Regional Veterinary Laboratories Report

July 2022

Regional Veterinary Laboratories (RVLs) carried out necropsy examinations on 325 carcases and 26 foetuses during July 2022. Additionally, 1,559 diagnostic samples were tested to assist private veterinary practitioners 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 July 2022.
The objective of this report is to provide feedback to veterinary practitioners on the pattern of disease syndromes at this time of the year by describing common and highlighting unusual cases. Moreover, we aim to assist with future diagnoses, encourage thorough investigations of clinical cases, highlight available laboratory diagnostic tools and provide a better context for practitioners when interpreting laboratory reports.
In addition, this month's report contains advice on using laboratory diagnostics to investigate bovine respiratory disease (BRD), which increases in incidence after housing.

CATTLE

Pneumonia/parasitic bronchitis and enteritis were the most common diagnoses at necropsy in cattle in the RVLs during July 2022.

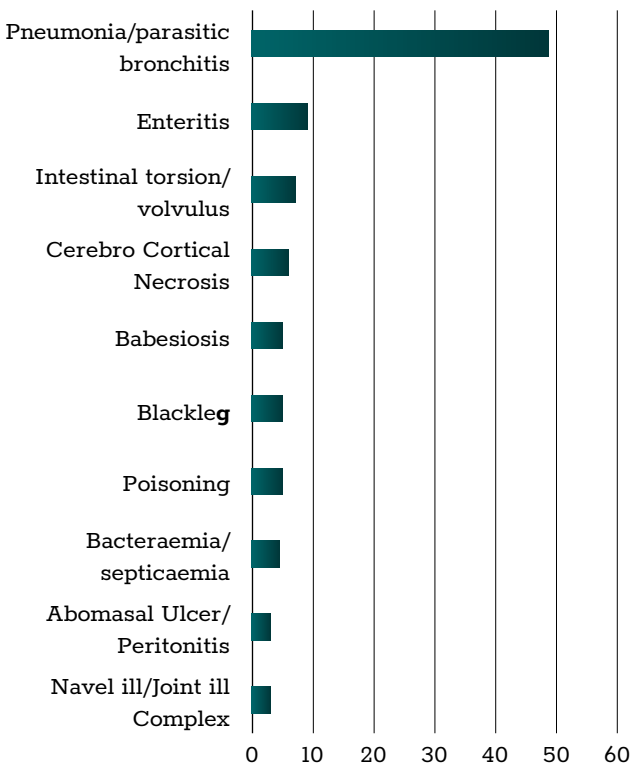

Table 1: The most common diagnoses in bovine animals submitted for necropsy in July 2022.

GASTROINTESTINAL TRACT

Cryptosporidium enteritis and septicaemia

A three-week-old calf was sick for a week, didn't respond to antibiotics, died and was submitted to Kilkenny RVL. There had been multiple cases in the later stages of the calving season. The calf was very dehydrated and there was faecal staining on the hind quarters. There was milk in the rumen (rumen drinker), there were mucous yellow intestinal contents. There was mild rounding of the liver edges indicating hepatomegaly, and the lungs were oedematous. One kidney contained multiple fluid filled cysts, but the other kidney was normal. *Cryptosporidium parvum* was identified on faecal samples, and a review of control was advised. *E. coli* was cultured from multiple organs indicating a bacteraemia.
The calf was too old to check for failure of passive transfer of colostral immunity, but sampling of suitable cohorts was recommended to check passive transfer on farm.

Figure 1: A cystic kidney in a three-week-old calf, deemed to be an incidental finding. The other kidney was not affected. Photo: Aideen Kennedy.

Coccidiosis

Athlone RVL examined a four-month-old calf with a history of having been "off-form and pining" for a few days; despite receiving treatment, the calf died. There were severe bilateral enophthalmia, suggestive of dehydration, and a faecally soiled tail and perineum. Both small and large intestinal contents were very liquid. A severe coccidial oocyte burden was detected in the faeces. Histopathology of the intestine showed diffuse destruction of enteric mucosa, and various coccidial life stages were observed. A diagnosis of coccidial enteritis was made.

