Regional Veterinary Laboratories (RVLs) carried out necropsy examinations on 776 carcases and 96 foetuses during July and August 2016. In addition, 5,385 diagnostic samples were tested to assist private veterinary practitioners with disease diagnosis and control in living animals during this period.

This report highlights some of the more interesting cases encountered in DAFM laboratories during the time period and is intended to provide feedback to veterinary practitioners on current disease syndromes and trends. It is also hoped that the description of both common and unusual presentations together with associated pathological and diagnostic descriptions will assist diagnosis, encourage thorough investigation of clinical cases and provide context when interpreting laboratory reports.

CATTLE

Four hundred and six bovine carcasses were submitted to DAFM laboratories during July and August 2016. Pneumonia and enteritis were the most frequent diagnoses in all bovine submissions but especially in young and growing animals. Seasonal peaks in diagnoses of disease, such as clostridial myositis, cerebrocortical necrosis and enteric torsions in 14%, 7% and 6% respectively of all submissions, are not representative of overall incidence of these diseases in the national herd. The relatively high-submission prevalence of animals with these diseases is likely to represent clinically undiagnosed, unexpected causes of sudden deaths in otherwise healthy young stock in their first grazing seasons that were deemed unusual enough to require laboratory confirmation by attending clinicians.

Enteric pathogen %Positive
E.coli K99 3.6%
Coronavirus 1.5%
Salmonella spp 4.4%
Cryptosporidium parvum 7.4%
Rotavirus 8.8%

Table 1: Relative frequency of agents identified in calf diarrhoea samples submitted to RVLs during July and August 2016.

FOREIGN BODIES

Ingestion of foreign bodies is a common occurrence in cattle and a frequent finding at necropsy. A foreign body may constitute an insignificant additional finding or may in some cases have contributed to disease. Both Cork RVL and Pathology Division Backweston reported large amounts of plastic present in the rumen of two cattle with clinical signs of ill thrift and no further significant pathological findings during July and August 2016. Similarly, in a later section of this report, numerous cases of traumatic reticulitis due to ingestion of wire are detailed. Farmers should be reminded of the dangers of improper disposal of plastic or other indigestible materials.
ABOMASAL ULCERATION
A six-year-old dairy cow was submitted to Limerick RVL with a history of bloat and recumbency. Another cow in the same herd had died a week earlier presenting with clinical signs of bloat, but was not investigated further at the time. Bloating and inappetence had been described in other cows in the herd over the previous week. Necropsy revealed only mild ruminal distension but severe abdominal swelling in the submitted carcass. A perforated abomasal ulcer was present with leakage of ingesta into the peritoneum causing a severe localised peritonitis. Further retrospective herd investigation revealed that this milking herd had been grazing on particularly exposed paddocks during wet weather and a number of cows including the two cows that had died had accessed an old orchard adjacent to the grazing paddocks. It was suspected that they had ingested large numbers of windfall apples causing acidosis and the clinical signs of bloat described in the herd. Although the finding of abomasal perforation in the submitted carcass could not be directly linked to the previous dietary indiscretion, it is possible that prolonged inappetence following rumen acidosis can cause abomasal ulceration or worsen pre-existing ulcers.

Abomasal ulcers are a relatively frequent finding in dairy cows. Many different causes have been suggested. Although abomasal ulcers can be seen at any time in the production cycle, they are more common in high-yielding cows and mature dairy cows within the first six weeks of lactation. It is believed the most likely contributing factors are prolonged inanition and stress, which results in sustained periods of low abomasal pH and subsequent mucosal damage. The mucosal damage may remain subclinical or can result in clinical signs associated with pain, haemorrhage or perforation. In order to reduce the risk of abomasal ulcerations, it is advised that dairy cows should be encouraged to maintain constant dietary intakes throughout lactation but especially directly after calving thus minimising the risks of prolonged low abomasal pH and stress occurring simultaneously.

