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Quarterly review of diagnostic cases
Quarterly report of investigations of suspected exotic disease
Quarterly report of investigations of suspected exotic marine and freshwater pests and diseases
Plants and environment investigation report

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Surveillance is published as the Ministry for Primary Industries' authoritative source of information on the ongoing biosecurity surveillance activity and the health status of New Zealand's animal and plant populations in both terrestrial and aquatic environments. It reports information of interest both locally and internationally and complements New Zealand's international reporting.

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Editorial

Resilience at Diagnostic and Surveillance Services

MPI has recently adjusted its surveillance, diagnostics and response, and response readiness arrangements to accommodate changing needs. Key considerations have been to manage increasing demands, achieve economies of scale and eliminate duplication by bringing biosecurity, food safety, climatic and international responses under the same umbrella. In late 2016 MPI established Diagnostic and Surveillance Services (DSS) and Readiness and Response Services as two separate Directorates. DSS comprises diagnostic experts under the Plant Health & Environment Laboratory (PHEL) and Animal Health Laboratory (AHL), as well as plant and animal health and marine scientists leading surveillance and incursion investigation activities, all across terrestrial and aquatic fields.

MPI is currently involved in three major biosecurity responses: myrtle rust, *Mycoplasma bovis* in dairy cows and *Bonamia ostreae* in flat oysters. These three responses have relied on DSS expertise for diagnostic testing and identification, advice on disease biology and management, and preparing specifications for activities in the field.

The relationship between surveillance and response functions is very close, because of common expertise and facilities (e.g. diagnostic laboratories), and because investment in specifically directed surveillance activity is required. For effective response to new pests and diseases, reliable identifications are absolutely essential, enabling organism biology to be understood and optimal management actions to be formulated. Getting this wrong can have big effects on costs and reduced the ability to successfully manage the problem. MPI operates ISO 17025-accredited plant and animal health laboratories to provide assurance of testing competence and reliability of output. This gives response managers confidence when making critical decisions, for example when declaring infected properties and controlled areas.

Here is an overview of recent significant responses:

Myrtle rust. The first notification of myrtle rust was from Raoul Island, 1,100 km north of the North Island, on 27 March 2017, followed by Kerikeri in Northland on 2 May 2017. MPI plant health diagnosticians and incursion investigators obtained samples under strict containment, and rapidly confirmed the identification of the disease using a suite of laboratory tests. MPI collaborated with internationally recognised experts at the Forestry and Agricultural Biotechnology Institute in South Africa, who confirmed the same pandemic strain that is present in Australia and a number of Pacific Island countries.

Myrtle rust causes substantial damage to a wide range of susceptible species in the family Myrtaceae. The pandemic strain of this fungal disease poses a significant threat to a number of New Zealand's iconic species such as pōhutukawa

and rātā, creating substantial concern across the nation, and particularly among Māori given the cultural importance of the plant species at risk. Mānuka could potentially be affected, which would have serious implications for the lucrative mānuka honey industry in New Zealand.

MPI diagnostic scientists have processed more than 2,600 notifications, of which 500 have tested positive for the disease. A rapid, highly specific molecular test has enabled timely and reliable confirmations to be provided. This test was developed before the outbreak by PHEL, with MPI operational research funding, and has been submitted to the International Plant Protection Convention (IPPC) for approval for use in the international diagnostic protocol for myrtle rust.

In addition to diagnostics, MPI surveillance experts provided technical specifications for response field activities, collaborated on industry guidelines to prevent disease spread and assisted with communications to stakeholders and media.

Mycoplasma bovis. Ever since *M. bovis* was confirmed, triggering a response in July 2017, diagnostic testing undertaken by AHL has enabled MPI to better understand the epidemiology of the outbreak and to make informed decisions. As *M. bovis* is an exotic disease to New Zealand, testing was undertaken in MPI's high-level containment facility (PC3+) at the AHL.

To date, more than 100,000 diagnostic tests have been performed on samples from thousands of farms across New Zealand. This has represented a sevenfold increase over the normal day-to-day testing regime, with routine work taking place in parallel. To support this and ensure timely results are provided, a combination of increased automation and staff resourcing has been deployed. This has been AHL's largest animal disease response to date and it has demonstrated the laboratory's ability to support high-throughput testing for an exotic disease.

As with the myrtle rust response, DSS involvement also includes animal health scientists, who have been providing technical expertise to help with tracing animals, sampling farms for disease, epidemiological investigation, data collection and analysis, surveillance design and implementation, and policy advice. DSS staff have also worked with industry throughout the country to inform them on response operations and ensure farmers understand the information available to them.

Bonamia ostreae. This is an exotic-to-New Zealand intracellular parasite of flat oysters (*Ostrea* sp.). It is notifiable to the World Organisation for Animal Health (OIE). Controlling this disease is challenging and eradication is virtually impossible.

In January 2015, AHL confirmed the detection of *B. ostreae* in the Marlborough Sounds and Nelson, at the top of the South Island. A biosecurity response was immediately initiated, leading to local movement controls of stock. The parasite was found in farmed oysters on Stewart Island in May 2017, and the response effort was immediately escalated to include de-stocking of these farms in order to protect the iconic Bluff wild oyster fishery. DSS experts in aquatic animal health played a crucial role from day one, and participated in the response work and response governance, including conducting diagnostic work on samples, collecting information, assisting with planning and providing technical advice. They contributed to the design and implementation of a nationwide delimiting survey. AHL tested more than 2,000 flat oysters from 11 different locations throughout New Zealand. DSS scientists encountered a few challenges related to fine-tuning of protocols and worked around the clock with the rest of the response team. A key concern was to effectively and promptly liaise with flat-oyster farmers awaiting test results for their oyster stock.

In conclusion, the above three responses have illustrated the strategic and operational value of MPI's diagnostic and surveillance scientists, and the importance of maintaining and developing this resource in the future. They also demonstrate the versatile role that MPI scientists play in biosecurity responses, contributing to a range of vital activities that help optimise investment and management.



Veronica Herrera
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Ministry for Primary Industries

ANIMALS

Quarterly review of diagnostic cases: October to December 2017

New Zealand Veterinary Pathology

Bovine

An outbreak of haemorrhagic diarrhoea occurred in 2-week-old mixed-breed calves in the Raglan area. Twenty animals from a group of 160 were affected and five died. *Salmonella Bovismorbificans* was isolated on faecal culture from the affected animals. The Bovismorbificans serovar is an important cause of salmonellosis in New Zealand cattle, and is included in a combined inactivated vaccine that is considered to provide at least partial protection. In this case the animals were too young to have been vaccinated.

Multiple first-calvers in the Taupo region were affected with chronic respiratory disease. The herd consisted of about 600, with a mob of 130–135 animals containing 30–40 cases including four or five dead or euthanased animals.

One animal aged 2 years and 3 months became recumbent and was sacrificed for post-mortem examination. Gross findings included generalised pulmonary consolidation with some areas of emphysema and pulmonary oedema. Large numbers of lungworms were visible in the airways. Histologically, there was a marked chronic pneumonia with sections of nematodes present within bronchioles, consistent with *Dictyocaulus* sp. Some multinucleated cells consistent with syncytial cells were also seen, raising the possibility of concurrent viral infection. An initial diagnosis of parasitic pneumonia was made. Further testing of 10 animals with respiratory signs showed nine were positive for bovine respiratory syncytial virus on antibody ELISA, indicating that dual infection was likely.