Parasitic gastroenteritis

A fourteen-month-old bullock was submitted to Kilkenny RVL with a history of ill-thrift and eventual euthanasia. On necropsy, the intestinal mucosa was hyperaemic, moderately thickened and there was multifocal purulent abscessation. On histopathology of the abomasum, the abomasal glands were tortuous (mucous neck cell hyperplasia) and contained a cross section of nematodes with the characteristics of strongyles. There was a severe chronic active enteritis. Multifocally, the normal architecture of the intestines was disrupted by large, dilated crypts containing crypt abscesses. Moderate to large numbers of eosinophils, lymphocytes and macrophages extended into the sub-mucosa. Multifocal colonies of cocci bacteria were seen. No definitive agent was identified as causing the enteritis; there had been recent antibiotic use, however. Submission of samples from cohorts was recommended, including blood and faecal samples for *Salmonella* spp. In addition, a review of parasite control was recommended.

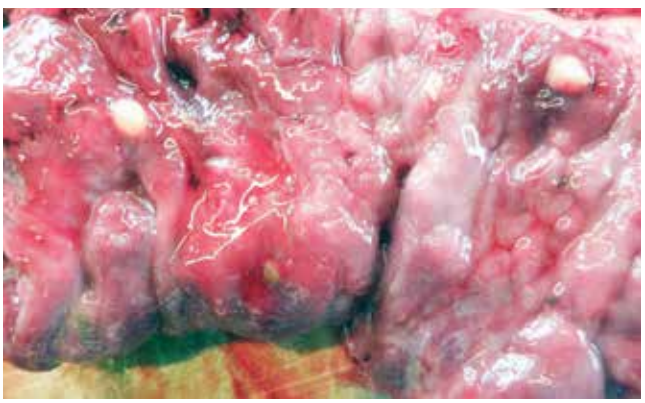

Figure 2: Multifocal abscessation of the intestinal mucosa. Photo: Aideen Kennedy.

RESPIRATORY TRACT

Lungworm

Multiple cases of lungworm (*Dictyocaulus viviparus* infection) were diagnosed in Limerick RVL, mostly in animals born in the spring of 2022. Submissions came with histories which included sudden death, and respiratory disease unresponsive to antibiotic treatment. Multiple animals affected or dying were common in the histories of these cases.

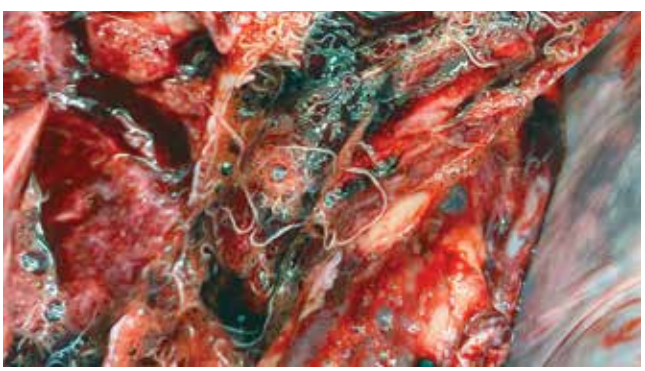

Figure 3: Lungworm visible upon dissection of the airways in the lung. Photo: Alan Johnson.

Lungworms were the most commonly diagnosed respiratory pathogen across all RVLs during July 2022. This is a common finding from mid-summer onward every year and is more common during wet weather as the worms are spread with the aid of the *Pilobolus* fungus.

