OVERVIEW

- Schmallenberg virus infection confirmed in Scotland
- Food chain issues after lead poisoning incident.
- Suspect ragwort poisoning in heifers
- Ewe abortions due to Salmonella enterica serovar Urbana
- Coxiella burnetii detected in aborted lambs

GENERAL INTRODUCTION

February in Scotland began with a week of generally unsettled and mild weather, with both sun and wintry showers. The mean temperature was 1.3°C above the long-term average. There was 109 per cent of average rainfall overall and sunshine was 99 per cent of average, with both showing marked regional variation.

DISEASE ALERTS

The following conditions were reported by SAC C VS disease surveillance centres in June 2016. Given similar climatic and production conditions, they could also be important this year.

- Idiopathic necrotising enteritis in suckler calves
- Salmonellosis in dairy calves
- Black disease in cattle
- Coccidiosis in calves and lambs
- Nematodirosis in lambs

CATTLE

Toxic conditions

Aberdeen continued to monitor cattle following a lead poisoning incident that was detailed in the February 2016 SAC C VS surveillance report. In this incident a tractor battery that was accidentally loaded into a feed wagon resulted in the deaths of 12 cows with a further 15 showing clinical signs of ataxia, blindness and recumbency. In general a 16-week withdrawal period is advised for lead exposures, to commence after the source of contamination has been removed or the cattle have been removed from the source. However in instances where a lead battery has been consumed the source of lead can be retained in the forestomachs (rumen and reticulum) for indefinite periods. Therefore a 16-week withdrawal period may be inadequate and blood monitoring is required. In this case extensive investigation determined the animals that posed a risk to the food chain and all animals were placed under restriction until their blood lead levels fell to below 0.15 µmol/l. Almost a year after the incident, 11 of the restricted animals were blood sampled to determine if they could enter the food chain. Only two of these had acceptable blood lead values, with the other nine having values up to 0.98 µmol/l. SAC C VS commented that this incident highlights the devastating animal welfare and financial significance of lead poisoning incidents.

Edinburgh suspected ragwort (Jacobaea vulgaris) toxicity in an 18-month-old beef heifer from a group of 35 youngstock, of which six were ill thriven. The stock were out-wintered in a ragwort-containing field. Two of these animals died and three were improving. One animal in poor body condition was euthanased for postmortem examination, which revealed peritoneal and pericardial effusions and oedema of the retroperitoneum and mesentery. The liver was small, pale, firm and tough on cut section (Fig 1). Histological examination confirmed widespread hepatic fibrosis and biliary hyperplasia, with greatly reduced numbers of hepatocytes. Similar histopathological changes were detected in a sample of liver from a second ill-thriven stirk, which was submitted by the veterinary practitioner. Taking the grazing history into consideration, SAC C VS considered the liver pathology was consistent with chronic pyrrolizidine alkaloid (ragwort) toxicity. There was also evidence of previous, severe parasite challenge in sections from the gastrointestinal tract, which likely contributed to the ill thrift.

Fig 1 – Pale, firm liver in a heifer due to ragwort poisoning
**Alimentary tract disorders**

Dumfries diagnosed parapoxvirus infection, ruminal drinking and secondary fungal infection in one- to two-week-old Limousin-cross dairy calves. Approximately 30 per cent of the calves in this age group had diarrhoea in the previous two weeks, with around 30 per cent fatality. The calves were fed two litres of colostrum after birth, followed by two litres of warm, waste milk twice daily from buckets with teats. Neither water nor creep feed were available. Both calves submitted for postmortem examination had evidence of rumen drinking. One calf also had 1 to 2 mm circular lesions on the hard palate, tongue and oesophageal mucosa, with more extensive lesions in the pharynx and around the teeth (Fig 2a, Fig 2b). Histopathology confirmed that these upper alimentary tract lesions were associated with fungal colonisation and parapox infection. In addition there was evidence of widespread superficial mycotic rumenitis secondary to ruminal drinking. Screening for bovine viral diarrhoea virus (BVDV) and bovine herpesvirus 1 (BHV-1) by PCR were negative. SAC C VS provided advice on best practice in feeding calves to avoid ruminal drinking.