Sudden deaths occurred in three out of 430 heifers in the Manawatu area, over a 3-day period. Post-mortem examination of one animal revealed pulmonary consolidation. Histology of the lung revealed acute interstitial pneumonia with evidence of vasculitis and thrombosis. Possible causes included a hypersensitivity reaction, *Dictyocaulus*

nematodes (though no organisms were detected in the tissue examined), 3-methylindole ingestion, chronic left-sided heart failure (including cardiac damage due to ionophore toxicosis). Acute interstitial pneumonia may also occasionally be seen in cattle feeding on brassica crops such as rape, kale and turnips.

Mastitis is a common problem for dairy cattle; in the Cambridge area 200 out of 1,000 animals were affected. Milk culture from two of these animals yielded a moderate growth of *Candida guilliermondii* with no bacterial growth. **Candida infection** of the mammary glands is usually due to environmental contamination, and can occur sporadically in individual animals or present as a herd outbreak of granulomatous mastitis. Such infections may also be subclinical, and organisms can also be isolated from clinically healthy animals.

Eighty 8–12-week-old beef x dairy calves in the Pukekohe area were affected with scouring and pale mucous membranes and weight loss, from a group of 200. Two animals died. Haematology performed on five affected calves showed a marginal to moderately severe anaemia, with haematocrits ranging from 0.23 to 0.14 (reference range 0.23–0.42). In all cases, *Theileria* sp. organisms were visible on the blood smear, warranting a diagnosis of theileriosis. Faecal culture from the same five affected calves yielded a culture of *Yersinia pseudotuberculosis*. Low numbers of strongyle eggs (50 eggs per gram) and coccidia (1+) were also seen in two of the calves; these were of uncertain significance. *Y. pseudotuberculosis* usually causes sporadic enteritis and scouring in cattle, but outbreaks may occur as seen in this case. *Yersinia* spp. may also be isolated from clinically normal animals.

Two Friesian cows presented with mastitis in the Cambridge area and *Serratia marsecens* was isolated from milk samples from both animals. This coliform bacterium is a potential cause of chronic mastitis in dairy cattle, usually the result of environmental

contamination. *Serratia* spp. tend to be resistant to most available antibiotic treatments.

Six out of 40 three-month-old calves from a property in the Northland region were affected with diarrhoea, and three died. The general management of the calves was assessed by the attending veterinarian to be poor, and they had been drenched two weeks previously (though specific drench information was not provided). Faecal samples from three affected calves revealed moderate to high numbers of coccidial oocysts, and histopathology from a dead calf showed coccidial oocysts and gametocytes in the colon. A diagnosis of coccidiosis was made. This disease generally affects stock aged 3 to 8 months, although younger animals can be affected when the environmental load of oocysts is high.

Four Friesian calves from a group of 170 in the central North Island presented with blindness and central nervous signs, with the most severely affected animal showing opisthotonus. One died and a post-mortem examination was performed. Examination of the brain under ultraviolet light by the veterinarian revealed some areas of fluorescence within the grey matter, but this was not evident at the reference laboratory. Nonetheless, histological examination of the brain confirmed the presence of laminar cortical necrosis, consistent with **polioencephalomalacia**. Other affected animals responded to treatment with thiamine disulphide nitrate, supporting an diagnosis of underlying **thiamine/vitamin B1 deficiency**. This can be caused by alterations in rumen microflora resulting in changes in thiamine and thiaminase production (e.g., secondary to rumen acidosis, sudden changes from poor to lush pastures, high-starch diets).

In a mob of 1100 cattle from the lower North Island, 120 were affected with anaemia and three died. A blood sample from an affected animal confirmed *Theileria* sp. on the blood smear, identified as *Theileria orientalis Ikeda* by PCR. These organisms proliferate in lymphoid mononuclear cells in the host

animal and release merozoites, which enter erythrocytes to become piroplasms that are seen on blood smears. Infective particles are generally transmitted between animals by ixodid ticks.

Ovine

Ataxia followed by sudden death affected 15–20 wethers from the Blenheim region. The vaccination history was questionable, but a lot of hemlock (*Conium maculatum*) was noted in the paddock and there was evidence that it had been grazed. Samples were submitted from one of the dead wethers for histopathology and trace mineral analysis. There were no specific findings on histopathology of multiple organs including the liver, but brain was not sampled. Liver B12, copper and selenium levels were adequate. A presumptive diagnosis of **acute hemlock toxicity** was made. Hemlock contains piperidine alkaloids that cause CNS depression and motor-nerve-end paralysis.

A two-year-old dairy ewe from the central North Island was noted to be lagging behind the rest of the flock; the following day she collapsed and died. Post-mortem examination revealed vegetations on the tricuspid valves in the heart, and some hepatic congestion. Histopathology confirmed fibrinous vegetative tricuspid valvular endocarditis with intralesional bacteria; similar changes were also present involving the left ventricular endocardium. Additionally there was evidence of eosinophilic and lymphoplasmacytic enteritis, consistent with endoparasitism. A diagnosis of **bacterial endocarditis** was made. This is relatively uncommon in sheep, and has been reported with a variety of bacterial infections (e.g., *Streptococcus* spp., *Mannheimia haemolytica* and *Erysipelothrix rhusiopathiae*). In some cases there may be concurrent septic polyarthritis, especially in lambs. Culture would be necessary to provide a final aetiological diagnosis in this case.

Porcine

A small breeding herd of three sows in the Richmond area had six dead piglets and another three moribund over a

period of 10 days. A total of 24 piglets were at risk. The diet consisted mainly of scrap food, especially supermarket waste. Histopathology of the liver showed severe pathology, with necrosis, megalocytes, fibrosis and disruption of lobular architecture. Chronic exposure to **hepatotoxins** such as aflatoxin or fumonisin was considered to be the most likely cause of this **chronic hepatopathy**.

Avian

A single Barnevelder hen from the Waikato region presented with poor body condition and open-beaked breathing, and was noted to be isolated from the rest of the flock. There was a transient improvement with nursing and rehydration, but 3 days later the bird deteriorated and died. Post-mortem examination revealed an enlarged, mottled spleen, pulmonary congestion and oedema. Histopathology demonstrated coalescing lymphohistiocytic infiltrates obliterating the splenic architecture, with similar infiltration into intestinal and gastric mucosa, the liver, kidney, and to a lesser extent the lung. A diagnosis of **disseminated lymphohistiocytic proliferative disease** was made. The most likely causes in this case were **avian leucosis virus** and **reticuloendotheliosis virus**. Both avian leucosis and reticuloendotheliosis are retroviral diseases resulting in sporadic deaths caused by lymphoproliferative disease and immune suppression.

Canine

A 12-year-old female spayed Bulldog presented with acute, foul-smelling and voluminous diarrhoea. There was a history of access to raw chicken, and faecal PCR was positive for *Campylobacter jejuni* and *C. coli*, warranting a diagnosis of **campylobacteriosis**. This disease typically presents with acute diarrhoea, and has zoonotic potential. Infection in humans and animals is typically acquired from contaminated food or water sources; in this case the raw chicken is a likely point of exposure, as it is a notoriously high-risk product for *Campylobacter* spp. contamination.

Equine

A 2-year-old Thoroughbred horse presented with a cough of a few days' duration, with a moderate amount of tracheal mucus present on tracheoscopy. Cytology of a tracheal wash revealed increased mucus and modest neutrophilic to macrophagic inflammation. Some squames with associated mixed bacteria were considered likely to be oropharyngeal contaminants. Culture of the sample isolated *Aspergillus* sp. as well as a scant mixed growth of *Staphylococcus* sp. and alpha-haemolytic *Streptococcus* sp., both of which were likely contaminants. Fungal pneumonia is fairly uncommon in horses, and can occur secondary to enterocolitis with disruption of colonic mucosa allowing for haematogenous spread of pathogens. Immunocompromise may also be a factor.