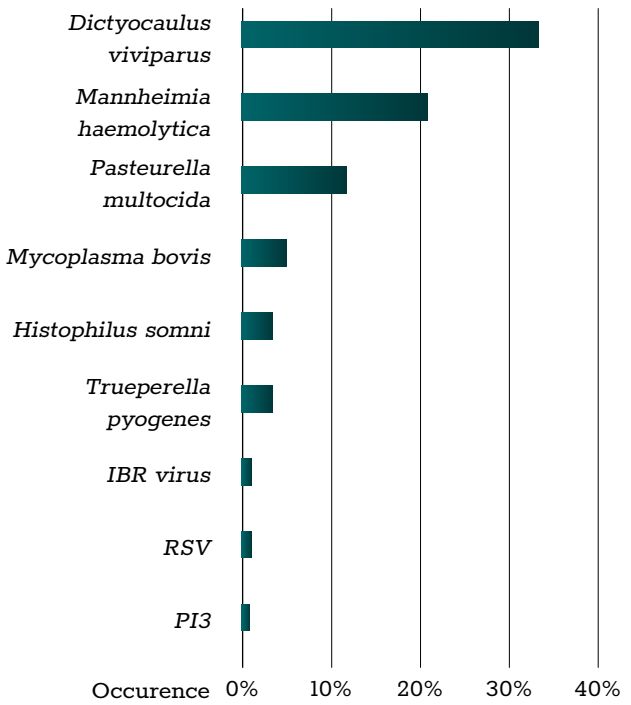

Table 2: The most common respiratory pathogens detected in bovine animals submitted for necropsy in July 2022.

Embolic pneumonia

A seven-year-old Friesian cow was submitted to Limerick RVL. There had been a history of lameness; the animal became unwell over a few days, with frothing from the mouth. Necropsy disclosed an embolic pneumonia, with multifocal abscesses distributed throughout the lungs. Emphysema was present but no lungworm larvae were seen. No lesions were seen in the heart, and there was a 'nutmeg' pattern in the liver parenchyma suggestive of venous congestion. The source of the infection may have been an infection in the foot, leading to embolic bacteraemic spread to the lungs via the bloodstream.

URINARY/REPRODUCTIVE TRACT

Abortion

A bovine foetus was submitted to Kilkenny RVL for examination. There were no significant gross lesions but, on histopathological examination, there was a multifocal non-suppurative encephalitis and a multifocal non-suppurative hepatitis. These lesions are suggestive of protozoal or viral infection. In abortions, a common cause of the lesions seen is *Neospora caninum* infection, but infection due to bovine herpesvirus 1 (BHV-1) and *Toxoplasma gondii* are other differentials that should be considered. It was advised to send in serum samples from the dam and any female breeding offspring of the dam if in the herd to test for *Neospora* antibodies.

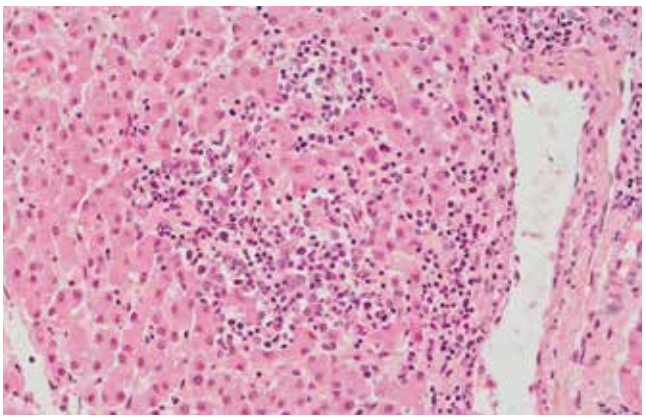

Figure 4: Focal area of non-suppurative hepatitis with associated hepatocyte degeneration and necrosis in an aborted foetus. Photo: Maresa Sheehan.

Nephritis and cystitis

Athlone RVL examined a three-month-old suckler calf with a history of sickness for five days prior to death, pyrexia, increased respiratory rate, anorexia and polydipsia. At gross post-mortem examination, there was a severe, diffuse, fibrinonecrotic peritonitis with copious amounts of foul-smelling fluid free in the abdomen. Bilaterally, the kidneys were markedly enlarged, and the renal capsules were covered in fibrin; on cross section, there were multifocal areas of suppuration, necrosis and haemorrhages throughout both kidneys. The urinary bladder was covered in fibrin; the wall was thickened and there was necrosis and fibrin on the bladder mucosa. The liver was enlarged and there was a thick layer of fibrin and haemorrhage on the surface and mild pulmonary congestion. *Trueperella pyogenes* was cultured from the kidney. A diagnosis of fibrinosuppurative nephritis, cystitis and peritonitis was made.

