

## ANIMALS

# Quarterly report of diagnostic cases

### Gribbles Veterinary Pathology Bovine

From a South Canterbury farm, samples were received from a 2-month-old calf that was part of a group in which several had diarrhoea. The calves had recently been treated with anthelmintic, and faecal worm egg counts were negative. Neither *Salmonella* nor *Yersinia* bacteria were recovered from the intestinal contents. Histopathological examination of the small intestine revealed blunting of villi, neutrophils within crypts, and bacteria attached to enterocytes along the surface of the villi, with scalloping of the surface of the epithelial cells. These changes were typical of an attaching and effacing *Escherichia coli* infection.

Eight calves from a group of 50 on a South Canterbury farm became blind and ataxic. Six had already died before the attending veterinarian arrived. Samples were collected from one of the calves. Histopathological examination revealed no lesions in the brain and no acid-fast inclusions were seen in the tubular epithelial cells of the kidney. However, analysis of a heparinised blood sample showed a blood lead concentration of 2.28 mg/L (toxic level > 0.35), consistent with a diagnosis of lead toxicity. The source was lead-based paint from an old house.

A 15-month-old Jersey heifer from Northland became acutely recumbent, hypothermic, dyspnoeic, apparently blind and had bloody faeces. At necropsy the large intestine and caecum appeared haemorrhagic with intestinal congestion. Histological examination revealed abomasitis and enteritis with haemorrhage, necrosis and villous atrophy with nematode parasites and endothelial intranuclear inclusion bodies. Along with a weakly positive reaction to a bovine viral diarrhoea (BVD) antigen ELISA test, these findings suggested a combination of bovine adenovirus infection, nematode parasitism and BVD virus infection leading to the unusual finding of **adenoviral lesions with haemorrhagic enteritis** in an adult

animal (most cases of adenoviral enteritis are seen in calves under 12 months old).

A yearling beef heifer was found recumbent on a Southland sheep-and-beef farm. Its rectal temperature was subnormal and the coronary bands on all four feet were very red and congested. The udder also had red and congested teats. A blood sample showed low serum albumin (15 g/L; reference range 27–42). Ovine herpesvirus-2 (the cause of malignant catarrhal fever, MCF) was detected in the serum by PCR. Unusually, there were no signs of ocular or nasal discharge or corneal oedema in this case.

Seven 2-month-old calves from a group of 200 on a Southland dairy farm were found dull and recumbent, and two others had died. Over the next 3 days ten more calves died. Histopathologic examination showed a severe non-suppurative encephalitis consistent with a diagnosis of sporadic bovine encephalomyelitis (SBE), a *Chlamydia pecorum* infection. PCR testing of brain tissue was positive for *C. pecorum*, further supporting this diagnosis.

In late November there were a number of sporadic deaths in a group of calves on a Southland dairy farm. A large proportion of the group were coughing and most were thin, with evidence of diarrhoea (faecal staining around the hindquarters). The calves had been treated with a broad-spectrum anthelmintic about 5 weeks previously. Necropsy of one calf revealed consolidation of about 75 percent of both lungs. There were abundant adult lungworms in the larger airways. Bacterial culture of the lung was unrewarding but histopathological examination revealed a severe acute bacterial bronchopneumonia and pleuritis. *Histophilus somni* was identified by PCR in the fresh lung tissue. The respiratory syndrome associated with this infection occurs most often in young cattle, especially those kept in large groups or on feedlots.

During the spring there were multiple outbreaks of *Salmonella* **Brandenburg** infection in young dairy calves on several properties in Canterbury and Westland.

The calves were generally 1–4 weeks old and displayed diarrhoea, lethargy and weakness. Some deaths occurred. Diarrhoeal disease in calves is now a very common manifestation of this infection in these regions, although diarrhoea, abortion and sometimes fatal sepsis in adult sheep and cattle are also seen.

### Other Bovidae

Several water buffalo (*Bubalus bubalis*) calves from Franklin died suddenly. Histopathological examination revealed lymphocytic vasculitis in the abomasum, heart, kidney, lung and liver, but not the brain. This was considered highly suspicious for **malignant catarrhal fever virus** (MCF) infection. The property had no sheep, but did have goats. PCR for ovine herpesvirus-2 (OvHV-2), the cause of MCF, was negative on frozen spleen and lymph node samples, but positive on formalin-fixed tissues, which was unusual. Additional PCR tests for caprine herpesvirus-2 (CpHV-2) were performed, as there have been reports of possible caprine-associated MCF in domestic water buffalo, but results were negative. MCF is usually sporadic, but outbreaks can occur. High stocking density and stress are suspected to be predisposing factors. Sources of infection can include deer and sheep. Disease is the result of cross-species infection by viruses from the MCF group of ruminant rhadinoviruses, which are highly cell-associated lymphotropic herpesviruses. Mortality in susceptible species approaches 100 percent, although there are rare recorded cases of chronic infection or recovery, especially in infected goats, bison, cattle and pigs. Although the agent is transmissible, the disease does not appear to be contagious among cattle or bison by direct contact. Sheep-associated MCF occurs where bovines or deer have an association with sheep, though direct or close contact is not necessarily required. There is considerable variation in the susceptibility of various ruminant species to sheep-associated MCF. Domestic cattle (*Bos taurus* and *B. indicus*) appear to require high levels of exposure to induce disease. In contrast, Bali

cattle or banteng (*Bos javanicus*), the domestic water buffalo (*Bubalus bubalis*), American bison (*Bison bison*) and most species of deer, with the exception of fallow deer (*Dama dama*), seem to be highly susceptible.