Feline

Two young cats (6 and 11 months) from separate households in the Wellington region both presented with histories of chronic diarrhoea. PCR tests of faecal samples from both were positive for *Giardia*, warranting a diagnosis of **giardiasis**. *G. intestinalis* is a potential cause of chronic diarrhoea in cats, with significant public health significance owing to the possibility of zoonotic infection. The organism is widespread in rivers and streams, and can be contracted by contact with infected animals, which shed the cysts via a faecal-oral transmission route. A wide range of other livestock, domestic and wildlife species can also be infected with *Giardia*.

Two cats from a single home in the Wellington region presented with chronic diarrhoea. Both had previously been diagnosed with giardiasis, but had been treated and subsequently tested negative. Apart from the diarrhoea, the cats were clinically well. Further testing of a faecal sample from one cat (8-month-old male neutered Domestic Shorthair) revealed a positive PCR result for *Cryptosporidium* sp. (but remained negative for *Giardia*), leading to an additional diagnosis of **cryptosporidiosis**. *C. parvum* is an

important cause of diarrhoea in cats, which sometimes may also result in other vague signs (e.g. lethargy, nausea, vomiting) even when the infection is clinically silent. This case was of public health concern owing to the potential for zoonosis.

Cervine

A fawn presented in the Richmond area with haemorrhagic diarrhoea. Small numbers of *Cryptosporidium* sp. (1+) were identified in a faecal sample. A faecal culture was negative for *Salmonella* sp. **Cryptosporidiosis** has become an increasingly important disease in farmed deer, with *C. parvum* reported in farmed deer in New Zealand. Severe infections can result in outbreaks of scouring with high mortality in farmed animals. Subclinical shedding has also been reported in clinically normal adults and juveniles, so it was not clear to what degree this infection may have been responsible for the signs observed. *Cryptosporidium* spp. have zoonotic potential, as noted previously. An important differential diagnosis for haemorrhagic diarrhoea is *Yersinia* infection.

Gribbles Veterinary Pathology

Bovine

Each year, groups of service bulls are tested by PCR to check for infection with bovine viral diarrhoea virus (BVDV). The primers in the test used at Gribbles also detect hairy shaker disease virus (HSDV, also known as border disease virus). Any animals that are positive on the PCR test are retested using the BVDV antigen ELISA test 4 weeks later to determine whether they are transiently or persistently infected with the virus. The ELISA test, too, can detect HSDV. Two bulls (one each from groups of bulls on different farms) that were PCR-positive to BVDV were ELISA-positive at the retest 4 weeks later but both had only low levels of virus that were inconsistent with persistent BVDV infection. A previous case like this was shown to be due to persistent infection with HSDV so

both these bulls were further examined using separate PCR primers that detect only BVDV and not HSDV. Both bulls were negative to this test. While specific primers for HSDV were not used, the results suggested that both these bulls were likely to be **persistently infected with HSDV**.

Cases of **sporadic bovine encephalitis** caused by *Chlamydophila pecorum* were identified from three separate farms – one in North Canterbury and two in South Canterbury. All cases involved female Friesian or Friesian cross calves that were about 6–9 weeks old. Most had neurologic signs that included circling, standing with head hanging, reduced menace response/blindness, tremors and seizures. Other clinical signs noted included pyrexia, lethargy, dehydration, harsh lung sounds, nasal discharge, respiratory distress and heart murmurs. Complete blood counts were submitted from two calves on one farm and both had findings consistent with inflammatory demand (elevated fibrinogen, with or without neutrophilia and monocytosis). Cerebrospinal fluid from one calf had a markedly elevated nucleated cell count and protein concentration. Cells were mostly large and mononuclear, with fewer lymphocytes and neutrophils. Intracytoplasmic structures suspicious for *Chlamydophila* spp. elementary bodies and residual bodies were noted in the cytoplasm of many macrophages. The brain was examined histologically in at least one calf from each farm (four brains in total) and all had histiocytic and lymphocytic meningoencephalitis, consistent with sporadic bovine encephalitis. Gross lesions reported in other organs included pneumonia, emphysema, pericarditis and hepatomegaly. In two animals, PCR was performed on fresh brain samples and was positive for *Chlamydophila pecorum*.

Six milking cows from the Taranaki district presented with signs of acute blindness and ataxia. The cows were treated with intravascular injections of vitamin B1 (thiamine) and most

responded clinically. However, one died and histopathology revealed lesions consistent with **polioencephalomalacia** (PEM). PEM in this circumstance was thought to be attributable to thiamine deficiency, which can result from sudden changes in feed, or be due to the ingestion of thiaminase-containing compounds found in some plants.

Four of 100 fifteen-month-old mixed-breed dairy cows from Northland had lumpy spreading skin lesions on their heads and one had ulceration of the hard palate. Some of the skin masses oozed creamy, purulent exudate. Histopathology of one lesion showed pyogranulomatous dermatitis with intralesional bacteria and Splendore-Hoeppli material (club colonies), typical of **actinobacillosis**. The diagnosis was confirmed by culture of *Actinobacillus* spp. from the lesion.

Five of 20 Angus calves from Northland died after browsing red cestrum (*Cestrum* spp.) and tobacco weed or woolly nightshade (*Solanum mauritianum*). Blood collected from one calf before death showed haemoconcentration (RBC $8.72 \times 10^{12}/L$, reference range $5-7.7 \times 10^{12}$; haemoglobin 134 g/L, reference range 85–130; HCT 0.42, reference range 0.24–0.4) and inflammation (WBC $40.6 \times 10^9/L$, reference range $3.8-11 \times 10^9$; neutrophils $27.2 \times 10^9/L$, reference range $0.7-4.9 \times 10^9$; band neutrophils $6.5 \times 10^9/L$, reference range $0-0.2 \times 10^9$; and monocytes $1.6 \times 10^9/L$, reference range $0-0.9 \times 10^9$). Striking biochemical abnormalities in that calf included increased liver enzymes (GGT 82 IU/L, reference range 3–47; GD 2,450 IU/L, reference range 5–35). Histopathology on a sample of liver from a different calf showed marked acute centrilobular necrosis with bridging between central veins, consistent with liver damage caused by ***Cestrum* spp. toxicity**, although other toxins and ischaemia/hypoxia can cause a similar change.

A dairy cow from Northland had pale mucous membranes and epistaxis. She died during attempted treatment for anaemia. A blood sample tested positive

for *Theileria orientalis* Ikeda by PCR, indicating that the animal probably died of **theileriosis**.

A group of seven rising-1-year-old heifers from a Taupo district dairy farm developed central nervous system clinical signs, progressing to recumbency and death in two animals. Histological examination of one brain revealed subtle changes including neuronal necrosis in the superficial cortical gyri. Based on clinical and histological suspicion, samples of liver and kidney were analysed for lead. The lead concentration was determined to be 88 mg/kg in the kidney and 4.6 mg/kg in the liver. Kidney lead concentrations greater than 10 mg/kg are considered compatible with **lead toxicoses** (Thompson, 2012).

Several outbreaks of **bovine polioencephalomalacia** occurred around the North Island during November and December 2017. Samples from reported outbreaks in the Wellington, Gisborne and Waikato regions were submitted to the Gribbles laboratory in Palmerston North. All cases occurred in rising-1-year-old Friesian bulls or steers on pasture-only diets. Death rates varied from 3/230 (1.3 percent) to 5/100 (5 percent). In all cases the diagnosis was confirmed by histological examination of the brain, which showed laminar cortical necrosis and associated vascular and cellular changes.

In a mob of 200 heifers on an Otago dairy farm, many had a sudden drop in milk production and developed respiratory signs (rapid breathing and coughing) but there was no nasal or ocular discharge. About 20 were severely affected but there were no deaths. An **acute lungworm infestation** was suspected and there was rapid resolution of the clinical signs within a week after treatment with a broad-spectrum anthelmintic. Older cows and calves were not affected.