RESPIRATORY SYSTEM
Pneumonia was diagnosed in 50% of all bovine carcases submitted to the Department of Agriculture, Food and the Marine (DAFM) laboratories during July and August 2016 and was particularly common in the carcasses of calves aged between one and 12 months old. Dictyocaulus spp was the most frequent agent identified in cases of pneumonia, being present in 25.4% of all cases. Viral aetiologies are likely to be markedly under-represented in Figure 3 as they are present at acute stages of disease and they may be no longer identifiable or detectable at the time of necropsy.

Parasitic Pneumonia
An eight-year-old lactating Friesian cow was presented to Limerick RVL with a history of milk drop, weight loss and coughing over a three-week period. The cow was subsequently dried off but continued to deteriorate and died. It was the third similar death from a group of 60 cows. At necropsy, plugs of Dictyocaulus viviparus adults were seen in the caudal bronchi and there were multifocal variably-sized areas of lobular consolidation with emphysematous bullae distributed throughout the lungs but most severe on the dorsal aspect of the middle and caudal lung lobes. The infection was active, severe and patent as evidenced by gross findings and the large numbers of Dictyocaulus larvae present in faecal samples. This case highlights the importance of parasite control and diagnosis in older cattle that may not have been previously exposed to sufficient lungworm challenge earlier in life to develop or maintain immunity.

BOVINE HERPESVIRUS 4 (BHV-4)
BHV-4 was identified by PCR in the lung of a four-month-old heifer calf submitted to Sligo RVL diagnosed with chronic active pleuropneumonia. Bacterial involvement, possibly secondary to a viral aetiology, was considered the most significant finding in this case. Similarly, BHV-4 was identified in the lungs of a five-month-old calf submitted to Limerick RVL with severe bronchointerstitial pneumonia and emphysema. Lungworm infestation was considered the most significant finding in the Limerick case based on the gross and histopathological findings. The significance of the contribution of BHV-4 as part of a multifactorial disease process in both of these cases is unclear.

BHV4 is has a worldwide distribution and several species are susceptible to infection. In cattle, BHV-4 has been associated with a number of clinical syndromes, including pneumonia, metritis, vaginitis and abortions. Determining the significance of BHV-4 detection is also complicated by the detection of the virus in the epithelial cells of the respiratory, intestinal and urogenital tracts of healthy cattle. Like all herpesviruses, BHV-4 can cause chronic latent infection, which is...
activated when the immune system is stressed. When shed, the virus can be present in ocular, nasal, and vaginal secretions and has also been detected in semen. There has been much debate regarding the clinical significance of BHV-4. Some reports have suggested that its role in bovine respiratory disease may not be that of a primary pathogen, as these workers reported experimentally infected calves not developing illness and only mild respiratory disease in others. There have been a number of reports of ulcerative post-parturient endometritis associated with BHV-4 in dairy cows but this has not been reported in Ireland. Research on the precise role of BHV-4 in clinical disease is ongoing.

CARDIOVASCULAR SYSTEM

TRAUMATIC RETICULOPERICARDITIS

Three cases of traumatic reticulopericarditis in a dairy herd were investigated by Pathology Division Backweston. Cows presented with brisket oedema and muffled heart sounds. The cows had severe chronic fibrinopurulent 'bread and butter' pericarditis. Small lengths of wire were present in the reticulums of the affected cows and associated with the lesions. The herd had been fed pit silage. The source of the wire was not determined but it was considered likely to have been present in either the silage or ration mixes fed to the herd. The chronic nature of these lesions and the variable course of disease following the ingestion of wire mean that it is difficult to accurately estimate when exposure occurred, or more importantly from the herdowners perspective the number of animals that may yet succumb to the disease without intervention (intraruminal magnets).

