Regional Veterinary Laboratories Report

October 2021

Regional Veterinary Laboratories (RVLs) carried out necropsy examinations on 559 carcases and 107 foetuses during October 2021. Additionally, 1,698 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 October 2021.
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.

CATTLE

Pneumonia and enteritis were the most common diagnoses from necropsy in cattle in the RVLs during October 2021.

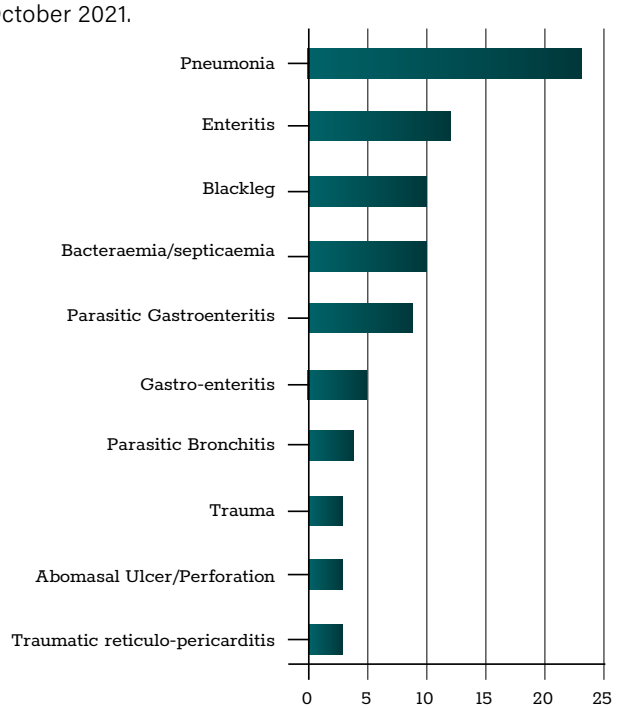

Table 1: The most common diagnoses in cattle submitted for necropsy in October 2021.

GASTROINTESTINAL TRACT

Parasitic gastroenteritis

Athlone RVL examined two seven-month-old weanlings from a herd with a history of having lost 10 weanlings over the previous few weeks, some with ill-thrift and others with respiratory signs. Their body condition was very poor, with bodyweights of 75kg and 90kg respectively, with marked serous atrophy of adipose depots around the heart and kidneys. Both had faecally soiled tails and perinea. The abomasal mucosa of one weanling was grey, thickened and 'cobblestoned', while the abomasal mucosa of the other was very thickened and there was a layer of fibrino-haemorrhagic exudate on the surface. Both weanlings had very fluid, watery intestinal contents and faeces. Strongyle egg counts of 4,800 eggs per gram (EPG) and 12,000 EPG, respectively, were detected in the faeces. A diagnosis of severe parasitic gastroenteritis was made and advice to review pasture management and parasite control on the submitting farm was issued.

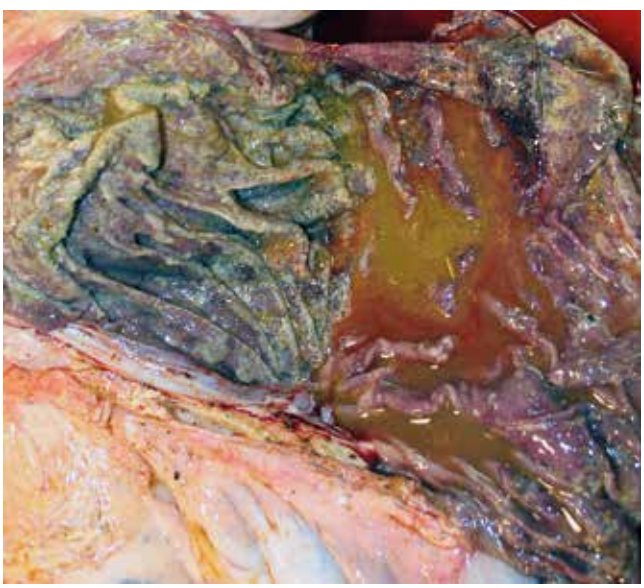

Figure 1: Thickened abomasal mucosa of a weanling with parasitic gastroenteritis. Photo: Denise Murphy.