![Fig 2 (a) - Oral lesions due to parapoxvirus and fungal infections](image)

![Fig 2 (b) - Oesophageal lesions due to parapoxvirus and fungal infections](image)

Dumfries diagnosed necrotising enteritis and colitis in a neonatal calf associated with lesions of attaching and effacing *Escherichia coli*. The affected dairy farm was experiencing high levels of neonatal diarrhoea with approximately 50 per cent morbidity and 25 per cent mortality. In most cases, diarrhoea in calves began in their first few days of life. One calf that showed clinical signs of diarrhoea from two days of age and deteriorated until it was in lateral recumbency was euthanased at seven days of age for postmortem examination. Rotavirus was the only pathogen recovered, but in addition to villous atrophy histological examination revealed exfoliative to necrotising enteritis and colitis associated with large numbers of small Gram-negative bacteria closely apposed to the luminal surfaces of degenerating enterocytes. SAC C VS considered these findings consistent with attaching and effacing *E. coli* infection.

**Generalised and systemic conditions**

Ayr investigated pneumonia and diarrhoea leading to mortalities in a group of 40 one-month-old dairy calves. Postmortem examination of one calf, which had received antimicrobial therapy, revealed that the carcase was lean, eyes were sunken and the hind quarters were covered with liquid faecal material. There was minimal internal fat and areas of congestion were noted throughout the lungs. The liver was congested and bronzed with adhesions to the diaphragm. The rumen contained a small wad of roughage material and white watery liquid, while the abomasum contained grey liquid and milk clots and the caecum pink watery fluid. No enteropathogens were detected, but histological examination of tissues identified chronic hyperplastic rumenitis associated with extensive heavy colonisation of yeasts. SAC C VS considered this could have been secondary to ruminal drinking or due to prolonged...
antibiotic treatment. In addition exfoliative/necrotising bronchitis and bronchiolitis characterised by degeneration and exfoliation of epithelial cells, some with small intracytoplasmic inclusion bodies and epithelial syncytial formation was noted. This finding was considered consistent with early widespread bovine respiratory syncytial virus (BRSV) infection and BRSV RNA was detected by PCR.

Reproductive tract conditions
Dumfries identified congenital deformities in a six-month gestation fetus, the only to abort from a group of outwintered Luing cows. Postmortem examination revealed that the cranium was grossly enlarged (Fig 3), indicating obstructive hydrocephalus, and no brain tissue was detected on opening the calvaria. The elbow joints and tarsal joints were fixed in flexion. Screening for BVDV and Schmallenberg virus (SBV) was negative and fetal fluid also tested negative for antibodies to these pathogens. Histological examination of the spinal cord revealed multiple abnormalities including duplication of the central canal, with the dorsal canal being greatly enlarged, and altered topography of the grey matter with the ventral grey matter being located lateral to the ventral canal. These changes were consistent with an early defect of neural patterning, and were distinct from those induced by teratogenic viral infections.

Edinburgh identified both aspergillosis and neosporosis in a five-month gestation fetus, the third to abort from a group of 60 dairy heifers. Postmortem examination revealed that the fetus was in an advanced state of autolysis and the placenta was grossly thickened and oedematous. Aspergillus fumigatus was recovered in mixed growths from both the stomach contents and placenta and histological examination confirmed placentitis consistent with fungal infection. In addition, non-suppurative myocarditis and non-suppurative and necrotising encephalitis characterised by glial proliferation that often surrounded a central area of necrosis were identified. SAC C VS considered these findings consistent with Neospora caninum infection, which was confirmed by immunohistochemistry.