ENDOCARDITIS

A 17-month-old heifer with a history of weight loss, which was unresponsive to antibiotic treatment, was presented to Athlone RVL. She was in a group of forty others, who were all thriving normally. A large 2-3cm diameter abscess was present on the right atrio-ventricular valve (see Figure 5). Multifocal variably-sized pale, non-purulent areas surrounded by a hyperaemic border were present in the renal cortices. These areas were interpreted as embolic infarcts arising from the cardiac lesion. Trueperella pyogenes was cultured from the abscess.

NERVOUS SYSTEM

ENCEPHALITIS

A six-year-old cow displaying neurological signs for two days, and described by the farmer as head-pressing, was submitted to Cork RVL. Specific gross lesions were not observed at necropsy and the cerebral cortex did not fluoresce under a UV light. Histopathological examination revealed heavy perivascular lymphocytic cuffing, occasional swollen axons and multifocal necrosis and microabscesses affecting the midbrain and medulla. The microscopic lesions were highly suggestive of listerial meningoencephalitis due to Listeria monocytogenes. L monocytogenes can produce three different disease syndromes that seldom overlap: encephalitis, abortion and septicamia. Encephalitis is more common in adult animal and is the result of bacterial invasion through the oral mucosa travelling centripetally along the trigeminal nerve to the brainstem.

HEPATIC ENCEPHALOPATHY

A six-month-old heifer calf was submitted to Sligo RVL with a history of circling and aggression. Histopathological examination confirmed a diagnosis of hepatic encephalopathy based on severe chronic hepatic cirrhosis and multifocal vacuolation of brain white matter (status spongiosus). The cause of the hepatic pathology in this case was unclear, but hepatotoxins in feed were suspected, eg. mycotoxins, or pyrroloidine alkaloids from ragwort.
**Senecio jacobea.** Similarly, a 16-month-old bullock was submitted to Limerick RVL with a history of blindness and ataxia. Eight previous cases had died and the problem only occurred when animals went to an outfarm. Histopathology of the liver identified bile duct hyperplasia, bridging fibrosis, hepatocyte necrosis and loss and megalocytosis. In sections of the cerebrum, cerebellum, midbrain and cranial spinal cord, there was marked vacuolation of the white matter (status spongiosus). The liver lesions in this case were most typical of those seen in pyrrolizidine alkaloid toxicity. Ragwort was confirmed to be present on the land where the deaths occurred. While the underlying pathological changes may be chronic in animals with hepatic encephalopathy, the clinical presentation of the disease is often variable and nervous signs or changes in temperament may occur relatively suddenly.

### Lead Poisoning

Cases of lead poisoning were diagnosed by Limerick RVL and Athlone RVL during July and August 2016. The diagnosis of lead poisoning is dependent on a history of nervous signs or sudden death, the absence of alternative diagnoses and the detection of lead in renal cortex or whole blood samples. The source of the lead may often be difficult to identify and requires a comprehensive investigation to quantify the risk to other animals in the herd. A broken up battery was found in a ditch grazed by affected animals in one of the cases investigated by Limerick RVL while lead paint on an old gate and on a tractor weight were considered likely sources in the other incidents this month.

Subclinical or sub-lethal lead poisoning in food animals represents a potential food safety hazard. The detection of lead poisoning in food animals by veterinary laboratories is immediately reported to the relevant regional veterinary offices and the Food Safety Authority of Ireland (FSAI) for appropriate follow-up actions to protect the food chain.

**Figure 7: Grey metal fragments containing high levels of lead found in the reticulum of a cow with nervous signs. Photo: Ian Hogan.**

**Musculoskeletal Clostridial Myositis**

Clostridial myositis was a frequent diagnosis in all DAFM veterinary laboratories during summer 2016. A 16-month-old bull was presented to Limerick RVL with a history of a number of deaths in its group. At necropsy, there were multifocal areas of myositis and muscular necrosis with crepitus, involving the gluteal and iliopsoas muscles. Similarly, two seven-month-old weanlings were submitted to Kilkenny RVL with a history of sudden death. Four animals had died in a group of 25. Both animals submitted were in good condition. In the case of one weanling gross examination revealed fibrinohaemorrhagic pleuritis, fibrinous pleural adhesions, dark friable diaphragm. The periphery of the diaphragmatic lesion was oedematous while the centre of the lesion was dry and emphysematous (see Figure 8). In the case of the second animal, dark dry emphysematous lesions were found along the sub-lumbar musculature. Blackleg was confirmed in all of these cases by a positive fluorescent antibody technique (FAT) result for *Clostridium chauvoeii* and the vaccination of cohort animals was advised.