Salmonellosis

A three-year-old cow, one of three cows that had died recently, was submitted to Kilkenny RVL for post-mortem examination. The cow had failed to respond to the veterinary treatment provided. On gross post-mortem, there was free straw-coloured fluid in the thorax and abdomen. There were extensive, severe, variably sized ulcers affecting the abomasum, which were typically 3-4mm in diameter. The carcase was pale. There was no blood clot in the heart and there was marked congestion of the myocardium. The mucosal surface of the small intestines was segmentally thickened with petechial haemorrhages. There was a distinctive pattern with pale areas in the liver and the spleen was enlarged. *Bacillus anthracis* involvement was ruled out by laboratory testing.

Salmonella enteritidis subspecies Dublin was isolated from multiple organs. A diagnosis of salmonellosis was made, and a review of *Salmonella* control is recommended. It was also noted that as *Salmonella spp.* are zoonotic, the people involved in the care of these animals were advised to take precautions to protect themselves and others from infection.

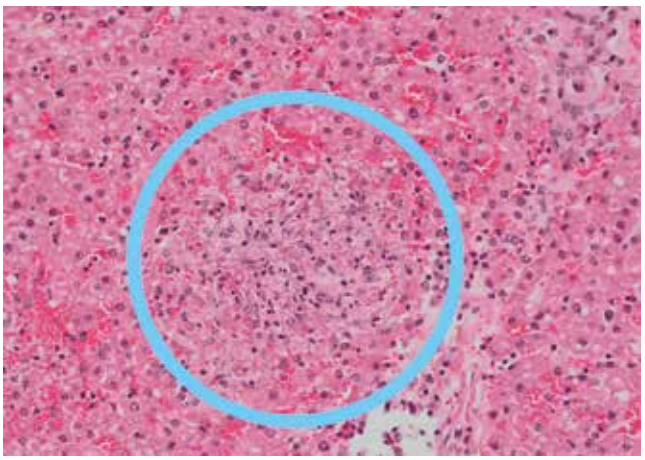

Figure 2: A focal area of necrosis and inflammation in the liver of a cow with salmonellosis. Photo: Maresa Sheehan.

Larval paramphistomosis

Athlone RVL examined a seven-month-old weanling that had a history of ill-thrift, severe diarrhoea and inappetence. It was one of a group of 20 weanlings that had been grazing ground that was prone to flooding. There was one other similar death in the group and five others were being treated. There was bilateral enophthalmia (characteristic of dehydration) and faecally soiled tail and perineum. There were haemorrhagic contents in the proximal small intestines, and large numbers of tiny paramphistome larvae were visible to the naked eye; the distal small intestinal contents and large intestinal contents were very fluid. The abomasal folds were very oedematous. A severe larval paramphistome infection was detected in the intestinal contents. Histopathology of the small intestine showed a severe parasitic enteritis with copious numbers of paramphistome larvae attached to mucosa. A diagnosis of larval paramphistomosis was made (immature rumen fluke infection).

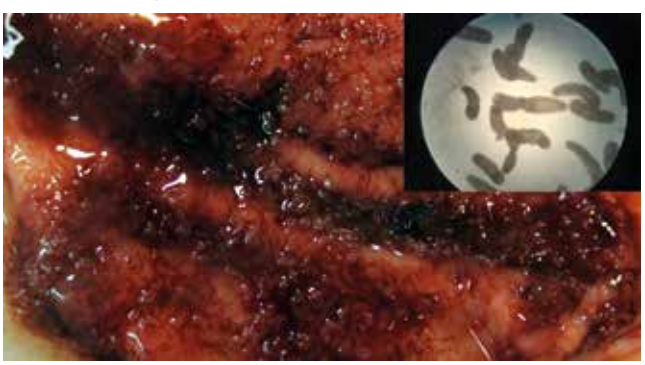

Figure 3: Translucent paramphistome larvae on the surface of the duodenal mucosa and (inset) magnified. Photo: Denise Murphy.

