Regional Veterinary Laboratories Report

March 2020

Like all workplaces across Ireland, working life was transformed for regional veterinary laboratories (RVLs) on Friday March 13, 2020 when the Government announced a range of measures to contain the spread of the global human pandemic, COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). RVLs were classified as an essential service and remained open for all their key roles throughout the period of restrictions (continuing at time of going to press), but the service had to take a number of steps to enhance social distancing and safe working for our staff, and clients while continuing to support the food chain by providing animal health surveillance. This had the inevitable and ongoing effect of reducing workload capacity, but through close collaboration between RVL and their farmer and veterinary stakeholders, key activities were prioritised and post-mortems and laboratory diagnostics continued throughout the emergency. Nonetheless, there was a perceptible impact on virtually all activities, and therefore all statistical and numerical outputs generated in this period will forever have a metaphorical COVID-19 asterisk attached to them.

RVLs carried out post-mortem examinations on 595 carcases and 263 foetuses during March 2020. Additionally, 2,118 diagnostic samples were tested to assist private veterinary practitioners (PVPs) with the diagnosis and control of disease in food-producing animals. The following report presents a selection of findings from carcase submissions to the RVLs during March 2020. There are five RVLs across Ireland located in Athlone, Cork, Kilkenny, Limerick, Sligo and Dublin to ensure representative livestock disease surveillance.

The objective of this report is to provide feedback to the veterinary practitioner on animal-disease patterns at this time of the year. Hence, both common and unusual clinical presentations are described together with the results of the various investigations and tests to further assist diagnosis, encourage thorough investigation of clinical cases, and to provide context for practitioners when interpreting laboratory reports.

CATTLE

Enteritis and pneumonia were the most common diagnoses as cause of death in bovine carcases submitted to Department of Agriculture, Food and the Marine (DAFM) RVLs in March 2020.

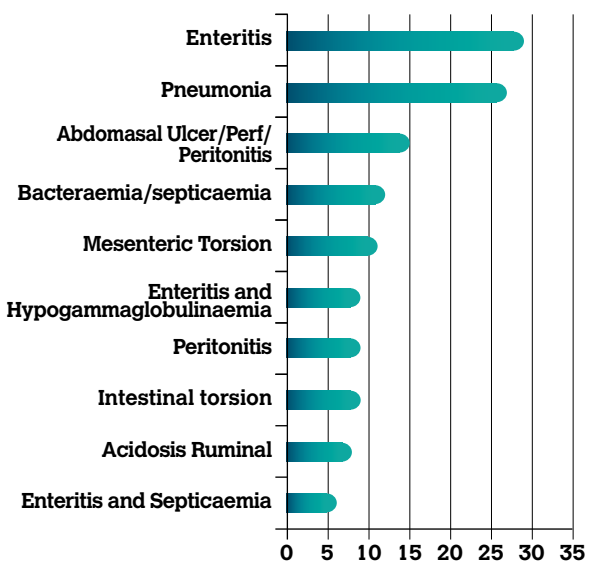

Table 1: The 10 most common causes of death diagnosed in bovine carcasses (excluding foetuses) submitted to DAFM RVLs in March 2020.

GASTROINTESTINAL TRACT

Ruminal acidosis

A one-month-old Friesian heifer calf was submitted to Sligo RVL by a contract-rearer after being found dead. On post-mortem examination, there was severe dehydration and soft, pulpy ruminal contents. There was a partial volvulus. The ruminal contents had a pH of 4.7. Post-mortem pH values below 5.5 are regarded as highly indicative of ante-mortem ruminal acidosis. A review of feeding management was advised.

Ruminal tympany

A six-months-old calf was submitted to Sligo RVL after becoming bloated and dying before any treatment attempts could be started. The calf was described as thriving poorly and presented with a small range of deformities of the head on post mortem examination. Mandibular hypoplasia as well as dental dysplasia was noted. The rumen was bloated and contents had a distinct acidic smell. The cranial part of the carcase showed general congestion with multifocal haemorrhages throughout neck, heart and pleura. There was a focally extensive haemorrhage in the right caudal lung. Ruminal pH was at 5.3. As previously mentioned, post-mortem ruminal pH values below 5.5 are considered indicative of ruminal acidosis. The most likely cause of death in this case was ruminal dysfunction caused by inappropriate diet resulting in ruminal acidosis and ruminal bloat.