Athlone RVL examined a three-month-old suckler calf with a history of having been found dead and was the second similar loss in five days. Like the cases described above there were multifocal dry, dark, black, gassy haemorrhagic lesions in the hindquarter muscles. There was a fibrinous, haemorrhagic pericarditis and localised fibrinous pleuritis. *Clostridium sordelli* was detected by FAT. Histopathology of muscle showed a fibrinosuppurative haemorrhagic necrotising myositis similar to Blackleg. Advice was issued to vaccinate the cohort animals with a multivalent clostridial vaccine that included *C sordelli*.

**Figure 8: Dark friable diaphragmatic muscle lesion in an animal with blackleg. Photo: Colm Brady.**
Table 2: Most frequent organ systems affected or disease syndromes diagnosed in sheep during July and August 2016.

<table>
<thead>
<tr>
<th>Affected organ system/syndrome</th>
<th>Relative frequency</th>
</tr>
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<tbody>
<tr>
<td>Alimentary tract</td>
<td>27.6%</td>
</tr>
<tr>
<td>Respiratory tract</td>
<td>15.5%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>12.9%</td>
</tr>
<tr>
<td>Systemic disease</td>
<td>10.3%</td>
</tr>
<tr>
<td>Neurological</td>
<td>6.9%</td>
</tr>
<tr>
<td>Septicaemia/bacteraemia</td>
<td>6.0%</td>
</tr>
<tr>
<td>Clostridial</td>
<td>4.3%</td>
</tr>
<tr>
<td>Urogenital tract</td>
<td>2.6%</td>
</tr>
<tr>
<td>Musculoskeletal/integument</td>
<td>1.7%</td>
</tr>
<tr>
<td>Circulatory</td>
<td>1.7%</td>
</tr>
<tr>
<td>Metabolic</td>
<td>0.9%</td>
</tr>
</tbody>
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URETHRAL OBSTRUCTION
Two ewes from the same flock died suddenly and were submitted to Cork RVL. The post-mortem findings in both carcasses were similar. They were in very good body condition but there was a focally extensive fibrinous peritonitis involving the caudal peritoneum and the serosal surface of the urinary bladder. Additionally, there was marked bilateral renal distension in both sheep. The kidneys were congested and there were multifocal to coalescing pale raised circular areas on cortical surfaces. There was a pyelonephritis and acute fibrinonecrotic cystitis. An intravaginal sponge was present in both sheep at the level of the urethral opening and was surrounded by a fibrinopululent inflammatory reaction.

The cause of death was attributed to complications caused by urethral obstruction due to a failure to properly insert or extract the intravaginal hormone delivery sponges that are commonly used for oestrous synchronisation. It is likely that an inability to urinate and fully empty bladder together with the development of a septic focus around the sponges eventually led to ascending cystitis, pyelonephritis and subsequent post-renal azotaemia, peritonitis and systemic complications. It was advised that other animals in the flock should be inspected to ensure that the sponges were properly placed and removed correctly.

TRAUMATIC PHARYNGITIS (DOSING GUN INJURY)
The danger of incorrect use of a dosing gun was highlighted in a case where a fourteen-week-old lamb submitted to Athlone RVL was diagnosed with pharyngeal abscesses and severe associated haemorrhage. An inexperienced operator had recently dosed the sheep.