A 6-year-old bison (*Bison bison*) in a zoo had been unwell and inappetent for 96 hours and died shortly before it was to be sedated for examination. Necropsy revealed that the animal was in good body condition. There was reddening of the abomasal mucosa and parts of the intestinal mucosa. The most notable lesions seen on histopathological examination were in the liver. The portal areas were expanded with abundant large lymphocytes and there was a similar cellular infiltration of the walls of the portal veins. These findings were suspicious for malignant catarrhal fever. Subsequent PCR testing for **ovine herpesvirus-2** on a mesenteric lymph node was positive, confirming this diagnosis.

## Ovine

On a large Southland sheep farm with 5,000 ewes, six 1-month-old lambs were found dead over a period of a few days. One lamb was necropsied by the attending veterinarian, who found large subcutaneous areas of haemorrhage over one side of the chest and the sternum, along with a thick layer of fibrin covering the congested lungs. Histological examination showed a severe fibrinous pleuritis and alveolar collapse. Sections from the affected area of skin on the chest showed a severe necrotising dermatitis and panniculitis with large areas of haemorrhage and occasional large colonies of bacilli. *Mannheimia haemolytica* was isolated from the pleural lesion. This is a common cause of bronchopneumonia in sheep, particularly in young animals around weaning age, and septicaemia may sometimes occur.

On a large Otago sheep farm 2,300 hoggets were yarded for shearing. About 24 hours later, while still in the yards, they were treated with a combination drench containing three different anthelmintics, including levamisole. Drenching treatment was halted after 26 hoggets died within a few minutes of being treated. Two days later the remainder of the group were drenched. There were no further immediate deaths but the next morning eight more animals were found dead. Two sick hoggets

recovered. On investigation it was found that the dose of anthelmintic used was 2–3 times higher than recommended. Necropsy of one animal showed only a mild, patchy consolidation of the lungs, and no significant lesions were found on histopathological examination of a range of tissues. The circumstantial evidence in this case strongly suggested that the deaths were the result of **levamisole toxicity**.

Three Arapawa lambs died suddenly on a Canterbury property at 2–3 months of age. The lambs had been treated with anthelmintic a month previously. They had not been vaccinated against clostridial diseases but the ewes had been vaccinated prior to lambing. Necropsy revealed excessive pericardial fluid. The brain showed no obvious fluorescence under ultraviolet light. Histopathological examination showed focal proteinaceous oedema in the meninges of the cerebellum and around blood vessels in the cerebellum and corona radiata. There was vacuolation of the cerebral cortex, with scattered proteinaceous perivascular droplets and proteinaceous fluid in the connective tissue around some arterioles in the inner cortex of the kidney. The lesions in the brain were considered typical of enterotoxaemia caused by *Clostridium perfringens* type D. The perivascular oedema in the kidney was unusual but was also attributed to the effects of the epsilon toxin responsible for this disease.

## Caprine

Eight Angora goats from a herd of 300 near Warkworth had an acute onset of neurological signs (circling). Three died. They had been fed mouldy baleage. Histopathological examination of the brain from one animal showed a moderate, multifocal, subacute meningoencephalitis with moderate numbers of gram-positive, short bacilli in the areas of inflammation, consistent with a diagnosis of listeriosis. Bacterial encephalitis caused by *Listeria monocytogenes* usually occurs in winter and spring in adult ruminants. The bacteria reside in the environment (especially in silage and soil) and in ruminant faeces. It is thought that initial infection in the nasal or oral cavity spreads by local invasion to the cranial nerves and then to the brain. Listeriosis can be sporadic, but outbreaks can be associated with feeding silage or baleage.

## Porcine

An 11-year-old kunekune sow from Auckland was euthanased after a mass in the uterus was discovered. Histopathological examination revealed that the mass was a uterine adenocarcinoma with intravascular invasion, necrosis and mineralisation. The lungs, heart, kidneys, adrenal glands and abdominal lymph nodes were all found to contain multiple metastatic adenocarcinomas. Uterine (endometrial) carcinoma is rare in domestic animals but there have been several reports from pigs, including in studies of pet pigs. This type of pig seems to have a tendency to develop hyperplastic and neoplastic uterine lesions, especially in older sows. The tumours generally metastasise to the lungs and regional lymph nodes.

In Canterbury, skin swabs were collected from two pigs that were showing clinical signs typical of greasy pig disease (brown, greasy areas of the skin with scales and scabs). *Staphylococcus hyicus* was isolated from both, supporting the clinical diagnosis. The isolates were sensitive to amoxicillin with clavulanic acid, trimethoprim with sulphamethoxazole, and ceftiofur, neomycin, erythromycin, and marbofloxacin, but resistant to penicillin, ampicillin and tetracycline.

## Camelid

An alpaca of unspecified age from a property in Wairarapa was lethargic and had pale mucous membranes. Examination of a blood sample showed changes consistent with iron-deficiency anaemia, with haematocrit 0.09 (reference range 0.24–0.40), marked hypochromasia, microcytosis and significant numbers of dacryocytes and fusiform cells. A faecal egg count showed 15,700 strongyle eggs per gram (epg) of faeces. In alpaca, counts over 300–400 epg are considered high and haemonchosis should be a consideration in these circumstances. The serum copper concentration was 1.0  $\mu\text{mol/L}$  (reference range 5.2–16), likely signifying a copper deficiency that had arisen secondary to the parasitism and which may have been contributing to the anaemia, as copper is required for the utilisation of iron and its absorption from the gastrointestinal tract. The anaemia was likely the result of combined **parasitism and copper deficiency**.