On an 800-cow Otago dairy farm the farmer found large purulent skin lesions on seven cows over a period of 7–10 days. Interestingly, the lesions were all in the same place, low on the left flank. Nothing was grown on bacteriological

culture but histologic examination of the lesions revealed findings typical of **Actinobacillus lignieresii** infection. This was considered to be most likely secondary to an initial wound. As the lesions were in the same area on all seven cows it was speculated that there may have been traumatic contact with a specific object, perhaps a protruding piece of pipework, during recent yarding.

Five of 1,000 cows on an Otago dairy farm died suddenly over a week. The cows were noted to have had diarrhoea before death. A heavy growth of **Salmonella Typhimurium phage type 9** was cultured from the faeces of one affected cow.

Five of 71 two-year-old Jersey cross heifers were found with spontaneous unilateral **spiral fractures of the humerus** over a 1-month period between late October and late November on a 260-cow Otago dairy farm. Four of these cases occurred in a single week. Liver copper concentrations in three of these heifers averaged 40 $\mu\text{mol/kg}$ (adequate level >95), suggesting that **copper deficiency** may have had a role in the pathogenesis of these fractures.

About 80 percent of a group of heifers on a Southland dairy farm developed a severe ulcerative vulvitis over a short period. They had been recently mated to a group of young virgin bulls. Clinical examination showed that the lesions were confined to the haired area of the vulva and not present in the mucosa of the vulva or vagina, so they did not resemble the pustular lesions of infectious pustular vulvovaginitis (IPV) caused by bovine herpesvirus-1 (BoHV-1). A biopsy revealed severe subacute multifocal lymphocytic dermatitis, folliculitis and vasculitis, suggestive of the granular vulvitis often associated with **ureaplasma infection**. PCR testing of a swab taken from a typical lesion detected a high concentration of *Ureaplasma diversum*. This organism can be found in low concentrations in the vagina of normal cattle, but the result was significant in this case given the history, location of the lesions and histology results.

On a Southland dairy farm one milking cow was found dead and four others were partially blind and recumbent. No gross lesions were found in the dead cow. Its brain was fixed and submitted for histopathologic examination. The histopathological findings of laminar cortical necrosis were consistent with a diagnosis of **polioencephalomalacia**.

Twelve dairy heifers on an Otago farm were placed in a small paddock adjacent to the farmer's house and garden. There was plenty of grass in the paddock. Three were found dead 12 hours later and a third cow was found depressed, tremoring and ataxic 24 hours later. This cow died within 5–10 minutes after the clinical signs were seen. Burnt and dried remnants of a yew tree (*Taxus baccata*) were found in the paddock and remnants were also found in the rumen contents of one of the dead cows, supporting a diagnosis of **yew toxicity**.

Several milking cows on a large Otago dairy farm suddenly developed skin changes consistent with photodermatitis. More than 1 percent of the 500 cows in this herd were affected over a week. Blood samples taken from two of the affected cows showed elevated liver enzymes, consistent with liver damage. GDH results were 1,037 and 222 IU/L (reference range 5–35) and GGT levels were 457 and 487 IU/L (reference range 3–47). Further investigation revealed that during that time the cows had been grazing a paddock of new grass infested with self-sown turnips that were affected by drought. These turnips were most likely the cause of this small outbreak of **hepatogenous photosensitisation**.

A dairy herd in the Waimate region had a high culling rate because many animals had chronic diarrhoea. There was a previous history of salmonellosis and Johne's disease as well as rejections of the livers at slaughter owing to evidence of liver-fluke damage, but necropsies on two typically affected animals did not reveal any evidence of flukes. However, when faecal samples from six cattle were examined, all had fluke eggs present. There were up to 481 *Fasciola* spp. eggs

per gram of faeces (average 123). This confirmed the diagnosis of **fascioliasis**.

Five out of a group of seven 6-month-old male Hereford calves in Taranaki died after displaying neurological signs. Old batteries were discovered in the paddock. Blood lead in the two survivors was 1.40 and 1.25 mg/L (> 0.3 is potentially toxic). This confirmed **lead toxicity**.

An 8-year-old Friesian cow from South Canterbury showed signs of depression. It had catarrhal nasal discharge, increased respiratory sounds and a temperature of 39.9°C. The parotid, supra-mammary and superficial inguinal lymph nodes were all increased in size and there were a number of small (2-cm-diameter) skin nodules. A fine-needle aspiration of the inguinal lymph node was performed and smears submitted to the laboratory for cytological examination showed a uniform population of medium-sized to very large lymphoid cells. The cells had round to slightly indented nuclei with a smudged chromatin pattern and some had a prominent, large nucleolus. There was a small amount of moderately basophilic cytoplasm and some cells contained intracytoplasmic vacuoles. Small numbers of plasma cells and normal small lymphocytes were also present. The cow was negative on ELISA testing for enzootic bovine leukaemia. These findings were consistent with a **lymphoma**.

Ovine

Forty out of 140 lambs from the Gisborne region presented with lesions on their feet and about five of these also had scabby lesions around their mouths. Histopathology of one of the affected lambs revealed a proliferative dermatitis with ballooning degeneration and intracytoplasmic eosinophilic inclusion bodies in the skin of the mouth and feet. These findings were consistent with **parapoxvirus** infection (orf/scabby mouth). Although most ovine parapoxvirus infections affect the perioral skin, the feet can also be affected. In this case, the foot lesions were also complicated by **Dermatophilus spp.**,

which likely proliferated in the altered skin environment.

A group of a hundred 4-week-old hand-reared East Friesian lambs from a Ruapehu district farm developed diarrhoea and began losing condition. At least 10 died. Post-mortem examination of two lambs revealed gross lesions in the distal small intestine and large intestine, suggestive of **coccidiosis**. The diagnosis was confirmed by histopathological changes including erosion, crypt abscesses and many coccidial gametocytes and oocysts in the distal small intestine, cecum and colon.

Of 2,400 lambs at risk on a farm in Central Hawke's Bay, about 15 died over a 3-day period in November. The affected lambs were jaundiced and had dark red urine. Histopathology revealed acute hepatic centrilobular necrosis, renal tubular haemoglobin and interstitial nephritis. A blood sample had a MAT titre of 1:800 for **Leptospira interrogans Pomona**, confirming the clinical suspicion of **leptospirosis**.

Copper toxicity was diagnosed in a group of mixed-aged Romney ewes yarded for shearing on a Hawke's Bay sheep farm. Six ewes died during the shearing period. Major gross changes were jaundice and black discolouration of the kidneys. Histologically, liver architecture was altered by portal fibrosis and numerous small bile ductules containing bile pigment. Scattered apoptotic hepatocytes and pigmented macrophages were noted. There was abundant haemoglobin within renal tubules. These findings were considered consistent with a haemolytic crisis, commonly seen with copper toxicity. In addition, the chronic liver changes suggested pre-existing damage from **sporidesmin toxicity**, a recognised predisposing factor for copper accumulation. Copper excess was confirmed by a kidney copper concentration of 511 µmol/kg (reference range 0–157).

Clostridial enterotoxaemia was diagnosed on a Gisborne district sheep station where 15 lambs developed central

nervous clinical signs after weaning. The diagnosis was based on characteristic protein-rich perivascular oedema affecting blood vessels of the thalamus and caudal colliculus in the midbrain. Waning of passive maternal antibodies is thought to contribute to outbreaks of disease in weaned lambs, whereas lambs aged 3–10 weeks are most susceptible in unvaccinated flocks.

