OVERVIEW

- Deaths in pre-weaned lambs associated with administering oral minerals containing copper
- Congenital malformations in calves
- Idiopathic necrotising enteritis in calves
- Abomasal obstruction due to trichobezoars in suckled calves
- Radial neuropathy (kangaroo gait) in a ewe

GENERAL INTRODUCTION

July in Scotland began with showers and longer spells of rain. It was briefly hot on the 19th followed by a thundery breakdown and a few days of warm weather, but the last week of July was unsettled and often quite cool. The mean temperature was 0.2°C below average. There was 144 per cent of average rainfall and 77 per cent of average sunshine overall.

Five focus farmers were selected for a new “Live Lambs” project, facilitated by Scotland’s Rural College. The project brings together sheep farmers, advisers, researchers, and members of the supply chain into a group that will tackle the causes of lamb loss, monitor on-farm performance and introduce improvements aimed at raising lamb survival by five per cent.

CATTLE

Nutritional and metabolic disorders
Dumfries diagnosed acetonaemia and coccidiosis in a two-year-old Friesian in-calf heifer. It was from a group of eleven heifers that were due to calve in one month and were turned out to grass for the first time ten days previously. Diarrhoea was noted in the group and two heifers aborted. At postmortem examination the liver was swollen and orange, the jejunal mucosa was red and ileal contents pink coloured. Aqueous humour beta-hydroxybutyrate value was elevated at 14.9 mmol/l (reference range less than 1.0 mmol/l) and 52,000 coccidial oocysts were detected in the faeces, with 82 per cent identified as pathogenic (both *Eimeria zuernii* and *Eimeria alabamensis* were present). SAC C VS commented that turning out to pasture for the first time in late gestation likely resulted in reduced dry matter intake, predisposing to acetonemia.

Toxic conditions
Edinburgh diagnosed lead poisoning at postmortem examination of a euthanased 13-month-old Salers heifer calf, from a group of young stock that escaped from their grazing. One other animal died and the animal examined was found stuck in a muddy hole. Both blood and kidney lead values were elevated at 3.79 µmol/l and 89 mg/kg fresh tissue (FT) respectively. Blood lead values greater than 1.2 µmol/l and tissue lead values greater than 2.07 mg/kg FT are considered consistent with a diagnosis of lead poisoning in cattle. A third calf, which was blind and being treated for suspect lead poisoning, had a blood lead value of 1.99 µmol/l. On further investigation an engine battery was found in the area where the cattle escaped. SAC C VS reported this incident to Food Standards Scotland.

Parasitic diseases
Ayr diagnosed parasitic pneumonia in a 14-month-old Belgian blue-cross heifer, the third sudden death in three days from a group of twelve yearlings at grass. No anthelmintic treatment was administered to the group since turn-out two months previously. At postmortem examination, the caudal lung lobes were emphysematous (Fig 1) and large numbers of lungworms were identified in the bronchi and bronchioles. *Histophilus somni* was recovered from consolidated cranial lung lobes.

DISEASE ALERTS

The following conditions were reported by SAC C VS disease surveillance centres in November 2015. Given similar climatic and production conditions, they could also be important this year.

- Hypomagnesaemia in suckler cows
- Infectious bovine rhinotracheitis in housed cattle
- Acute fasciolosis in sheep
- Systemic pasteurellosis in lambs
- Cobalt deficiency in lambs

Fig 1. Pulmonary emphysema in the caudal lung lobes of a 14-month-old heifer with parasitic pneumonia
Dumfries diagnosed coccidiosis outbreaks on two farms. On one farm three calves died from a batch of 40. At postmortem examination of an affected three-month-old Luing calf diarrhoea and dehydration were evident and the colon contained blood clots and sloughed mucosa. Screening for *Salmonella* species was negative. Although only 200 coccidial oocysts per gram (opg) were detected in caecal content, histopathology confirmed severe, widespread colitis in association with varying numbers of coccidial stages. In the second outbreak two animals died from a batch of 25 yearlings with haemorrhagic diarrhoea. At postmortem examination of the second animal to die, a one-year-old Charolais stirk, diarrhoea was evident, the colonic mucosa was thickened and 1,283,000 coccidial opg were detected in the faeces. Speciation identified that 98 per cent of these were *Eimeria zuernii* and *Eimeria alabamensis* present.

