Northern Ireland Disease Surveillance Report, April to June 2021

- Ragwort poisoning in cows and steers
- Copper poisoning in calves
- Listerial septicaemia in calves
- Enteric disease in young lambs
- Tick pyaemia in lambs
- Pneumonia in ewes

These are some of the matters discussed in the Northern Ireland animal disease surveillance quarterly report for April to June 2021

CATTLE:

Alimentary diseases

Generalised candidiasis was diagnosed in a two- week- old calf which had presented initially with diarrhoea. There were miliary 4mm grey to black foci throughout the lungs. There were multifocal larger areas of consolidation (3cm diameter) in multiple lung lobes. There were multifocal to coalescing haemorrhages (2-4cm diameter) on the serosal surface of the rumen. There were 5mm to 2cm diameter circular red haemorrhagic foci on the reticulo-ruminal mucosal surface and a grey pseudo-membranous layer over most of the mucosa. There were multiple red foci on the ventral tracheal mucosal surface with blue mould growing from many of these foci. *Candida* spp yeast was cultured from multiple tissues.

FIGURE 1: Candidiasis in a calf; fungal lesions on the tracheal mucosa can clearly be seen

Johne's disease

1,112 sera were tested for MAP antibody during the reporting period, of these one hundred and ninety were positive

Nutritional and metabolic disease

Ragwort poisoning

Pyrrolizidine alkaloid toxicity due to ingestion of ragwort (*Senecio jacobaea*) was diagnosed in two separate herds during the reporting period. In one herd, an eighteen-month-old steer was the third in a batch of similar animals to die in recent weeks. The herd owner reported that the purchased silage the animals had been fed whilst housed may have contained ragwort. On gross examination the carcase was pale, in poor condition and there was a rectal prolapse. The abdominal cavity contained a large excess of sero-sanguinous fluid, and the peritoneum and serosa and mucosa of the abomasum and intestinal tract were expanded with gelatinous oedema. There was a fibrinous peri-hepatitis and the liver was shrunken, had a fibrous texture and a prominent 'nutmeg' appearance to the cut surface. Histological examination of the liver showed extensive centri-lobular, portal and bridging fibrosis, with compression and obliteration of central veins, extensive ductular reaction and hepatocyte necrosis. Many remaining hepatocytes were swollen with large nuclei (megalocytosis). In the brain there was extensive spongiform change in the grey matter and white matter and intra-myelinic oedema. There were single and small groups of astrocytes with clear vesicular nuclei and scant cytoplasm (Alzheimer's Type II cells).

Changes were most severe in the brainstem but were also present at the grey/white matter junction in the cerebrum. The histological changes in the liver and brain were considered consistent with pyrrolizidine alkaloid toxicosis and hepatic encephalopathy (FIGURE 2).

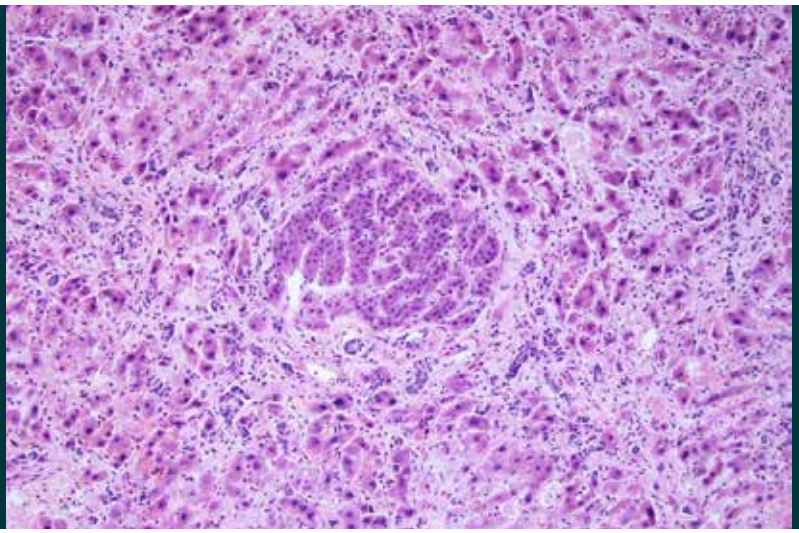

FIGURE 2: Ragwort poisoning in a steer; hepatic fibrosis and megalocytosis are present

In the second herd, six adult cows had died and listerial encephalitis had initially been suspected but on full postmortem examination gross and histological lesions consistent with pyrrolizidine alkaloid toxicity were detected.