Three alpaca from Northland were reported to be very sick and one died before the veterinarian arrived. The other two animals were found to be in shock, with severe dehydration, tachycardia, hypothermia and haematuria. The owner had placed clippings of oleander (*Nerium oleander*) on a bonfire 2 days previously. Necropsy of one alpaca revealed large ecchymotic haemorrhages in the heart, along with reddened mucous membranes and regions of reddening in the small intestine. Histopathological examination showed multifocal myocardial necrosis and haemorrhage, consistent with **oleander toxicity**. Oleander contains a cardiac glycoside (oleandrin) with a structure similar to digoxin.

## Equine

A veterinarian was called to examine a 2-year-old Standardbred horse from Canterbury that had a fleshy mass protruding from the rectum. Histopathological examination of sampled tissue revealed this to be a **rectal adenoma**. Rectal adenomas are commonly recognised in dogs but rarely seen in horses.

A 19-year-old Clydesdale cross horse from Mid Canterbury developed a small mass on the edge of the third eyelid. Histopathological examination showed that this was a **squamous cell carcinoma**. The surrounding tissue had solar elastosis. It is likely that this tumour was induced by ultraviolet solar radiation.

A 14-year-old Thoroughbred horse from Northland had bilateral uveitis characterised by blepharospasm, epiphora and miosis. There was no corneal ulceration. Clinical response to topical corticosteroids in combination with systemic non-steroidal anti-inflammatory drugs was slow. Serum haematology and biochemistry revealed only minor changes, with eosinophils  $0.4 \times 10^9/L$  (reference range  $0-0.03 \times 10^9$ ), creatinine  $80 \mu\text{mol}/L$  (reference range  $81-164$ ), phosphate  $1.05 \text{ mmol}/L$  (reference range  $1.2-2.2$ ), albumin  $33 \text{ g}/L$  (reference range  $34-41$ ), bilirubin  $13.2 \mu\text{mol}/L$  (reference range  $40-100$ ) and creatine kinase  $392 \text{ IU}/L$  (reference range  $0-410$ ). Serological testing revealed a 1:1,600 titre to **Leptospira serovar Pomona** in the microscopic agglutination test, suggesting the horse could have leptospirosis-associated uveitis. The syndrome of "equine recurrent uveitis" has been linked to leptospirosis infection,

possibly with some component of auto-immunity in its pathogenesis.

A Thoroughbred foal from Auckland had purulent fluid aspirated from a distal radial physis. Culture of a swab produced a heavy growth of **Salmonella Typhimurium phage type 56** variant, consistent with **Salmonella** osteomyelitis. **Salmonella** spp. can cause osteomyelitis in this location secondary to septicemia in foals, typically when they are less than 4 months of age. Other bacteria that may cause this type of lesion include *Escherichia coli*, *Streptococcus* spp., *Klebsiella* spp. and *Rhodococcus equi*.

Three foals less than a week old on a large horse-breeding establishment in Otago became unwell and developed a severe diarrhoea. The first two affected animals died despite intensive supportive treatment. The first foal had been sick for 5 days before it died. Necropsy of this foal revealed a severe enterocolitis. No significant enteric bacteria were isolated on routine culture but histopathological examination revealed severe coagulative necrosis of the intestinal mucosa. The luminal surface of the affected mucosa was lined with abundant large blunt-ended gram-positive bacilli resembling a *Clostridium* species. The second foal had been sick for only 24 hours when it died at 2 days of age. Histopathological examination revealed similar changes in the intestinal mucosa, and routine bacterial culture was again negative. However, PCR tests of the intestinal contents for *Clostridium difficile* toxins A and B were positive for both foals, supporting a diagnosis of **Clostridium-associated enterocolitis**. A third sick foal was treated with metronidazole and a broad-spectrum antibiotic, using a stomach tube, and it recovered rapidly. It is unusual to see outbreaks of *Clostridium*-associated enterocolitis. It was of interest that in this case the mares and foals were living in a muddy paddock with large puddles, as there had been a lot of rain over a short period. The mares and remaining foals were moved to drier paddocks and no more cases were reported.

## Avian

A 7-month-old domestic chicken from Auckland exhibited weakness of the legs. It was euthanased and samples of sciatic nerve, adipose tissue, duodenum and pancreas were submitted to the laboratory. Histopathological

examination showed infiltration of all the tissues with sheets of neoplastic large lymphocytes, consistent with lymphoma. In birds, lymphoma can be induced by the viruses that cause **Marek's disease** or lymphoid leukosis. These two diseases are difficult to differentiate histologically, but finding neoplastic lymphoid infiltrates in the peripheral nerves (as in this bird), or in the iris or brain, supports a diagnosis of Marek's disease. This disease is common in New Zealand and is caused by an alpha-herpesvirus. It primarily affects chickens (Fletcher & Abdul-Aziz, 2008).

An 11-month-old scarlet macaw (*Ara macao*) from Marlborough was found dead. The bird was in poor body condition. Histopathological examination revealed a multifocal necrotising heterophilic and granulomatous hepatitis, splenitis and pneumonia. The lesions were moderate to severe and subacute to chronic. Gram-negative bacteria suspicious of *Yersinia*, *Salmonella* or *Escherichia coli* were seen within the lesions. This severe bacteraemia was considered to be the cause of death. The lesions were at least several days old. The poor body condition must have developed over a period of weeks rather than days, and this may have been a predisposing factor, but chronic infection was also a possible cause. There was no histopathological evidence of underlying viral or chlamydial infection.

