary cobalt is converted into vitamin B12 in the rumen and absorbed in the small intestine. Vitamin B12 is required for gluconeogenesis and synthesis of the amino acid methionine which is essential for wool growth. This explains why deficient lambs appear to lack energy and have poor quality fleece. Concurrent parasitic gastroenteritis is common so collection of both blood and faecal samples is advised when investigating poor growth rates in lambs.

CATTLE

Nutritional and metabolic disorders

An eighteen-month-old Jersey heifer became the fourth animal from a group of 42 to die over a few days. The heifers had been imported from Denmark two to three weeks earlier and were around six months in calf. They had been at grass since arrival but their grazing history prior to purchase was unknown. Postmortem examination identified poor rumen fill and severe fatty liver. The aqueous humour beta-hydroxybutyrate result of 15.8 mmol/l (reference range <2.5 mmol/l) confirmed acetonaemia. A syndrome of acetonaemia/fatty liver is recognised in recently imported in-calf dairy heifers, thought to be associated with multiple stressors occurring over a short time period. This may include being turned out to grass for the first time and failure to adapt quickly to this diet change. Heifers in late gestation are most frequently affected. A bacterial enterocolitis was also diagnosed in this animal which may have predisposed to acetonaemia at an earlier stage of pregnancy. *Escherichia fergusonii* was cultured from the ileum in mixed growth and may have been significant as a predisposing factor.

Toxic conditions

A yearling stabiliser heifer was noted to be blind and subsequently developed seizures prior to death. Lead poisoning was suspected as this had previously occurred twice on the holding. A kidney lead level of 16.8 mg/kg fresh tissue (FT) (reference range < 0.1 mg/kg FT) confirmed the diagnosis. The cattle had access to an extensive area of hill ground and no source could be identified. Following consultation with Food Standards Scotland a restriction was placed on the rest of the group for a period of 16 weeks. Lead poisoning was also diagnosed in a three-month-old Belgian blue heifer from a second holding four days after moving to a new field. Blood lead was elevated at 3.19 umol/l (reference range < 0.15 umol/l). In this case a damaged electric fence battery was subsequently discovered in the field. Strip-grazing had been introduced, and stock were grazing to the field margins for the first time in many years. Lead toxicity also confirmed on a third farm after a five-month-old Limousin calf became blind and ataxic. Blood lead was 0.81 umol/l (reference range ≤ 0.15 umol/l) and paint on old gates was suspected to be the source. Thorough checking of pastures for possible sources of lead before cattle are introduced would avoid unnecessary losses.

Generalised and systemic conditions

SRUC VS investigated milk drop and pyrexia in a 200 head dairy herd after 100 animals exhibited milk drop and pyrexia over a ten-day period. Faecal samples, blood samples and nasopharyngeal swabs were collected from acutely affected animals and concerns were raised about a spoiled batch of first cut silage that had been fed prior to the start of the outbreak. Six out of eight blood samples showed neutrophilia and lymphopenia consistent with acute inflammation. PCR testing for respiratory viruses and Schmallenberg virus proved negative. Two recently calved cows died and a five-year-old Holstein Friesian cow was euthanased on welfare grounds for postmortem examination. This animal had a history of respiratory disease prior to the outbreak and deteriorated markedly after calving. This detected evidence of diarrhoea in addition to chronic bacterial pneumonia and tracheal abscessation. *Salmonella enterica* serovar Bredeney was isolated from the ileum of this case and from all four submitted faecal samples. S Bredeney is a group B *Salmonella* sp that is more frequently isolated from poultry or humans in the UK. It is not reported to be particularly virulent, although persistent shedding has been described.¹ Samples of the silage and total mixed ration were cultured but *Salmonella* sp were not detected. Outbreaks of clinical disease associated with S Bredeney are thought to involve a predisposing factor. In this case, the spoiled first cut silage may have reduced dry matter intakes, altered abomasal pH or affected gut motility. All of these changes have been associated with a reduction in the normal gastrointestinal inhibition of *Salmonella* sp.²