A group of 106 clinically healthy Merino ewes from a Central Otago sheep farm were sent for slaughter in early December. At post-mortem inspection the kidneys of more than 70 of these ewes had pinhead-sized black foci randomly distributed over the surface. Most were confined to the outer cortex but they occasionally extended in a thin line down to the medulla. Histological examination showed a few clusters of tubules that were obstructed by dense brown/black material (staining positive with a silver stain), and a similar dark pigment was also found in the intact tubular epithelium. There were no inflammatory changes and, since the rest of the kidney parenchyma was normal, there would have been no effect on kidney function. This pigment was most likely melanin and it was speculated that the tendency to deposit this pigment as **melanosis** could have been familial in the sheep population on this farm.

About 20 of 1,500 three-month-old Perendale lambs on a Southland sheep farm died over 2–3 weeks after a short period of diarrhoea and weight loss. They had been drenched regularly with an anthelmintic. Severe **coccidiosis** was confirmed by the presence of large numbers of coccidial oocysts in the faeces and typical histological changes of coccidiosis in sections of the intestine of the one lamb necropsied.

Thirty of 4,000 three-month-old lambs were found dead over a short period on a large Otago sheep farm. Enterotoxaemia was suspected but necropsy of one lamb that was found comatose and “stargazing” was inconclusive. The fixed brain of this lamb was submitted for histological examination, which revealed pallor and vacuolation of the cortical grey matter

with shrunken red neurons, confirming that **polioencephalomalacia** was the cause of the clinical signs.

About a hundred Texel cross ewe hoggets out of a group of 450 on an Otago sheep farm produced small, weak, late-term lambs that died shortly after birth. These ewes had been vaccinated against both toxoplasmosis and campylobacteriosis before mating. **Toxoplasmosis** was confirmed by a high positive PCR result on the stomach contents from two dead lambs found on different days. Histology on the fixed placenta from one of these lambs also showed lesions suspicious for toxoplasmosis. Serology on blood samples taken 3 months later comparing the *Toxoplasma* latex agglutination test titres of six affected ewes with six ewes that had produced normal live lambs showed a significant difference. The aborted ewes all had titres > 1:2048 while the titres of the normal ewes were much lower. The reason for the apparent failure of the vaccination could not be determined.

Caprine

Several of a group of goats from North Canterbury had mastitis. A milk sample from one 3-year-old animal was cultured and a heavy pure growth of *Bibersteinia trehalosi* was isolated. This organism is usually associated with respiratory disease in animals but has also been associated with mastitis in cattle. This isolation, from a goat, was unusual.

A primiparous doe from Northland gave birth to a stillborn kid and had retained fetal membranes, 1 month prior to term. Another primiparous doe on the same property had given birth to a mummified fetus several weeks previously. The stillborn fetus was too autolysed to examine, but dam serology revealed a \geq 1:2048 antibody titre to *Toxoplasma*, suggesting that the cause of abortion was likely **toxoplasmosis**, the most common infectious cause of abortion in goats.

Cervine

About a quarter of 125 velvet stags from North Otago developed crusty lesions on their velvet antlers.

Histopathology revealed rare epidermal cells with ballooning degeneration and intracytoplasmic eosinophilic inclusion bodies. There was also a large amount of secondary suppurative inflammation. These findings were consistent with **parapoxvirus** infection of deer.

Equine

A 16-year-old gelding from North Canterbury was presented to a veterinarian for being obviously but non-specifically unwell. A complete blood count showed anaemia (haematocrit 0.23; reference 0.32–0.55) and a markedly increased white cell count ($152.0 \times 10^9/L$; reference range $5.5–12.5 \times 10^9$). More than 90 percent of the nucleated cells had a lymphoid appearance. Some of the lymphoid cells appeared slightly larger than normal and occasional indistinct structures suspicious for nucleoli were seen. The cell preservation was unfortunately rather poor, which limited interpretation, but **chronic lymphoid leukaemia** was suspected. The horse deteriorated rapidly and died. Necropsy revealed a markedly enlarged spleen. On histopathological examination the red pulp was found to be massively expanded by an infiltrate of small, round cells with small, round to slightly oval nuclei with dark diffuse chromatin, indistinct nucleoli and small amounts of cytoplasm. Mitoses were not readily apparent. These findings were consistent with chronic lymphocytic leukaemia or, less likely, the leukaemic phase of a lymphoma. Chronic lymphocytic leukaemia appears to be a rare condition in horses (Dasciano *et al.*, 1992).

Canine

A 5-year-old male Rottweiler from the Christchurch area with a history of poorly controlled diabetes mellitus had persistent glucosuria and had been previously treated with antibiotics for a urinary tract infection. Examination of the urine sediment revealed numerous rod-shaped bacteria and culture yielded a pure, heavy growth of *Escherichia coli*. Antibiotic sensitivity testing with the disc diffusion method showed that this was a **multi-drug-resistant strain**

of *Escherichia coli*. The isolate was resistant to amoxicillin/clavulanic acid, cephalothin, penicillin, tetracycline, trimethoprim/sulphamethoxazole, enrofloxacin, cefpodoxime, ceftazidime, cefovecin and clindamycin, but sensitive to gentamicin and nitrofurantoin.

A 15-week-old male Border Collie puppy from North Canterbury with a history of recurrent bouts of diarrhoea was presented to a veterinarian for examination. The puppy was still bright, was eating and drinking normally and there had been no vomiting. A faecal sample was collected. No worm eggs or coccidia were detected and ELISA tests for *Giardia* spp. and *Cryptosporidium* spp. were negative, but ***Salmonella* Typhimurium phage type RDNC-Mar 12** was isolated, supporting a diagnosis of **salmonellosis**.

An 8-year old spayed female dog from Canterbury presented with a cutaneous mass 2 cm in diameter on the lateral pinna that may have been present for up to 2 weeks. Cytology showed mixed inflammation, including macrophages and multinucleated giant cell macrophages that contained rod-shaped, beaded or negative-staining rods in their cytoplasm. Samples were submitted 2 weeks later for histology, including biopsies of several nodular masses up to about 35 mm diameter on the left and right hind legs. Histology confirmed a severe multifocal granulomatous dermatitis and panniculitis with intralesional acid-fast rods, consistent with ***Mycobacteria* spp.** This was thought to be a case of **canine leproid granuloma syndrome**.

A 9-year-old mixed-breed dog from the Franklin district had a swollen left eye with epiphora and third-eyelid prolapse for about a week. Glaucoma was diagnosed on clinical examination. The eye was removed and submitted for histopathology. This revealed a pyogranulomatous chorioretinitis with intrahistiocytic and extracellular endospore-forming organisms, consistent with ***Prototheca* spp.** These were also isolated subsequently in a faecal sample

from the dog. **Protothecosis** is caused by a green alga found worldwide in soil, water and sewage; disease is rare and thought to be related to immunosuppression in the host. Systemic disease in dogs commonly affects the eye, brain and colon, and occasionally the kidney, liver and heart. The prognosis is poor for systemic disease.

A three-year-old Cavoodle from the Auckland region had acute vomiting followed by bloody diarrhoea and inappetance. Faecal analysis yielded **Salmonella Brandenburg**, suggesting that this dog had **salmonellosis**, although carnivores can be inapparent carriers of salmonellae.

Feline

A 13-year-old cat from the Nelson district had a chronic ulcerative wound on the right chest wall, which had not responded to treatment with amoxicillin/clavulanic acid antimicrobial treatment. The cat was known to be seropositive for feline immunodeficiency virus. Cytological examination of material from the affected area showed a pyogranulomatous (neutrophilic and macrophagic) inflammation and numerous variable-sized round structures consistent with yeasts, which sometimes had variable-sized clear capsules. This was consistent with **fungal panniculitis associated with *Cryptococcus* spp.** Subsequent histopathological examination of excised tissue confirmed a marked pyogranulomatous panniculitis with intralesional yeasts, consistent with *Cryptococcus* spp. A serum sample tested positive to a *C. neoformans* latex agglutination test that had been validated for use in humans.