Pyrrolizidine alkaloids are not directly toxic to the liver but require bio-activation in hepatocytes, leading to binding of these agents to proteins and nucleic acids with inhibition of mitosis, without inhibiting DNA synthesis, leading to megalocytosis accompanied by fibroplasia and bile duct proliferation. Clinically, chronic intoxication by pyrrolizidine alkaloids is characterized by liver failure and its possible consequences (icterus and photosensitization). Secondary neurological signs can develop due to a buildup of ammonia, produced by the breakdown of protein and urea in the large intestine and in other tissues, and which is normally removed from the blood when it enters the portal circulation. The ammonia remaining in the bloodstream passes through the blood-brain barrier causing injury to astrocytes and oedema formation. Grazing animals tend to avoid eating ragweed as it has a bitter taste, however when ensiled it loses the bitter taste, and although the plant is dead, all parts are still poisonous.

Copper poisoning

Copper poisoning was diagnosed in a five-month-old calf submitted with a history of sudden death whilst outdoors on grass. At gross post-mortem examination evidence of navel-ill and omphalophlebitis was noted. There was also marked orange discolouration of the hepatic parenchyma, and the bladder was filled with densely blood-stained urine. On histological examination there was generalised, pan-zonal hepatic parenchymal fatty change and necrosis with yellow-brown pigment granules in the cytoplasm of many hepatocytes. In the kidneys there was a large amount of eosinopphilic flocculent material in the urinary spaces of the renal corpuscles and yellow-brown granular pigment in the epithelial cells of the distal tubules. Hepatocytes and Kupffer cell nests in the liver were positive for copper by the Rubeanic acid test, as were tubulo-epithelial cells in the kidney tissue. Results from Biochemistry revealed 184 ug/g copper in the liver (normal range 25-100ug/g) and 7ug/g in the kidney (normal range 4-5.5ug/g). Results from Histology and from Biochemistry therefore supported a diagnosis of copper poisoning in this case.

Nutritional cardiomyopathy

Nutritional cardiomyopathy and congestive heart failure was diagnosed on full post-mortem examination of a bullock submitted with a history of malaise and dyspnoea. At gross post-mortem examination the heart was found to be enlarged and globular in shape. Pallor of the myocardium was noted especially of the auricles. The liver was congested, swollen and with rounded borders, the cut surfaces having a 'nutmeg' appearance. The lungs were congested and oedematous and there was a slight excess of thoracic fluid. Overall pallor of the skeletal muscles was also noted. On histological examination, marked centri-lobular and mid-zonal bridging congestion was noted in the liver. There was fatty change in the hepatocytes and centri-lobular biliary stasis. The lung tissue was congested, petechiated and ecchymotic, especially the septae, and there was acute peri-vasculitis in some lobules. The heart muscle showed marked interstitial oedema, generalised moderately severe segmental myofibrillar swelling and necrosis and mineralisation with occasional macrophage involvement. These changes are considered likely to be consistent with white muscle disease (WMD/ nutritional myopathy), caused by vitamin E and/or selenium deficiency. It was noted that these cases often present with dyspnoea due to either intercostal muscle weakness or to pulmonary oedema.

Hypomagnesaemia

There were numerous hypomagnesaemia cases in cattle during the spring period. Necropsy and histopathology are usually unremarkable in these cases but magnesium levels in vitreous humour can be used to aid the diagnosis.

Reproductive and mammary diseases

Abortion due to Neospora caninum and Bacillus licheniformis

A combined infection of *N. caninum* and *B. licheniformis* was considered to be the cause of abortion in a suckler cow in the six month of pregnancy. On histological examination of foetal tissues, the lung tissue was found to be congested, with chronic interstitial pneumonia. In the brain there was focal lympho-plasmacytic meningitis, mainly cerebral in distribution, and occasional microglial foci in the cerebrum. Bacillus licheniformis was recovered in profuse pure growth from the foetal stomach content. This infection is a recognised cause of sporadic abortion, or small outbreaks of abortion in cattle, and is often associated with feeding of spoiled hay or silage. The foetus was also serologically positive for Neospora, and considering the histological findings on brain tissue, it is likely that both *N. caninum* and *B. licheniformis* infection were present, the latter probably acting as an opportunistic pathogen.