Salmonellosis

Athlone RVL examined two calves aged two and three weeks of age, respectively. The farmer reported that the calves had been pyrexic and lethargic. Both calves were in poor body condition. The post-mortem examination of the first calf revealed omphalophlebitis with significant enlargement of the umbilical stump. The umbilical remnants contained necrotic material extending into the umbilical vessels and into the urachus, extending caudally to the bladder. Small intestinal contents were yellow and faeces were green and mucoid. The liver was enlarged with petechial haemorrhages on the surface. There were white foci in the renal cortex of one kidney.

The other calf had pale mucous membranes, notable enophthalmus and its perineum was soiled. Small intestinal contents and faeces were very loose; the liver appeared pale. *Salmonella* Dublin was isolated from several tissues in both calves and rotavirus detected in faeces. On histopathology, there were multifocal random areas of acute necrotising hepatitis in the liver suggestive of a gram-negative septicaemia. A diagnosis of salmonellosis was made in both calves.

Peritonitis

A yearling bullock was submitted to Athlone RVL with a history of sudden death after a herd tuberculosis (TB) test on the previous day. On necropsy, there was ascites and hydrothorax.

There was a diffuse fibrinous peritonitis with fibrinous adhesions between loops of intestine and contamination of serosa with gastrointestinal tract (GIT) contents. There was a 2-3mm perforation of the jejunum. Intestinal contents were very loose but not haemorrhagic. No significant aetiological agent was identified in the intestinal contents. It was concluded that the animal died of peritonitis secondary to a jejunal perforation of undetermined aetiology.

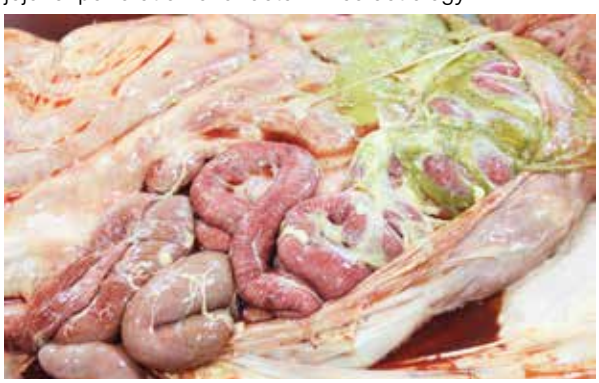

Figure 1: Diffuse peritonitis in a calf. Photo: Denise Murphy.

Figure 2: Intestinal perforation in a calf with severe peritonitis. Aetiology unidentified. Photo: Denise Murphy.

Abomasal ulceration

Sligo RVL diagnosed abomasitis in three calves submitted in March 2020. *Sarcina* spp. and/or *Clostridium* spp. were detected in all of them and diagnosed as the most likely cause. Both pathogens are associated with abomasal bloat and ulceration, particularly in non-suckling calves, and are the likely cause of the severe acute presentation observed. Both are present in the environment and infections have been associated with poor hygiene of calf feeders, stomach tubes and environmental contamination.

The first case involved a two-month-old calf that had been reported with bloat and mild diarrhoea prior to death. Post-mortem examination revealed a perforated ulcer in the abomasum with focal abomasitis. An abomasal smear from the abomasum revealed the presence of bacteria consistent with *Sarcina* spp. and *Clostridium* spp..

In a further case, an eight-week-old calf that had been reported with bloat was submitted. Four further calves with similar symptoms had died previously on the same holding and another four calves were showing signs of sickness. On post-mortem examination there was peritonitis, emphysematous abomasitis and perforated ulceration. Blood was present in the abdomen. Intestinal contents were black. A smear taken from the area of ulceration identified bacteria with morphology consistent with *Sarcina* spp. bacteria and clostridium species. Cause of death in this calf was the peritonitis and haemorrhage due to the abomasal ulcer. It was not certain if other deaths in the herd had been due to the same aetiology, however improved feeding hygiene and closer observation of calves at feeding times were advised.

