Regional Veterinary Laboratories Report
March 2019

Regional Veterinary Laboratories (RVLs) carried out necropsy examinations on 508 carcases and 330 foetuses during March 2019. Additionally, 2,487 diagnostic samples were tested to assist private veterinary practitioners (PVPs) with the diagnosis and control of disease in food-producing animals. This report describes a selection of cases investigated by the Department of Agriculture, Food and the Marine’s (DAFM) veterinary laboratories in March 2019. It is also hoped these descriptions of both common and unusual clinical presentations together with the results of the various investigations and tests will assist diagnosis, encourage thorough investigation of clinical cases, and provide context for practitioners when interpreting laboratory reports.

CATTLE

Table 1: The 10 most common diagnoses in bovine carcases (excluding foetuses) submitted to DAFM RVLs in March 2019.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Count</th>
</tr>
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<tbody>
<tr>
<td>Bacteraemia/septicaemia</td>
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<tr>
<td>Pneumonia</td>
<td>8</td>
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<tr>
<td>Pregnancy toxæmia</td>
<td>8</td>
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<tr>
<td>Trauma</td>
<td>7</td>
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<tr>
<td>Mesenteric torsion</td>
<td>7</td>
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<tr>
<td>Enterotoxæmia</td>
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<tr>
<td>Abscessation-miscellaneous</td>
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<td>4</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>4</td>
</tr>
<tr>
<td>Enteritis and septicaemia</td>
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Figure 1: Full thickness abomasal ulcer in a calf with necrotising abomasitis. Photo: Aideen Kennedy.

Two nine-day-old, bucket-fed calves from a 60-cow dairy herd were submitted to Limerick RVL. They both had a history of diarrhoea for two days. Both calves deteriorated rapidly and died. On post-mortem examination, one calf was a rumen drinker, *Listeria monocytogenes* was isolated from the liver and a faecal sample was positive for rotavirus. The second calf was also positive for rotavirus and was dehydrated.

Salmonellosis

A two-week-old calf was submitted to Limerick RVL with a history of sudden death. *Salmonella Typhimurium* was isolated by culture from the intestinal contents. Gross post-mortem examination disclosed liquid small intestinal contents and a reddened intestinal mucosa. Histopathology disclosed severe enteritis. The herd owner was informed of the zoonotic implications; as this is a notifiable zoonosis the Health Service Executive was informed of this outbreak.

Rumenitis

Sligo RVL diagnosed rumenitis due to ruminal drinking in three submitted calf carcases. In one case, a 10-month old calf was submitted with a history of diarrhoea and pneumonia-type symptoms. Mycotic rumenitis, diffuse enterocolitis and severe dehydration were evident on gross post mortem examination. Laboratory testing revealed...
hypogammaglobulinemia. *Candida spp.* was isolated from the rumen and *Cryptosporidium* was identified in the intestinal contents.

**Atresia**
A two-day-old calf was submitted to Sligo RVL for post-mortem examination. The calf had appeared normal after birth, but no meconium was passed. The animal deteriorated quickly within 48 hours and died, despite treatment efforts. Post-mortem examination revealed an intestinal atresia in the mid jejunum where both the proximal and distal intestinal segments were blind ending, and linked by a fibrous cord (Figure 2).

Intestinal segmental anomalies usually develop during early foetal development and ischaemia of gut segments for various reasons is the most plausible explanation. The extent and severity of the anomaly can vary in degree from stenosis in which the lumen is narrowed and some passage is still possible, to atresia in which passage of intestinal contents is completely occluded. Atresias can occur with just a membrane obstructing passage through the lumen (membrane atresia), separation of the gut in which the blind ends are still connected by a connective tissue cord (cord atresia) or with an intestinal segment fully missing, leaving two blind ends (blind-end atresia).

**Figure 2:** Intestinal atresia in a two-day-old calf. Severely dilated cranial portion of jejunum (J) connected with a connective tissue cord (arrow) to the caudal portion. Photo: Rebecca Froehlich-Kelly.

