GRAZING – WATCH OUT FOR LEAD POISONING

Lead (Pb) is the most common cause of accidental poisoning in farm animals reported to the veterinary laboratory service. Cattle are more susceptible to toxicity than horses or sheep and younger animals are affected more than older animals due to higher intestinal absorption rates (>90%) and being more prone to pica. In general, the ingestion of lead-based products such as discarded batteries and lead paint are identified in outbreaks although other lead sources such as bonfire ash have been implicated. Uncommonly, outbreaks due to the ingestion of lead-enriched soils or mine waste are reported. In Ireland, outbreaks tend to be seasonal, generally after turnout in late spring and involving a limited number of animals that have access to an isolated source. However, large outbreaks can occur where silage becomes contaminated by lead batteries accidently shredded and included in silage making. From January to July, the number of herds investigated with lead poisoning has reduced from 13 in 2017 to six in 2018.

Often, the first sign of lead poisoning in a herd, are sudden death. Clinical signs reflect the three main bodily systems affected: the central nervous system (CNS), the gastrointestinal tract (GIT) and the blood. Acutely affected cattle may display anorexia and colic, diarrhoea, anaemia and encephalopathy characterised by depression, ataxia, tremors, head-pressing, blindness and/or seizures (rare) before death. Animals that are chronically affected may display non-specific signs of abdominal discomfort, lethargy and weight loss. Occasionally, the indicative findings of pale musculature and ecchymoses of the thymus and endocardium are observed at necropsy, more rarely cerebrocortical necrosis is observed microscopically in poisoned cattle. Whole blood concentrations (lithium heparin samples) in the live animal and kidney lead concentrations in the dead animal are the diagnostic samples of choice. Blood, renal cortex and liver concentrations greater than 2.4umol/L, 120umol/kg and 96umol/kg respectively are each a sufficient basis for diagnosis of lead poisoning, although lower concentrations (>24umol/kg) may also be indicative of poisoning in certain cases, in particular in consideration of animal age and the presence of good corroborative evidence such as access to risk material or associated clinical signs in the animal.

Where lead poisoning is diagnosed in a herd, similarly exposed, but subclinical animals may exist and thus, present a risk to the food chain if adequate time has not elapsed for sufficient depletion of residues in tissues and milk. Maximum limits are set in legislation for milk, offal and meat. A coordinated response to evaluate and prevent risk to the food chain is enacted by DAFM where a diagnosis of lead poisoning is made.

CATTLE

The GIT was the most commonly affected organ system diagnosed (37.5% of cases) as cause of death in cattle excluding foetuses in May 2018.
GASTROINTESTINAL TRACT

SALMONELLOSI S

A three-month-old Friesian calf was submitted to Limerick RVL with a history of sudden death while at pasture. Other fatalities in the group were associated with some vague nervous signs before death. On post-mortem, there was reddening of sections of the small intestine with watery contents. The liver appeared congested and the spleen was enlarged. There was some consolidation of the cranial lung lobes. Salmonella Dublin was isolated from the liver, lung and intestine. Pasteurella multocida was isolated from the lung. A diagnosis of septicaemic salmonellosis was made.

URINARY/REPRODUCTIVE TRACT

NEPHRITIS

An eight-year-old cow was submitted to Cork RVL for necropsy after a sudden death. The animal had calved a dead calf three weeks before death with no apparent complications. On post-mortem examination, the kidneys were manifestly enlarged, approximately twice the size, and presented with multifocal white areas affecting mainly the capsular surface and the renal cortices (see Figures 2 and 3). Moreover, there was puerperal metritis. Trueperella pyogenes was isolated in the uterus. There was no bacterial growth from the kidneys. A polymerase chain reaction (PCR) assay for Leptospira spp yielded a negative result. Histological examination revealed scattered bacterial colonies in the renal tubules and an intense neutrophil infiltrate in the renal interstitium and the cortical tubules. The diagnosis pyelonephritis was concluded.

CONGENITAL ABNORMALITIES

Sligo RVL reported a cluster of lethal congenital abnormalities in calves during May, including three calves with atrial septal defects, one with a double outlet from the right ventricle, one with hydrocephalus and one with congenital hepatic fibrosis. Another neonate that developed sepsis in the first week of life was found to have a patent ductus arteriosus. All of the cases were believed to be sporadic and unrelated to each other.
CARDIOVASCULAR SYSTEM

MALIGNANT CATARRHAL FEVER

A 12-year-old cow was submitted to Sligo RVL for post-mortem examination. The animal had been noticed dull and anorexic for two weeks, showing slight improvement to treatment followed by relapse. During this time, she calved a dead calf and died two days later. There was an undulating high temperature. The farm is a suckler farm and had introduced sheep on the holding a few weeks before. On post-mortem examination, eyes appeared clouded and there was mucoid, flaky nasal discharge. The lungs appeared emphysematous. White-to-yellow (diphteric) adhesions were present in the trachea. There was necrotising metritis. Intestinal contents appeared mildly haemorrhagic. Ovine herpesvirus-2 (OvHV-2) was detected by PCR from tissues. OvHV-2 is one of the malignant catarrhal fever viruses (see panel below) capable of causing a very severe, acute and, generally, fatal disease in cattle. *Pseudomonas spp* was isolated from the uterus. Histopathology revealed a multifocal lymphocytic vasculitis in the central nervous system, (CNS), kidney and liver.

