OVERVIEW

- Toe tip necrosis syndrome in calves
- Abortions in embryo recipient gimmers associated with *Paecilomyces variotii*
- Amyloidosis secondary to dosing gun injury in a ewe
- Rhinitis and middle ear infection in pigs
- Fungal pneumonia in a duck

GENERAL INTRODUCTION

January was generally cold, sunny and settled with some snow in parts mid-month. The mean temperature for January was 1.0°C above the long-term average. It was generally dry, with only 53 per cent of average rainfall overall. It was also the third sunniest January since 1929, with 135 per cent of the average sunshine.

DISEASE ALERTS

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

- Black disease in cattle
- Salmonellosis in neonatal calves
- Tick borne fever in sheep and cattle
- Nematodirosis in lambs
- Coccidiosis in lambs

CATTLE

Respiratory tract diseases

Dumfries diagnosed infectious bovine rhinotracheitis (IBR) in a batch of 50 homebred beef calves. The whole group of 9- to 15-month-old Simmental and Limousin-cross calves was coughing, three calves had died and two were moribund. Clinical signs of hypersalivation, nasal discharge and coughing were initially noted in the oldest calf. Postmortem examination of three carcases revealed congested conjunctivae, a moderate to severe necrotic laryngotracheitis (Fig 1) and a cranioventral pneumonia, from which *Trueperella pyogenes* was isolated. Bovine herpesvirus-1 (BHV-1) was detected by PCR from swabs of affected tissue in all cases. Ayr diagnosed pneumonia due to bovine respiratory syncytial virus (BRSV) in a batch of 34 homebred, weaned, housed beef calves, where two calves died, despite antimicrobial and anti-inflammatory therapy, and a further 22 were coughing and had nasal discharges. Postmortem examination of one calf, which was in good condition, revealed enlarged carcase lymph nodes, consolidated cranial lung lobes and emphysematous caudal lobes (Fig 2). BRSV was detected by PCR and no significant bacteria were isolated. Histological findings of bronchointerstitial pneumonia/interstitial pneumonia were consistent with subacute BRSV infection. In addition, there was evidence of current bacterial bronchopneumonia with associated significant vascular injury.

St. Boswells diagnosed acute interstitial pneumonia in a three-month-old Limousin bull calf, the only affected animal from a group of 20 that was non pyrexic and showed signs of respiratory disease for two days before death. There was no response to antibacterial therapy, non-steroidal anti-inflammatories and steroids.
Postmortem examination revealed consolidation of the cranioventral lung lobes and interlobular septal oedema with over inflation of the caudal lobes. No bacteria were recovered on routine culture or selective culture for *Mycoplasma bovis* and screening for respiratory viruses by PCR was negative. Histological examination identified a wide range of lesions of varying duration and severity including fibrosing bronchointerstitial pneumonia with widespread bronchiolitis obliterans, patchy purulent bronchopneumonia and acute bronchointerstitial/interstitial pneumonia with hyaline membrane formation. Studies in the United States on interstitial pneumonia of housed cattle indicate that acute interstitial pneumonia frequently occurs between three and ten weeks following previous respiratory illness, and it has been suggested this may relate to the effects of proinflammatory cytokines within lungs due to chronic bronchiolar disease combined with endotoxin from gram negative respiratory infections. There was both longer standing pneumonia and significant bacterial bronchopneumonia in this case, which could be a source of endotoxin.