A female kahu/harrier hawk (*Circus approximans*) in a raptor rescue facility suddenly became very weak and began convulsing and vomiting. The concentration of lead in a blood sample was found to be very high at  $5.46 \text{ mg}/L$ , confirming **lead toxicity**. No reference range was available for this species, but in general a blood lead concentration of  $0.2 \text{ mg}/L$  or more in birds suggests acute lead toxicity if there are supportive clinical signs. The source of the lead could not be determined.

A group of pateke/brown teal (*Anas chlorotis*) hatched at a captive breeding facility in Canterbury were transferred into an aviary of their own at 7 weeks of age. Their weights were within expectations for their age and they appeared clinically normal despite a recent influx of mice in the parent aviary. Routine screening of faeces showed no evidence of worms but *Yersinia kristensenii* was isolated from the faeces.

This organism is not usually considered to be a pathogen but its epidemiology is unclear. It has been reported previously in kiwi creches but we are not aware of any reports from pateke.

## Canine

A swab was taken from the left ear canal of a 13-year-old desexed female Schnauzer from Christchurch. The dog had a history of left otitis externa and otitis media with rupture of the tympanic membrane. There were severe ulcerative lesions of the ear canal and pinna, with discharge from the middle ear. Facial nerve paralysis was also evident. Previous culture had found *Pseudomonas aeruginosa* and the dog had been treated with enrofloxacin. No bacteria were cultured from the new swab, but there was a pure growth of *Aspergillus fumigatus*, confirming **mycotic otitis externa and otitis media**. This condition is uncommon but is often associated with immune suppression, otic foreign bodies and, commonly, a history of prior antibiotic use (Goodale, 2016).

A 2-year-old male German shepherd from Canterbury had recurrence of a painful subcutaneous mass on the left thorax, which had initially been successfully treated with amoxicillin/clavulanic acid 6 weeks previously. Cytology performed at the clinic at that time was reported to show infectious cells (presumed to indicate neutrophils). A swab was collected from the lesion and bacterial culture revealed scant growth of an *Actinomyces* species most closely resembling *Actinomyces hordeovulneris*. Methods of identifying this organism included matrix-assisted laser desorption ionisation time of flight mass spectrometry (MALDI-TOF MS) at a referral laboratory. This supported a diagnosis of **subcutaneous actinomycosis**. The organism was sensitive to most commonly used antibiotics when tested by the disc diffusion method, including amoxicillin and clavulanic acid, which had been used previously with some clinical success. *Actinomyces* infection commonly results in pyogranulomatous inflammation and is frequently associated with migrating grass awns that have been inhaled or ingested, or that have penetrated the skin. This can result in abscesses within body cavities, internal organs, the central nervous system and also subcutaneous tissues (Sykes, 2012). It is likely that

the presence of a grass awn at this site resulted in the recurrence of the lesion in this case.

## Feline

A 10-month-old neutered male Persian cat from Queenstown was presented for veterinary examination with chronic mucoid, bloody diarrhoea. The veterinarian noted that the cat was small for its age. It had been treated previously with metronidazole and spiramycin antimicrobials and the broad-spectrum anthelmintic fenbendazole. There was no reported improvement following this treatment, but a subsequent change of diet did appear to result in some improvement. PCR testing of a faecal sample did not detect any *Tritrichomas fetus* genetic material, and ELISA tests for *Giardia* and *Cryptosporidium* were negative, but a faecal egg count showed 250 ascarid eggs per gram of faeces, which was surprising given the recent anthelmintic treatment. There was also a heavy growth of a ***Salmonella* species**. These findings supported a diagnosis of **salmonellosis with concurrent ascarid parasitism**.

A 15-year-old tiger from a zoological collection was anorexic and lethargic for 2 months. The clinical signs appeared to respond to non-steroidal and steroidal anti-inflammatory drugs. Serial serum biochemistry and haematology were unremarkable apart from hyperglobulinaemia, with globulin 60 g/L (reference range 21–45). A splenic mass was found on abdominal ultrasound. Biopsies were collected from the mass and the ileocaecal lymph node for histological examination, along with fine-needle aspirate samples from peripheral nodes for cytological examination. Results of both examinations were similar and revealed the presence of neoplastic intermediate to large lymphocytes, consistent with a diagnosis of **lymphoma**. Non-domestic felids are prone to many of the same neoplastic diseases as domestic cats, with lymphoma reported in African lions and more rarely in cheetahs or cougars. In lions, lymphoma occurs most often in the spleen and a T-cell origin is commonly reported.

## Marsupial

Four sick Australian brushtail possums (*Trichosurus vulpecula*) in poor body condition were found on an Otago farm over a 2-month period. One,

which was found emaciated and dull with neurological signs, was killed and necropsied. There were no gross changes at necropsy but histopathological examination of a range of tissues revealed changes consistent with **wobbly possum disease** in the liver and the brain. The characteristic histopathological feature of this disease is perivascular infiltration with mononuclear cells in multiple organs including the liver, spleen, brain and kidney. This disease was first reported in captive possums in 1995 and later also found in wild animals. A novel nidovirus was identified in affected animals in 2011. The virus is probably endemic in possums in New Zealand. It only occasionally results in clinical signs and death. It is suspected that disease is more likely to be manifest if the possum population is under some type of stress.