An unusual case of subacute-chronic focal symmetrical encephalomalacia was diagnosed in a 14-month-old Limousin cross stirk. The animal had been at grass for several months with access to barley fed via a hopper. It appeared healthy in the morning but was found in lateral recumbency later the same day and was described as very dull with limited vision but not pyrexia. Corticosteroids, antibiotics and vitamin B were administered. Re-examination 48 hours later confirmed that it was now blind and it was treated for suspected lead poisoning. The farmer continued nursing the animal and its vision improved after a week. Blood testing ruled out exposure to lead and it was euthanased ten days after clinical signs were first observed as complete recovery was considered unlikely. Neuropathology revealed bilateral, symmetrical relatively well-demarcated areas of malacia, characterised by neuroparenchymal rarefaction and cavitation infiltrated by Gitter cells, and vascular proliferation affecting the medial geniculate bodies, cerebral peduncles and inferior colliculi. These findings were considered consistent with a diagnosis of focal symmetrical encephalomalacia. Screening of small

intestinal contents for epsilon toxin was undertaken retrospectively and proved negative most likely due to the subacute-chronic presentation of the case. Vaccination against clostridial disease was recommended.

Reproductive tract conditions

Acinetobacter baumannii was thought to be the cause of abortion in a homebred Belgian blue heifer. The bacteria was isolated from foetal stomach contents and histopathology findings of a purulent pneumonia and placentitis confirmed a bacterial aetiology. This was the third near term abortion in the group, but the first to be submitted for investigation. Studies have shown that *A baumannii* can be carried in the upper respiratory tract of cattle.³ It was advised to submit further material for investigation if abortions continued.

Two stillborn calves were submitted from a herd of 37 homebred pure Hereford and Hereford cross cows. A diagnosis of anoxia during parturition was made in one case. The second calf was small (16.5 kg, crown-rump length 78 cm) reflecting intra-uterine growth retardation, and internal hydrocephalus and hypomyelination were detected on examination of the brain. Neither BVDV antibody nor antigen were detected. Given that this was a single case, and the same bull had been used in previous years without any issues, a sporadic genetic cause was considered most likely.

Mammary diseases

A three-year-old Holstein Friesian cow was dried off with antibiotic and teat sealant and appeared well until three days later when it became very dull. There was no response to treatment with fluids and antibiotics, it developed black diarrhoea and died after five days. At postmortem examination three udder quarters were found to be firm with areas of mottled haemorrhagic parenchyma and fibrinous change. There were multiple bleeding abomasal ulcers and petechial haemorrhages were noted on the heart, lungs and oesophagus. *Escherichia coli* was isolated in pure growth from the udder, liver and spleen consistent with a diagnosis of *E coli* mastitis and septicaemia. Cases of mastitis following introduction of bacteria at drying off have been documented, however, the delay between drying off and development of clinical signs in this case suggested that unhygienic tubing technique was not to blame. The possibility of incomplete teat canal closure was suggested. Abomasal ulceration can be associated with stress and hypovolaemia and, given that melaenic faeces occurred late on in the clinical course, this was likely to be the case here.

Circulatory system disorders

A four-year-old, Aberdeen Angus cross cow was found dead in a group of 28 cows and calves without any previous signs of ill health. This was the second sudden death in a two-week period. The group had been on rough grazing since turnout and up until three weeks earlier had been supplemented with 2 kg per day of a barley, soya bean pulp and mineral mix. Postmortem examination revealed multiple large abscesses in the liver. One of these had eroded through the wall of the caudal vena cava and a thrombus had formed which partly occluded the vessel lumen at this site (Fig 1). Multiple areas of scarring and distortion consistent with sites of previous ulceration were found in the ventral ruminal sac (Fig 2) and were considered to have been the likely portal of bacterial entry leading to hepatic abscessation. Previous episodes of mucosal injury associated with ruminal acidosis were the most likely cause of these chronic lesions and a review of the diet was recommended.