Cryptococcosis was also diagnosed in a 3-year-old neutered male Ragdoll cat from the Hawke's Bay region. The cat presented with a neck mass from which fine-needle aspirates were taken. Routine biochemistry and haematology were unremarkable apart from a mild hypereosinophilia ($3.9 \times 10^9/L$; reference range $0-1.5 \times 10^9$). Serum immunoassay tests for feline immunodeficiency virus and feline leukaemia virus were negative.

Smears of the aspirates were stained with Leishmann's stain and examined. Large numbers of 5–15µm refractile yeast structures with thick clear capsules were observed, interspersed with moderate numbers of macrophages, multinucleated giant cells and mixed inflammatory cells.

A 6-year-old neutered male Domestic Shorthaired cat from the Bay of Plenty presented with chronic (> 8 months' duration) recurrent scabs and wounds over the left front foot. Partial response to treatment with amoxicillin, clavulanic acid and meloxicam was reported, but the lesions recurred. Thick, purulent exudate was expressed from the wounds. Histological assessment of a punch biopsy of the affected region confirmed a regionally extensive pyogranulomatous dermatitis and cellulitis containing large colonies of slender, filamentous, beaded bacteria. These bacteria were partially acid-fast and partially Gram-positive with Fite's and Gram stains, consistent with a diagnosis of cutaneous **nocardiosis**.

A sample of mucus from behind the soft palate of an 11-year-old neutered male Domestic Shorthaired cat from Canterbury was submitted for fungal culture. This yielded a heavy growth of ***Trichosporon gracile*** (identified by MALDI-TOF). *Trichosporon* spp. are ubiquitous and can be opportunistic pathogens in immunocompromised patients.

A sample from a discharging nodular sinus lesion on the right thoracic wall of a 7-year-old spayed female Domestic Shorthaired cat from Canterbury was submitted for aerobic and anaerobic bacterial culture and fungal culture. In-clinic cytology had revealed pyogranulomatous inflammation. A **rapidly growing mycobacterium (RGM)**, most closely resembling ***Mycobacterium smegmatis***, was identified by MALDI-TOF.

A blood smear was received from an 18-day-old Birman kitten. The animal was so small, weak and anaemic that it was considered too risky to attempt a larger sample. The veterinarian described the blood obtained as “looking like

a pink milkshake”. A capillary tube centrifuged at the clinic showed a PCV of 0.1 (reference range 0.24–0.45). In the smear, changes consistent with anaemia included a significant number of polychromatic red blood cells and there were 13 nucleated red blood cells per 100 white blood cells (nucleated RBCs are rarely seen in normal feline blood.) No haemotropic *Mycoplasma* spp. were definitively identified on the red blood cells. Neutrophils, eosinophils, monocytes and lymphocytes were morphologically normal. There were pale globular structures interpreted as lipid scattered over the blood smear. Two weeks later the kitten was clinically improving and less anaemic after supportive therapy, a low-fat diet and treatment for fleas (although infestation was not obvious). The findings were considered consistent with **transient hyperlipidaemia and anaemia syndrome**, which has been reported sporadically in kittens in other countries. The cause of the syndrome is unknown and some kittens recover with medical support. It is not considered to be a primary hyperlipidaemia, inherited lipoprotein lipase syndrome, or diabetes mellitus (Blackstock *et al.*, 2012; Gunn-Moore *et al.*, 1997).

Avian

A 2-year-old male great spotted kiwi or roroa (*Apteryx haastii*) from a captive colony in the Canterbury region presented with ulceration at the corners of the bill. It had a prior history of yeast infections. Cytology of a swab from the ulcerated area revealed superficial squamous epithelial cells and moderate numbers of round-to-ovoid, yeastlike structures that were 2–6 µm long and had variable budding. No inflammation was detected. Microbial culture confirmed the presence of ***Candida albicans***.

A juvenile male kea (*Nestor notabilis*) from the Arthur's Pass area in the Southern Alps had been observed to be vomiting and lead poisoning was suspected. The blood lead concentration was 0.54 mg/L when the bird was first tested at the end of October. No specific toxic range has been identified for this species, but it has been suggested that

> 0.2 mg/L indicates abnormal exposure that may result in clinical signs of toxicity in birds, so this result supported the clinical suspicion of **lead toxicity**. After chelation therapy, the blood lead level had fallen to 0.19 mg/L a week later and there was significant clinical improvement. After 2 weeks the blood lead level was 0.12 mg/L and this fell further to 0.07 mg/L a month after initial presentation.

A breeding female North Island brown kiwi (*Apteryx montelli*) from a captive colony in Otago had blood submitted for a health screen as she had a history of weight loss and was producing small eggs. Complete blood count and biochemistry were unremarkable except for a markedly increased serum calcium concentration (> 5 mmol/L, which is the upper detection limit of the analyser). **Hypercalcaemia** is considered physiological and can be markedly elevated in egg-laying birds. The cause of the weight loss and small eggs was not identified.

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Bovine

Some less-common *Salmonella* species were isolated from dairy cows during this quarter. A dairy cow on a property in the Tasman district (where *Salmonella* Bovismorbificans had previously been isolated) presented with weight loss, increased sitting and diarrhoea. **Salmonella Amsterdam** was isolated from faecal cultures. In another case, in Waipa, a crossbred dairy cow with ill-thrift had acute onset of diarrhoea and **Salmonella Senftenberg** was isolated from the faeces. This is an uncommon phagetype in New Zealand, reported in North America to be associated with feed contamination by infected birds. Serology for Johne's disease in this cow was also positive, indicating underlying chronic enteric disease.

A dairy cow in the Waitomo district had diarrhoea and increased respiratory effort. **Salmonella Hindmarsh** was isolated from the faeces. Histopathology on lung tissue revealed a concomitant suppurative bronchitis, more commonly

seen in young stock than adult dairy cows. This was associated with bronchial mucosal colonisation of moderately virulent bacteria (often **Pasteurella multocida**, although no cultures were done in this case). This was not considered to be a sequel of the **salmonellosis**, which when it spreads via septicaemia tends to lead to an interstitial pneumonia.

A 7-year-old dairy cow in the South Waikato district presented off-colour one morning, with marked reduction in milk yield. She improved during the day but collapsed and died during the afternoon milking. Necropsy revealed a large, pale liver that on histopathology showed diffuse marked hepatocellular macrovesicular vacuolation consistent with hepatic steatosis. This is a common hepatocyte change that can be induced by a range of hepatocellular insults, but in a high-yielding dairy cow is usually associated with negative energy balance, more commonly seen in the transition phase. The acute and rapid nature of this case suggests a sudden decrease in dietary energy intake in a cow that had good fat reserves, leading to rapid mobilisation of triglycerides, overwhelming the liver's capacity to synthesise protein and phospholipids, and causing hepatocellular triglyceride accumulation.

Fifteen 3-month-old calves died in a mob of 600. Several showed respiratory stridor and weight loss. Parasitology on faeces from several calves revealed some high **Strongyle** egg counts (1,600 and 750 eggs per gram in two samples) and evidence of lungworm infestation (133 **Dictyocaulus viviparous** larvae/g faeces in one sample), giving diagnoses of **enteric helminthiasis** and **parasitic bronchitis**.