**RESPIRATORY TRACT**

**Pneumonia**
Limerick RVL examined a five-week-old Simmental-cross calf with a history of pneumonia. On post-mortem examination there was emphysema involving portions of the middle lung lobes and well demarcated consolidation of the cranial lung lobes (Figure 3). There was also evidence of ruminal drinking, with an associated acidosis detected in subsequent laboratory tests. No significant bacterial pathogens were isolated from the lungs, but a polymerase chain reaction (PCR) test was positive for respiratory syncytial virus (RSV).

**Figure 3:** Consolidation and emphysema in a case of pneumonia in a calf. Photo: William Fitzgerald.

A two-week old calf was submitted with a history of inappetence and scour to Limerick RVL. Necropsy detected cranio-ventrally distributed consolidated lungs indicating bronchopneumonia. Histopathology disclosed purulent bronchopneumonia, mild enteritis and nephritis. *Mycoplasma bovis* and *Histophilus somni* were detected by PCR. Purulent tubulointerstitial nephritis is a relatively common finding in calves following bacteraemia.

**Figure 3:** Consolidation and emphysema in a case of pneumonia in a calf. Photo: William Fitzgerald.

A one-month old calf was submitted from a herd with a history of pneumonia in young calves. The animal was treated, recovered and relapsed. Gross post-mortem examination disclosed multiple abscesses in the liver; several abscesses in the lungs with severe congestion of the cranial right lung, and abscesses in the urachus. Histopathology disclosed abscessation, hepatitis, purulent pneumonia and pulmonary haemorrhage. *Trueperella pyogenes* was isolated on culture.

These findings probably reflect the end-stage of a chronic sequel to an acute respiratory disease, and the referring PVP was advised to investigate acute cases to learn more about the primary disease pathogen involved.

**URINARY/REPRODUCTIVE TRACT**

A full-term Aberdeen Angus-cross calf was submitted to Athlone RVL. The calf was deformed and there was a history that the dam had been off form for a few months. On gross post-mortem examination, the carcase appeared small, it had an enlarged dome-shaped head, cleft palate, no tail, spina bifida, hydranencephaly and cerebellar hypoplasia (Figures 4 and 5). Test results for Schmallenberg Virus, Bluetongue Virus and BVD were negative. Serology of the dam was recommended to rule out seroconversion. Gross congenital brain malformation can result from infectious agents (ie. teratogenic viruses), chemical toxin exposure or hereditary defects. A definitive cause was not, however, determined in this case. It is often difficult to determine an aetiology in cases of congenital deformities as insults occur early in gestation and in many cases are no longer present.
or identifiable at birth. Sporadic cases may not warrant an exhaustive investigation. However, if the incidence in a herd or area are high, a thorough herd level investigation involving characterisation of lesions, nutritional history of dam, genetic and temporally associated environmental factors should be assessed.

Omphalophlebitis
A one-week old calf was submitted to Sligo RVL with a history of sudden death. On gross post-mortem examination, the carcass appeared very pale, and very dehydrated. There was a focally extensive fibrino-necrotic omphalophlebitis. _Listeria monocytogenes_ was isolated from the lesion. This organism is often associated with meningoencephalitis and abortion in ruminants but a septicemic form can also occur. Two calves, one month and two months old, respectively, were submitted to Limerick RVL with a history of loss of appetite. Grossly, the older calf had a large abdominal abscess. The abscess involved the umbilical and hepatic vasculature and was likely to have originated from the umbilicus. The younger calf had congested lungs with numerous fibrin tags (pleuritis). Within its abdomen there was widespread severe fibrinous peritonitis, which originated from an infected urachus. The calf had a ZST result of five units, likely reflective of little or no colostral transfer.