## Otariidae

A wild New Zealand fur seal/kekeno (*Arctocephalus forsteri*) was euthanased after being found on an Auckland beach with severe wounds on the hind flippers. There was concern that members of the public might recently have inflicted trauma. Histopathological examination showed that the subcutis in the region of the left groin contained multiple **granulomas with intralesional cestodes** (presumptive *Diphyllobothrium* and/or *Phyllobothrium* species). The stomach had a moderate multifocal subacute ulcerative gastritis with numerous luminal nematode parasites presumed to be ascarids (*Contracaecum* and/or *Anisakis* species). The airways of the lungs contained numerous nematodes with larvae (presumptive *Parafilaroides* species). The large intestine contained numerous luminal cestodes. Infection with multiple parasites is common in this species. The right flipper had a severe regionally extensive subacute laceration with dermatitis, cellulitis, myositis, granulation tissue and superficial mixed bacteria. The flipper wound was estimated to be at least 3–5 days old, which meant that it had occurred before the seal was found on the beach. The origin of the wounds could not be determined. Natural predators of this species include great white and sevengill sharks, sea lions, orca and leopard seals.

## Reptilian

A male grand skink (*Oligosoma grande*) from Auckland had a history

of chronic weight loss and infection of the hemipenes (paired intermittent hemipenis organs characteristic of squamates), and was euthanased. Histopathological examination showed that multiple organs including the liver, kidney, testis, lung, coelom and epicardium contained chronic multifocal active granulomatous inflammation with short acid-fast bacilli (presumptive *Mycobacterium* species) identified in Zeihl-Neelsen-stained sections. The skeletal muscle (especially in the tail, pelvic and head regions) and kidney had large foci of inflammation with circular cytoplasmic structures (skeletal myofibers and macrophages) of 6–20 round organisms about 2 mm in diameter (presumptive **microsporidia**). In the hemipenes region there was a bilateral dermatitis with numerous mixed bacteria. These included gram-negative short rods, gram-positive cocci and short rods, and mixed fungal hyphae that were narrow to wide, even to uneven, walled, branching and septate. It was thought likely that the chronic mycobacterial infection resulted in immunosuppression with secondary bacterial, microsporidial and hyphate fungal infections. The skeletal muscles of the pelvic area and tail would have been severely affected, making movement difficult.

## Piscine

A school shark (*Galeorhinus galeus*) in an aquarium was euthanased after a bite wound on its tail developed a green colouration and was found to contain a malodorous, gelatinous fluid. Histopathological examination of the lesion revealed severe acute regionally extensive ulceration with haemorrhage, necrosis, cellulitis and myositis, and short curved gram-negative bacilli were present. *Photobacterium damsela* ssp. *damsela* (formerly *Vibrio damsela*) was cultured from the wound. This marine halophilic bacterium causes infections and fatal disease in a wide range of marine animals and in humans. Initially isolated in 1981 as the causative agent of skin ulcers in damselfish, it is a primary pathogen causing ulcers and haemorrhagic septicemia in a number of marine animals including sharks, dolphins and shrimps, as well as in wild and cultivated fish. Most of the reported infections in humans originate in wounds inflicted while handling fish, or are associated with exposure to seawater and marine animals or eating raw seafood.

## New Zealand Veterinary Pathology Bovine

On a Waikato property, four out of a mob of 45 Murray Grey cows aged 2 years presented with very light body condition and loose faeces. Faecal samples from three of the animals revealed 50–1,050 strongyle eggs per gram, with the most severely affected animal having the highest egg count. Serology on all four cows was negative for bovine viral diarrhoea virus antigen by ELISA but there was a medium pooled result for *Fasciola hepatica* ELISA, with an estimated 20–50 percent of animals infected. All four affected animals had low serum copper levels (3.1–7.7 µmol/L; reference range 8.0–22.0). A diagnosis of **copper deficiency** was made, which may have been due to low copper intake or induced deficiency as a result of excessive molybdenum and sulphur intake. This was complicated by **endoparasitism** in these animals.

A first-calving heifer from Waipa presented with a fractured leg. A fresh liver sample was submitted for copper analysis, with a result of 41 µmol/kg (reference range 95–2,000). **Copper deficiency** is a risk factor for fractures, often of the humerus, in the absence of a history of trauma. Copper is required for the enzyme lysyl oxidase, which is involved in forming collagen cross-linkages. If this process is compromised, bone strength may be decreased.

On a property in South Taranaki, two rising-1-year-old cattle from a mob of 140 presented with lethargy and clinical signs of anaemia. EDTA blood samples from both animals revealed *Theileria orientalis Ikeda* by PCR, leading to a diagnosis of **theileriosis**.

Two out of four Lowline Angus cows aborted on a lifestyle property in Kāpiti. Examination of one aborted fetus revealed that it was moderately autolysed, with an estimated gestational age of 120 days. No gross lesions were present, but histology revealed foci of necrosis and chronic inflammation in the brain and heart. A presumptive diagnosis of **abortion** caused by *Neospora caninum* infection was made. Outcomes of congenital infection with *N. caninum* range from early embryonic death to abortion to congenital defects to production of a normal calf, depending on the gestational age at infection.