**Reproductive tract conditions**

Dumfries identified *Coxiella burnetii* in two stillborn calves from a group of 30 to 40 heifers in a 470 cow dairy herd that had five consecutive stillbirths. The heifers were homebred and appeared in good health, both before and after parturition. The first calf was meconium stained and both inhalation and ingestion of meconium were present. The second calf had five broken ribs on the right side with associated bruising. Acid-fast inclusion bodies were seen in placental smears stained by the modified Ziehl-Neelsen method from the stillbirth examined. PCR testing for *Coxiella burnetii* (the causal agent of Q fever) was positive on placental tissue and histological examination identified mild to moderate, sub-acute, multifocal, necrotising supplicative placentitis with associated vasculitis. This was considered consistent with an infectious process due to an intra-cellular pathogen and immunohistochemistry revealed strong positive cytoplasmic labelling for *C. burnetii* antigens. The placenta from the second calf was not available for examination, but PCR testing of serum collected at postmortem examination was also positive for *C. burnetii* DNA. The histological changes seen on examination of tissues from the second calf were non-specific.

Dumfries diagnosed salmonellosis in another farm that had five abortions in the preceding month. *Salmonella enterica* serovar Dublin was recovered in pure growths at post mortem examination from the stomach contents of the two foetuses submitted for examination. The dam of one of the submitted foetuses was pyrexic and diarrhoeic.

Both Q fever and salmonellosis are zoonotic and SACCVS advised hygienic precautions.

Inverness recovered *Campylobacter fetus* from the sheath washing of a bull. High barren rates had been noted in the herd and *C. fetus* had been recovered from other bulls on the farm in recent months. Differentiation to the subspecies level is in progress and will allow the definitive diagnosis. SAC C VS advised on control measures for this venereal infection.

**Musculo-skeletal conditions**

St Boswells investigated an outbreak of lameness in a group of nine-month-old, spring-born calves that were handled through a crush three times soon after housing for worming and vaccinations. About one month later several developed lameness and coronary band swellings, predominantly in the hind feet. Over the following weeks 30 calves out of the group of 100 were affected. Two Limousin-cross bull calves were euthanased for postmortem examination. The first calf had white line separation at the toe of the lateral digits of both hind feet, with associated severe pedal bone necrosis and infection, and septic arthritis of distal interphalangeal joint (Fig 3). Ulceraions at the coronary band indicated where an abscess previously ruptured and there was a pathological fracture of the pedal bone in the right hind foot. The second calf had similar lesions in the right hind. The gross and histological findings were considered consistent with toe tip necrosis syndrome (TTNS) (Penny and others, 2017). SAC C VS considered that repeated trauma/wear occurs when calves, particularly wild ones, are moved off pasture and onto concrete collection yards, or in this case the crush floor, and handled leading to struggling and concussion impact damage. Apical/axial white line damage then allows infection to track into the hoof capsule and pedal bone. In order to reduce the risk of TTNS, calves coming off pasture and requiring multiple handling should have minimal standing time on concrete/rough surfaces and consideration should be given to ensuring that steel crush floors are covered by rubber or a layer of straw/dung to minimise concussion and wear of the hooves.
Fig 3 – Toe tip necrosis syndrome in calf. Distal sole removed to show necrotic third phalanx (arrows)

SMALL RUMINANTS

Toxic conditions
Inverness diagnosed copper toxicity in a mule ewe, one of four from a group of 120 that died after a short period of malaise. Postmortem examination revealed a yellow tinged liver, dark coloured kidneys and haemorrhagic large intestinal contents. The liver copper level was 41,000 µmol/kg dry matter (DM) (reference range 314 to 7850 µmol/kg DM) consistent with a diagnosis of chronic copper toxicity. The sheep were fed cattle minerals and had gained access to a field that had recently been spread with distillery waste. Both of these were considered to be possible sources of excess copper. Food Standards Agency (Scotland) was notified and precautions taken to prevent these animals from entering the food chain.

Aberdeen also diagnosed copper toxicity in two in-lamb Texel ewes from a small group of 12 animals that were dull and passing red urine for 48 hours before death. In this case distillery by-product effluent was used routinely as a fertiliser on the farm.

Parasitic diseases
Chronic fasciolosis was the most common diagnosis recorded from ovine submissions during January indicating a need to monitor for infection and treat if required.