PARAMPHISTOMES

Larval paramphistomosis is a disease syndrome seen in Ireland in recent decades in particular years, typically late in the grazing season, and associated with the ingestion of large numbers of the larval stage of the rumen fluke *Calicophoron daubneyi.* Paramphistomes or rumen fluke are parasites of ruminants and occur worldwide, they utilise snails as an intermediate host. The adult parasites live in the rumen (stomach) and the immature larval forms live in the small intestine, especially in the proximal duodenum. Clinical disease is due to intestinal damage caused by massive numbers of larvae in the small intestine (larval paramphistomosis). The adult flukes in the rumen are not usually considered to cause disease. The current preliminary scientific research suggests that the main/only pathogenic rumen fluke in cattle in Ireland is *C. daubneyi* which uses the mud snail *Galba* (formerly *Lymnaea*) *truncatula* as its intermediate host and this is the same snail that acts as the intermediate host for the liver fluke *Fasciola hepatica*. Although the exact reasons for the increase in rumen fluke infections in recent decades are not fully understood, the increase in warm wet summers and mild winters—conditions that favour *Galba truncatula*, the intermediate host of both *F. hepatica* and *C. daubneyi*—are thought to be the major contributing factor (Skuce *et al*, 2013). In fact, in the UK, it has been suggested that *C. daubneyi* is adapting to out-compete the already endemic *F. hepatica* in their shared environment and snail intermediate host species (Jones *et al*, 2015).

Clinical disease occurs occasionally with clinical signs including dullness, dehydration, rapid weight loss, and severe watery scour which may contain traces of blood and sub-mandibular oedema (bottle-jaw). Severely affected animals may die due to dehydration. As the clinical signs described here are not exclusive to rumen fluke infection, diagnosis by clinical signs alone is unreliable. However, a severe diarrhoea and weight loss and abnormally low levels of albumin in blood samples combined with a history of grazing wet 'flukey' ground, especially in the late summer or autumn, would raise suspicions. Demonstration of rumen fluke in a faecal sample (eggs/larvae) would help confirm the diagnosis but testing for the larvae rather than the egg is not routinely available in laboratories and because, generally, it is only in severe cases that larvae are detected in faeces, a negative result does not rule out larval paramphistomosis.

Control of rumen fluke should focus on reducing the possibility of exposure to rumen fluke larvae on pasture. Restricting access to fields, or parts of fields, which are or have been wet or waterlogged will reduce exposure to contaminated herbage. Most of the drugs that control liver fluke DO NOT kill rumen fluke. Although not specifically licensed in Ireland for the treatment of rumen fluke, it has been reported in the scientific literature that oxyclozanide can kill both mature and immature stages of this parasite. Cattle may occasionally show transient scouring, inappetence and dairy animals may have decreased milk yield following treatment.

RESPIRATORY TRACT

Parasitic bronchitis

An eight-month-old weanling with a history of coughing and dyspnoea was submitted to Kilkenny RVL. It was the third death on the submitting holding, and the animal's condition had been unresponsive to antibiotic and anti-inflammatory treatment. On necropsy, there were multiple *Dictyocaulus viviparus* larvae visible in the trachea. Caudally, the lungs were overinflated and rubbery with multifocal 'ground glass' emphysema, and the cranial right lobe was consolidated. The abomasum had a 'cobblestone' appearance. Strongyle egg counts were over 5,000 EPG. No significant bacterial agent was cultured, and respiratory viral polymerase chain reaction (PCR) test results were negative. A diagnosis of parasitic bronchitis and parasitic gastroenteritis was made, and a review of parasite control was recommended.

Figure 4: Abomasal mucosa with a 'cobblestone' appearance. Photo: Aideen Kennedy.