**Generalised and systemic conditions**

Perth diagnosed an unusual congenital malformation in a Salers calf that was delivered alive by Caesarean section. There were no abnormalities in the forelimbs, but the hindlimbs were immovable. After euthanasia, postmortem examination revealed that the hocks and fetlocks were fixed in position and the hips and stifles had reduced range of movement. Marked narrowing of the spinal cord was found in the lumbosacral area. Histopathology revealed the primary lesion to be a segmental lumbar spinal hypoplasia/dysgenesis and hydromyelia with focal absence of ventral horn neurones. SAC C VS considered this to have resulted in the observed hindlimb arthrogryposis, as a consequence of reduced movement of these limbs in utero. SAC C VS commented that these lesions were most likely an intrinsic defect of spinal cord formation. They were considered distinct from the effects of teratogenic viral infections and from those known to be associated with early gestational maternal exposure to toxic plants or maternal hyperthermia. Although a small number of cases of lumbar spinal hypoplasia/hydromyelia have been reported in calves, no breed predilection has been noted to date.

St. Boswells examined an Aberdeen Angus calf with multiple congenital malformations. The affected calf was produced by in vitro fertilisation, but aborted two weeks before its due date. It had a domed head, cleft palate, atrial septal defect, patent ductus arteriosus and dextropositioning of the aorta. In addition there was bilateral hindlimb polydactyly with duplication distal to the metatarsal-phalangeal joints and a large accessory digit on the medial aspect of each hind foot. The limb lesions and range of other malformations were features distinct from the developmental duplication condition of Angus cattle, and genetic analysis demonstrated that the calf did not carry the developmental duplication mutation. This case was considered most likely to be a sporadic event. Inverness diagnosed three cases of blackleg on the same farm. Affected animals were in three separate groups and all died suddenly over a period of five days. Two were aged 17 months and the third was four months of age. In all three cases musculature of the neck was dark red. In the older animals this extended to the muscles over the left forelimb and sternum. Cardiac lesions (Fig 2) were also evident in two of the animals. In all three cases *Clostridium chauvoei* was detected by fluorescent antibody testing and the same isolate was recovered in a heavy growth from lesions. No clostridial vaccination programme was in place on the farm.

![Fig 2. *Clostridium chauvoei*-associated pericarditis in a calf](image)

**Alimentary tract disorders**

Cases of idiopathic necrotising enteritis continued to be diagnosed across Scotland with St. Boswells, Inverness and Perth all reporting the condition. Affected animals were all suckled calves aged between two and four months. Gross lesions included diphtheresis of the small intestine, necrotic oral and laryngeal lesions, ulceration of muscles over the left forelimb and sternum. Cardiac lesions were considered distinct from the effects of teratogenic viral infections and from those known to be associated with early gestational maternal exposure to toxic plants or maternal hyperthermia. Although a small number of cases of lumbar spinal hypoplasia/hydromyelia have been reported in calves, no breed predilection has been noted to date.
in the third case free gas bloat was evident. Edinburgh also considered an abomasal trichobezoar to have contributed to the death of an 11-year-old suckler cow. The aggregation of hair was approximately 15 x 8 x 3 cm and a rough area appeared to have resulted in abomasal mucosal ulceration (Fig 3). The affected animal was reported to have lost weight over a prolonged period prior to death. SAC C VS commented that cattle with bezoars are reported to show loss of appetite, weight loss, reduced faecal production, lethargy and depression.

Generalised and systemic conditions
Ayr diagnosed malignant oedema (bighead) as the cause of death of a two-year-old Texel ewe. Subcutaneous oedema was present over the head and fluorescent antibody testing was positive for *Clostridium novyi*. Trauma was considered to be a possible predisposing factor.