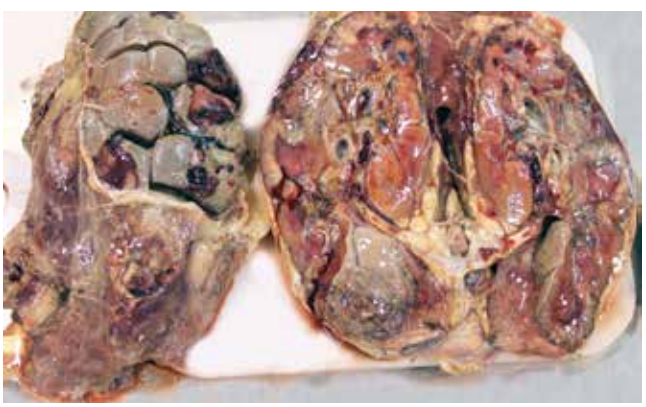

Figure 5 : Bilateral fibrinosuppurative nephritis. Photo: Denise Murphy.

CARDIOVASCULAR SYSTEM

Atrial septal defect/pleuropneumonia

Athlone RVL examined a three-month-old suckler calf that was submitted with a history of sudden death. There was a fibrinous pericarditis, pleurisy, and bilateral cranioventral fibrinous pneumonia with consolidation extending into right caudal lobe. The heart was enlarged and there was a 1-to-1.5 cm diameter atrial septal defect. There was mild ascites and a nutmeg pattern in the liver. *Mannheimia haemolytica* was isolated from the lungs and was detected by polymerase chain reaction (PCR). Histopathology of the lung showed an acute, diffuse, fibrinosuppurative bronchopneumonia with streaming 'oat cells' and there was periacinar hepatic degeneration and necrosis, and haemorrhage in the liver. A conclusion of a congenital atrial septal defect and an acute fibrinous pleuropneumonia was made.

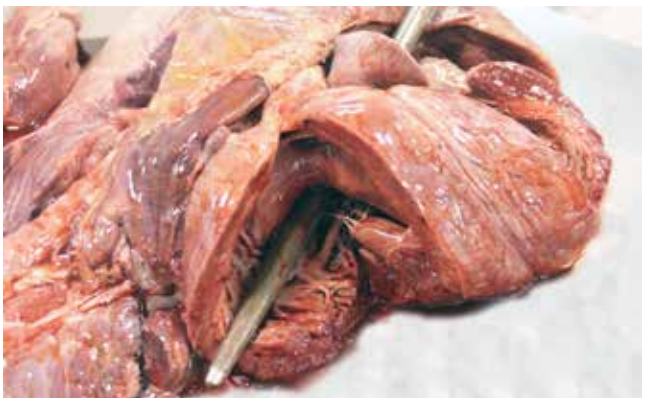

Figure 6: Atrial septal defect in a three-month-old calf. Photo: Denise Murphy.

Babesiosis

A two-year-old lactating Friesian cow was submitted to Limerick RVL. It had been found dead having been noticed with a reduced milk yield the evening before. Another cow in the herd had recently been treated for babesiosis or 'red water.' Gross signs included anaemia, haemoglobinuria and splenomegaly. *Babesia divergens* was detected in the spleen by PCR.

Babesiosis was also diagnosed in two yearling heifers with a history of sudden death; they were described as having been grazing rough pasture, an ideal environment for exposure of cattle to *Ixodes Ricinus,* the tick which is the reservoir host of *B. divergens*. Necropsy disclosed gross findings of autolysis, signs of dehydration, and red urine in the bladder. The kidneys of both animals were black in colour and there were signs of jaundice in the hearts and livers. *B. divergens* was detected in the spleen by PCR.

Vegetative endocarditis

A first lactation cow with a history of ill-thrift was submitted to Kilkenny RVL. On necropsy, there was approximately ten litres of fluid in the thoracic cavity. A vegetative endocarditis was found on the atrioventricular valve of the heart. There was pneumonia, with approximately 30-40 per cent of the lungs consolidated cranioventrally, and there was a mild pleuritis. There were multiple suspect infarcts on the kidneys. A diagnosis of vegetative endocarditis and subsequent bacteraemia was made.