History, necropsy results, PCR result and histopathology suggested malignant catarrhal fever the most likely cause of death.

Malignant catarrhal fever (MCF) is a systemic infectious disease, usually fatal, that affects domestic, wild and captive ruminants. The causative agent of MCF is a virus from the herpesviridae family. Five viruses are known within this family to cause MCF but the most common are OvHV-2 carried by sheep, alcephaline herpesvirus-1 (AIHV-1) found in wildebeeste, and caprine herpesvirus-2 (CpHV-2) carried by goats. In the case of Ireland, the most important is OvHV-2. Infection in lambs occurs in utero, perinatally or by aerosol transmission at three to six months and infected lambs then become reservoirs. If there is close contact, lambs transmit the virus to the susceptible-end host, such as cattle, where the incubation period lasts for months. Even though transmission is generally by direct contact, through nasal and ocular discharges, indirect transmission through fomites has also been reported in humid areas where the virus can efficiently survive.

The clinical signs vary from different grades of acute to chronic disease. The most common symptoms are diarrhoea, fever, lacrimal and catarrhal discharge from nose and progressive bilateral corneal opacity starting at the periphery. Oral mucosa is also affected, and markedly, ulcers in tongue, hard palate and gums have been found. Skin ulceration and necrosis of muzzle and udder can also appear. In addition, decreased milk production, incoordination, and hyperaesthesia have been reported. On necropsy, haemorrhagic erosions can be found in the gastrointestinal (GI) system, and catarrhal exudate, erosions and diphtheritic membranes are described in the respiratory tract. In cattle, enlarged lymph nodes, and lymphoid infiltration in kidney and liver are reported. Also, it could appear non-suppurative meningoencephalitis with lymphocytic perivascular cuffing.

The diagnosis of the disease is based on PCR, as gold standard, to identify OvHV-2 from clinical material in MCF cases. The tissues collected for PCR should be blood, kidney, lymph nodes, intestinal wall, and brain. Reservoirs, such as sheep-induced antibodies constantly; however, antibody production in clinically-acute infected cattle is limited, so serological tests are not widely used in those cases.

Among the differential diagnosis for MCF, the diseases included should be rinderpest, bovine viral diarrhoea (BVD) mucosal disease, Infectious bovine rhinotracheitis, bluetongue, epizootic haemorrhagic disease, foot-and-mouth disease and vesicular stomatitis. For disease control, cattle should be separated from sheep or goats if they share pasture or any other area that could lead to direct contact.

TRAUMATIC PERICARDITIS

A two-year-old heifer with a history of coughing was submitted to Kilkenny RVL for necropsy. On post-mortem examination there was a severe purulent pericarditis with wire in the myocardium (see Figure 5). The reticulum was adherent to the diaphragm. *T pyogenes* was isolated in cultures from the pericardium.

NERVOUS SYSTEM

LISTERIAL MENINGOEENCEPHALITIS

A four-year-old cow with suspected hypomagnesaemia was submitted to Cork RVL for necropsy. The animal initially responded to administration of magnesium, but became recumbent and blind and was subsequently euthanised. The post-mortem examination was unremarkable.

Histological examination revealed mononuclear perivascular cuffs, microabscesses, malacia, neuronal necrosis, swollen axons and scattered aggregates of globular thrombi in some arterioles (endothelial damage). These lesions were localised in the midbrain near the origin of the trigeminal nerve and were considered to be indicative of listerial meningoencephalitis (*Listeria monocytogenes*). Lead poisoning and cerebrocortical necrosis (CCN) were ruled out early in the examination.
is actually a complicated mixture of alkaloids that are cardiotoxic. They interfere with cellular channels that cause an over-accumulation of calcium in the myocytes. They also cause bradycardia. Most cattle are found dead close to where they ingested the poisonous material as the effects are rapidly fatal and only require a small amount to be eaten.

**Figure 6:** Photomicrograph demonstrating characteristic listerial meningoencephalitis lesions in a blind recumbent cow: a microabscess (green circle) and associated area of malacia, neuronal necrosis (blue arrows) and mononuclear perivascular cuffs (red arrows). Photo: Cosme Sánchez-Miguel.

In a further case, three adult dairy cows were submitted to Kilkenny RVL with a history of nervous signs including occasional circling and staggering. Seven in the herd had shown neurological symptoms in the space of one week. The animals were treated for hypomagnesia, and also received antimicrobials and thiamine (vitamin B12). In the absence of response to treatment the cows were euthanised. The cows were at grass and had not received silage in the past month. Listeriosis was diagnosed on the basis of histological lesions. An additional cow was submitted three weeks later, again with a history of vague neurological symptoms, histological lesions were again suggestive of listeriosis.