Respiratory tract conditions
Aberdeen, Edinburgh and Dumfries diagnosed three separate incidents of lamb mortality due to inhalation of mineral drenches containing copper. Affected flocks reported multiple deaths in six- to eight-week-old lambs following handling for multiple management tasks, which included administration of anthelmintic and mineral drenches, clostridial and orf vaccination, tagging, castration and application of topical ectoparasiticides. Some lambs exhibited coughing and respiratory distress after treatment; one farm reported deaths within 15 minutes with other lambs found dead during the subsequent 24-hour period. At postmortem examination non-specific, patchy pulmonary congestion with or without consolidation was present. No significant bacteria were isolated. Pericardial effusion and the detection of epsilon toxin suggested the possibility of type D clostridial enterotoxaemia in two lambs, but neurohistopathology did not support this provisional diagnosis. In addition, maternal protective antibody was likely to have been present as the dams had been vaccinated against clostridial disease. In all cases examination of lung revealed airway necrosis consistent with recent inhalation of an irritant substance. Copper levels in multiple samples of lung tissue had a mean concentration of 552 µmol/kg dry matter (DM); copper content of normal lamb lung ranges from 28 to 98 µmol/kg DM (Scholes and others 2012). However, there was wide variation in copper levels from lung tissue in individual cases. In one extreme case the copper levels from different areas of lung varied from 145 to 3220 µmol/kg DM; hence the need to take multiple lung samples for biochemical and histological analyses. These incidents highlight the need for care when administering oral minerals to pre-weaned lambs. These products are used routinely on many farms, often with no evidence that supplementation is
required. Postmortem findings could be mistaken for either pasteurellosis or pulpy kidney, but a history of recent handling should prompt further investigations, including sampling of multiple areas of lung for histopathology and copper analysis.

Cardiovascular diseases
St. Boswells investigated sudden deaths in two Lleyn ewes, from a group of 140, that died over a two-day-period. Streptococcus suis was isolated from bilateral atrio-ventricular vegetative endocarditis lesions in one ewe. S. suis is more commonly considered to be a pathogen of pigs and is potentially zoonotic, particularly serotype 2. This bacterium has been isolated from previous cases of ovine endocarditis and previously isolates have typed as serotype 33. The second ewe had Staphylococcus aureus mastitis with associated nephropathy and uraemia.

Nervous system disorders
Edinburgh diagnosed purulent meningitis and meningoencephalitis as the cause of death of lambs from two flocks. The first case involved an 11-week-old lamb that had been found recumbent in the field. Pus was visible over the hind brain and brain stem and Mannheimia haemolytica was isolated from the meninges. The second lamb was an eight-week-old mule-cross, which had died after showing signs of ataxia and disorientation. Meningeal cultures were sterile, possibly due to treatment, but the histological appearance was considered to be within the spectrum of lesions associated with Histophilus species.

Edinburgh also identified bilateral radial neuropathy on histological examination in a ewe which presented with kangaroo gait. The predisposing factors for radial neuropathy have not been determined.

Perth diagnosed myeloencephalopathy in a lamb, one of three five-month-old Beltex tups that developed ataxia and hindlimb weakness. The lamb was unable to stand unaided and had poor proprioception, while retaining muscle strength. Following euthanasia no significant gross postmortem abnormalities were present. Histopathological examination of the brain and spinal cord showed white matter degeneration with axonal degeneration involving the cerebellar core, medulla and ascending and descending spinal cord tracts. These lesions indicated a metabolic, genetic or toxic cause. The lesions have similarities to recognised breed-related multisystemic axonal degenerations, and as the affected animals were embryo transfer lambs born to three different recipient ewes but with the same genetic dam and sire, an hereditary cause remained a possibility.

PIGS
Generalised systemic diseases
Streptococcus suis serotype 2 was found to be the cause of nervous signs in four-week-old piglets from a 400 sow, closed, indoor pig unit. The outbreaks were predominantly in piglets one- to two-weeks post weaning, but occasionally pre-weaning animals were affected. Disease was usually preceded by a stressful event such as cooler temperatures or a feeder blockage. There was a good response to treatment with amoxicillin and steroids. In-feed antibiotics appeared to reduce the incidence, but there was a desire to culture a pure causative organism for use in autogenous vaccine production. Live piglets with signs of recumbency, paddling or shaking were submitted and euthanased. Findings of note included clear, viscous fluid on the surface of the brainstem and congestions of the blood vessels overlying the brain. S. suis serotype 2 was cultured from the brains two of the piglets and cultures were sent for autogenous vaccine production.

BIRDS
Game birds
The rearing of pheasants and red-legged partridges in the UK for sporting purposes is carried out mainly in spring and summer, reaching a peak in July and August. As in most years this was reflected in avian diagnostic submissions to SAC C VS in July, which were dominated by game birds. Also, as in most years, the common protozoal parasitic diseases of game birds, coccidiosis and spirocheliosis made up the majority of diagnoses in both pheasants and partridges. However, recent and ongoing investigations into birds with “swollen heads” and infraorbital sinusitis suggests that mycoplasmosis due to Mycoplasma gallisepticum infection caused problems on a few sporting estates in Scotland this year. More details of what would appear to be an increasingly prevalent problem in reared game birds will be provided in a future SAC C VS surveillance report.