Generalised and systemic conditions
Edinburgh examined a ewe, one of three to die from a batch of 96 that were gathered from the hill for housing and where some fighting and bullying was observed. The ewe was lethargic the previous day and despite supportive treatment died overnight. Postmortem examination revealed extensive haemorrhagic subcutaneous and intramuscular oedema over the neck, shoulders, upper forelimbs and thorax, together with necrosis and cavitation of the subcutaneous fat in the shoulder region. There was a haemorrhagic pleural effusion and the trachea contained stable foam consistent with pulmonary oedema. *Clostridium sordellii* was isolated from the shoulder lesion and spleen and SACCVS considered that malignant oedema secondary to trauma was the likely cause of death.

Inverness suspected listerial septicaemia as the cause of death of seven Bleu de Maine gimmers from a group of 29 that were due to lamb in one week. The flock were housed, and fed good quality haylage, following poaching of their field in wet weather. Affected animals were dull and pyrexic and some developed acute diarrhoea. *Listeria* species were not isolated, but histopathological findings were consistent with *Listeria monocytogenes* infection. Small Gram-positive bacilli were detected in association with fibrino-purulent, haemorrhagic abomasitis, enteritis and necrotising, purulent hepatitis. One affected gimmer subsequently aborted and *L. monocytogenes* was recovered from foetal stomach contents. Ingestion of soil, as a result of the severe poaching shortly before housing, was considered a likely source of infection.

Alimentary tract disorders
Inverness diagnosed oesophageal choke as the cause of death of a three-year-old North Country Cheviot ewe. This was the second death from a group of 60 animals being fed large (cob sized) ewe rolls, barley, molasses and a vitamin/mineral supplement at rough grass. Postmortem examination revealed food material in the pharynx above the soft palate and along the entire oesophagus. The distal oesophagus was distended with a large volume of dry, impacted feed. The ewe rolls were fed in the field in piles, which can limit access, resulting in ewes tending to eat quickly and not chew sufficiently, hence predisposing to choke.

Cardiovascular diseases
St. Boswells diagnosed disease of the cardiovascular system in sheep from two separate flocks in January. An on-farm postmortem examination of a two-year-old Border Leicester ewe that died suddenly revealed extensive thoracic haemorrhage. An 18 to 20 mm split was found in the wall of the aorta and histopathology findings were consistent with aortic dissection, with no evidence of underlying aneurysm or inflammation. Aortic dissection is well described in humans, but no reference to it was found in sheep.

An eight-month-old Texel-cross ewe hogg died after a vague history of malaise. Postmortem examination revealed a large vegetative valvular and mural endocarditis lesion involving the right atrio-ventricular...
valve and adjacent mural endocardium which almost filled the right ventricle. *T. pyogenes* was isolated from the lesion.

**Reproductive tract conditions**

Aberdeen confirmed *Paecilomyces variotii*, an environmental mould, as the cause of an outbreak of seven abortions from a group of 48 synchronised, embryo recipient gimmers that had been scanned in lamb. The organism was isolated in pure growth from the foetal stomach contents of multiple submissions. Lesions consistent with a fungal aetiology (circular white skin lesions, thickened birthing fluids) were also present (Fig 4). Ewes carrying embryos flushed from a single donor ewe seemed to be at much higher risk of being affected. The investigation is ongoing.

**Musculo-Skeletal conditions**

Dumfries diagnosed joint ill, due to tetracycline-resistant *Streptococcus dysgalactiae* in a two-week-old lamb, the fourth to be affected in a flock of 28 Charollais ewes, where half had lambed. Treatment of previous cases with tetracycline was not effective. Clinically both hocks were swollen and the elbows were painful to manipulate. Postmortem examination revealed no evidence of navel ill, but septic arthritis was confirmed in all of the carpal, elbow, hock and stifle joints.