Stillbirth due to thyroid hyperplasia

Stillbirth due to thyroid hyperplasia was diagnosed in a large stillborn calf with a thyroid weight of 49 grams. Thyroid weights over 30 grams are often associated with thyroid hyperplasia. Histologically there was thyroid epithelial hyperplasia with intra-follicular papillary projections and absence of colloid (FIGURE 3). on next page.

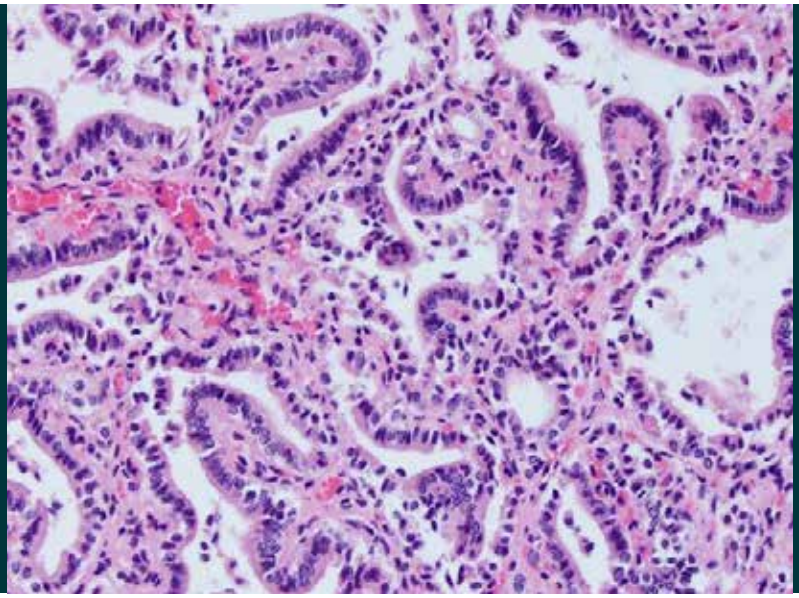

FIGURE 3: Thyroid hyperplasia in a stillborn calf; intra-follicular papillary projections and absence of colloid can be seen

Osteogenesis imperfecta

Osteogenesis imperfecta was diagnosed in a term calf which suffered multiple fractures at birth. On examination, there was contraction of the flexor tendons on the forelimbs with fixed flexion at the fetlocks. The hind limbs were presented partially detached with fractures and separation at the growth plates. There was a series of bilateral fractures at the costochondral junctions. Lungs did not appear aerated. Schmallenberg virus nucleic acid was not detected in foetal tissues by RT-PCR. Osteogenesis imperfecta (OI) was considered as a possible cause. OI describes a group of connective tissue disorders characterised by bone fragility that are usually transmitted in a dominant manner

Mastitis

During the reporting period, *Streptococcus uberis* was the most commonly diagnosed cause of bovine mastitis, followed by *Staphylococcus aureus* and *Bacillus cereus*.

A five-year-old, recently calved dairy cow found dead in the cubicle house was submitted for examination. At necropsy, the cow was in good body condition with severe congestion of the tissues of head and upper respiratory tract with serosal haemorrhages of the pharynx, larynx and trachea. There were sub-pleural haemorrhages and there was widespread epicardial and pericardial haemorrhage. The left hind quarter of the udder was hard, and a watery grey secretion was expressed. The mammary sinuses contained thick fibrin and gelatinous oedema. Histologically the changes were of severe suppurative mastitis; the ducts were filled with neutrophils showing toxic change, often with gland epithelium necrosis and extension of neutrophilic inflammation into the interstitium. Haemolytic *E. coli* was recovered from the mammary tissue and a diagnosis of acute coliform mastitis was made.

Neurological diseases

A pituitary abscess and purulent meningitis was diagnosed in a one-year-old Charolais heifer which presented with acute blindness whilst at pasture. At necropsy there was severe excess cloudy cerebral fluid. Lateral ventricles contained excess cloudy fluid. There was thick mucopurulent exudate on the ventral aspect of the brain and abscessation of the pituitary gland. *T. pyogenes* was cultured from the abscess and from cerebro-spinal fluid.