A weanling was found dead with no history of clinical signs and submitted to Kilkenny RVL. It was the third death from a group of 60. The lungs didn't deflate on opening the carcase. Caudally, the lungs were overinflated, rubbery and there was multifocal to diffuse ground glass emphysema; cranially, there was also consolidation. Approximately 80-90 per cent of the lung tissue was abnormal in total. No lungworm was observed grossly or detected by Baermann examination. PCR on lung tissue tested positive for bovine respiratory syncytial virus (BRSV). In addition, *Pasteurella multocida* was cultured. A review of respiratory disease control on the farm was recommended.

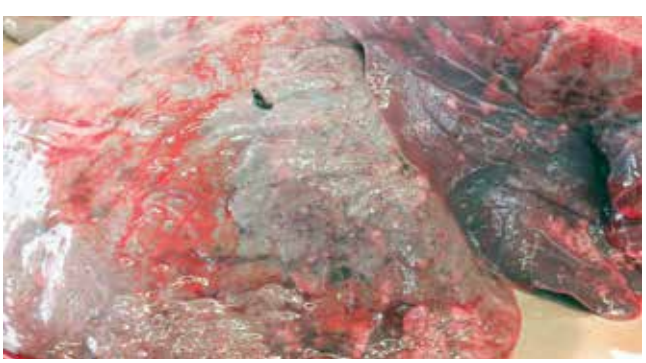

Figure 5: Emphysema on the pleural surface of the lungs with a 'ground glass' appearance. Photo: Aideen Kennedy.

Similar to the previous month (September), Sligo RVL received several cases of parasitic bronchitis. All age groups were affected. In one case, a one-year-old heifer was affected. All animals in the group presented with severe coughing. On necropsy, the trachea was hyperaemic and the cranioventral lung lobes were consolidated. There was ground glass emphysema and large amounts of adult lung worms, as well as haemorrhage, were present in the airways. Histopathology of the lung revealed diffuse, chronic, severe parasitic pneumonia. *Trueperella pyogenes* was detected by PCR. A diagnosis of parasitic pneumonia with bacterial infection, likely secondary, was reached. Initial viral involvement could not be ruled out. For further investigation of viral involvement, further serum samples were requested for serosurveillance.

Figure 6: Adult *Dictyocaulus viviparus* in a bovine trachea. Photo: Shane McGettrick.

Athlone RVL examined two weanlings with a history of respiratory signs, with no response to treatment. There had been seven losses in the group, which were purchased two months previously. On gross post-mortem examination, there were similar findings. The lungs had severe, cranioventral congestion and consolidation with multifocal-to-coalescing abscessation, affecting approximately 80-90 per cent of the pulmonary parenchyma, and there was caudo-dorsal emphysema and overinflation. There was also a marked, diffuse fibrinous pleuritis. The Baermann examination detected moderate numbers of lungworm larvae in the faeces of one of the weanlings. *Mannheimia haemolytica* was isolated from the lung of one weanling. PCR examination detected *Histophilus somni, Mycoplasma bovis, M. haemolytica* and *P. multocida* in both weanlings. Histopathological examination revealed a severe, multifocal-to-coalescing, chronic-active, suppurative bronchopneumonia with foci of caseous necrosis, multifocal areas of hyaline membrane formation and type 2 epithelialisation. These findings were consistent with a primarily bacterial aetiology. A diagnosis of bronchopneumonia and parasitic pneumonia was made. The parasitic pneumonia (caused by the lungworm) most likely predisposed to the development of bacterial bronchopneumonia.

Figure 7: Bronchopneumonia, with congestion and consolidation in the cranioventral lung (left). Photo: Sarah Delaney.

An eight-month-old weanling was submitted to Limerick RVL with a history of coughing. Gross findings at necropsy included a high number of lungworms in the airways, cranioventrally distributed pneumonia (likely secondary to lungworm) and inflamed abomasal mucosa. A strongyle egg count of 18,850 EPG was found in the large intestinal contents and *P. multocida* was cultured from pulmonary tissue.