Prototheca spp. algae were isolated from bacterial cultures of milk in a case of chronic mastitis in a dairy cow in the Matamata-Piako district. **Protothecal mastitis** usually has a low sporadic incidence in a dairy herd, but occasionally larger numbers are affected (Cranefield *et al.*, 2016; Hodges *et al.*,

1985). The initial source of the algae is environmental since they exist in soil and waterways, but spread of the infection between cows can then occur through contamination of the milking apparatus. Since intra-mammary antibiotics are ineffective against the algae, culling is recommended.

A dairy heifer in the South Waikato district presented with a swollen, erosive lesion in the rostral mandible causing tooth displacement and tooth loss. Because of its deteriorating condition, the heifer was euthanased and the lesion was submitted. Histopathology revealed a pyogranulomatous lesion with Splendore-Hoeppli material (club colonies), typical of **bovine actinobacillosis** caused by **Actinobacillus lignieressi**.

Yersiniosis continued into late spring and early summer and several cases were diagnosed in weaner dairy calves. In the Taranaki district, six 3-month-old weaner calves in a mob of 100 presented with ill-thrift, significant weight loss and watery diarrhoea from which **Yersinia pseudotuberculosis** was isolated. In another case, in a mob of 2-month old calves affected with diarrhoea, **yersiniosis** was diagnosed on faecal cultures, together with **enteric helminthiasis** based on high faecal egg counts of around 900 eggs per gram.

Theileriosis was diagnosed in several cases in dairy cows, mainly in the Waikato and Bay of Plenty regions. One case was seen in the Marlborough district; a 2-year-old Lowline/Angus bull relocated from the North Island presented with condition loss, pale mucous membranes, coughing and pyrexia. The bull had marked haemolytic anaemia (HCT 0.19; reference range 0.24–0.40) and **Theileria sp.** organisms were seen on red blood cells.

A pruritic dairy cow in the Whakatane district with reduced milk yield had severe, diffuse skin crusting around the neck and shoulders and some raised weals over the body (see **Figure 1**). Histopathology of skin biopsies revealed an **eosinophilic collagenolytic**



Figure 1: Severe, diffuse skin crusting caused by eosinophilic collagenolytic dermatitis in a dairy cow

dermatitis but no ectoparasites were seen in the sections. The main differentials were hypersensitivity reaction and ectoparasitic dermatitis (though no mites were seen on biopsies). The cow was treated with steroids, antibiotics and antihistamine and moved to the run-off; she showed some improvement but remained slightly pruritic. In a previous, similar case reported in Surveillance (March 2015), demodex mites were observed in sections. Demodicosis is usually related to a stress trigger and more commonly seen in younger cattle.

Ovine

Six 2-month-old lambs in the Wairoa district were found dead and a further recumbent lamb was euthanased. Necropsy tissues were submitted for histopathology and fresh liver for biochemistry. Selenium, copper and B12 levels in fresh liver were all adequate. Gross examination of submitted fixed tissues revealed a large adult tapeworm (*Moniezia expansa*) occluding the lumen of the jejunum. Histopathology of the jejunum revealed multifocal mucosal ulceration with lamina propria

oedema and lymphoplasmacytic infiltrate, consistent with the effects of **parasitic gastroenteritis** (although no nematode sections were seen). Sections of lung tissue revealed areas of lung lobe consolidation with marked interstitial infiltrates of neutrophils and bronchiolar luminal suppuration, consistent with a **bacterial bronchopneumonia**. The role of tapeworms in causing disease and production loss in lambs has long been debated and they are generally not considered to cause significant disease. In this case signs were considered multifactorial, with the lamb succumbing to a bacterial pneumonia, likely to be of haematogenous spread with portal of entry from a compromised gut.

Caprine

Two 3-year-old dairy doe goats presented with chronic weight loss. Following euthanasia, necropsy revealed thickening small intestines and caseation of the mesenteric lymph nodes. Histopathology on submitted samples showed marked diffuse lymphoplasmacytic enteritis with prominent crypt globule leukocytes and diffuse oedema, consistent with

Johne's disease. The mesenteric lymph nodes showed caseous necrosis with marked granulomatous inflammation and mineralisation. This tubercle-like change in the mesenteric lymph nodes is typical of goats with Johne's disease but not seen in cattle – an interesting comparative pathology aspect of the disease.

Porcine

All six piglets in a 4-weeks-old litter from Matamata presented with dullness, pyrexia and erythematous skin lesions. One piglet died and was submitted for necropsy. Its skin was diffusely soiled with mud and there were multifocal ulcerated skin lesions, particularly around the head and neck; the intestines were diffusely reddened and had watery contents. Histopathology of tissues revealed a marked **suppurative dermatitis** with numerous intralesional bacterial colonies and marked lymphoid hyperplasia of the retropharyngeal lymph nodes. The small intestine showed a **fibrinohaemorrhagic enteritis** and lung sections revealed multifocal **bronchopneumonia**. Cultures yielded a

beta-haemolytic *Streptococcus* sp. from the skin lesions and a heavy growth of *E. coli* from the small intestines. A dirty environment was considered to be the key underlying husbandry factor in the pathogenesis of the disease.

Equine

A 3-year-old Thoroughbred filly in the Waikato presented with hindlimb lameness. Owing to a deteriorating condition the filly was euthanased. Joint capsule and synovial samples were submitted for histopathology, which revealed a marked suppurative arthritis with a capsular fibrovascular reaction and synovial hyperplasia. Such hip-joint arthritis is often due to haematogenous spread from a distant nidus of inflammation such as gastrointestinal lesions.

A 3-month-old Standardbred foal in the Waikato presented with ill-thrift and pale, pasty faeces but without diarrhoea. Clinical pathology revealed a moderate metabolic acidosis, moderate loss of electrolytes and a mild decrease in albumin (23 g/L; reference range 25–35) with a high normal globulin level (40 g/L; reference range 24–44), suggestive of GI-tract losses with inflammation. However, without clinical evidence of diarrhoea, other differentials were considered including a pancreatic insufficiency (due to the nature of the faeces) but since this is very rare in equids, availability of species-specific TLI testing is problematic. The foal deteriorated and was euthanased and necropsied. Histopathology of the small intestine revealed diffuse oedema with plentiful cross-sections of nematode larvae within the mucosal wall, giving

a diagnosis of **helminthiasis**. In a foal that was likely to have been infected from an early age, *Strongyloides westeri* was suspected. This helminth can be harboured in the mare's tissues and activated during parturition to infect the foal via the milk or contaminated skin. This is far less common these days thanks to routine pre-foaling drenching.

A 2-year-old Thoroughbred filly in the Waikato had a soft tissue mass in the left nasal cavity. Histopathology on the surgically excised tissue revealed a suppurative **granuloma** with bacterial colonies and moderate mucosal necrosis.

Rhodococcus equi was isolated in two separate cases involving 2-month-old Thoroughbred foals in the Matamata-Piako district. Both had inguinal abscesses from which a heavy growth of *R. equi* was cultured. Since the pathogen is spread via the respiratory route, the incidence of *R. equi* cases can increase as a result of increased aerosol spread when conditions become warmer and drier. PCR tests have the advantage of speedy detection and positive diagnosis of the virulent *R. equi* VapA gene, which is useful for differentiating less-virulent environmental strains of the bacterium in respiratory isolates. Cultures, however, are still required for bacterial antimicrobial sensitivities.

A 19-year-old Clydesdale cross mare in the Waikato presented with a bilateral purulent nasal discharge from the guttural pouches. A qPCR test for *Streptococcus equi equi* was positive (confirming a diagnosis of **strangles**) but cultures isolated the equine opportunist bacterium *S. equi zooepidemicus* and not *S. equi equi*. This indicated that both

species were present but *S. equi equi* in very low numbers that were only detected by the highly sensitive qPCR test. This horse may have been a chronic carrier of *S. equi equi*, which is typically harboured in the guttural pouch (Mallicote, 2015), causing persistent low-grade shedding. A possible stress factor may have triggered multiplication of *S. equi zooepidemicus*, at which time both pathogens were discovered.