**Renal diseases**

Dumfries diagnosed renal disease in two easycare ewes from the same flock. The first ewe was anorexic and diarrhoeic and pre-mortem blood samples indicated uraemia and hypoalbuminaemia (urea 50 mmol/l (reference range 4 to 8 mmol/l), albumin 24 g/l (reference range 30 to 40 g/l)). A chronic dosing gun injury was present in the left pharynx with an area of necrotic tissue lateral to the penetrating wound. Histopathology revealed renal glomerular and vascular amyloidosis and evidence of protein-losing nephropathy, which was considered to be secondary to necrotising inflammation associated with the dosing gun injury. The intestines were considered too autolysed for histopathology, however as the gastrointestinal tract is a main target site for amyloid deposition associated with necrotising lesions in sheep, it was suggested that in addition to hypoalbuminaemia associated with the protein losing nephropathy, deposition of amyloid in the intestinal wall could have contributed to the diarrhoea.

The second ewe died after being seen ill for one day. Postmortem examination revealed pale, swollen kidneys, multiple petechial haemorrhages in the lungs and both the liver and spleen were enlarged. Histopathology revealed glomerulonephritis and a systemic vasculopathy. SACCVS proposed a possible immune-mediated aetiology.

**PIGS**

**Generalised and systemic conditions**

Two live growing pigs with head tilts were submitted as representative of an ongoing group problem of rhinitis and suspected middle ear infection. There was an increase in incidence, with approximately 10 to 15 affected in the previous three weeks from a group of 200. Some animals progressively lost condition and died, but most continued to have a good appetite. The herd was closed until recently, when two new batches of gilts were introduced. The herd vaccinated against enzootic pneumonia (EP), porcine respiratory and reproductive syndrome (PRRS), porcine circovirus type 2 (PCV2), erysipelas and porcine parvovirus. Postmortem examination of both pigs revealed purulent sinusitis and middle ear infection. No deviation of the nasal septum and no significant loss of nasal conchae nor distortion of the snouts was seen in either case. A profuse mixed growth was isolated from both sinus swabs and both *T. pyogenes* and *Fusobacterium necrophorum* from swabs of middle ear abscesses. Histopathology confirmed severe purulent rhinitis, which extended to involve the ethmoidal sinuses. There was also damage to submucosal glands and intranuclear herpes-like viral inclusion bodies, indicating underlying inclusion body rhinitis.

Three freshly euthanased six-week-old pigs were submitted to investigate a problem with failure to thrive in weaned piglets on a breeding to finishing establishment. Most sows farrowed outside, but a small number of gilts farrowed indoors. About five per cent of their offspring were affected with ill-thrift and about four percent died following weaning of each batch. The pigs were vaccinated at weaning against PRRS, PCV2 and EP and
received in-feed zinc oxide and sulfadiazine/trimethoprim for 10 to 14 days after weaning. Some batches were also given a course of doxycycline in water at about six weeks of age, which appeared to be effective. Postmortem examination of one animal revealed a fibrinous peritonitis and the spleen appeared reactive. There was a dry pleuritis affecting the lungs and an extensive fibrinous pericarditis. The large intestinal contents were liquid, the colon appeared slightly thickened and the mesocolonic lymph nodes were enlarged. In another pig there was a slight excess of clear pericardial fluid and a fine fibrin strand in the pericardial sac. The large intestinal contents were liquid. *Salmonella* Typhimurium phage type 193 was isolated from the large intestinal content of both animals and *Bordetella bronchiseptica* from lung lesions in one of the pigs. Histopathology revealed patchy lesions of enzootic-type pneumonia with more extensive exudative changes consistent with bacterial involvement. Proliferative enteropathy was present in the colon of one pig and both had moderate widespread bacterial-type enteritis consistent with salmonellosis. There was no evidence of PCV2-associated disease.