Urinary tract diseases

Two cases of pyelonephritis were seen in separate herds during the quarter. In one herd the diagnosis was made in a three-month-old male suckler calf euthanased for ill thrift. On gross postmortem examination the left kidney was significantly enlarged and had a soft, nodular, abscessated surface. On the cut surface, the left kidney cortices were reduced to a thin rim due to necrosis and replacement by liquid and plastic pus. The serosal surface was adherent to the adjacent small intestinal loops due to abscess rupture and localised peritonitis which had resulted in a functional obstruction of the intestine. There was also a purulent omphalophlebitis (navel ill) with a thin track of purulent material extending along the umbilical vessel remnant. *T. pyogenes* was recovered from the navel and the left kidney, suggesting that the pyelonephritis may have resulted from haematogenous spread from the navel. Bilateral pyelonephritis is more commonly seen due to ascending infection from the lower urinary tract (FIGURE 4).

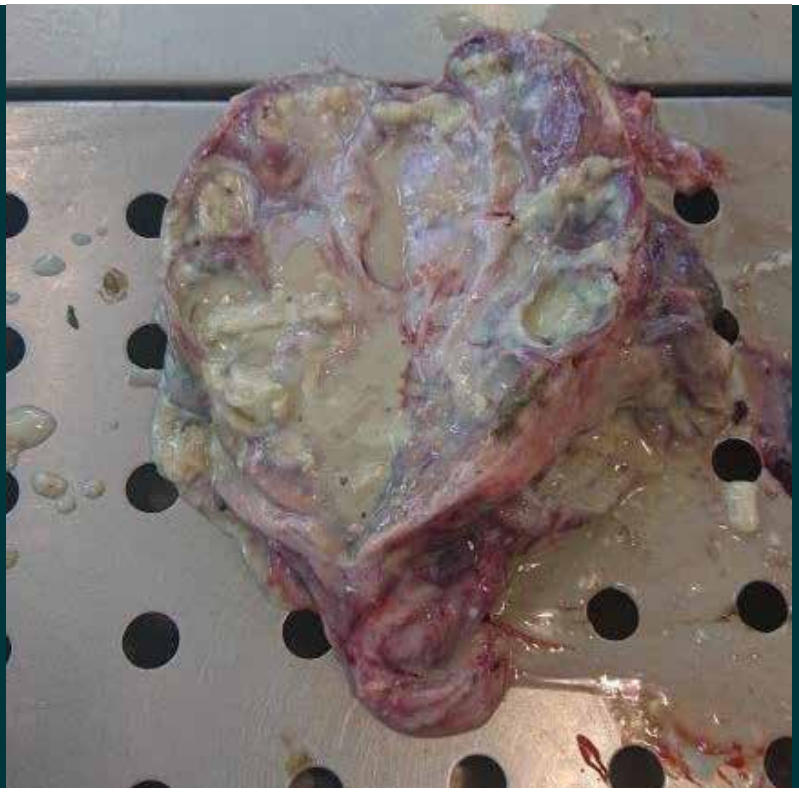

FIGURE 4: Pyelonephritis in a heifer

In the second herd pyelonephritis associated with an ascending urinary tract infection following service injury and vulvo-vaginitis was diagnosed in an in-calf beef heifer. Corynebacterium spp were isolated from the kidneys in large numbers. Pyelonephritis in cattle is most commonly caused by bacterial species that are normal commensals in the bowel and skin, and especially of the urinary tract (such as *Corynebacterium renale*) and is most common following parturition.

Musculo-skeletal system diseases

Several cases of septic arthritis were diagnosed during the reporting period with *T. pyogenes* being most commonly recovered from lesions. Typical pathology was seen in a five-year-old cow which was submitted after being euthanased on welfare grounds. On gross examination there was severe chronic arthritis in both stifle joints. On incision there was severe periarticular gelatinous oedema and haemorrhage in the fascia and connective tissue surrounding the left and right stifle joints and extending towards the hock on both sides. There was very severe eburnation of the articulatory

surfaces of both stifle joints, particularly on the medial condyles of the femurs. There was fibrino-necrotic synovitis of both stifle joint capsules and some bone fragments were present within the left joint capsule. The articulatory surfaces of the hock joints were unaffected. There was slight ebunation of the head of both humeri, with corresponding lesions in the scapular articulations. In another case, in a two-year-old cow from another herd there was a purulent lesion in the space between the atlas and the skull.

