CATTLE
RESPIRATORY SYSTEM
Table 1: The most frequently isolated respiratory pathogens from cases of bovine pneumonia during March 2017.

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>Pasteurella multocida</td>
<td>21.1%</td>
</tr>
<tr>
<td>Trueperella pyogenes</td>
<td>14.0%</td>
</tr>
<tr>
<td>Infectious bovine rhinotracheitis (IBR) virus</td>
<td>8.8%</td>
</tr>
<tr>
<td>Mannheimia haemolytica</td>
<td>5.3%</td>
</tr>
<tr>
<td>Mycoplasma bovis</td>
<td>3.5%</td>
</tr>
<tr>
<td>Histophilus somni</td>
<td>3.5%</td>
</tr>
<tr>
<td>Respiratory syncytial virus (RSV)</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

Note that the contribution of viral agents to multifactorial pneumonia is likely to be under-represented due to the advanced nature of most of the cases submitted to RVLs.

LARYNGITIS
A five-week-old calf was submitted to Kilkenny RVL with a history of dysphagia. There was a suppurative laryngeal chondritis, a moderate chronic bronchopneumonia and a severe ulcerative abomasitis. Multifocal suppurative necrotising hepatitis was present on histopathology, confirming a bacteraemic/septicaemic process. It was thought that the pneumonia may have been associated with the aspiration of purulent material from the infected larynx and that the abomasitis was secondary in nature and may have been associated with chronic stress. Although the aetiology of the laryngeal condition is uncertain, given the age of the animal and time of onset, a review of feeding practices and hygiene was recommended.

PNEUMONIA AND OTITIS
Two calves with a history of respiratory clinical signs were submitted to Kilkenny RVL from a veal producer. At necropsy, one of the calves had dark-green inspissated material present bilaterally in the external ear canals and pus filled the middle and inner ears with destruction and osteomyelitis of the ear bones and surrounding cranial bones. There was some catarhal exudate in the tracheal lumen. There was cranioventral patchy consolidation of 30% of the lung, which had a rubbery texture. Mycoplasma bovis was detected from swabs of the middle ear and lung in this case. Trueperella pyogenes and Pasteurella multocida were also isolated from the middle ear, and both of these were considered secondary invaders. Mycoplasma bovis is more commonly associated with pneumonia, arthritis and mastitis in cattle. Otitis media is described in calves due to Mycoplasma bovis and is postulated to occur following ingestion of contaminated milk. The main clinical sign described in affected calves is persistent ear drooping or head tilt, which was not described in this case (perhaps due to the bilateral lesions).

URINARY SYSTEM
PYELONEPHRITIS
Sligo RVL diagnosed bilateral pyelonephritis in a one-month-old calf with a history of passing white flocules of pus in its urine since shortly after birth. The extent of the renal obliteration was remarkable (see Figure 2) and although the calf was on antimicrobial therapy at the time of its death, a haemolytic Escherichia coli was isolated from the lesions.
GASTROINTESTINAL SYSTEM

<table>
<thead>
<tr>
<th>Enteric pathogen</th>
<th>%Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>E coli K99</td>
<td>1.4%</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>0.1%</td>
</tr>
<tr>
<td>Salmonella sp</td>
<td>0.3%</td>
</tr>
<tr>
<td>Cryptosporidium parvum</td>
<td>17.8%</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>33.6%</td>
</tr>
</tbody>
</table>

Table 2: Percentage of faecal samples that tested positive for specific pathogens from all samples submitted to RVLs during March 2017.

CALF DIARRHOEA SUBMISSIONS

Limerick RVL reported that rotavirus was detected in 37% of calf faecal submissions during March 2017; while Cryptosporidium was detected in 18%. Co-infection with both of these pathogens was found in 4% of submissions. These results show a reduction in detection of these pathogens from the same period in 2016, when rotavirus was detected in 53% of submissions, Cryptosporidium in 28% and both pathogens in 14%.

Figure 3: Photomicrograph highlighting (black arrows) acid-fast Cryptosporidium oocysts in a thin faecal smear from calf (stained by the modified Ziehl-Neelsen technique) 20x magnification. Photo: Ian Hogan.

Salmonella spp and E coli K99 were not regularly detected during March. Of samples from calves old enough to suspect coccidiosis as a cause of clinical signs of diarrhoea, coccidial oocysts were detected in 15%. Failure to isolate recognised enteric pathogens does not preclude their involvement—especially if detection is attempted in the post acute stages of infection or following treatment. It is common to receive samples in all RVLs from calves and lambs which have had diarrhea for several days. The submission of fresh rectal faecal samples (c. 15g) from untreated clinical cases early in the clinical course is recommended to obtain best diagnostic value.