Fungal infection

A one-week-old calf with a history of diarrhoea was submitted to Kilkenny RVL. Other calves were similarly affected on the farm. The carcase was extremely dehydrated. There was a severe multifocally extensive rumenitis as well as reticulitis and omasitis comprising focal areas of necrosis. There was multifocal abomasal ulceration. There were putrid contents in the fore stomachs, the mucosa of the small and large intestines were thickened. *Escherichia coli* was detected from several organs and the zinc sulphate turbidity (ZST) levels were eight indicating insufficient passive antibody transfer. On histopathology, a necrotising reticulitis with fungal hyphae was seen. A diagnosis of severe necrotising rumenitis, reticulitis, omasitis and abomasal ulceration with fungal involvement was reached resulting in bacteraemia and septicaemia. A lack of colostral immunity was the main predisposing factor in this case, and a review of hygiene was also recommended.

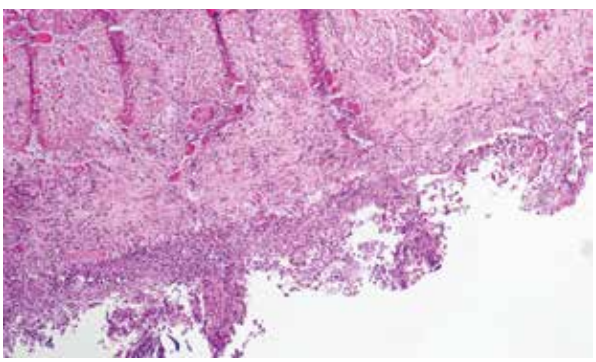

Figure 3: Necrotising reticulitis due to mycotic infection. Photo: Maresa Sheehan

RESPIRATORY TRACT

Pneumonia

A six-week-old calf was submitted to Limerick RVL with a history of respiratory disease. A significant number of calves were affected in the herd. Necropsy disclosed fluid and fibrin in the thoracic cavity and pneumonia of the cranial lung lobes. *Mannheimia haemolytica* and *Mycoplasma bovis* were detected by means of polymerase chain reaction (PCR). Histopathology disclosed suppurative bronchopneumonia and enteritis.

A four-month-old calf with a history of pneumonia and pyrexia was submitted to Sligo RVL. The calf had been treated several times but relapsed after each treatment attempt. Two other calves were affected in the group and a further three animals had died previously. Post-mortem examination revealed pneumonia affecting approximately 70% of the lung with diffuse abscessation.

M. bovis was detected from the lesions by PCR. The cause of death in this calf was diagnosed as a chronic bacterial bronchopneumonia.

Two 16-day-old dairy calves were submitted to Kilkenny RVL with a history of drooling and respiratory problems. Five had died from a group of 60 and others in the herd were showing similar clinical signs. Grossly, the first calf had raised white foci on the mucosal surfaces of the oesophagus, trachea and rumen. The lungs were oedematous and congested with fibrin focally on the pleura. There was a mild fibrin covering on the liver capsule, and the liver was tan in colour. The other calf had a diffuse fibrinous pleurisy. The right cranial lung lobe was necrotic, with the remainder of the lung lobes having a meaty consistency. Raised white foci were only observed on the rumen of this calf. Both calves were rumen drinkers. Histology findings included multifocal necrotising hepatitis, rumenitis and intra nuclear inclusion bodies consistent with infectious bovine rhinotracheitis (IBR). Bovine herpesvirus 1 (BHV1) PCR-positive results were obtained confirming a diagnosis of systemic IBR.

Figure 4: Necrotising tracheitis in a calf with systemic IBR. Photo: Aideen Kennedy.