Gapes due to Syngamus trachea infection were diagnosed in a group of 4000 nine-week-old red-legged partridges in a rearing field with wild bird contact. Sporadic cases of poor condition or sudden death were seen. Of two birds submitted alive, one was in poor condition and one was grossly normal. The bird had dried bloody mucus around the beak and in the oral cavity, and a heavy burden of S. trachea worms in the trachea (Fig 4).
Fig 4. Gape worms (Syngamus trachea) in trachea of red legged partridge

**MISCELLANEOUS**

**Camelids**

Dumfries examined a two-year-old male alpaca that was treated for suspected pneumonia, but died within one hour. At postmortem examination poor body condition and subcutaneous haemorrhages were seen. The anterior lung lobes were moderately consolidated and there was froth in the airways. An excess of pericardial fluid that included a fibrin clot was noted and an area of fibrous scarring was found on the left ventricular endocardium in the area of the papillary muscle. The liver was very firm and contained small numbers of 1 to 2 mm necrotic foci. Multiple scattered 2 to 3 mm friable plaques were seen on the ventral peritoneal surface and the diaphragm. Histopathological examination found extensive fibrosis and small foci of necrosis with associated multinucleated macrophages in liver and confirmed the presence of peritonitis; the immediate cause of death was suspected to be secondary disseminated intravascular coagulation and fatal acute interstitial pneumonia. A necrotic plaque was identified as a pyogranuloma containing parasitic remains, believed to be fluke, suggesting that these lesions were due to aberrant parasite migration. No fluke were detected in the liver; however, the group was treated with the flukicide closantel two weeks earlier.

**Exotic animals**

Perth diagnosed yersiniosis in two common male marmosets (Callithrix jacchus), a three- and a six-year-old from a group of nine, which died two weeks apart. The marmosets were moved to a temporary enclosure for maintenance works to be carried out. In both cases gross pathology was confined to the liver, which had multifocal, pale, miliary lesions throughout the parenchyma. *Yersinia enterocolitica* was isolated from both livers. *Y. enterocolitica* has been described as a cause of fatality in zoo marmosets and other non-human primates (Poelma and others 1977; Frederiksson-Ahomaa and others 2007).

**REFERENCES**


Featured Article – Copper Poisoning in cattle and sheep

Kendall and others 2015 reported that over half of liver copper concentrations in 510 cull cattle were over the Nottingham University Veterinary Nutritional Analysis normal reference value of 5,618 µmol/kg dry matter (DM). Their study highlighted potential overfeeding of copper and that a significant proportion of animals were at risk from chronic toxicity. AHVLA and SACCVS combined surveillance data from 2000 to 2010 reported an increase in copper poisoning cases with a maximum number of 41 in 2007 (Bidwell and others 2012). Copper is recognised as a common cause of poisoning in sheep.

Cases recorded as copper poisoning from diagnostic submissions to SAC C VS from 2011 to 2015 are presented in Fig (a). A case is a single herd or flock outbreak (of one or many animals) diagnosed by blood, viscera or carcase submissions.

![Figure A](attachment:cases_of_copper_poisoning.png)

*Figure A*

Diagnostic cases may not be directly extrapolated to national trends due to the limitations of scanning (passive) surveillance. However, further examination of the 89 ovine submissions gives valuable insight into these cases. Liver residue was tested in 73 of 89 cases with results ranging from 9,020 to 68,700 µmol/kg DM, with a median value of 24,200 µmol/kg DM (reference range 314 to 7,850 µmol/kg DM).

Breed was recorded in 78 cases of which 51 per cent were Texel, Beltex or first generation crosses and 13 per cent were bluefaced Leicester. In 48 per cent (43 of 89) of sheep cases there was reference to a likely source of the copper. In 29 of these 43 cases the source was likely to be mineral supplementation within feed (compound or blended concentrates). In three cases there was reference to additional mineral supplementation (free powder, licks, boluses or drenching) and seven cases were associated with cattle feed. One case was in a suckling lamb and in one case contaminated pasture was implicated. Accidental ingestion was reported in only two cases.
These diagnostic submissions indicate that the planned sheep ration was the most common likely source of copper poisoning. This highlights that mineral nutrition of ruminants should be planned on a species, breed and farm basis. For copper the inclusion rates in rations need to be assessed in the context of requirement, risk and feeding rates.

References