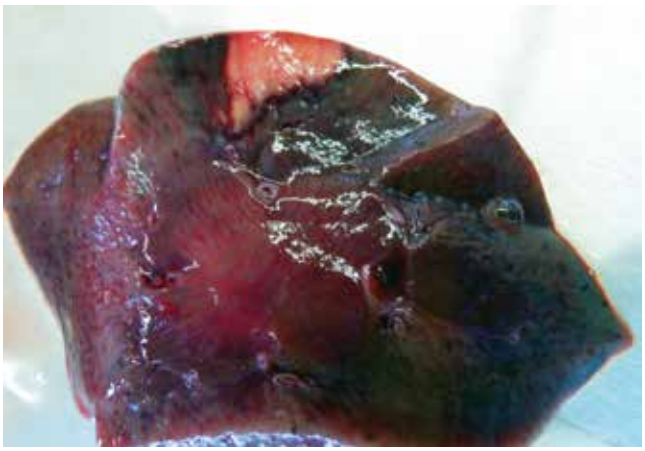

Figure 7: A pale infarct in the kidney (top), a sequel to a case of vegetative endocarditis. Photo: Aideen Kennedy.

NERVOUS SYSTEM

Cerebrocortical necrosis

Multiple cases of cerebrocortical necrosis (CCN) were recorded in Kilkenny RVL during July 2022. Histological examination of the brain is required for diagnoses. Some of these brains will fluoresce grossly under ultraviolet light. CCN has been associated with dietary risks: altered thiamine status and high sulphur intake. Restricted water availability can also increase the risk of developing CCN. Any enteric inflammation, such as that caused by endoparasites, which reduces small intestinal absorption of the vitamin, can potentially be involved in the development of the condition.

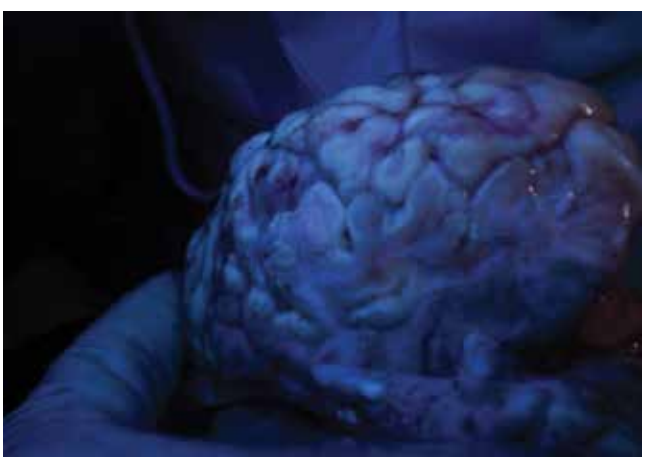

Figure 8: A brain fluorescing under ultraviolet light, sometimes found in cases of cerebrocortical necrosis. Photo: Aideen Kennedy.

MUSCULOSKELETAL

Blackleg

Athlone examined a four-month-old calf that was only noticed the evening before panting and recumbent; the calf died despite treatment. On gross post-mortem, there was subcutaneous crepitus in the upper left hindlimb and marked dry haemorrhagic myositis in the muscles of the left hindquarter. Similar lesions were found in the sternal muscles and the diaphragm, and there was a severe fibrinous haemorrhagic pericarditis. *Clostridium chauvoei* was detected in muscle by fluorescent antibody technique (FAT) and a diagnosis of clostridial myositis/blackleg was made. Advice was given regarding the vaccination of comrades with a multivalent clostridial vaccine.

Figure 9: Dry haemorrhagic myositis in the skeletal muscle of a calf with blackleg. Photo: Denise Murphy.

POISONINGS

A five-month-old Friesian bull calf was submitted to Limerick RVL from a 70-cow dairy herd with a history of dullness for a three-day period. Another calf had died six weeks previously. Necropsy findings included pale lungs and other signs of anaemia. Jaundice was present and the liver was orange. Haemoglobinuria was observed. Histopathology of the liver disclosed a large amount of collagen bundles and a lesser number of fibroblasts dissecting and expanding the hepatocyte cords, diffusely affecting a whole section. Multifocally, there was an increased number of bile ducts with cuboidal epithelium and coarse chromatin (hyperplasia). Multifocally, there were moderate numbers of three times larger than expected hepatocytes with a very large, round, centrally-located nucleus with indistinct nucleolus and coarsely stippled chromatin (megalocytosis and megalokaryosis). Multifocally, there was moderate bile plugging within the cuniculi (bile stasis). Multifocally, there was a moderate vacuolar degeneration within the centrilobular and midzonal hepatocytes. These lesions are consistent with pyrrolizidine alkaloid toxicosis, or ragwort toxicity. Toxicity of pyrrolizidine alkaloids is due to necrosis, antimitotic action (crosslinks with DNA and inhibits mitosis with concomitant formation of megalocytes) and vascular damage mainly in the liver. Some alkylating pyrroles can escape the liver and reach the lung damaging capillaries, resulting in acute pulmonary oedema and hydrothorax. Renal damage is also reported. The bile stasis was likely caused by fibrosis and hepatic remodelling.