A middle-aged Friesian cross cow from a property in New Plymouth presented with disseminated, variably alopecic and sometimes ulcerated cutaneous nodules 1–4 cm in diameter. Over a period of 4–6 weeks the nodules had spread to cover the entire body. A wedge biopsy from a nodule was submitted for histopathology, revealing effacement of the dermis by closely packed sheets of medium to large lymphocytes with a high mitotic rate (60 figures per ten 400x fields). Neoplastic cells extensively infiltrated the epidermis and follicular epithelium, leading to a diagnosis of **epitheliotropic lymphoma**. This is a form of **T-cell lymphoma** uncommonly reported in cattle and considered to be a sporadic disease. Advanced disease may progress to involve the lymph nodes and viscera.

Two dairy heifers in Northland were found dead, less than 500 m apart. The animals had breached a farm fence and entered an area containing sodium fluoroacetate (1080) bait stations, which were found to be disrupted and empty. The carcasses were at least 4 days old when skeletal muscle and rumen contents were submitted for 1080 analysis. Although 1080 is highly labile and may not be detected 24–48 hours after death, it was found in all samples in varying levels, up to 0.54 µg/g in the rumen contents from one cow. These results implicated **1080 toxicosis** as the cause of death.

Increased numbers of mature Friesian/Jersey cross cows on a dairy property in Taupo were presenting with mastitis and not responding to treatment. Milk culture from an infected animal revealed moderate growths of both *Corynebacterium* sp. and a *Pseudomonas* sp. (not *P. aeruginosa*). *Corynebacterium* spp. (including *C. bovis*) are considered to be opportunistic mammary pathogens that may be associated with suppurative lymphoplasmacytic or mixed inflammatory infiltrates in mammary tissue (Bianchi et al., 2019), but can also colonise the distal teat canal without inducing mastitis. The contribution from the *Pseudomonas* sp. isolate is uncertain, but some species (especially *P. aeruginosa*) can form biofilms that reduce antibiotic efficacy (Park et al., 2014). In addition, *Pseudomonas* spp. can survive in chlorhexidine-based products, and

infections have been caused by using contaminated dry cow therapy tubes and contaminated hot water.

An adult beef cow from a property in Hauraki presented with a very large swelling in the back of the throat, about three times the size of a tennis ball. A biopsy taken for histopathology revealed coalescing pyogranulomatous inflammation centred on aggregates of bacteria forming club colonies. Gram stain revealed indistinct gram-negative bacteria within the club colonies. A presumptive diagnosis of **actinobacillosis** was made.

A 4-month-old Friesian cross heifer calf from Waikato presented with lethargy, pale mucous membranes, anorexia and haemorrhagic scouring. A faecal sample revealed moderate to high numbers of coccidial oocysts, leading to a diagnosis of **coccidiosis**. Coccidiosis primarily causes clinical disease in cattle aged 3–8 months, although younger animals and adults can also be affected.

A 17-month-old dairy heifer from New Plymouth presented with ill-thrift and diarrhoea. A faecal egg count was negative for parasites, and an ELISA test for BVD antigen was negative. Faecal culture revealed a heavy growth of **Yersinia pseudotuberculosis**. **Yersiniosis** is most commonly diagnosed in weaned calves, yearlings and young adults. Clinical disease is more common in winter and spring, with environmental or management stress factors increasing the risk.

A property in Waikato had recurrent problems with pinkeye or conjunctivitis in Friesian cows. Three ocular swabs were submitted for culture, and **Moraxella bovoculi** was isolated from two (identified by the Bruker Maldi biotyping method). While *M. bovis* is historically considered to be the primary agent involved in **infectious bovine keratoconjunctivitis**, *M. bovoculi* and *M. ovis* can also be involved in clinical cases.

## Ovine

A submission of mastitic milk from a Waikato property yielded a heavy growth of **Mannheimia haemolytica**. This organism has the potential to cause severe peracute **mastitis** and gangrenous necrosis of the udder, with potential for toxæmia and death. Teat lesions may increase the risk of infection.

Six Texel/Suffolk cross lambs were born in Napier with tremors and hindquarter ataxia. The affected lambs showed normal appetite and weight gain, with no progression of neurological signs. A ram lamb was sacrificed at 1 month of age for further investigation. Histology of the central nervous system showed hypomyelinogenesis in white-matter tracts of the cerebellum and spinal cord, consistent with **hairy shaker/border disease**, although PCR was not performed to confirm a diagnosis. This disorder is due to congenital infection with **border disease virus**, a pestivirus closely related to BVD virus. Fetal lambs infected after 85 days' gestation are usually born normal, but prior to 85 days there is insufficient development of the fetal immune system and infection typically results in abortion or birth of live lambs with some degree of damage to the nervous system and skin (known as "hairy shakers"). These lambs are immunotolerant to the virus and remain persistently infected.

A property in Taupo had lambs under 12 months of age presenting with clinical signs described as "swayback". Fresh liver from an affected lamb submitted for copper analysis had 53 µmol/kg (reference range 95–2,000), confirming **copper deficiency**. **Swayback or enzootic ataxia** is associated with copper deficiency, which decreases the activity of multiple enzymes including cytochrome oxidase. This enzyme is involved in phospholipid synthesis and needed to develop normal myelin sheaths around nerve fibres. Copper deficiency prior to parturition can induce congenital disease, while a deficiency at or after the time of birth results in delayed onset of clinical signs.