**Musculo-Skeletal disorders**

A 19-day-old Hampshire cross landrace piglet was submitted to investigate a high incidence of pre-weaning joint-ill. Postmortem examination revealed subcutaneous abscesses containing bloody fluid with flocculent fibrin aggregates over the ventral sternum and left hock. There was thick purulent material within the joint capsule of the right carpus and a large abscess within the flexor muscles of the left forelimb, which contained thick green pus. A profuse, pure growth of *Streptococcus dysgalactiae* subspecies *equisimilis* was isolated from the right carpal joint abscess. This organism is part of the normal flora of pigs and can also be found in sow’s milk and vaginal secretions. A bacteraemia can arise secondary to skin wounds, such as due to rough floors, or entry through the navel or tonsils. The organism may then localise in joints, the meninges or endocardium.

**Nutritional and metabolic disorders**

An acute degenerative myopathy was diagnosed in a six-month-old, castrated Tamworth boar, which was the second pig to die within two weeks in a small herd. Histopathology of samples collected during an on-farm post-mortem examination showed evidence of acute congestive heart failure. In the myocardium there was widespread variation in fibre size and morphology, with acute degenerative changes present. There was no evidence of an infectious or inflammatory process in any of the tissues submitted and vitamin E deficiency was considered a possible cause. A review of the dietary vitamin and mineral supplementation was advised.

**Respiratory disorders**

Two outbreaks of rhinitis in weaners on unrelated farms were investigated by obtaining nasal swabs for bacterial culture from 12 representative untreated pigs in different pens. In one batch, *Haemophilus parasuis* was isolated from nine of the twelve swabs and from the other, *H. parasuis* was isolated from six and *Bordetella bronchiseptica* from four of the twelve swabs. In both investigations, the swabs were packed with ice packs immediately after collection and posted for next-day delivery to the laboratory. This was believed to facilitate the bacterial isolations by reducing proliferation of rapidly-growing contaminant organisms, which are common in respiratory passages of pigs, that may cause bacterial overgrowth in laboratory cultures.

**BIRDS**

**Poultry**

Dumfries diagnosed fungal pneumonia in two adult runner ducks from a flock of 12 ducks, where three died suddenly within a three-day period. Postmortem examination revealed that no food was present in the crop and gizzard of either bird. Multiple 1 to 2 mm white nodules were present around the thoracic inlet, at the heart base and within the lungs of one bird (Fig 5). The second bird had mottled kidneys, three small white lesions on the liver and a single nodule on an abdominal air sac. Pure growths of *Aspergillus fumigatus* were isolated from both birds. It is possible that the risk of aspergillosis may have been increased due to the requirement to house birds in the avian influenza prevention zone. SACCVS advised that feed and bedding be inspected for obvious areas of mould and, if possible, ventilation should be improved.
**Fig 5** – Multiple white nodules in the lungs of a runner duck due to *Aspergillus fumigatus*

**Cage and Aviary birds**  
Ayr examined a 10-year-old male Timneh grey parrot (*Psittacus timneh*) that was found dead. Postmortem examination revealed the presence of a large volume of ascitic fluid. The liver was slightly firm with some pale mottling on the surface. Urates were present in the ureters, but generalised gout was not present. Histopathology of the liver revealed prominent subcapsular coalescing foci of well differentiated carcinomatous/adenocarcinomatous infiltrations forming tubules of columnar epithelium with basal nuclei and a brush border that resembled intestinal epithelium. These were accompanied by moderate multifocal mixed inflammatory cell infiltration and fibrosis. The superficial location in the liver of this fairly well-differentiated carcinoma was consistent with a metastasis resulting from “transcoelomic” spread. The resemblance to intestinal epithelium suggests the primary was possibly an intestinal carcinoma. Carcinomas of the abdominal viscera in birds frequently spread in this way and are often accompanied by ascites, the classic example being carcinomas of the reproductive tract in hens.

**References:**

Featured Article - Investigating congenital malformations in ruminants

An upsurge in malformations associated with in utero Schmallenberg virus (SBV) infection is being seen in the 2017 lambing and calving season, following the initial SBV diagnoses in Scotland in 2013.