Edinburgh diagnosed abortion due to N. caninum in a dairy farm. The farm had a history of abortions associated with neosporosis and had two recent abortions within one week. Histological examination of fetal tissues revealed a predominantly non-suppurative placentitis, myocarditis and hepatic necrosis. N. caninum was detected by PCR. This finding together with the histological lesions confirmed the diagnosis.

SMALL RUMINANTS
Nutritional and metabolic disorders
Thurso diagnosed hypocalcaemia as the cause of recumbency in two mule ewes in late pregnancy. The serum calcium levels were 0.7 and 0.8 mmol/l (reference range 2.0 to 3.0 mmol/l). SAC C VS confirmed 13 cases of hypocalcaemia in February compared with three cases in the same month in 2016 and an average of nine cases in this month over the past five years.

Parasitic diseases
Thurso diagnosed chronic fasciolosis as the cause of death in a Suffolk cross gimmer, a sheep Cheviot tup and a three-year-old Zwartbles ewe from three separate flocks. SAC C VS diagnosed 29 cases of fasciolosis in February; this is similar to the number of cases (26) to the same month in 2016.

Generalised and systemic conditions
Aberdeen diagnosed clostridial enterotoxaemia as the cause of sudden death of a two-year-old male pygmy goat. A change of management meant that it was unclear whether clostridial vaccinations were up to date. Clostridial epsilon toxin was detected in the small intestinal contents and neuropathology showed the brain to be severely congested with limited vacuolation of the white matter. The histological appearance of the kidney was strongly suggestive of the accelerated postmortem change seen with pulpy kidney disease. SAC C VS notes that histological changes of cerebral vasculopathy due to Clostridium perfringens epsilon intoxication are found less consistently in goats compared with sheep.

Reproductive tract conditions
A fetus and placenta were submitted from a flock of 90 Beltex ewes, where Chlamydia abortus infection was diagnosed in a previous submission. In this case a modified Ziehl-Neelsen preparation of a placental smear revealed staining of small coccobacilli; however the
organisms seen were not considered typical of *C. abortus*. Twin fetuses from a second flock were also submitted with similar findings. In both cases PCR testing for *Coxiella burnetii* proved positive. Lesions of placentitis were evident on histopathology, but immunohistochemistry was negative for *C. burnetii*. Although not shown to be the definitive cause of abortion in either case the detection of *C. burnetii* is significant due to its zoonotic potential. Information to reduce the risk of infection was provided to both farms.

Dumfries investigated malformations in a 700 crossbred ewe flock. The first batch of ewes lambed relatively uneventfully with only a couple of stillbirths. However, 20 of the first 30 ewes to lamb in the second batch gave birth to deformed lambs, often with one normal lamb accompanying the deformed lambs. Of two lambs that were submitted for examination, one had severe arthrogryposis affecting all joints in all four limbs, slight kyphosis, an undershot mandible and microcephaly, cerebellar hypoplasia and hydrocephalus. Arthrogryposis in the second lamb affected the fetlocks only and microencephaly and hydrocephalus were also present. These findings were consistent with Schmallenberg virus (SBV)-induced malformations and SBV RNA was detected in brain samples from both lambs.

St. Boswells diagnosed *Salmonella enterica* serovar Urbana as the cause of abortion storms in two separate flocks. Twenty of 320 Texel-cross ewes aborted in the first flock. The fetuses were autolysed and five ewes died. The flock’s field was flooded twelve days prior to the first abortion and the same salmonella serotype was isolated from a pond in the field. The second flock of 1700 ewes experienced more than 30 abortions and some ewes were unwell. Investigations are ongoing.