URINARY/REPRODUCTIVE TRACT

Pyelonephritis

Limerick RVL examined a five-week-old Friesian calf with an eye infection and lameness prior to death. Despite antimicrobial treatment, it died within a few days. On post-mortem examination, there was bilateral enlargement of the kidneys with diffuse white to yellow 1mm-sized spots throughout. Culture yielded a mixed bacterial growth. On histology, lesions of multifocal embolic tubulointerstitial nephritis were seen, consistent with haematogenous bacterial infection. Bacteraemia and sepsis were the most likely causes of death.

Figure 5: Kidney of a five-week-old calf with multifocal embolic nephritis. Photo: Alan Johnson.

Omphalophlebitis

A one-day-old suckler calf was submitted to Limerick RVL with a history of sudden onset recumbency and death. A previous calf had died in similar fashion. Necropsy disclosed a thickened umbilicus and congestion of all thoracic and abdominal viscera. Petechiae were visible on the spleen. *Trueperella pyogenes* was isolated from the umbilicus, lung, liver and spleen. A diagnosis of septicaemia, likely due to umbilical infection post-calving, was made. It was suggested that the herd owner should be advised on hygiene in the calving area and on umbilical care for newborn calves.

Trueperella pyogenes

This organism has been reclassified several times and was formerly known as *Corynebacterium pyogenes, Actinomyces pyogenes* and *Arcanobacterium pyogenes*. It is a gram-positive bacterium and an extremely widespread opportunistic pathogen. It is present in the environment and in the digestive tracts of animals and has been detected in the tonsils of healthy cattle. Infections with this pathogen occur commonly in cattle, sheep and pigs, and occasionally in other species.

T. pyogenes causes pyogenic infections and is frequently isolated in the RVLs from abscesses. These may be local to the point of entry via wounds or abrasions, or anywhere throughout the body following haematogenous spread. Infection via the umbilicaus leads to omphalophlebitis and hepatic abscesses. Further common presentations are spinal abscesses in pigs after tail biting, foot abscesses or sinusitis following dehorning. It will also cause other purulent infections including pneumonia, endocarditis, arthritis, and osteomyelitis.

T. pyogenes is one of the primary isolates from summer mastitis in cattle. It is one of a number of bacteria associated with sporadic abortions; via maternal bacteraemia, it reaches the uterus and leads to foetal death. Infections due to *T. pyogenes* respond poorly to antimicrobial therapy even in the absence of antimicrobial resistance due to the purulent nature of the infection; where possible surgical drainage in combination with antimicrobials is normally required to treat abscesses caused by *T. pyogenes*.

References: Radostits Gay; Hinchcliff and Constable, Veterinary Medicine, 10th edition; Saunders, 2007; Quinn, Markey, Leonard, Fitzpatrick, Fanning and Hartigan, Veterinary Microbiology and Microbial Disease, 2nd edition, Wiley-Blackwell, 2011.

Granulosa cell tumour

A two-month-old Friesian calf was examined in Athlone RVL with a history of sudden death after feeding. The abdomen was distended, and a large volume of blood came from the vagina of the calf prior to commencing the post-mortem examination. The conjunctivae and carcase were pale. There were large blood clots free in the abdomen and the liver, lungs and heart were pale. The right ovary was massively enlarged and was approximately 12cm in diameter. There was a perforation on the surface where it had bled from into the abdominal cavity. There were multiple cyst-like structures in the ovary on cross section. There was blood in the uterus and vagina. Histopathology of ovary diagnosed a granulosa cell tumour. It was concluded that the animal died of massive haemorrhage following rupture of an ovarian granulosa cell tumour.