BLOAT

Sligo RVL reported an unusual case of bloat due to oesophageal obstruction in a two-month old calf that had been tested positive in a routine tuberculosis (TB) herd test but had died prior to removal from the herd. At necropsy, it was observed that bilateral enlargement of the retropharyngeal lymph nodes had caused stenosis and occlusion of the caudal pharynx and proximal oesophagus. Histopathology confirmed severe granulomatous caseous lymphadenitis typical of Mycobacterium bovis infection, which was later confirmed by culture and Ziehl-Neelson staining.

PARASITIC GASTROENTERITIS

All RVLs reported cases of ostertagiosis in cattle during March 2017. Type 2 ostertagiosis, caused by the simultaneous emergence of hypobiotic larvae of overwintering larvae from ruminal mucosa was a frequent finding. The risk of clinical ostertagiasis can be greatly reduced in vulnerable young stock by correct pasture management and the timing of anthelmintic interventions.

Figure 4: Typical Morrocan leather-stippled appearance caused by hyperplastic gastric glands in the abomasal mucosa of cattle diagnosed with ostertagiosis. Ostertagia ostertagi larvae can be seen in situ in a histological cross section of the abomasal mucosa (inset). Photo: Cosme Sánchez-Miguel.

MESENTERIC TORSION AND PERITONITIS

A 10-day-old calf was presented to Limerick RVL with a history of sudden illness. The herd owner had remarked that the calf had appeared to be in great pain before its death. Necropsy revealed a mesenteric torsion and that a section of the affected small intestine had ruptured causing an acute local peritonitis (see Figure 5).

Figure 5: Photograph illustrating blackened necrotic loops of intestine covered in fibrin tags. Further incision revealed a mesenteric torsion with seepage of intestinal contents into the peritoneum (Photo: William FitzGerald).
MULTI-DRUG ANTIBIOTIC RESISTANCE
Bacterial isolates identified by RVLs and Pathology division are subjected to antibiotic sensitivity testing and trends in the observed resistance patterns are monitored with the assistance of the Central Veterinary Research Laboratory. In March 2017, three herds submitted calves from which highly resistant strains of *E. coli* were cultured. Clinical history of high morbidity diarrhoea in young calves were similar in all herds. Colisepticaemia was diagnosed following necropsy and pure cultures of *E. coli* were recovered from multiple organs. *E. coli* isolates obtained from all three cases displayed resistance to multiple classes of antibiotics. Most notably, two cases displayed resistance, and the third partial resistance, to cefpodoxime which is a marker for extended-spectrum beta lactamase resistance (ESBL). Genotyping is required to confirm ESBL and characterise the resistance mechanism, which is under way.

Antimicrobial resistance monitoring and prudent antibiotic usage are essential to ensure continued efficacy of treatments in human and veterinary medicine. There is increasing focus on the role of animals and the environment and the ways in which resistant bacteria or resistance genes can be transmitted between species. Extended-spectrum beta-lactamases (ESBLs) have been increasingly reported in enterobacteriaceae in animals since their discovery in the 1980s. Nowadays, they are mostly found in *E. coli*. In humans they are a frequent cause of community-acquired infections and an increasing frequency of ESBLs containing similar resistance mechanisms to those found in humans, are being identified in livestock.

HARDWARE DISEASE
Sligo RVL diagnosed traumatic reticulaperitonitis in a 10-year old suckler cow that had become emaciated following calving. There were extensive chronic fibrous abdominal adhesions accompanied by hepatic and splenic abscesses. A 5cm piece of strong fence wire was found in situ perforating the wall of the reticulum. Traumatic reticuloperitonitis or hardware disease is not uncommon in cows because any wire or other metal present in the feed is swallowed without chewing in the first instance. The position of the reticulum and its honeycomb inner surface tend to trap pieces of wire which then become embedded in the mucosa. Strenuous pressing at the time of calving, can force these sharp wires through the wall of the reticulum and allow leakage of ruminal contents. When this occurs into the peritoneal cavity, peritonitis occurs, which can result in death, but often the animal survives with localised adhesions. Penetration of the liver or spleen can result in abscesses in these tissues. Penetration of the diaphragm is usually more problematic, possibly resulting in pleuritis, pneumonia, pericarditis and myocarditis. If the animal survives the initial insult, the wire may retract or dissolve with time and sometimes can’t be found at necropsy or while attempting surgery. The prognosis is always guarded.