Pulmonary embolism

A five-year-old Friesian cow was necropsied in Athlone RVL with a history of having been sick for only two to three hours. The farmer recounted a history of dyspnoea, agitation and apparent pain. The cow had been dried off and administered dry cow intramammary treatment three days earlier. There was marked bilateral pulmonary emphysema, congestion and oedema especially in the caudo-dorsal lobes. There were well scattered, multifocal, firm, yellow/brown foci palpable in all lung lobes. The right side of the mammary gland was hard, there were multiple abscesses upon cross section, and *T. pyogenes* was isolated from these abscesses. Histopathology of the lung showed diffuse expansion of the interstitium with neutrophils and multifocal, suppurative, fibrino-haemorrhagic necrotic lesions. It was concluded that the animal had died of septic pulmonary emboli and septicaemia secondary to the mammary abscessation.

URINARY/REPRODUCTIVE TRACT

Neosporosis

Kilkenny RVL investigated an abortion storm affecting a considerable number of cows in a herd, which was attributed to *Neospora caninum* infection. Lesions typical of protozoal infection were detected in the brain.

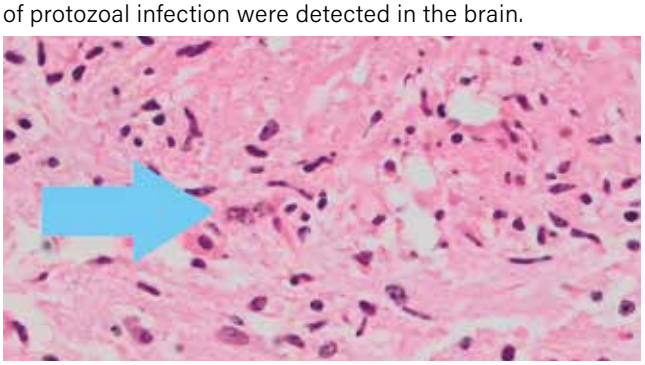

Figure 8: An area of necrosis in the brain with suspected intralesional protozoa (arrow). Photo: Maresa Sheehan.

NEOSPOROSIS

The protozoan parasite *Neospora caninum* is a major cause of abortion in both dairy and beef cattle in Ireland and worldwide. Ferris (2003, PhD thesis, University of Wales, Bangor) found that 15.5 per cent of 5,785 recently aborted Irish foetuses had been exposed to *Neospora* and he estimated that about 9 per cent of all bovine abortions in Ireland were the result of neosporosis.

Cattle can become infected with *Neospora* in two ways:

- From their mothers: the in-utero foetus of an infected dam becomes infected.
- From canine faeces: cattle may become infected by ingesting feed or water contaminated by *Neospora* oocysts (eggs) in the faeces of an infected dog. Once infected, a dog will remain infected for life, but typically it passes oocysts in its faeces (i.e., is capable of infecting cattle) for only a short period (up to a few weeks) after acquiring the initial infection. About 90 per cent of infected cattle contract the infection from their dams while only about 10 per cent are infected by eating or drinking feed or water contaminated with infected canine faeces.

Diagnosis

Neosporosis may be suspected on clinical grounds but requires laboratory examination for confirmation.

Suitable samples to submit to the laboratory for testing for Neospora infection include:

» Aborted foetuses and placentas.
» Blood samples from animals that aborted and from other non-aborting animals in the group.
» The more samples that are submitted, the greater the chance of a correct diagnosis.

Antibodies to Neospora fluctuate at various stages of the reproductive cycle and blood and milk serology may give negative results at certain times in infected animals. Antibodies are at their highest about 10 to four weeks before calving. The usefulness of individual milk testing is reduced as many cows are dry when antibodies are highest.

A negative bulk milk test for neosporosis does not necessarily mean that the herd is free from infection as a negative result can be obtained when 10 to 20 per cent of the animals contributing milk to the tank are *Neospora* positive.

Any animals testing negative on a pre-breeding or pre-purchase blood test should be retested 10 to four weeks before calving (ideally over two pregnancies) to confirm that they are free of infection.