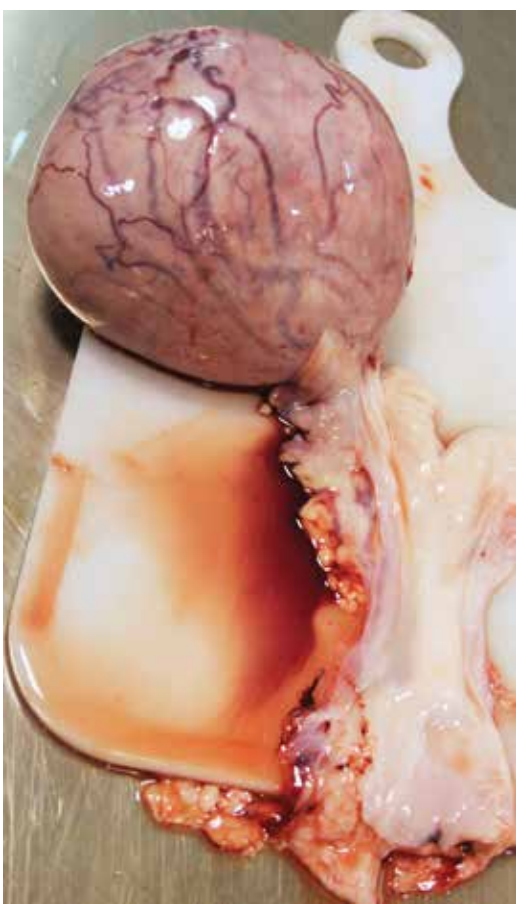

Figure 6: Enlarged ovary due to granulosa cell tumour. Photo: Denise Murphy.

Figure 7: Cross section of granulosa cell tumour in a calf. Photo: Denise Murphy.

Granulosa cell tumours are reported to be the most common ovarian tumour in cattle but are relatively rare. They occur in all age groups from young heifers to older cows. Heifers and cows with granulosa cell tumours may present with a variety of clinical signs ranging from anoestrous to nymphomania to male-like behaviour. Other clinical signs that may be present include abnormal oestrous cycles, mammary gland development and lactation in heifers. The presence of vaginal discharge and enlargement of the vulva and clitoris may also be present. Cows have also been presented for chronic weight loss due to persistent heat or male-like behaviour. These changes have been attributed to the secretion of progesterone and oestrogen from the tumour. Granulosa cell tumours vary in size and structure and are rarely malignant. They are most often unilateral and may suppress the function of the contralateral ovary. Size can vary from relatively small, solid, yellow to white structures to large structures composed of multiple cysts, a single large cystic structure, or a combination of solid and cystic structures. Haemoperitoneum caused by the rupture of a granulosa cell tumor is an uncommon sequel and clinical signs including anemia, abdominal pain and distension, and signs of hypovolaemic shock are reported.

Treatment of granulosa cell tumours is limited; unilateral ovariectomy is the only treatment option available.

CARDIOVASCULAR SYSTEM

Septal defects

Limerick RVL encountered a few cases of ventricular septal defect in young calves. In one case, a one-month-old purchased Hereford calf developed signs of respiratory distress within a week of arrival on the farm. The heartbeat was very audible to the farmer. The PVP suspected a heart defect and it was euthanased. On post-mortem examination, cardiomegaly was obvious and there was a large ventricular septal defect.

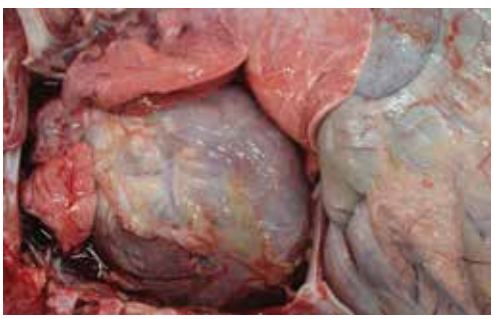

Figure 8: Cardiomegaly in a calf with a ventricular septal defect. Photo: Alan Johnson.

NERVOUS SYSTEM

At this time of year, cattle have been mostly turned out on pasture. It is worth noting that farmers and PVPs should again be vigilant for possible sources of lead on pastures. Lead poisoning is a perennial issue at this time of the year and can have significant ramifications for affected herds from the point of view of supply into the food chain.

Outbreaks are most commonly associated with old machinery and fencing batteries, old paint and on occasion, oil containers. While these sources may appear straightforward, it is worth remembering that old gates or wheels exposed to another winter may be a source of lead now as old paint (which contained high lead levels) becomes exposed due to the flaking off of a more recent paint coat.