Figure 1 – Vena caval thrombosis secondary to liver abscessation



Figure 2 – Scarring of the rumen wall as a result of subacute acidosis

SMALL RUMINANTS

Nutritional and metabolic disorders

Six, two-month-old mule lambs developed progressive hindlimb weakness and tremor. All the affected lambs had been born to group of 26 Scottish blackface ewes that had been purchased in October 2019 and managed separately from the rest of the flock. One lamb became recumbent and was submitted for postmortem examination. Histopathology revealed brainstem neuronal chromatolysis and degeneration of long fibre tracts. Multiple small intensely eosinophilic ovoid-round inclusions were found within Purkinje neuronal dendritic trees. These findings were considered consistent with delayed swayback and a liver copper result of 80.3 $\mu\text{mol/kg DM}$ (reference range 314 to 7850 $\mu\text{mol/kg DM}$) confirmed deficiency. As lambs born to the existing flock were unaffected it was assumed that the bought in ewes had pre-existing low copper status and/or were more susceptible to copper deficiency.

Generalised and systemic conditions

Clostridial enterotoxaemia type D (pulpy kidney disease), in combination with significant parasitic gastroenteritis, was found to be the cause of death of lambs from four flocks during July. In the absence of recognised triggers for the development of type D enterotoxaemia, it was considered possible that endoparasitism may have predisposed to the proliferation of *Clostridium perfringens* associated with alterations in the gut microbiota. None of the lambs had been vaccinated against clostridial disease.

Respiratory tract diseases

A group of ten tupes was walked slowly into a fresh field on a warm day. The farmer reported hearing loud respiratory sounds following their movement and two were found dead the following morning. The carcass of a yearling Texel tup in good body condition was submitted for postmortem examination. Small, bilateral ragged proliferations of laryngeal mucosa associated with soft tissue swelling were found to have occluded the airway. The laryngeal lesions appeared chronic with no purulent material detected on the cut surfaces. Focal, marked epithelial hyperplasia and subjacent fibrosis were confirmed on histopathology, suggesting previous episodes of mucosal injury.

Renal diseases

Several three-month-old male Texel lambs died two weeks after the concentrate component of their diet was changed due to unavailability of the original feed. One

carcase was submitted and, despite significant post-mortem change, extensive ventral subcutaneous oedema and haemorrhage together with haemorrhage around the distal penis were apparent. The bladder, both ureters and kidneys were distended confirming a diagnosis of urinary tract obstruction. It is known that high concentrate, low forage rations will predispose to urolithiasis which is usually due to magnesium ammonium phosphate (struvite) calculi. The farmer verified that the lambs were being pushed to achieve high growth rates. Other risk factors include inadequate access to clean water and diets that are high in magnesium and/or phosphorus. The feed company agreed to review the mineral component of the diet in this case.

PIGS

A 13-week-old Duroc cross pig, the sixth in the group of 250 to die over the course of one week, was submitted for postmortem examination. The animals had been moved to a new room and had changed diet two weeks earlier. The lungs were oedematous and there was an increased volume of pericardial fluid. Food was present in the stomach and there was no evidence of diarrhoea. The cerebral meninges appeared congested and *Streptococcus suis* type 2 was isolated. Histopathology confirmed severe acute-subacute fibrinopurulent meningoencephalitis and detected changes in other tissues consistent with septicaemia. Stress associated with the change of environment and diet was considered likely to have been a predisposing factor.

A five-week-old female post-weaned piglet died suddenly and was submitted for postmortem examination. The piglet was in good body condition with a marked pleural effusion and multifocal to coalescing ecchymotic haemorrhages on the epi- and endocardium. Extensive oedema was found around the stomach and liver hilus (Fig 3). Histopathology identified changes consistent with acute heart failure associated with mulberry heart disease (MHD). Analysis of liver tissue showed adequate Vitamin E and selenium values as is often observed in cases of MHD, however, this does not confirm that tissue availability is adequate particularly for Vitamin E. Routine cultures from the intestines, that were normal in appearance, yielded a pure growth of haemolytic *E. coli* that was positive for F18, shiga-toxin, and both heat-stable and heat-labile virulence factors. The role of this infection in the death of the piglet was not determined as unequivocal histopathological changes that would have implicated shiga-toxin in its pathogenesis were not identified.