Uterine torsion

Sligo RVL examined a three-year-old cow with a history of sickness a month prior, from which it had apparently recovered. In the last days leading up to her death, she appeared bloated and anorexic and only improved slightly on treatment. The cow was six months pregnant according to the history. On post-mortem examination, there was

severe fibrinous and necrotising peritonitis. The uterus was friable and ruptured, and macerated foetal material was present in the cow's abdomen. There was a 180-degree uterine torsion evident cranial to the cervix. Peritonitis subsequent to spontaneous uterine torsion was diagnosed as the cause of death.

NERVOUS SYSTEM

Cerebrocortical necrosis

An eight-month-old calf was submitted to Sligo RVL. The calf was one of a group of four calves which had started presenting with severe diarrhoea, nervous signs and exaggerated movement after treatment with an anthelmintic. Three of the calves recovered under treatment with fluid therapy, antimicrobials and vitamin B1. On necropsy of the submitted calf, intestinal contents were very liquid throughout. *Escherichia coli* was cultured from multiple organs. The brain was soft and fluoresced under ultraviolet light. Histopathology revealed multifocal neuronal necrosis in a laminar pattern in the cerebrum. Cerebrocortical necrosis (CCN) and enteritis were diagnosed as the most likely cause of death consistent in view of the observed clinical signs, gross findings and response to treatment in cohort animals. *E. coli* was isolated from multiple organs and is likely to indicate a terminal sepsis. This is likely to occur in a debilitated animal with compromised mucosal and immune barriers. CCN occurs due to vitamin B1 deficiency or sulphur excess. Cases are frequently seen when there is a change in diet associated with introduction of concentrates or grazing of lush pasture. The history of recent diarrhoea is likely to be very significant in this case as it indicates significant recent digestive upset. CCN is not directly related to anthelmintic use but may occur concurrently as dosing is often administered as soon as a digestive upset is encountered in a group of animals and CCN lesions may take some time to develop, especially in milder cases. Furthermore, the movement and confinement of animals for dosing (which sometimes includes the outdated practice of fasting before dosing) may itself cause a digestive interruption.

MUSCULOSKELETAL

Septic arthritis

Sligo RVL examined the carcase of a two-month-old calf with a history of ongoing lameness for the previous month. On necropsy, the left hock presented with septic tarsal arthritis. There was also pericarditis and petechiae were present on both kidneys. *Proteus spp*. was cultured from the septic joint. *Mycoplasma bovis* was detected in lung tissue by PCR. Histopathology of the kidney revealed acute, moderate interstitial nephritis with bacterial colonies present and tubules expanded by proteinaceous fluid. The liver presented with multifocal, randomly distributed areas of chronic hepatitis. Furthermore, there was multifocal acute, mild, interstitial pneumonia with thrombi present within the pulmonary interlobular septae. These findings were suggestive of bacteraemia and sepsis. Septic arthritis with subsequent bacteraemia and sepsis was diagnosed as cause of death. *Proteus spp.* is a common post-mortem invader and its significance is unclear in this case.

Clostridial myositis (blackleg)

Two weanlings were found dead having displayed no symptoms and were submitted to Kilkenny RVL. Necropsy revealed that both weanlings had multifocal areas of dry, necrotic, black, emphysematous myositis, predominantly along the dorsal back muscles. There were smaller areas of myositis in the gluteal muscles. *Clostridium chauvoei* positive results were obtained using fluorescent antibody technique (FAT) on both animals and a diagnosis of blackleg was made. A review of vaccination protocols was advised, with use of multivalent clostridium vaccines recommended.

Figure 9: Lesion of clostridial myositis or blackleg. Photo: Aideen Kennedy.

A six-month-old weanling, with a history of a protruding tongue, was euthanised and submitted to Limerick RVL. Necropsy disclosed severe swelling of the tongue, submaxillary soft tissue and proximal throat; when this was dissected a black, dry cellulitis with a small amount of crepitus was disclosed. FAT returned a positive for *C. chauvoei;* a diagnosis of blackleg was made.