SHEEP

Parasitic gastroenteritis was the most common diagnosis at necropsy in sheep in the RVLs during July 2022.

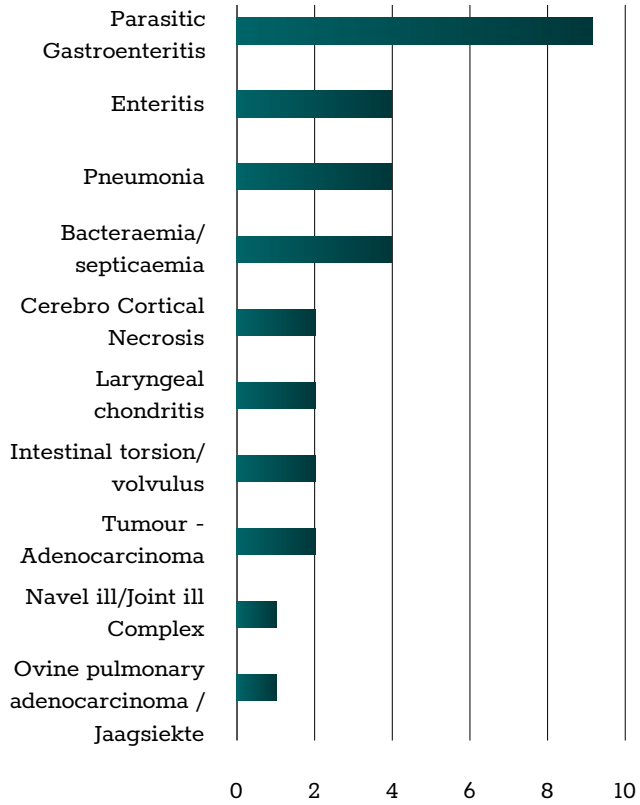

Table 3: The most common diagnoses in ovine animals submitted for necropsy in July 2022.

GASTROINTESTINAL TRACT

Rumen fibropapilloma and Intestinal adenocarcinoma

Athlone RVL was presented with a four-year-old ewe, with a four-day history of diarrhoea and respiratory signs. It responded to treatment very briefly and was found dead shortly after. On gross post-mortem examination, a hard, strangulating mass (approximately 3 x 5cm) was located in the distal jejunum. Additionally, small multifocal white nodules 2-10mm in diameter were present on the serosal surface of the jejunum.

The jejunal mucosa was dark red in colour. The ruminal mucosa contained multifocal to coalescing exophytic pale white nodules, cauliflower in shape. Histopathological examination of the rumen revealed that the observed cauliflower-shaped nodules were a fibropapilloma.

Figure 10: Rumen fibropapilloma. A focally, extensively exophytic cauliflower-like mass in the rumen mucosa. Photo: Sara Salgado.

The hard mass detected in the small intestines was identified as an adenocarcinoma. A diffuse mild lymphoplasmacytic and neutrophilic enteritis was observed within other sections of the intestines. Fibropapillomas are infrequently observed in sheep as exophytic masses. No viral aetiology has been related to those masses in sheep (in contrast to cattle). Ovine fibropapillomas do not usually undergo malignant transformation. Intestinal adenocarcinomas have been reported in sheep, with expansion to local lymph node in 84 per cent of cases and distant metastasis in 52 per cent of cases. It is suggested, but unconfirmed, that dietary carcinogens may be involved in tumour genesis in sheep.