## Equine

A 9-year-old Thoroughbred mare in Palmerston North presented with clinical signs of toxæmia. The mare had recently foaled. Abdominocentesis revealed opaque, red-to-brown fluid with marginally increased nucleated cells ( $1.8 \times 10^9/L$ ; reference range  $0-1 \times 10^9$ ), increased RBC ( $0.8 \times 10^{12}/L$ ; reference 0), and elevated fluid protein (45 g/L; reference range 0–25). Despite the low cellularity, cytology revealed **septic suppurative inflammation** with mixed bacteria. Additionally, there were several large ovoid ciliate organisms characterised by a dense

ovoid eccentrically placed macronucleus, multiple internal granules and vacuoles, and bipolar tufts of cilia (**Figure 1**). Based on morphology, these organisms were suspected to be **Polymorphella sp.**, and the presence within the abdominal fluid with concurrent septic inflammation was strongly suggestive of **large intestinal rupture**. Post-mortem examination confirmed rupture of the colon, consistent with a foaling injury.

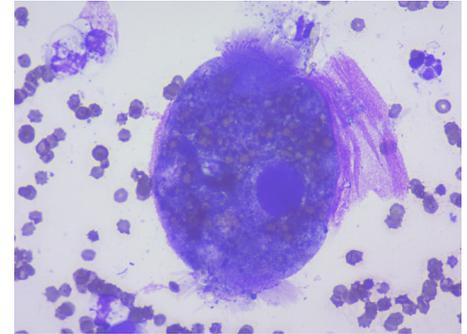


Figure 1: Ciliate organism found on cytology of peritoneal fluid. Its morphology suggests *Polymorphella* (Diff-Quik stain, 500x magnification).

A yearling Thoroughbred colt presented in Auckland with a history of severe weight loss over a period of 4 months, followed by acute colic. On post-mortem examination an abscess-like lesion was identified surrounding part of the jejunum. Histopathology revealed that the lesion was composed of sheets of neoplastic lymphoid cells, which also infiltrated the mucosa, submucosa and muscularis of the small intestine. Scattered epithelioid and multinucleated cells were also noted. Ziehl-Neelsen staining was performed to rule out concurrent mycobacterial infection, and was negative. A diagnosis of **intestinal lymphoma** was made.

## Caprine

A single 4-year-old wether from Kapiti presented with bilaterally swollen carpal joints. Serology was positive for **caprine arthritis encephalitis virus** by antibody ELISA test. This infection is present in many herds within New Zealand, and most commonly leads to chronic arthritis in mature animals. Disease is exacerbated by stress.

## Lagomorph

A captive and partially spayed (ovaries retained) 7-year-old female Flemish Giant rabbit from Horowhenua presented with an 8 x 10-cm ulcerated ventral abdominal mass with a small

satellite nodule. Histopathology of both lesions revealed a poorly differentiated carcinoma with production of myxoid matrix, presumed to be poorly differentiated **mammary carcinoma**. Mammary neoplasms are relatively uncommon in rabbits, but have been diagnosed in conjunction with uterine adenocarcinoma. It is unknown whether the partial-spaying procedure in this animal had been performed in response to uterine neoplasia. Most mammary tumours diagnosed in rabbits are malignant.

## Avian

An adult bantam hen from a backyard situation in Tauranga presented with weight loss; another had died suddenly without clinical signs. A small-intestinal mucosal swab and a piece of fresh liver were submitted for culture and **Salmonella Typhimurium** was isolated from both samples. This is an important zoonotic infection and is often subclinical in poultry. It is important to maintain good hygiene practices with backyard poultry, including hand-washing after working with the birds or their environment, preventing birds from entering the house (especially where food is prepared) and supervising children under the age of 5 to prevent facial contact and ensure hand-washing.

A 1-year-old male little spotted kiwi (*Apteryx owenii*) presented with persistent neurological signs consisting of ataxia and hypermetric gait. Paired serology for *Toxoplasma* was performed, with the first sample yielding an increased titre of 1:1,024, and a second sample 3 weeks later yielding a higher titre of 1:4,096. These results indicated recent ***Toxoplasma gondii*** infection, which likely explained the clinical signs. *T. gondii* can cause fatal disease in a number of native New Zealand birds (Howe et al., 2014).

A captive male monal (*Lophophora* sp.) in Wellington presented with a prior history of a galvanised intestinal foreign body. Follow-up serum zinc analysis was performed, with a result of 54.6  $\mu\text{mol/L}$ ; levels > 30 are considered diagnostic for **zinc toxicity**. Zinc toxicity in birds can present with a wide range of clinical signs, including weakness and neurological signs, urinary signs, gastrointestinal disease, feather-picking and death.

## SVS Laboratories Bovine

Mastitic milk samples from two cows on the same farm in Hauraki were submitted to the laboratory for culture. *Nocardia* sp. was isolated in pure culture from both samples. ***Nocardia mastitis*** often appears as mastitis that is refractory to treatment. It is often the result of soil contamination of teat tips, udders or milking equipment, or using intramammary preparations.

A heifer from a Waipa farm was euthanased owing to a **fractured humerus**. This was the third heifer in the group to have a broken humerus. The copper level in a liver sample collected at post-mortem was below the detection limit of 50  $\mu\text{mol/kg}$  (reference range 95–2,000), confirming **copper deficiency**.