Cases such as these should always be investigated for the involvement of *Mycoplasma bovis*. *Myc. bovis* infection may be diagnosed on the basis of gross examination with histology, immunohistochemistry, bacteriology and detection of nucleic acid by RT-PCR. In the series of cases discussed here, there was no evidence of mycoplasmal infection.

Spinal abscess and osteomyelitis due to Salmonella Dublin infection

A spinal abscess at the level of the first and second thoracic vertebrae was detected in a six-week-old bull calf submitted with a history of being unable to stand. *Salmonella* Dublin was recovered in moderate growth from the lesion.

Clostridial myositis (Blackleg)

Blackleg was diagnosed in an eight-month-old heifer which had not been vaccinated against any clostridial disease. At necropsy, both sides of the neck were seen to be swollen and firm and there was necro-haemorrhagic wet swelling of the right latissmus dorsi muscle, right shoulder muscles and muscles along the right side of the neck. There was a butyric smell of affected muscles and they contained gas bubbles. It was noted that Blackleg and other clostridial diseases can be inexpensively prevented by full and proper vaccination.

Cardiovascular system diseases

Hardware injury of 'wire' was seen in a nine-month-old heifer which had been pale, lethargic and inappetant. On gross examination there was a fibrosing purulent tract from the rostral surface of the reticulum, through the diaphragm (which was locally inflamed) and into the pericardium with resulting organising fibrinous pericarditis and the presence of approximately two litres of floccular watery pus in the pericardial sac. The liver was congested and swollen with rounded borders, there was 'nutmeg' pattern of the cut surfaces, and there was a marked abdominal transudate. Histology confirmed centri-lobular congestion and hepatocyte necrosis associated with congestive heart failure.

Vegetative endocarditis

Vegetative endocarditis was detected in a four–year-old cow which had died following a period of ill thrift. At gross post-mortem examination there was subcutaneous oedema in the neck and shoulder area. There was also gelatinous oedema of the pleura and omentum, and sub-epicardial gelatinous oedema. In the heart there was a very large vegetative lesion obstructing the right pulmonic valve; on incision of the lesion suppurative foci were noted. There was also a multi-nodular vegetative lesion on the left atrio-ventricular valve. (FIGURE 5). *E. coli* and *Acinetobacter* spp. were isolated from the vegetative lesion (next page).

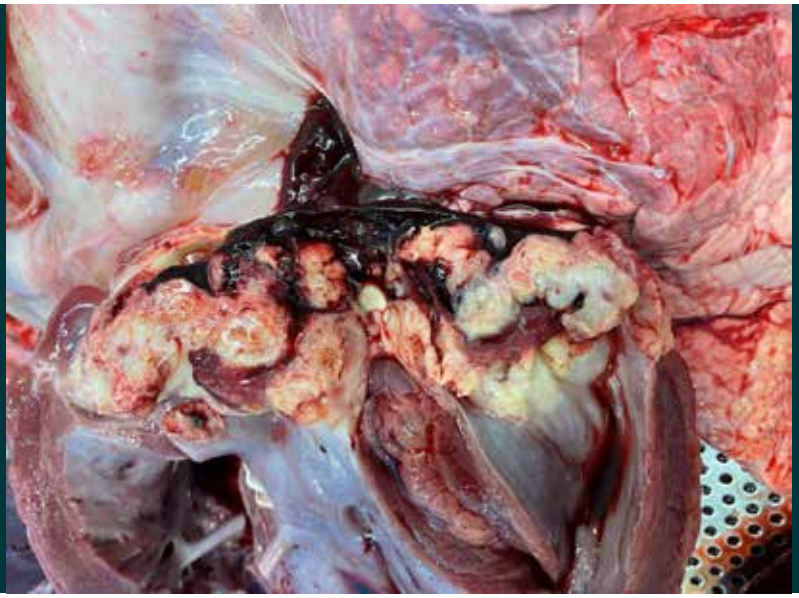

FIGURE 5: Vegetative endocarditis

Vena-caval thrombosis

Posterior vena-caval thrombosis was diagnosed in a three-year-old cow. At necropsy there was a large septic embolus in the posterior vena cava and patchy haemorrhagic consolidation in the caudodorsal and cranioventral lung lobes. Histology confirmed pulmonary thromboembolism.