ENDOCARDITIS
An adult ram was submitted to Kilkenny RVL with a history of polyarthritis. At necrospy, large irregular vegetative masses were attached to the right cardiac ventricular wall and to the atroventricular valve (see Figure 11). The right knee and the right hock and fetlock were swollen.

Exploration of these joints revealed a thick green purulent exudate. *Trueperella pyogenes* was isolated from the cardiac lesion, joint exudate, and lungs. *T. pyogenes* is an opportunist pathogen which is frequently associated with endocarditis.

Right-sided vegetative endocarditis and polyarthritis was diagnosed. Endocarditis is normally bacterial in origin and is caused by a bacteraemia, often originating from a septic focus elsewhere, that becomes established in the endocardium. Polyarthritis is a possible sequel to endocarditis as septic emboli may break away from the cardiac lesion and become localised in the joint vasculature.

COPPER POISONING IN A RAM
A ram was submitted to Kilkenny RVL with a history of sudden death. The carcass was jaundiced. The superficial cortex of the kidney was dark grey in colour and the remaining kidney tissue was deep brown. The urine was...
a deep red colour. Biochemistry testing of a sample of liver tissue revealed toxic concentrations of copper. The results of gross necropsy and biochemistry testing supported a diagnosis of copper poisoning in this case.

**BORDER DISEASE**
Sudden death was reported in a pet lamb, which had been reared on milk replacer and cereal ration, that was submitted to Sligo RVL. The lamb had been housed since birth but had shown poor growth compared to most of its comrades. A second lamb had similar clinical signs. It was noticed at necropsy that wool growth was patchy and was more like hair as opposed to wool on certain parts of the body. The lamb was considered to have very fine underdeveloped bones. There was gross evidence of an acute pneumonia, which was later characterised as bronchointerstitial pneumonia by histopathology, and was likely to have been ultimate cause of death. A PCR test was positive for border disease virus (BDV), which together with the gross findings, would indicate that this lamb had been infected with BDV in utero. Border disease is a congenital disorder of lambs characterised by low birth weight and viability, poor body condition, neurological signs including tremor, and an excessively hairy birth coat.

**TICK-BORNE FEVER**
Tick-borne fever was diagnosed by Sligo RVL in two lambs from separate holdings. The first was a three-month-old lamb in poor condition, which was severely dehydrated. There was acute pulmonary oedema and haemorrhage. A moderate typhlitis was observed grossly and there was histopathological evidence of coccidia infection. DNA associated with *Anaplasma phagocytophilum* was detected in this lamb by RT-PCR technique. The second lamb was a similar age and died suddenly with froth noted around the mouth by the owner. The lamb was anaemic and dehydrated. There was concurrent severe parasitic gastroenteritis and coccidial enteritis, which may have caused the typhlitis.

**OTHER SPECIES**
Regional veterinary laboratories do not routinely accept submissions of carcases from non-farmed species. However as in the case described below, laboratories will assist in investigations of disease in other animal species when there are dramatic increased mortality events or when there is a potential threat to farmed animals or public health.

**VIRAL HAEMORRHAGIC DISEASE**
A five-month-old pet rabbit was submitted to Limerick RVL with a history of neurological signs, which included convulsions, rapid deterioration, and death within a short time. It was the fourth rabbit to die from a group of 24. The owner had noticed that some wild rabbits had died in fields surrounding the house. On gross examination the liver was pale and the lungs were diffusely congested. Histopathology of the liver revealed severe mid-zonal necrosis with widespread single cell necrosis of hepatocytes in all liver zones. The pathological findings and clinical signs were consistent with a diagnosis of rabbit haemorrhagic disease (RHD), caused by RHD virus, from the family, *Caliciviridae*. In this outbreak, deaths continued in the group until only two adults remained. Some young rabbits, born after the deaths had begun, were unaffected. This ‘age-related’ resistance is a feature of this disease. Vaccines are available for RHD and myxomatosis, both common causes of death in pet rabbits that may have direct/indirect contact with wild rabbits.