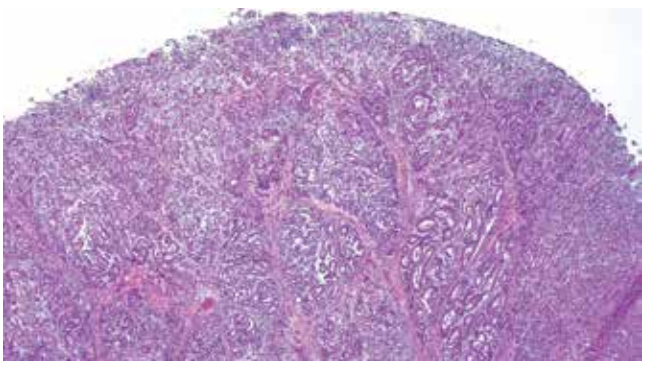

Figure 11: Small intestinal lesion of a poorly-demarcated and encapsulated infiltrative neoplasm with neoplastic cells arranged in tubules supported by a moderate amount of fibrovascular stroma. Morphological diagnosis was of an adenocarcinoma. Photo: Diana Bochynska.

RESPIRATORY TRACT

Laryngeal chondritis

Athlone RVL examined a three-year-old pedigree Texel ewe with a history of having been noticed one day earlier with breathing difficulties. On gross post-mortem examination, the lumen of the laryngeal opening was markedly reduced due to a swelling of the right laryngeal cartilage. Necrosis was discovered on cross section, consistent with laryngeal chondritis. There was a fibrinous hydrothorax and fibrinous pericarditis with a large fibrin clot in the pericardial sac and haemorrhages on both epicardial and endocardial surfaces, and pulmonary congestion. PCR for *Mycoplasma ovipneumonia* was inconclusive. Histopathology of the lung showed diffuse alveolar congestion and oedema, and mild peribronchiolar lymphocytic aggregation consistent with *M. ovipneumonia* infection. A diagnosis of laryngeal chondritis and secondary fibrinous pericarditis and pneumonia was made.

Figure 12: Necrosis of the laryngeal cartilage on cross section, consistent with laryngeal chondritis. Photo: Denise Murphy.

NERVOUS SYSTEM

Ovine white liver disease/cerebrocortical necrosis (CCN)

A five-month-old lamb was submitted to Kilkenny RVL for necropsy. On gross examination, the mucous membranes were very pale, and the carcase was mildly jaundiced. There were watery contents in the abomasum where worms with a barber pole appearance were seen. Cobalt levels were below the reference range and a very high strongyle egg count was detected. CCN was diagnosed on histopathology and there was marked vacuolation of hepatocytes in the centrilobular area of the liver. The changes in the liver were suggestive of ovine white liver disease (OWLD). OWLD is associated with cobalt deficiency, CCN has also been described in association with cobalt deficiency in weaned lambs. However, given the parasitism in this case, care must be taken not to over-interpret this association. *Haemonchus contortus* is a key differential for the gross lesions and high strongyle egg count seen here. A review of mineral supplementation and parasite control was recommended.

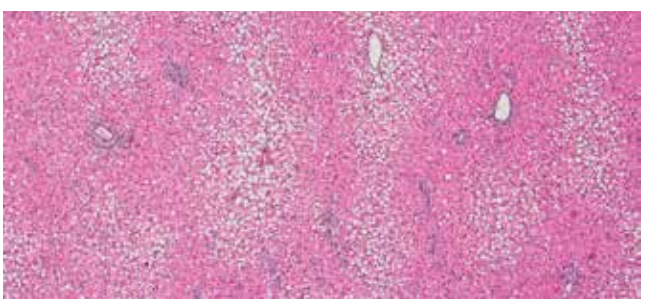

Figure 13: Marked vacuolation of hepatocytes in the centrilobular liver, suggestive of ovine white liver disease. Photo: Maresa Sheehan.

MUSCULOSKELETAL

Erysipelothrix rhusiopathiae was isolated from a joint fluid aspirate taken from a lamb with a flock history of lameness. This gram-positive anaerobic bacterium may cause a non-suppurative polyarthritis in lambs; it enters the body through the navel or castration and docking wounds. It may also cause cellulitis and lameness in older lambs and sheep if dipping solution becomes contaminated.