SBV is an arthropod borne orthobunyavirus capable of causing severe congenital malformations in ruminants following infection in early- to mid-gestation. Affected lambs and calves may be born along with normal sibling(s). The most common clinical presentation by far is arthrogryposis (AG, joints fixed in extension or flexion) and associated muscle wasting. AG is present in more than 95 per cent of SBV malformation cases and usually more than one limb, often all four, are affected. The vertebral column is frequently involved, mainly resulting in scoliosis. Porencephaly / hydranencephaly, microcerebellum and brachygnathia inferior are also common. The characteristic histopathological lesions of SBV-associated AG involve myelodysgenesis, primarily oriented on the ventral horns and funiculi (Fig (a)), in the segments of spinal cord corresponding to the source of innervation of the affected limbs (cervical intumescence (C6 to T1) in cases of forelimb AG and lumbosacral intumescence (L4 toS2) for hindlimb involvement).

The malformed foetuses usually survive to term or near-term, by which time SBV RNA may not be detectable; in some studies SBV RNA was detected in central nervous system (CNS) samples in less than 50 per cent of lambs, and less than 20 per cent of calves. However studies in Germany indicate that PCR analysis of placental fluid scrapes, umbilical cord or lung is equally or more sensitive compared with CNS tissue samples for detecting SBV RNA, particularly in calves. In contrast, SBV RNA has been detected as an incidental finding in meconium from normal neonatal calves following natural early- to mid-gestational infection of their dams. There is no evidence for the development of persistent SBV infection associated with specific immunotolerance. It is also notable that SBV antibody may be detected in normal calves; for example precolostral antibody was detected in 28 per cent of calves in one study in Belgium during the first SBV epidemic.

Arthrogryposis is a consequence of reduced foetal movement; therefore any exogenous insult or intrinsic defect that reduces skeletal muscle function and hence limb movement has the potential to result in AG, particularly in earlier stages of gestation. Thus in addition to SBV, possible causes of AG include other teratogenic viral infections, genetic defects (a confirmed or possible genetic basis for AG has been recorded in many breeds of cattle and sheep), plant and chemical teratogens and very rarely protozoal infection (Neospora caninum). AG can occur in association with complex malformations such as spina bifida, perosomus elumbis (lumbosacral agenesis) and schistosomus reflexus, none of which are associated with SBV infection.

AG is generally a rare feature of foetal pestivirus infections, but was a frequent finding in the progeny of ewes following experimental infections with HoBi-like pestivirus. AG has not been confirmed in association with Bluetongue virus. However, aborted and neonatal ruminants presenting with hydranencephaly particularly in the absence of AG should be considered as suspect congenital Bluetongue virus infection.

As SBV antibody or RNA may be detected in normal calves, the possibility of detection of SBV infection that is unrelated to the malformation should be borne in mind when investigating congenital anomalies, thus investigators should ensure that the clinicopathological presentation is consistent with that induced by SBV. As the differential diagnosis of AG is extensive, the optimal means of investigating possible SBV malformations is full necropsy examination and extensive sampling including collection of spinal cord and brain for histopathological examination. However, if submission of carcasses is not possible, veterinary investigation officers at disease surveillance centres can provide guidance on differential diagnosis and sampling if required.
Transverse section of spinal cord from a lamb with SBV-induced arthrogryposis that varied in severity between limbs. Asymmetric micromyelia and dysgenesis involving depletion of neuronal cell bodies from the ventral horn (black arrowheads) and associated hypoplasia of ventral nerve roots (black arrows) on one side corresponds to severe AG in the ipsilateral limb. There is more subtle reduction in the numbers of neurones in the ventral horn (blue arrowheads) and size of the ventral nerve roots (blue arrows) on the other side, corresponding to milder degree of AG on that side. White matter of the ventral funiculi is reduced in cross sectional area and staining intensity.