MISCELLANEOUS

A three-year-old suckler cow was submitted for necropsy to Limerick RVL with a history of weakness, inappetence and diarrhoea over a two-week period. The post-mortem findings included hydrothorax and hydroperitoneum. A large number of white soft growths were seen on the liver, uterus, heart and kidneys. Multiple lymph nodes were enlarged. PCR testing returned a negative result for enzootic bovine leucosis (EBL). Histology confirmed a diagnosis of lymphoma. A diagnosis of sporadic bovine leucosis was made.

SHEEP

Parasitic gastroenteritis and bacteraemia/septicaemia were the most common diagnoses from necropsy of sheep in the RVLs during October 2021.

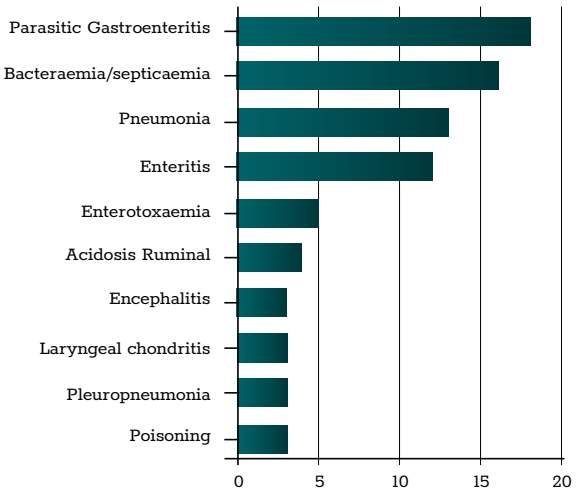

Table 2: The most common diagnoses in sheep submitted for necropsy in October 2021.

GASTROINTESTINAL TRACT

Ruminal acidosis

Athlone RVL examined a seven-month-old lamb with a history of sudden death. There had been three other losses in the group, which had been housed three days previous on a diet of straw and ad-lib concentrates. On gross post-mortem examination, the ruminal contents were very loose and of a porridge-like consistency, with a significant quantity of grain and a strong acidic smell. Small and large intestinal contents were liquid and contained a significant quantity of grain. The pH of the rumen contents was 4.1. Rumen pH values less than 5.5 are highly suggestive of ruminal acidosis and pH values rise post-mortem. Histopathological examination of the ruminal wall revealed a suppurative rumenitis with multifocal vacuolation, consistent with chemical rumenitis. A review of the diet of this lamb's cohorts was recommended. A sudden increase in the amount of carbohydrate ingested is more important than the actual amount in the aetiology of acute ruminal acidosis. Sudden temperature changes, e.g., hot or cold weather, may result in temporary reductions in feed consumption, and acidosis may develop once animals return to full feed.

Sligo RVL diagnosed ruminal acidosis in several cases of submitted lambs. In one case, two lambs were submitted with a history of sudden death. Concentrates were being fed. Both lambs presented with soft, sour-smelling ruminal contents with large amounts of corn and meal present. Parasitic roundworms were present in the intestines but no intestinal contents. Ruminal pH was 5.1 and 4.8 respectively. Ruminal acidosis was diagnosed as most likely cause of death and a review of feeding management was recommended. There was a concurrent parasitic gastroenteritis.

Larval paramphistomosis

In mid to late October, Sligo RVL received several submissions with acute paramphistomosis. In one case, a four-month-old lamb which had died suddenly was submitted. There were further deaths in the flock. The management group had been changed to different pasture in the previous two weeks. On necropsy, there was visible damage on the hepatic parenchyma typically seen in acute fasciolosis. Small intestinal contents were, throughout the gastroenteric tract, very watery. On laboratory testing, there was a heavy rumen fluke larvae burden present in the small intestinal contents. Acute fasciolosis and paramphistomosis was diagnosed as the most likely cause of death in this case.