**POISONINGS/MISCELLANEOUS COPPER POISONING**

A three-month-old calf with a history of depression and incoordination was submitted to Limerick RVL. On gross post-mortem examination there was jaundice and haemoglobinuria. Copper concentrations in the renal cortex were elevated and in the toxic range. Histopathology revealed massive liver necrosis with bile duct hyperplasia and cholestasis. Traces of copper could be confirmed in histological sections using a rubeanic acid stain. A diagnosis of copper poisoning was made and a follow-up investigation was initiated.

Sligo RVL diagnosed poisoning in a four-year old cow due to the ingestion of leaves and twigs from a yew tree. The animal had been found dead. A fallen tree branch was later discovered close to where the carcass lay. Vegetation that was recognisable as yew was detected in the reticulum and rumen (see Figure 7). All parts of the yew tree are toxic to cattle except the aril (fleshy, red, cup-shaped structure surrounding the seed). The poisonous component ‘taxine’

**Figure 7:** Yew-tree twigs recovered from the rumen of a cow which died of yew-tree poisoning. Photo: Colm Ó Muireagáin.

**SHEEP**

The respiratory tract, with 11.7% of cases, was the second most commonly affected organ system causing death in submitted sheep carcasses excluding foetuses.

**Table 2:** The most common diagnoses in the respiratory tract of sheep submitted to DAFM RVLs in May 2018.

**RESPIRATORY TRACT NECROTIC LARYNGITIS**

Athlone RVL examined a three-year-old ewe with a history of dyspnoea. She was treated with penicillin but was found dead later. There was bilateral cranio-ventral fibrinous pulmonary consolidation and a large fibrinous clot in the pericardial sac. There were bilateral necrotic pustular lesions in the laryngeal cartilage. *T. pyogenes* was isolated from a swab of the larynx. Histopathology of lung showed a suppurative bronchopneumonia. A diagnosis of necrotic laryngitis and secondary pneumonia was made.
GASTROINTESTINAL TRACT
PARASITIC GASTROENTERITIS
There were several cases of parasitic gastroenteritis submitted to Sligo RVL. *Nematodirus* spp was the most common parasite detected in May in lambs, mostly in mixed infection with trichostrongyle eggs and/or coccidial oocysts. In two cases, *Trichuris ovis* (whipworm) eggs were also present.

REPRODUCTIVE TRACT
ABORTION
Three aborted or weak born lambs were submitted to Limerick RVL as the last of a flock to lamb. Necropsy findings were unremarkable. Laboratory findings included notable toxoplasma titres as high as 1/256 on the foetal pleural fluid. Histopathology confirmed the diagnosis, showing focal areas of non suppurative encephalitis throughout the brain (see Figure 10).

CARDIOVASCULAR SYSTEM
TRAUMATIC RETICULOPERITONITIS
A five-year-old ewe was submitted to Athlone RVL for post-mortem examination with a history of pining over the previous month. There was a bread and butter fibrinous pericarditis and cardiac tamponade. There was a pustular tract through the diaphragm to the reticulum and a sewing needle was found in the reticulum (see Figure 11). A diagnosis of traumatic reticulopericarditis was made. Traumatic reticulopericarditis, while common in cattle, is very rare in sheep because they are much more discriminating in their grazing and feeding habits and less likely to swallow sharp objects.

NERVOUS SYSTEM
SPINAL ABSCESSTATION
A six-week-old lamb was submitted to Kilkenny RVL with a history of ataxia and recumbency. The lamb was euthanised as there was no response to treatment. An abscess was noted in the spinal column with an associated necrotising vertebral osteomyelitis (see Figure 12). *T pyogenes* was isolated on culture.
Infective and traumatic lesions of the spinal column are common in sheep, and can cause spinal-cord compression and dysfunction. Infectious lesions can occur at any age group but most often occur in lambs aged one to three months old. Abscesses in the vertebral body can occur as a result of the haematogenous spread of an infectious process elsewhere in the body. Often evidence of this localised infection of another organ can be difficult to identify. *T. pyogenes* and *Staphylococcus spp.* are the typical agents identified. Often, prolonged antibiotic therapy may impede bacteriological isolation. Pyogenic lesions commonly involve T2-L3 region and often at the thoracolumbar region. Sheep adopt a dog-sitting stance. The thoracic limbs have normal function and there is spastic paralysis of the pelvic limbs. Other causes of spinal cord lesions include trauma, neoplasia and iatrogenic lesions associated with intramuscular injections. Clinical signs depend on the degree and the location of the spinal cord compression.

Athlone RVL examined a two-month old lamb with a history of ataxia, suspected to be of spinal origin. There was a 10cm-sized (approximately) retroperitoneal blood clot in the abdomen at the lumbar vertebrae. The psoas muscles were bulging bilaterally and pus was evident on incision. For examination, the vertebral column was split which revealed a vertebral abscess in the last lumbar vertebra. A mixed growth of coliforms and streptococci was isolated from a swab of the lesion. A diagnosis of vertebral abscessation was made.

Figure 12: Vertebral abscessation in a two-month-old lamb. Photo: Seamus Fagan.