CAUDAL VENA CAVAL THROMBOSIS
A four-year-old cow was submitted to Kilkenny RVL with a history of acute respiratory distress and profuse nasal haemorrhage. A large (8cm diameter) liver abscess was found adjacent to the vena cava. Close inspection revealed that the wall of the great vessel had become eroded by the abscess and that purulent material was discharging into the vessel’s lumen (see Figure 6).

Figure 6: Liver abscess discharging into the caudal vena cava in a four-year-old cow. Photo: Colm Brady.

Dark, dry, and variably-sized infarcts and abscesses were scattered randomly in the pulmonary parenchyma. The subsequent erosion of the pulmonary blood vessel walls and haemorrhage into the airways was responsible for the haemoptysis observed. In some cases, depending on the severity and calibre of blood vessel affected, the nasal haemorrhage observed clinically can be profuse, acute and very dramatic.

JOHNE’S DISEASE
A five-year-old bull was submitted to Kilkenny RVL with a history of diarrhoea without any response to treatment. The carcass was in poor body condition and dehydrated. There was a focal, well-demarcated 15mm diameter gritty area on the endothelial surface of the aorta. There was mild segmental corrugation of the ileum but no other gross findings were reported. Johne’s disease was confirmed by histopathology by the presence of granulomatous enteritis with large numbers of acid-fast bacteria in the lesions. It was advised that a Johne’s disease control programme be initiated on this farm.

Figure 7: Area of gritty mineralisation on the wall of the aorta. This lesion has been described in association with lesions of Johne’s disease. Photo: Maresa Sheehan.
CARDIOVASCULAR SYSTEM

Congenital cardiac defects in young or stillborn calves were reported by all RVLs in March 2017. For example, Kilkenny RVL reported a one-month-old calf with a history of dyspnoea and pale or cyanotic mucous membranes. On gross examination, the liver was very enlarged with rounded edges (see Figure 8).

Figure 8: Liver enlargement in a calf with congestive heart failure due to a ventricular septal defect.

The heart was globular in shape and a ventricular septal defect was present. This is one of the most common congenital cardiac anomalies in animals and can lead to congestive heart failure and passive venous congestion. Changes related to passive venous congestion such as the enlargement of the liver in this case are supportive of a diagnosis of congestive heart failure.

BOVINE NEONATAL PANCYTOPAenia

A three-week-old Belgian Blue-cross calf was submitted to Limerick RVL with a history of pneumonia. Antibiotic treatment had failed to bring about any improvement in its condition and the animal died within two days of first showing clinical signs. At necropsy, a haemorrhagic condition was revealed, with haemorrhages in many locations including the lungs and pleura (see Figure 9). Histopathology carried out on a sample of its bone marrow confirmed the presence of a trilineage hypoplasia consistent with a diagnosis of bovine neonatal pancytopenia (BNP). This condition has been associated with some bovine viral diarrhea (BVD) vaccines, and there was a history of BVD vaccination in the herd for a number of years.

Figure 9: Multifocal haemorrhages in a three-week-old calf with BNP. Photo: Alan Johnson.

REPRODUCTIVE SYSTEM

CHRONIC PYRROLIZIDINE ALKALOID POISONING

A 15-month-old Charolais-cross bullock was presented to Limerick RVL with a history of drooling, inappetence, depression and tenesmus. The animal had been outwintered on a diet of grass and bought-in, round-bale silage of dubious quality. At time of necropsy, the animal was in poor body condition and icteric. The liver was enlarged, hard, and fibrosed, with thickened and prominent bile ducts and a full gall bladder. Histopathology revealed lesions consistent with toxic hepatic damage and strongly suggestive of ragwort poisoning.

Similarly, Cork RVL reported a series of cases where, over the course of three weeks, five yearlings from the same pen died with clinical signs of progressive weight loss and constipation before eventually becoming aggressive prior to death. Histological examination revealed lesions consistent with pyrrolizidine alkaloid hepatopathy (chronic ragwort toxicity). The aggressive behaviour was likely...
to have been the result of hepatic encephalopathy, as their diseased livers failed to remove ammonia from the bloodstream. In cattle, the liver damage and fibrosis caused by chronic pyrrolizidine alkaloid poisoning can be very severe and may result in ascites, severe mesenteric oedema, constipation and the persistent tenesmus (straining) often described clinically.