CARDIOVASCULAR SYSTEM
(Traumatic) Reticulopericarditis
A yearling Friesian bullock was submitted to Athlone RVL with a history of sudden death. It was the third similar loss. There was a fibrous adhesion and a pustular tract penetrating the diaphragm from the reticulum. No foreign body was found in the forestomachs. The pericardial sac was severely distended and contained large amounts of purulent fluid. There was a severe diffuse “bread-and-butter” fibrinous pericarditis and a focal suppurative myocarditis in the left ventricle wall. There were multifocal pinpoint yellow necrotic foci throughout both renal cortices. There was a ‘cobblestone’ appearance to the abomasal mucosa indicating proliferative abomasitis. _Trueperella pyogenes_ was isolated from the kidneys. A diagnosis of severe pericarditis, focal suppurrative myocarditis and multifocal suppurrative nephritis was made. The heart lesions were secondary to a foreign body reticulitis and a subsequent haematogenous spread of bacteria to the kidneys. A trichostrongyle egg count of 4,600 eggs/gram was detected in the faeces confirming concurrent parasitic gastroenteritis and a review of parasite control on farm was also advised.

NERVOUS SYSTEM
Thrombo-embolic meningoencephalitis (TEME)
Sligo RVL received an 11-month old heifer for post-mortem examination. The heifer had displayed hind limb weakness after dosing four days before death, with a slight improvement after treatment. Necropsy revealed multifocal, variably sized reddened areas on meninges covering the cerebrum and multifocal well demarcated infarcted areas in underlying...
cerebrum. There was focally extensive bruising in muscle over the tail head and the flanks. Increased amounts of fibrinous joint fluid were noted in the left hip and stifles. Histopathology revealed a severe focally extensive necrotising fibrino-suppurative meningoencephalitis and vasculitis with multifocal vasculitis of surrounding blood vessels which contained thrombi, viable and degenerate neutrophils and bacteria. Histophilus somni was identified on PCR from brain swab. Gross histopathology and laboratory results suggest thrombotic meningoencephalitis (TME) as a likely diagnosis.

MUSCULOSKELETAL

Fracture
A three-day-old calf was submitted for post-mortem examination to Athlone RVL. The herd owner reported a difficult calving and the need to stomach-feed the calf three times daily. Post-mortem examination showed a fracture of the vertebral column at the junction of the first and second lumbar vertebrae (L1-L2) with necrosis and inflammation of surrounding tissues. A diagnosis of trauma due to dystocia was given.

MISCELLANEOUS/POISONINGS

Bovine neonatal pancytopenia
A two-week-old calf was submitted to Kilkenny RVL with a history of melaena. Necropsy revealed a pale carcase, pale lungs, liver and kidneys indicative of anaemia. There were haemorrhagic contents in the intestines. There were ecchymotic haemorrhages on the epicardium, kidney and focally in the lung. The lung had focal emphysema. Bone marrow was collected for histology and there was evidence of trilineage hypoplasia which led to the diagnosis of bovine neonatal pancytopenia.

Bovine neonatal pancytopenia (BNP), is a highly fatal condition causing haemorrhages in calves aged fewer than four weeks. It has been associated with BVD vaccination of pregnant dams. There was no vaccination history available in this case.

Lead poisoning
Lead poisoning was diagnosed in Cork RVL. A calf with a clinical history of sudden death in a group of 42 was submitted for post-mortem examination. Lead intoxication is difficult to detect on gross examination due to its acute nature and the absence of specific macroscopic lesions, which can vary from anaemia to hepatic and tubulorenal degeneration and necrosis. The submitted calf displayed marked enophthalmos, its liver had a pulpy consistency (hepatic degeneration) and the kidneys and thymus showed petechial haemorrhages (tubular necrosis). Specific lead involvement in toxic tubular injury cannot be identified by the renal lesions alone and biochemistry is required for the diagnosis; however, intranuclear inclusion bodies can occasionally be seen in glomeruli and epithelium of the proximal tubules (Figure 9) as seen in the kidney sections of this calf. Most submitted cases of sudden death are tested for lead as a precaution given that in most events the potential source of lead is unknown in the initial investigation. This calf had a toxic kidney lead concentration of 846µmol/kg (normal range 0-24µmol/kg). Subsequently, an epidemiological investigation was carried out and revealed that the source of lead was an old wooden post fence use in the calf shed. Additionally, 16 cohort calves showed blood lead levels well above the normal range consistent with exposure to lead.