Figure 3 – Oedema around the stomach and liver hilus in a case of mulberry heart disease

BIRDS

Poultry

A flock of 1200 layers reported a 10 per cent drop in egg production and a reduction in egg size. Twelve birds had died and the carcasses of two, 30-week-old birds were submitted for investigation of the problem. Birds arrived on the premises at 16 weeks-of-age and were in full lay by 22 weeks. Both birds were thin with an excess of peritoneal fluid and multiple small (< 1 mm) white spots on all liver lobes. Fibrin deposits were noted on the liver, air sacs and caudal lung lobes. Developing eggs appeared normal in one bird but small in the second with fragments of shell adhered to the yolks. Spotty liver disease was suspected and confirmed on histopathology which described multiple random foci of necrosis. This condition is associated with infection with *Campylobacter hepaticus* which is difficult to culture. It is seen in hens with access to the outdoors and is thought to be transmitted by the faecal oral route. Treatment with tetracyclines is reported to be effective.

Game birds

A 13-week-old pheasant was presented live from a flock of 6000 poults that were outside through the day and housed at night. Diarrhoea had been seen and 100 birds were reported to have died. The submitted bird was dull and mouth breathing. It was very thin and had a haemorrhagic tracheitis associated with a large burden of *Syngamus trachea*. The caecal mucosa was noted to be slightly thickened but no worms were observed. A worm egg count was negative and only small numbers of coccidial oocysts (500 oocysts per gram) were detected. Histopathology revealed multiple cross sections of nematode worms within the wall of the caeca and evidence of parasitic pneumonia. The caecal worms were considered to be *Heterakis isolonche* which develops to maturity within nodules in the mucosa and is

capable of causing diarrhoea and emaciation in infected birds. Anthelmintic treatment of the remaining birds was advised.

A batch of three-week-old pheasants was submitted to investigate an outbreak of severe ocular disease. Affected birds had swollen or closed eyelids and lost weight rapidly. Postmortem examination detected inflammation of the infraorbital sinuses and a slightly opaque appearance to the thoracic air sacs. Molecular analysis of ocular swabs detected *Mycoplasma gallisepticum* DNA. This organism is a known cause of sinusitis in pheasants resulting in a presentation known as “bulgy eye”. *M. gallisepticum* is transmitted through the egg from infected hens and is subsequently spread between chicks in the hatchery and at feeders and drinkers.

References:

- 1 Marly J, Pardon P, Marquis B. Persistent faecal shedding of *Salmonella* Bredeney in a dairy farm. *Vet Res* 1994;25:413-4
- 2 Neilsen L. Review of pathogenesis and diagnostic methods of immediate relevance for epidemiology and control of *Salmonella* dublin in cattle. *Vet Microbiol* 2013;162:1-9
- 3 Klotz P, Higgins PG, Schaubmar AR, *et al.* Seasonal occurrence and carbapenem susceptibility of bovine *Acinetobacter baumannii* in Germany. *Front Microbiol* 2019: <https://doi.org/10.3389/fmicb.2019.00272>

Mycoplasma bovis diagnoses in Scottish Cattle

Mycoplasma bovis was first identified as a potential bovine pathogen in 1961 and is one of 13 *Mycoplasma* species known to infect cattle. The organism has been implicated in a wide range of clinical disease syndromes including reproductive tract disorders, keratoconjunctivitis, mastitis, arthritis and otitis media.¹ However it is as part of the pneumonia complex in cattle that *Mycoplasma bovis* has its greatest clinical significance.

Figure A shows the number of diagnoses of *Mycoplasma bovis* pneumonia confirmed by VIDA criteria per year in Scotland. This is expressed as a percentage of submissions from which that diagnosis could potentially have been made. This includes both samples from live animals with a clinical history of pneumonia and postmortem samples.