A rising-2-year-old heifer died after being seen straining to defecate the previous day. Two weeks previously, two heifers from the same group had been seen with similar clinical signs and one of them had died. Ruminal acidosis was suspected clinically and a range of fixed tissues were sent to the lab for histopathology. There was neutrophilic rumenitis and reticulitis with ulcerations, which may be seen with ruminal acidosis but also with infectious diseases. Three weeks later a third animal from the same group was dehydrated, with decreased rumination and multiple oral ulcerations. Haematology revealed a marked inflammatory leukogram, with neutrophils  $0.7 \times 10^9/\text{L}$  (reference range  $1.0\text{--}4.6 \times 10^9$ ), band neutrophils  $4.2 \times 10^9/\text{L}$  (reference range  $0.0\text{--}0.3 \times 10^9$ ), metamyelocytes  $0.6 \times 10^9/\text{L}$  (reference level 0.0) and monocytes  $3.3 \times 10^9/\text{L}$  (reference range  $0.0\text{--}1.0 \times 10^9$ ). The fibrinogen was also increased, at 12.0 g/L (reference range 2.0–8.0). There was haemoconcentration, with haematocrit 0.52 (reference range 0.26–0.48). Biochemistry revealed a mild azotaemia, with creatinine 164  $\mu\text{mol/L}$  (reference range 55–130) and urea 16.5 mmol/L (reference range 2.7–12.3), and albumin was mildly increased at 42 g/L (reference range 25–40), consistent with dehydration. A PCR test on serum detected **bovine viral diarrhoea virus** nucleic acids and a presumptive diagnosis of **mucosal disease** was made. Unfortunately the animal died a few days later and could not be re-tested to confirm persistent infection. No fresh tissues were available

for testing from the animals that had died previously.

## Ovine

An aged ram in Waikato was examined for multiple ulcerated skin masses. The ram had been treated with antibiotics but did not respond and the lesions continued to progress. One of the dermal masses was excised and submitted for histopathology. The mass consisted of a round-cell neoplasm infiltrating the dermis and extending into the subcutis. A presumptive diagnosis of **cutaneous lymphoma** was made, but immunohistochemistry to confirm the diagnosis was not performed.

## Equine

Uterine lavage fluid from a mare in Waikato was submitted to the laboratory for cytology and culture. No history was provided with the submission. Cytology revealed large numbers of degenerate neutrophils and bacteria, and culture revealed a heavy growth of ***Nocardia* sp.**, consistent with ***Nocardia endometritis***. This agent can be isolated from the genital tract of healthy mares but is also sporadically associated with infertility, endometritis, placentitis and abortions. A veterinarian submitted blood samples from a 3-day-old filly that had slightly discoloured corneas. The foal was a twin, but the larger twin had died. The foal had not been feeding from the mare but had been drinking well from a bottle. Serum biochemistry showed low globulins (9 g/L; reference range 24–44) and the IgG level was 126 mg/dL (> 800 indicates adequate passive transfer; < 400 indicates **failure of passive transfer**). Serum amyloid A was 1,708 mg/L (reference range 0–8). A CBC demonstrated a neutropenia (neutrophils  $1.2 \times 10^9/\text{L}$ ; reference range  $4.3\text{--}11 \times 10^9$ ) and a left shift with band neutrophils at  $0.8 \times 10^9/\text{L}$  (reference range  $0.0\text{--}0.4 \times 10^9$ ), consistent with inflammation and a concern for **sepsis**. Three weeks later the leukogram had returned to within the reference range. A section of skin had sloughed off from a superficial wound, which was thought to be the portal of entry for sepsis, and the wound was healing well.

## Poultry

In early November a veterinarian was consulted regarding increased mortality in a flock of 4-week-old Hyline Brown layer hens, with 0.7–0.8 percent deaths per week over the previous 5 weeks. At

postmortem the animals showed signs of septicaemia, with enlarged spleens, pinpoint areas of hepatic necrosis and lesions of valvular endocarditis. Spleens from two animals were sent to the laboratory for culture and *Pasteurella multocida* was cultured from both.

This is the causative agent of **fowl cholera**, which causes septicaemia and manifests in flocks as increased mortality, often without previous clinical signs. Subclinical carriers are often the source of infection, but wild birds or mammals can also occasionally carry the organism and introduce the disease in a flock.

## Canine

A Border Terrier of unspecified age from Hawke's Bay was brought to the veterinarian with anorexia, dehydration, lethargy and mucoid diarrhoea. The dog had lost weight since the previous visit, from 8.8 to 6.4 kg. In-house chemistry showed hyponatraemia and low creatinine. A faecal sample submitted to the laboratory had 54,950 *Trichuris* eggs per gram of faeces and *Campylobacter coli* was cultured. In dogs, **trichiuriasis**, also called **whipworm infection**, is caused by *Trichuris vulpis*. The parasites live in the caecum and colon and cause inflammation that can lead to weight loss and diarrhoea, sometimes with fresh blood in cases of heavy infection. *Campylobacter* is commonly isolated from normal dogs as well as dogs with diarrhoea, and therefore is not always clinically significant, but *C. coli* is a zoonotic organism that can cause diarrhoea in humans.

## Reptilian

Faeces from a bearded dragon (*Pogona* sp.) were submitted for routine parasitology screen and very large numbers of coccidia were found.

**Coccidiosis** in reptiles often causes non-specific signs such as poor growth, weight loss and depression, as well as diarrhoea and melena. As coccidia in bearded dragons have a direct cycle, and oocysts can survive for long periods in the environment, these can quickly accumulate if enclosures are not meticulously cleaned regularly.

## Zoo animal

A female Siamang gibbon (*Symphalangus syndactylus*) was lethargic and had a tender abdomen. Abundant diarrhoeic faeces were present in the enclosure. Culture of faeces yielded a moderate

growth of *Campylobacter jejuni*. This organism can cause enteritis in non-human primates, but can also be cultured from healthy animals. It is zoonotic and a common cause of foodborne illness in humans.

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