Lead toxicity represents a potential risk to the food chain and should be prevented by making sure that any recycled material used in the farm is inspected and, any sudden unexplained death of a previously healthy animal is investigated by the veterinary practitioner with an early involvement of their RVL. A restriction in animal movements and the sale or consumption of milk is placed on animals exposed to lead and regular blood testing is required to guarantee that their blood levels are within the allowed normal concentration range.
Pleural and pneumonia
A two-year-old ewe with a history of ‘going away on her own’ was submitted to Kilkenny RVL. The ewe was unresponsive to treatment administered the previous day. Post-mortem examination detected an ulcerated area on the skin at the point of the sternum. Subcutaneously, there was a purulent abscess extending into the musculature with a necrotic tract through the sternum. There was pleurisy and approx 10% of lung tissue was necrotic. Additionally there was multifocal abscessation in lung. T. pyogenes cultured from lung. Although there was no history of trauma, the main findings of pleurisy and pneumonia most likely resulted from infection entering through the sternum wound.

Figure 9: Microphotograph demonstrating acid-fast inclusion bodies (arrows) stained with Ziehl–Neelsen in the convoluted tubular epithelium of a calf with lead poisoning. Photo: Cosme Sánchez-Miguel.

Table 2: The 10 most common diagnoses in submitted sheep carcasses to DAFM Laboratories in March 2019.

GASTROINTESTINAL TRACT
Coccidiosis
Sligo RVL diagnosed jejunal intussusception in two six-week-old lambs. Both lambs had a severe infection with coccidiosis and were severely dehydrated.

RESPIRATORY TRACT
Ovine pulmonary adenomatosis
A one-year-old pedigree ram with a history of dyspnoea and ill-thrift was submitted to Sligo RVL. On necropsy, the lungs appeared consolidated with approximately 80% of the organ affected. Mannheimia haemolytica and Pasteurella multocida as well as jaagsiekte sheep retrovirus were detected by PCR. Histopathology revealed cuboidal neoplastic cells arranged to form acini and papillary projections that effaced the normal alveolar epithelium. Ovine pulmonary adenomatosis with concurrent bacterial pneumonia was diagnosed.

Figures 10 and 11: Demonstration of a necrotic tract through the sternum causing pleurisy and pneumonia in a ewe. Photo: Aideen Kennedy.
NERVOUS SYSTEM

Haemorrhage

A large single lamb was submitted for post mortem examination to Athlone RVL with a history of nervous signs commencing approximately five hours after birth. Post-mortem examination showed a large blood clot in the brain, compressing the cerebellum. A diagnosis of trauma and brain haemorrhage was given.

Figure 12: Cranial haemorrhage compressing the cerebellum in a newborn lamb. Photo: Séamus Fagan.

Hypocalcaemia/Hypomagnesaemia

A four-year-old ewe that was being fed on rape was found dead and submitted to Kilkenny RVL. The ewe had lambed two weeks earlier. On necropsy, there was diffuse congestion of the lungs. There were no other visible lesions. Testing of ocular fluid for magnesium and calcium revealed low concentrations of both. Magnesium concentrations <0.33mmol/litre in the aqueous humour or <0.65mmol/litre in the vitreous humour are suggestive of hypomagnesaemia and hypocalcaemia as cause of death. Calcium concentrations <1mmol/L in the aqueous humour or vitreous humour are suggestive of clinical disease. Values can rise post-mortem so sampling from fresh carcases is advisable.

POISONINGS/MISC

Hepatic abscessation

A 2.5-week-old single lamb from a 270-ewe flock with a history of depression and failure to respond to treatment, with rapid deterioration and death was submitted to Limerick RVL for necropsy. On gross post mortem examination there was abscessation of the umbilical vessels from the navel to the liver and miliary abscessation of the liver (Figure 13). Pulmonary congestion and oedema was also present. Streptococcus dysgalactiae was isolated from the liver.