RESPIRATORY TRACT

Bronchopneumonia and parasitic gastroenteritis

A lamb was submitted to Kilkenny RVL with a history of sudden death. External examination showed heavy faecal staining of the hindquarters. There was cranioventral pulmonary consolidation with 30 per cent of the pulmonary parenchyma consolidated, with the remainder oedematous. The intestinal contents were very fluid and green in colour. *Bibersteinia trehalosi* was cultured on the lung. PCR positive results were obtained for *B. trehalosi, Mycoplasma ovipneumonia, P. multocida* and *M. haemolytica.* In addition, there was a strongyle egg count of over 1,000 EPG. The parasite burden may have contributed to immunosuppression. A diagnosis of PGE and pneumonia was made and a review of parasite control and respiratory disease control was recommended.

Figure 10: Pneumonia in a lamb from which multiple pathogens were detected. Photo: Aideen Kennedy.

Athlone RVL examined a six-month-old lamb with a history of respiratory signs and coughing, with no response to treatment. There had been eight losses in the previous four or five days in the group. On necropsy, the lungs were diffusely congested with cranioventral consolidation affecting approximately 30 per cent of the pulmonary parenchyma, and there was a cranioventral fibrinous pleurisy. Intestinal contents were liquid. *M. haemolytica* was detected in lung tissue by PCR. Parasitological examination of a faecal sample revealed an extremely high strongyle egg count of 6,000 EPG and a *Strongyloides* egg count of 8,000 EPG, as well as a heavy coccidial infection.

Histopathological examination revealed a moderate, acute, multifocal, suppurative bronchopneumonia with oedema, congestion and intra-lesional bacteria, and a marked, diffuse, lymphocytic enteritis with cross sections of parasitic structures. A diagnosis of bronchopneumonia secondary to parasitic gastro-enteritis was made. A review of the flock's parasite control programme was recommended, including faecal sampling of cohorts.

Laryngeal chondritis

A two-year-old ewe was submitted to Kilkenny RVL with a history of respiratory signs unresponsive to treatment. There had been three deaths recently in the flock, attributed to parasites and the remainder of the flock had improved post-dosing. Post-mortem examination of the larynx identified bilateral abscessation and necrosis in the larynx cartilage. The trachea contained a large volume of bloody froth and the lungs were heavily oedematous and congested. No significant agent was identified on culture, this may have related to recent treatment. It was considered likely that the pneumonia was secondary to the laryngeal chondritis.

Figure 11: Laryngeal chondritis in a two-year-old ewe. Photo: Aideen Kennedy.

MISCELLANEOUS

Clostridial enterotoxaemia

Clostridial enterotoxaemia was a common diagnosis in submitted lambs in Sligo RVL in October 2021. In one case, a six-month-old lamb with a history of sudden death was submitted. There were many further deaths in the management group. On necropsy, there was a large fibrin clot in the pericardial sac. There was cerebellar coning suggesting elevated intracranial pressure, and cranioventral pulmonary consolidation. *Clostridium perfringens* and its alpha and epsilon toxin were detected in the small intestinal contents. Fibrinous pericarditis indicates acute toxaemia as the cause of death in this animal. The identification of epsilon and alpha toxin and post-mortem findings indicated the presence of *C. perfringens* Type D, the cause of pulpy kidney disease.

Figure 12: A large fibrin clot in the pericardial sac. Photo: Shane McGettrick.

REFERENCES

- Jones RA, Williams HW, Dalesman S, Brophy PM. Confirmation of *Galba truncatula* as an intermediate host snail for *Calicophoron daubneyi* in Great Britain, with evidence of alternative snail species hosting *Fasciola hepatica*. Parasit Vectors. 2015 Dec 23;8:656. doi: 10.1186/s13071-015-1271-x. PMID: 26695066; PMCID: PMC4688931.
- Skuce PJ, Morgan ER, van Dijk J, Mitchell M. Animal health aspects of adaptation to climate change: beating the heat and parasites in a warming Europe. Animal. 2013 Jun;7 Suppl 2:333-45. doi: 10.1017/S175173111300075X. PMID: 23739475.