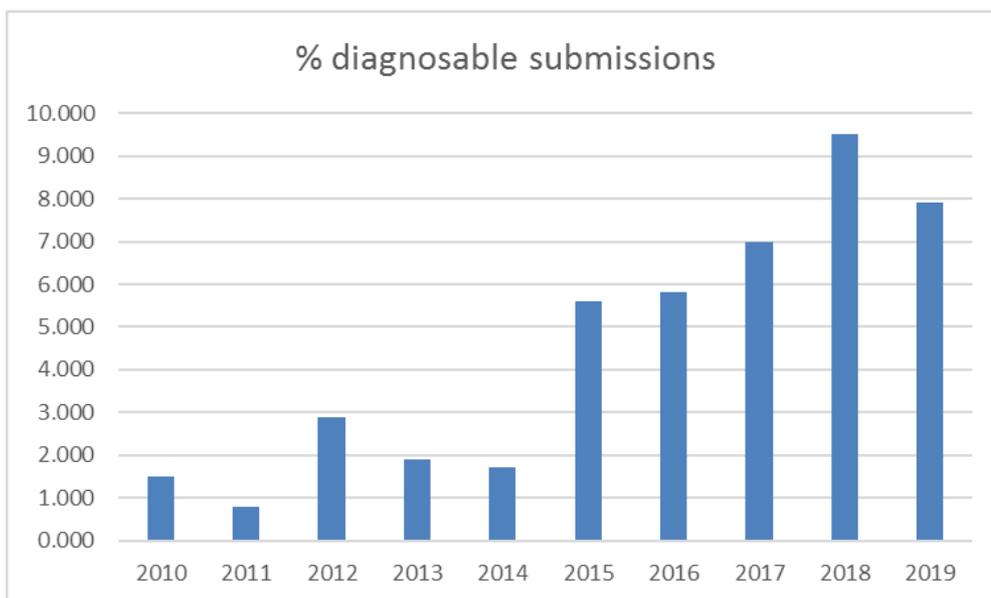


Figure A: SRUC VS diagnoses of M bovis pneumonia as a percentage of diagnosable submissions

The diagnostic criteria include a relevant clinical history and/or gross pathology of pneumonia, plus demonstration of the organism by either culture or PCR from the affected tissue or animal. Since 2015 there has been a marked increase in the number of diagnoses made, a trend that has been noted throughout the UK.² In Scotland, the majority of diagnoses are confirmed in cattle originating from the beef herd (Fig B), reflecting the relative size of this sector within the Scottish cattle industry. In addition, the majority of cases have occurred in cattle pre-weaning (Fig C) with a much lower proportion in adult cattle.