**Figure 10:** Photograph of a submitted piece of liver demonstrating fibrosis caused by ragwort toxicity (inset: histological appearance). Photo: Cosme Sánchez-Miguel.

**SHEEP ENTERITIS IN LAMBS**

All RVLs reported multiple cases of enteritis in young lambs due to gastrointestinal nematode parasites and coccidia indicating the susceptibility of the naïve population to pathogens during their first grazing season. A two-month old lamb was submitted to Athlone RVL. The lamb had been noticed with diarrhoea previously, had been found dead. There was a history of problems with coccidiosis, nematodiosis and tapeworm infestation in the flock. Necropsy revealed a large amount of Moniezia tapeworms present (see Figure 11). This species is considered non-pathogenic, but is controlled by most anthelmintics, and the presence of the characteristic Moniezia segments (visible to the naked eye) in sheep faeces is regarded as a warning flag of poor parasite control. The intestinal contents were very liquid and there was excess fibrinous pericardial fluid. The capsule of the kidneys was slightly adherent to the underlying renal cortex. The urine tested negative for glucose using a dipstick test, and *Clostridium perfringens* toxin by ELISA. Faecal parasitology showed a moderate coccidial oocyst count and significant numbers of trichostrongyle and nematodirus eggs. There were no significant findings on culture. Histology revealed a multifocal randomly distributed interstitial pneumonia but, unfortunately, intestinal sections were autolysed. It was considered that parasitic gastroenteritis with a terminal septicaemia was the most likely diagnosis in this case.

**Figure 11:** Moniezia sp tapeworms recovered from the intestine of a lamb submitted to Athlone RVL.

Twin lambs submitted to Limerick RVL with a history of anorexia and listlessness and were subsequently found to have high numbers of coccidia spp in intestinal contents.

**UROLITHIASIS**

Sligo RVL diagnosed bilateral hydronephrosis and cystitis due to urolithiasis in a one-year old ram lamb that had displayed rapid abdominal swelling and dyspnoea prior to death. There was a history of concentrate feeding. As is common in young rams and wethers, the blockage was in the urethral process (see Figure 13).

**Figure 12:** Photomicrograph highlighting unstained coccidial oocysts (black arrows) in a stained thin smear of intestinal contents from a lamb (modified Ziehl-Neelsen stain. 20X magnification). Photo: Ian Hogan.

**Figure 13:** Penile contusion in a ram with a urethral obstruction due to urolithiasis.
**PNEUMONIA**

Sligo isolated *Bibersteinia trehalosi* from four separate cases of pneumonia in young lambs during March 2017 indicating the importance of this bacterium in cases of pneumonia and septicaemia in lambs. These cases can often occur as sudden deaths.

An adult ram was submitted to Kilkenny RVL with a history of having been treated for pneumonia. The left lung was covered by a severe diffuse fibrinous exudate, with copious serosanguinous fluid present in the thorax. On histopathology, the bronchioles and multifocal alveoli contained numerous neutrophils. There was severe diffuse fibrinosuppurative pleuritis. No significant bacteria were isolated. Pneumonia cases which have been treated with antibiotics often have unrewarding bacterial culture results. The histological lung changes suggest *Pasteurella*-type bacterial pneumonia as the most likely aetiological diagnosis.

**ATRESIA JEJUNI**

A Texel-cross lamb was submitted to Kilkenny RVL with a history of having been born with fluid under the skin. There was faecal material and haemorrhage subcutaneously. There was atresia jejuni with a rupture of the intestine proximal to the blockage.

**CONGENITAL MALFORMATIONS IN A LAMB**

A stillborn ovine foetus was submitted to Kilkenny RVL for Schmallenberg virus investigation. The distal right forelimb had three metacarpal bones instead of one, and six phalanges and hooves instead of two of each (polydactyly). The chest cavity was small with only nine ribs present, the last two of which were floating, while ribs six and seven curved inwards and upwards, beneath ribs five and four. The lung was hypoplastic. The brain appeared to be grossly normal. On histopathology, the pulmonary architecture was immature with alveoli lined by cuboidal epithelium. Schmallenberg virus (SBV) was not detected. The two main findings of polydactyly and rib malformation are most likely related to each other, but are not associated with SBV. Polydactyly is a rare condition in sheep, which is considered to be inherited, although its pattern of inheritance is poorly understood. The reduced space in the chest cavity may have contributed to the lack of lung space and the immaturity of the organ. These lesions are not associated with SBV or other viral teratogens.