**Musculo-Skeletal conditions**

Dumfries diagnosed arthritis due to *Erysipelothrix rhusiopathiae* infection in a yearling Suffolk-cross tup, the fourth animal in the group to be euthanased because of chronic lameness. Postmortem examination revealed that the carpal joints were swollen and difficult to flex and there was a reduced range of movement in the stifle joints. This was due to proliferation of the soft tissues surrounding the joints, as there was no increase in the quantity of synovial fluid. Granulation tissue was overgrowing the articular surfaces of the stifle joints, but the underlying cartilage appeared grossly normal. *E. rhusiopathiae* was cultured from one of five joint samples confirming it as the cause of the problem. Although *E. rhusiopathiae* was cultured from only one sample, it is often difficult to isolate this environmental organism from chronically damaged joints. There was no history of dipping before the onset of lameness.

St. Boswells diagnosed a yearling Beltex ewe was found dead two weeks before it was due to lamb. Postmortem examination revealed a thin carcass with a 10 cm tear in the membranous diaphragm, through which approximately 50 per cent of the abomasum herniated into the thorax. Adhesions had formed around the edges of the tear preventing its return to the abdomen. The diaphragmatic muscle dorsal to the tear was abnormally thickened, to a depth of 2 cm, and necrotic. Histopathology detected no evidence of infection or inflammation, instead indicating that previous trauma was the most likely cause of the muscle damage.

**Nervous system disorders**

Perth diagnosed cerebrocortical necrosis (CCN) in a nine-month-old Scottish blackface ewe lamb from a group of 400 on permanent pasture, where five deaths occurred over the previous two weeks. Poor condition and some diarrhoea was observed in the group. Postmortem examination revealed evidence of parasitic gastroenteritis. The possible causes of CCN in ruminants are still under discussion, but conditions that result in rapid change in the ruminal microflora such as thiaminolytic enzymes, ruminal upset, water deprivation/salt poisoning and high levels of sulphate have all been implicated. No specific housing or management changes were noted in this case.
Featured Article - OPA diagnoses by SACCVS

Ovine pulmonary adenocarcinoma (OPA) is an infectious lung tumour caused by the Jaagsiekte sheep retrovirus (JSRV) which leads to neoplastic changes within alveolar cells. Clinically affected sheep may be thin and become dyspnoeic after exercise, or may die suddenly due to secondary bacterial infection. There is no effective treatment or vaccination for OPA and the condition is usually fatal. Postmortem examination is required to make a diagnosis, as there is no commercially available laboratory test which meets robust diagnostic criteria.

The disease is present in all area of Scotland with diagnoses being made from the border counties in the south of Scotland to Thurso in the north.

A review of OPA diagnoses in SACCVS Surveillance centres for the past five years shows that sheep are affected from six months of age onwards throughout their commercial lifespan. The peak number of diagnoses occurs in three- to four-year-old sheep (Fig a), but this is confounded by a submission bias as farmers are more likely to investigate death or disease in younger animals. When OPA diagnoses are calculated as a percentage of carcass submissions the relative importance of the disease does not decline with age. In rams the peak age for diagnosis is two years. Often investigation is prompted by the death of a tup within six months of purchase.

![Fig a. Age of ovine pulmonary adenocarcinoma cases as a percentage of diagnosable submissions](image)

The main farmer clinical history in OPA cases was “found dead” with 45 per cent of cases being submitted with this description. Often these animals were in good body condition and death was attributed to OPA with secondary bacterial infection. “Respiratory” disease accounted for 19 per cent of farmer clinical histories and “wasting” 15 per cent.

The high percentage of animals submitted with a history of sudden death may be due to selection bias, as it is likely that farmer recognition of the disease reduces subsequent submissions. Farmers are much more likely to identify a thin, breathless sheep as a suspect case than an animal dying suddenly in good body
condition. In the past five years there have been 266 diagnoses of OPA from 216 holdings indicating that most farmers are only submitting on a single occasion. The maximum number of diagnoses on a single farm over the past five years was five.

OPA is identified in all months of the year but diagnoses peak in January to March (Fig b). The reasons for this seasonality are unclear but the additional strains of late pregnancy on the respiratory and immune systems are likely to be contributing factors.

![Fig b. Monthly incidence of ovine pulmonary adenomatosis diagnoses](chart.png)