MISCELLANEOUS

Hypogammaglobulinaemia

Two calves, less than one week of age were submitted to Kilkenny RVL with a history of lethargy and being unresponsive to treatment. Three calves had died from the group of 15. Both calves had peritonitis, pleuritis and pericarditis. The umbilicus of both calves was inflamed and enlarged. Both had sub-optimal ZST results. *E. coli* was cultured from multiple organs on both. Omphalophlebitis with bacteraemia was diagnosed as cause of death. A review of colostrum management and navel hygiene at calving was recommended.

SHEEP

Bacteraemia and septicaemia were the most common diagnoses as cause of death in sheep carcases submitted to the RVLs in March 2020.

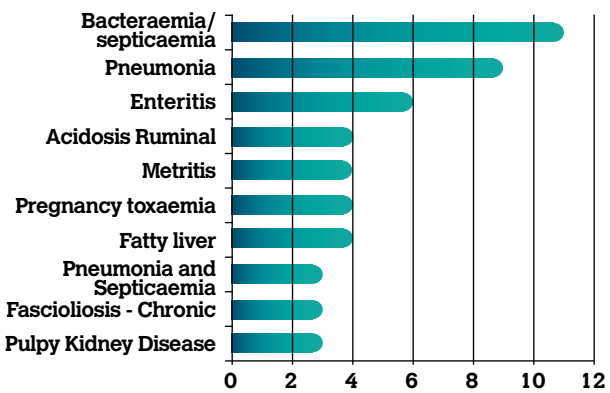

Table 2: The 10 most common diagnoses in sheep carcases (excluding foetuses) submitted to DAFM RVLs in March 2020.

GASTROINTESTINAL TRACT

Enterotoxaemia

A three-week-old lamb was submitted to Limerick RVL with a history of sudden onset recumbency and death. Necropsy disclosed inflamed intestines, liquid red intestinal contents and fibrin clots in the thoracic cavity. *Clostridium perfringens* and its alpha and epsilon toxins were detected by ELISA. A diagnosis was made of clostridial enterotoxaemia.

A two-month-old lamb was submitted to Sligo RVL with a history of sudden death. On necropsy there was oedematous abomasitis and the intestinal walls appeared thickened. Laboratory testing revealed a heavy burden of *Coccidia*. *Clostridium perfringens* and its alpha and epsilon toxins were detected in intestinal contents. Histopathology revealed a severe necrotising abomasitis with intralesional bacteria. There was also a diffuse, severe, parasitic enteritis with numerous protozoal stages present in enterocytes. Enterotoxaemia with concurrent coccidiosis was diagnosed as the cause of death.

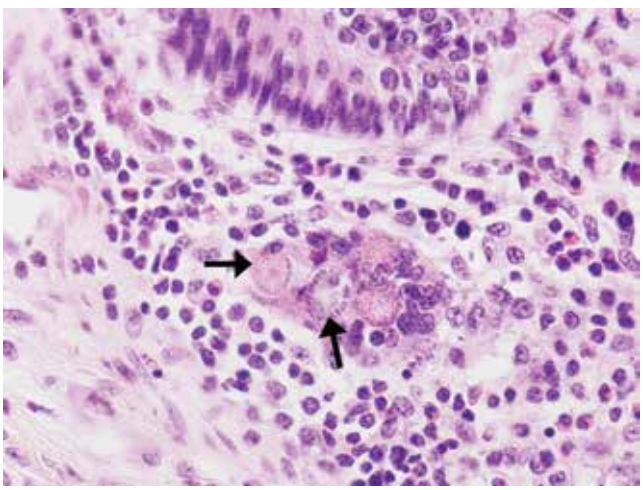

Figure 9: Several coccidial developmental stages (arrows) present in the intestinal wall of a lamb. Photo: Rebecca Froehlich-Kelly.

Ruminal bloat and rupture

Sligo RVL received a three-day-old lamb for necropsy; it was the third lamb to die within a few days on the farm after a sudden onset of bloat and diarrhoea. On post-mortem, there was a large amount of milk and stomach contents free in the abdomen. There was an ante-mortem rupture of the abomasum. The cause of death in this lamb was abomasal bloat and rupture. This may have occurred due to an inflammatory response in the abomasal tissue causing weakness but gross findings in this case were not typical of this aetiology. Bloat may also occur in lambs with excess feeding or abdominal trauma following feeding. Care was advised when feeding large amounts of milk via stomach tube.