SMALL RUMINANTS: SHEEP

Respiratory diseases

Jaagsiekte and pneumonic pasteurellosis

Jaagsiekte (OPA) and secondary pneumonic pasteurellosis was diagnosed in ewes in two separate flocks during the reporting period. In each case the ewes presented as sudden death, in one instance in close association with shearing. Advice was given to further investigate the prevalence of OPA by ultrasound scanning of the flock. Currently ultrasound scanning of the chest to detect early changes associated with tumour growth in the lungs is the best option for early diagnosis, and can be used in conjunction with a routine cull ewe post mortem screen to establish the presence of the disease in a flock and individuals.

Jaagsiekte is a contagious tumour of the lungs of sheep caused by a virus known as Jaagsiekte Sheep Retrovirus (JSRV). It is spread largely by the aerosol route, but may also transmit from ewe to lamb via the colostrum and in utero. The disease is common in most sheep producing countries and GB, Northern Ireland and Ireland are no exception. Flocks affected with Jaagsiekte experience considerable loss through lowered production and increased ewe mortality and culling.

Given that thin ewes and culls are only infrequently submitted for veterinary post mortem examination, and because diagnosis of the disease in the live animal can be problematic unless there is access to chest scanning, the level of Jaagsiekte actually diagnosed is thought to be much lower than the level of disease actually present. Hence Jaagsiekte is often termed an ‘iceberg’ disease.

Alimentary diseases

Enteric disease in young lambs

Cases of enteritis in neonatal and young lambs were investigated in several flocks during the quarter. In very young lambs, *Cryptosporidium* SP and *E. coli* (enteric colibacillosis) were the most common pathogens and disease was most usually associated with insufficient absorption of colostrum. Coccidiosis and nematodirosis were diagnosed in older lambs and frequently there was a combined infection. Using a forecasting system based on climate data, AFBI Veterinary Sciences Division predicted that peak hatching of Nematodirus eggs would take place during first and second week of April 2021 and this was borne out by events. Mesenteric torsion associated with over-feeding of grain to early finishing lambs was also seen in several flocks. In some instances the lambs themselves were not being given concentrate feed but were gaining access to ewe rations.

Johne's disease

Seven sera were tested for antibody to MAP during the reporting period, of which one was positive.

Nutritional and metabolic disease

Poisoning due to ingestion of Forest Flame (*Pieris* spp) was seen in one flock. In these cases gross and histological findings are either unremarkable or non-specific and the diagnosis is based on history and detection of plant fragments in the rumen contents.

Urinary tract disease

A two-month-old lamb that was found dead in the field was submitted for post-mortem examination. The peritoneal cavity contained profuse haemorrhagic fluid associated with bladder rupture. Most of the penile urethra from the sigmoid flexure to the urethral process was obstructed by crystalline material and urolithiasis was diagnosed.

Renal amyloidosis

Renal amyloidosis and tubular necrosis most likely associated with an extensive, resolving peritonitis was diagnosed on full post-mortem examination of a four-year-old ewe.

Other diseases of sheep

Diseases of pre-weaned lambs

Listeria monocytogenes was recovered in septicaemic distribution from the viscera of a five-day - old lamb with multi-focal hepatitis. Histological finding included necrotising hepatitis and acute and sub-acute meningitis and vasculitis affecting all areas of the brain. Septicaemic listerial infection is not uncommon in young lambs, although involvement of the brain is rarer. The pathogenesis of the meningitis in these cases is not the same as that of listerial encephalitis of older sheep in which the brain lesions are not a sequel to septicaemia.

Septic arthritis

'Joint ill' was seen in three-to-four-week-old lambs which presented as lame and weak. There was purulent arthritis affecting multiple limb joints and the atlanto-occipital joint and *Streptococcus*

dysgalactiae was recovered in profuse pure growth from the joints and other tissues. There was severe renal septic thrombo-embolism and infarction.