Figure 13: Miliary hepatic abscessation in a lamb caused by a streptococcal infection. Photo: William Fitzgerald.

Predation

A three-week-old lamb was submitted to Sligo RVL with a history of sudden death. This was the first unexplained death in the flock in the current lambing season. The lamb was at grass and was found dead in the middle of the paddock. The flock had been vaccinated against clostridial disease but had experienced deaths due to clostridial disease in previous seasons so the farmer and submitting vet were aware of the importance of a prompt diagnosis. At necropsy the lamb was found to be in good condition and lesions were confined to the head. There was focally extensive bruising in the ventral neck and there was a single small 5mm puncture wound in the skin overlying the parietal bone on the skull. Further dissection revealed that the skull had been punctured by a sharp object and there was haemorrhage involving meninges and adjacent cerebral brain tissue. (Figure 14). Cause of death in this animal was trauma and likely to have been caused by a predator with long canine teeth such as a fox which punctured the skull of the lamb.

Figure 14: Photo of lamb’s head with skin removed and skull partially reflected to show puncture wound in bone (asterisk) and damage to underlying brain tissue (arrow). Photo: Shane McGettrick.
Contagious pustular dermatitis (Orf)
Athlone RVL received a one-year-old hogget after euthanasia with a history of losing weight and lameness for a few weeks and with multiple crusty (pustular) lesions on the legs and also on its brisket. Parapox virus, the cause of orf, was detected in crust material by PCR technique. Histology showed epidermal hyperplasia with orthokeratotic hyperkeratosis, multifocal reticular degeneration of the epidermis, superficial dermal perivascular lymphoplasmacytic infiltrates and superficial pyoderma, findings consistent with Orf. Orf is highly contagious in small ruminants and can be zoonotic. Protective clothing when handling infected animals is indicated.

Figure 15: Contagious pustular dermatitis (orf) lesion in the interdigital area of a hogget. Photo: Séamus Fagan.

OTHER SPECIES
Pigs
Pigs aged six to eight weeks were submitted to Sligo RVL with a history of increased mortality rates in batches with clinical signs occurring in the weeks following weaning and associated dietary changes. Nervous signs such as weakness, blindness and increased vocalisation were reported in some pigs but this was not a consistent clinical finding. At necropsy, pigs had reddened skin over ventral body, neck and ears. Multifocally, there were petechial and ecchymotic haemorrhages in lungs, kidney cortex and intestinal serosa. In all pigs the meningeal vessels were congested and in some of the pigs a thick pronounced fibrinopurulent exudate was grossly visible on the meninges (Figure 16). Streptococcus suis was isolated from multiple organs including brain in all pigs. It is likely that there was an outbreak of Streptococcus suis-associated disease in the herd. This is most likely to occur at times of stress such as weaning or mixing of batches.

Figure 16: Severe diffuse fibrinopurulent meningitis in a weaner pig. Photo: Shane McGettrick.

Goat
A nine-year-old goat was submitted to Kilkenny RVL with a history of inappetence and displaying respiratory signs. The goat had been unresponsive to treatment. On necropsy there was a large volume of froth in the airways with diffuse congestion and oedema in the lungs. On histology of the lung there were multifocal colonies of cocci bacteria, diffuse oedema, mild to moderate peribronchial lymphoid hyperplasia and diffuse congestion. These findings were suggestive of bacteraemia. S. zooepidemicus was cultured from multiple organs. This is a potential zoonotic pathogen and appropriate advice to reduce the risk to in-contact humans was given.

A three-week-old kid goat was submitted to Athlone RVL with a history of growths inside the mouth. There were proliferative wart-type lesions bilaterally on medial and lateral aspects of upper and lower molars and centrally on lower gum (Figure 17). Histopathology of the lesions was consistent with ovine parapoxvirus (orf virus) although no viral inclusions were observed in histopathology from the case. A PCR for parapox virus was positive. Parapox virus is a zoonosis and highly contagious (see above).

Figure 17: Wart-like orf lesions in the mouth of a goat kid. Photo: Séamus Fagan.