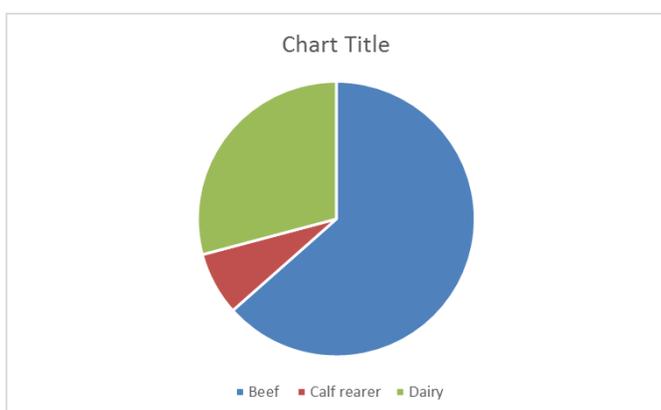


Figure B: Breakdown of M bovis diagnoses by herd type

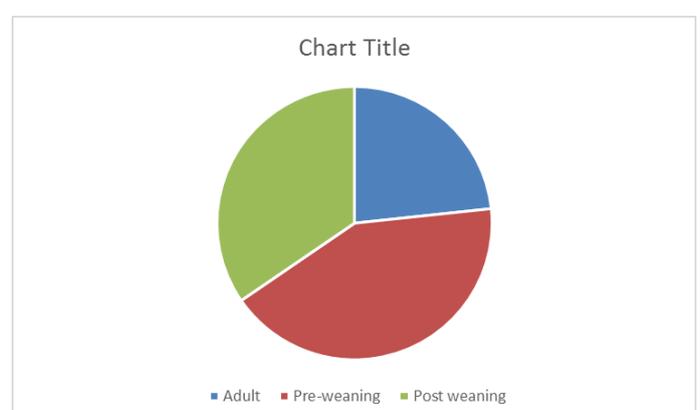


Figure C: Breakdown of M bovis diagnoses by age

Possible reasons for this increase in diagnoses include both an increased awareness of the disease by veterinary practitioners and farmers and also the wider availability of cost-effective diagnostic tests. However, information from cattle practitioners in the field would also suggest that this increasing trend does reflect what is occurring on farm. Concurrent with pneumonia is the frequent clinical finding of otitis media in a proportion of a group of affected cattle presenting as a unilateral ear droop or head tilt.³

Proportionally the numbers of diagnoses of *Mycoplasma bovis* associated mastitis and arthritis are very low and within such numbers there are no apparent trends. It is accepted however that for certain affected herds the impact of arthritis and mastitis can be significant.

It is considered that within the pneumonia complex, *Mycoplasma bovis* will contribute to disease in conjunction with other recognised respiratory pathogens. As for the other pathogens, it may also be present without causing signs of disease. *Mycoplasma bovis* can also be the cause of specific pathology as a sole pathogen causing a caseonecrotic pneumonia (Fig D). Such clinical cases can be chronic, with coughing, significant weight loss and a poor response to treatment with relapsing episodes of clinical disease.

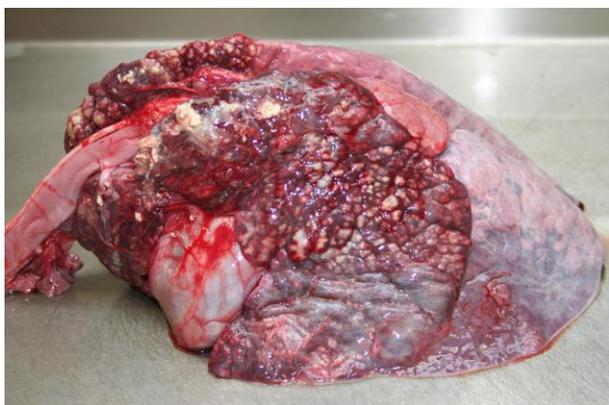


Figure D: Caseonecrotic pneumonia

With the beef industry supply chain model including beef from the dairy herd with calves multi-sourced and reared in groups this disease can have a significant impact both on welfare and productivity.

There are several important unknowns with regard to *Mycoplasma bovis* as highlighted recently by the UK Cattle Expert Group.⁴ Notable among these are the lack of any national herd prevalence data or quantification of risk factors for the presence or absence of disease in herds. The genetic diversity of the organism, particularly in relation to the pattern of disease, is unknown and, due to the additional expense involved in testing this organism for susceptibility to antibiotics, there is limited data available to aid antibiotic selection when managing cases.

This is of particular importance as *Mycoplasma bovis* has no cell wall and is therefore resistant to any antibiotics that target the cell wall. In addition, some potentially effective antibiotics such as fluoroquinolones or macrolides are classified as High Priority Critically Important Antibiotics which rightly limits their use.

There is therefore an urgent need for further surveillance and research to better inform the role of *Mycoplasma bovis* in clinical situations on farm and the best interventions and therapeutics with which to manage them.

References

1. Maunsell FP, Woolums A, Francoz D, *et al.* *Mycoplasma bovis* infections in cattle. *J of Vet Int Med* 2011;25; 772 – 83
2. Ridley A, Hateley G. *Mycoplasma bovis* infections in cattle. *Vet Rec* 2018;183; 256-8
3. Strugnell BW, Glover M, Wessels M, *et al.* Ear droop and stertor in dairy calves associated with *Mycoplasma bovis*. *Vet Rec* 2013;173; 299-230
4. UK Cattle Expert Group. *Mycoplasma bovis*: current knowledge, industry challenges and knowledge gaps for the UK cattle industry. 2018 Available from: <http://apha.defra.gov.uk/documents/surveillance/diseases/ceg-mbovis-oct18.pdf>