GOATS

A four-month-old goat was submitted to Kilkenny RVL with a history of being bloated prior to death. There had been other deaths in the flock. On necropsy, there was cranioventral consolidation affecting 30-40 per cent of lung tissue. Caudally, the lungs were oedematous and there were focal areas of fibrin on the pleura. On histopathology, there was a fibrinosuppurative bronchopneumonia and pleuritis with multifocal bacterial colonies visible. *M. haemolytica* was cultured, and positive PCR results were obtained for *Bibersteinia trehalosi* and *M. ovipneumoniae.* A review of respiratory disease control was recommended.

Figure 14: Cranioventrally-distributed congested consolidated pneumonia in a goat from which multiple respiratory pathogens were identified. Photo: Aideen Kennedy.

USING LABORATORY DIAGNOSTICS TO INVESTIGATE BOVINE RESPIRATORY DISEASE (BRD) IN CALVES, WEANLINGS, OR COWS

The RVLs have designed a Bovine Respiratory Disease (BRD) Package. This may change your approach to investigating group BRD problems. Follow these simple steps for better, more cost-effective diagnoses.

What sample for different age groups?

Housed calves – nasal swabs only

Calves at grass – nasal swabs, faecal samples*, Bronchoalveolar lavage (BAL) samples*

Weanlings > six months – nasal swabs, blood samples, faecal samples*, BAL samples*

Adult animals – nasal swabs, blood samples, faecal samples*, BAL samples*

* Required where lungworm is a differential diagnosis only

What to DO?

Nasal samples – collect plain swabs (moistened using bottled water) from the naso-pharynx of up to six acutely affected, untreated animals and place all swabs in one universal container. Nylon flocked swabs (Figure A) are the swabs of choice for PCR as they have bristles perpendicular to the shaft which improve the respiratory epithelial cell collection from the animal and also the release/recovery of the cells from the swabs at testing. Swabs with wooden shafts can inhibit

the PCR assays. Charcoal swabs cannot be used for PCR testing.
As virus shedding only lasts for a few days, suitable animals are those early in the course of infection i.e., have a high temperature, may not yet look depressed and nasal discharge will be serous rather than purulent. These will be pooled and tested for a range of BRD viruses (IBR, PI3, RSV, BoCo and BVD) by PCR. If needed, **additional swabs MUST** be taken for *Mycoplasma bovis* and *Histophilus somni* PCR.

Figure A: Nylon flocked swab.

Blood samples - collect serum/red top vacutainers from 10 per cent of weanlings or adult cattle groups only (minimum of four to six animals). These will be tested individually for antibodies to the common BRD viruses. As antibodies are likely to be present, paired samples (four weeks apart) may be recommended to detect rising titres. Where cattle have been vaccinated against IBR, request IBRgE testing and where they have not, request IBRgB testing. If tick-borne fever (TBF) is suspected as the cause of BRD, submit EDTA (purple top) tubes for TBF PCR.
Faecal samples – where lungworm is a differential diagnosis, collect 30-50g of faeces from nine animals in the affected group (first lactation cows should be targeted where adult cows are affected). Remember that clinical signs of hoose can occur in the pre patent period so a negative Baermann doesn't rule out lungworm. This is particularly important to consider in re-infection syndrome causing coughing in adult cows. Faecal samples should only be submitted in screw-top plastic containers.

BAL samples – where lungworm is a differential diagnosis, collect lung lavage samples from five to six clinically affected or newly introduced animals. Instructions on how to collect BAL samples can be found at:
https://www.vet.cornell.edu/animal-health-diagnostic-center/testing/protocols/bronchoalveolar-lavage-fluid-technique.
These samples will be examined for evidence of lungworm or their eggs only (Figure B).
BAL samples may be useful for diagnosing lungworm infection in adult cows or other animals showing clinical signs during the pre-patent period.

Figure B: BAL sample with larvated lungworm egg and a larva emerging from an egg.

What NOT to do?

- Don't collect nasal swabs from less than five cattle (reduces the likelihood of detecting an agent).
- Don't collect swabs from chronically BRD-affected cattle (unlikely to detect primary pathogen).
- Don't collect nasal swabs for 'routine bacteriology (culture or PCR)' from any age of animal (just detects commensals).
- Don't collect bloods from calves less than six months old (maternally derived antibodies [MDA] still present).
- Don't rely on carcase submissions alone to reveal causes of BRD (these often represent chronic, treated cases where the primary pathogen(s) can no longer be identified).

If in doubt about sample selection, contact the laboratory directly for advice.