URINARY/REPRODUCTIVE TRACT

Athlone examined a three-year-old ewe with a history of sudden death. It was the 8th similar loss. Carcase preservation was very poor with advanced tissue autolysis. There were two decomposed lambs in a ruptured uterus. There were diffuse haemorrhagic tracts of immature fluke throughout the liver, but no liver fluke were seen in the gall bladder or bile ducts. A diagnosis of acute fascioliosis was made.

NERVOUS SYSTEM

Listeriosis

An adult ewe was submitted to Kilkenny RVL for examination. She was one of four deaths out of 40 affected animals in two different pens. All four sheep were exhibiting nervous signs, such as walking aimlessly and drooling. On gross

examination, the mucous membranes were pale and there was moderate dehydration. There were bloody contents in the abomasum and small intestines, some worms were seen on gross exam. There were solid contents and undigested grain in the large intestine. A faecal egg count revealed a very high trichostrongyle egg count of 5,400 eggs per gram. Histopathology of the brain showed multifocal random areas of microabscessation, perivascular cuffing comprising multiple layers of lymphocytes, macrophages and neutrophils, and multifocal meningitis. The foci of microabscessation were associated with degeneration and necrosis of the neuropil and white matter; these foci contained gitter cells and large numbers of lymphocytes and macrophages. The lesions seen are highly suggestive of the involvement of *Listeria monocytogenes*. A review of parasite control was also recommended given the very high worm egg count. Listeriosis with concurrent parasitic gastroenteritis was diagnosed as the most likely cause of death.

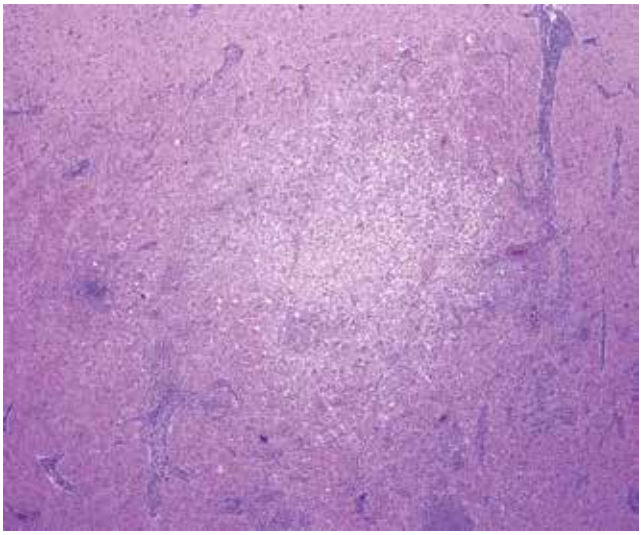

Figure 10: Focally extensive area of encephalitis with rarefaction and perivascular cuffing. Photo: Maresa Sheehan.

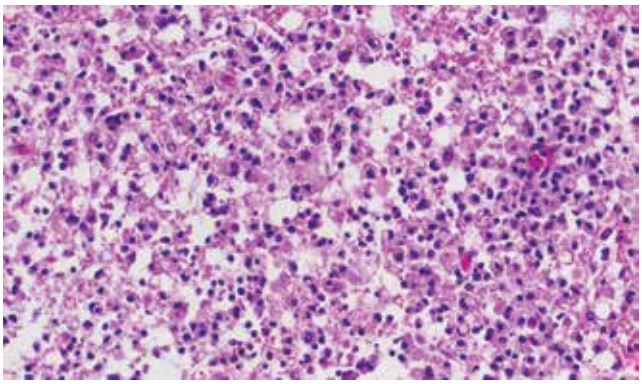

Figure 11: Higher magnification of encephalitis showing mixed inflammatory infiltrate and degeneration and necrosis. Encephalitis with suspected *Listeria monocytogenes* involvement. Photo: Maresa Sheehan.