Tick pyaemia

Tick pyaemia was diagnosed in three –to four-week-old lambs which presented as lame and lethargic. On gross examination, there was a pale focus (4mm diameter) at the level of the rostral colliculus of the cerebellum and there was thick cloudy fluid in the ventricles.

Miliary pale suppurative foci, 2mm to 15mm diameter, with cavitation, were present throughout the myocardium. Many bulged into the ventricular lumen discharging purulent material into ventricular blood leading to a generalized pyaemia with frequent pale yellow foci throughout the cortex and medulla of both kidneys, yellow suppurative foci in the diaphragmatic lung lobes and mediastinum and pale grey green foci in skeletal muscles of the limbs and spine. (FIGURE 6).

FIGURE 6: Severe cardiac abcessation due to tick pyaemia

Pulpy kidney disease

Clostridial enterotoxaemia was suspected in a four-month-old lamb, based on cerebellar coning and suggestive brain histopathology (perivascular protein lakes and neuropil oedema) and detection of *Clostridium perfringens* type D epsilon toxin in the small intestinal content. It was unclear if the lambs had been fully vaccinated against pulpy kidney and was noted that by sixteen weeks of age, passive immunity from maternal colostrum would have waned.

HORSES:

17 swabs were examined for the presence of *Tayorella equigenitalis* ,all were negative. Two swabs were cultured from horses with a history suggestive of strangles during this quarter, one ws positive.

PIGS:

A four-week- old pig died a few days after weaning and was submitted for examination. At necropsy the carcase was noted to be rather congested and dehydrated. There was a large bulla with associated haemorrhage in the left caudo-dorsal lung lobe, but there was no significant pulmonary consolidation. *Klebsiella oxytoca* was isolated in pure culture from liver, lung, spleen and brain. *K. oxytoca* is an opportunistic pathogen in pigs and post-weaning stress together with dyspnoea resulting from the lung lesion may have precipitated infection in this case.

WILDLIFE and EXOTICS:

A three-year-old Manx shearwater from a monitored offshore island colony was submitted having being found moribund with suspected puffinosis (a disease with possible viral aetiology of Manx shearwaters and some other seabirds). The carcase was dehydrated and no food was present in the alimentary tract. The webs of both feet were reddened and bore several fluid-filled blisters (FIGURE 7); there was necrosis and epithelial detachment of the web skin. On histological examination the affected skin showed necrosis of the basal layers of the epidermis with severe heterophilic inflammation of the basal epidermis and superficial dermis. There was extensive bacterial colonisation in this area (moderate-sized rods) and there was fungal invasion and micro-thrombosis of blood vessels in the vicinity. In the brain there was a single large encephalomalacic lesion in the cerebral white matter, and there was heterophilic conjunctivitis. There was mild ulceration of the mucosa of the proventriculus. Parasitological examination of the intestine revealed large numbers of coccidial oocysts. Electron microscopy examination of the web skin and blisters revealed no viral particles. *Serratia* sp. was cultured from the web skin lesions and from the liver and kidney in pure culture. Bearing in mind that invasion by environmental microorganisms is often associated with wet and dirty conditions, and that numerous coccidial oocysts were detected in the intestinal content, a possible scenario is that the primary lesions on the feet represent contact dermatitis due to ammonia in the substrate. This could also account for the conjunctivitis, while opportunistic bacterial and fungal infection, as well as coccidiosis is likely to have originated from the contaminated substrate. Pain in the feet may have prevented normal feeding activity, and ultimately led to dehydration (.

FIGURE 7: Reddened and blistered feet, Manx Shearwayter; puffinosis was suspected in this case but no viral involvement in the lesions could be demonstrated

Leiomyoma in a pot- bellied pig

An eight- year- old Tamworth pig from a zoological collection was euthanized on welfare grounds following long term treatment for arthritis. Gross postmortem examination found a large mass (approximately 14kg) expanding the wall of the left uterine horn and occluding the lumen. Histology of the mass showed that the normal structure of the myometrium was replaced by masses of mainly spindle-shaped cells with elongated nuclei, and an extensive desmoplastic reaction, suggestive of a leiomyoma. Leiomyomas are described in the literature in older pot-bellied pigs (FIGURE 8).

FIGURE 8: Leiomyoma in a pot-bellied pig