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Quarterly report of investigations of suspected exotic diseases

Brucella abortus excluded

A veterinarian from South Canterbury called the exotic pest and disease hotline to report orchitis in two 1–2-year-old bulls. The bulls had been diagnosed within days of each other. The first was responding well to systemic antibiotics and the second hadn't yet had time to respond. Orchitis in bulls is not considered common. It can occur for many reasons including trauma, bacteria (e.g., *Histophilus somni*), viruses (herpesvirus) and other exotic agents such as *Brucella abortus*. Also, because this case occurred during the *Mycoplasma bovis* outbreak, this pathogen was considered another possible cause. However, sera from both two bulls tested negative for both *M. bovis* and *B. abortus*, and the investigation was closed.

PRRS excluded

A veterinary pathologist notified MPI of a case of two dead Kunekune pigs at a piggery in the Manawatu. One was a sow with a facial abscess and histological evidence of vasculitis and multiorgan neutrophil-rich inflammation. The other was a male which had been buried so no tissues were available and for this animal no cause of death was determined. The sow's vasculitis was concerning because it resembled that caused by porcine reproductive and respiratory syndrome (PRRS) virus. Other causes of vasculitis include the endemic bacterial agents *Staphylococcus suis* and *Erysipelas rhusiopathiae* but bacterial culture for these prior to contacting MPI was negative. Frozen tissues including liver, pleural fluid and pericardial fluid tested negative for PRRS virus at the Animal Health Laboratory (Wallaceville). An unidentified bacterial cause of the vasculitis and generalised suppurative inflammation was considered most likely. The investigation was closed.

Brucella canis excluded

A veterinarian called the MPI exotic pest and disease hotline to report a dog showing signs of orchitis or epididymitis. Causes of orchitis and epididymitis in

Exotic disease investigations are managed and reported by the MPI Diagnostic & Surveillance Services, Wallaceville. The following is a summary of investigations of suspected exotic disease during the period from October to December 2017.

dogs include infections such as endemic strains of bacteria and exotic bacteria such as *Brucella canis*. Serum from the dog was negative for *B. canis* by the card test. A cause of disease was not established, but exotic disease was ruled out and the investigation was closed.

Canine ehrlichiosis and Leishmania canis excluded

A veterinarian called the exotic disease and pest hotline after examining a dog imported 4 months earlier from the United States. The dog was a 6-year-old Boxer cross that had been unwell during the previous week with vomiting and melena. The dog had a history of autoimmune haemolytic anaemia of indeterminate origin while living in Arizona. Haematology and a biochemistry panel were unremarkable apart from a mild reduction in reticulocytes. Findings were potentially consistent with diseases exotic to New Zealand, including chronic ehrlichiosis and leishmaniosis. New Zealand Import Health Standards for dogs do not require testing for these diseases owing to the absence of suitable vectors in NZ (respectively, phlebotomine sandflies and the brown dog tick, *Rhipicephalus sanguineus*). Blood samples were submitted to the AHL (Wallaceville) for both serological and molecular assays for *Leishmania* spp. and *Ehrlichia canis*, with all negative results. Exotic disease was excluded and the investigation was stood down.

A veterinarian called the exotic pest and disease hotline after examining a 10-year-old Corgi with lymphadenopathy. The dog had been imported into New Zealand 3 years earlier, after living in Romania and South Korea. Haematology and a biochemistry panel were unremarkable. Findings were potentially consistent with diseases exotic to New Zealand including

chronic ehrlichiosis and leishmaniosis. Samples were submitted to the AHL (Wallaceville) for serological and molecular assays for *Leishmania* spp. and *Ehrlichia canis*. Serological assays (IFAT) were negative for both and molecular assays carried out on whole blood were also negative. Exotic disease was excluded and the investigation was stood down.

Canine distemper ruled out

A veterinarian from the Manawatu called the exotic pest and disease hotline to report possible distemper virus infection in a 16-week-old Labrador-Pit Bull cross. The puppy was not vaccinated at all. It had presented with a history of accidental traumatic femoral fracture, which had been surgically plated. After the initial surgery, the puppy had developed a tremor considered to be of CNS origin, and it also developed self-limiting diarrhoea. A serum sample was sent for distemper virus serology. The fracture failed to heal and radiography showed fragmentation of bone. The limb was removed but perineal reddening and oedema then ensued and the puppy was euthanased. Autopsy with histopathology showed a severe panniculitis, most likely caused by *Clostridia* spp. infection. Serology was negative for distemper and the investigation was closed.

Rabbit mortality investigated

A rabbit breeder reported via the exotic pest and disease hotline the deaths of three adult rabbits (~1 year) and one young (16-week-old) animal over the previous 2–3 days. The adults had not been vaccinated but the 4-month-old rabbit had been recently vaccinated. The breeder maintained a vaccination programme but this was somewhat intermittent depending on when the necessary number of rabbits had reached the appropriate age. Three freshly

dead rabbits were submitted to the laboratory for postmortem, where liver samples were collected for histology and molecular testing. Fresh liver samples were submitted to Landcare Research, where PCR and sequencing confirmed the New Zealand field strain of RHD virus-1 (RHDV1 v351-derived NZ field strain). An exotic disease incursion was ruled out and the investigation closed.

Pigeon paramyxovirus excluded

An avian veterinarian notified MPI about suspect paramyxovirus or circovirus in a flock of pigeons from South Auckland. Several pigeons had died and others had diarrhoea, some anorexia, lethargy and head-tilt. Concurrently, cloacal swabs were taken for culture and consistently tested positive for *Salmonella* Typhimurium at a commercial laboratory. Exotic diseases were ruled out by confirmation of a plausible endemic cause, and the investigation was closed.

Avian influenza and *Salmonella Pullorum* excluded

A commercial poultry service contacted MPI to request follow-up testing to confirm the results of export-screening tests for grandparent flock birds under very high biosecurity standards. Positive results were returned for *Salmonella* Pullorum in one bird out of the 106 tested, and in a separate flock one bird out of 90 tested positive for avian influenza (AI). New screening processes were thought to be the most likely cause of these results, but samples were cultured for *Salmonella* and PCR-tested for AI. All confirmatory tests were negative and the investigation was stood down.

Small hive beetle excluded

A commercial beekeeper called the exotic pest and disease hotline to report finding three small (4 mm) dark brownish-black beetles in a dead hive. The other 24 hives across the apiary site were checked and found to be strong, with large numbers of bees, healthy brood and good honey

stores. The beetles were sent to PHEL (Christchurch), where they were determined to be sap beetles, *Epuraea* sp. (Coleoptera: Nitidulidae). These beetles are not uncommonly found amongst the detritus on the bottom-board of New Zealand hives. Small hive beetle was excluded and the investigation was stood down.

European foulbrood excluded

A scientist at an agricultural research laboratory notified MPI of a honey bee hive with clinical signs resembling European foulbrood (EFB, caused by the exotic bacterium *Melissococcus pluton*). Endemic causes were also possible, including half moon syndrome, caused by malnutrition or illness of the hive queen. Only one hive in the apiary was affected, and it was noted to have “half-moon”-shaped larvae and patchily deposited brood. PCR of a brood sample from the hive was negative for EFB and the investigation was closed.

Bee mortalities investigated

A Waikato beekeeper called the exotic pest and disease hotline to report bee deaths that had been occurring over a period of one month in her one hive, resulting in handfuls of dead bees in front of the hive. The duty Incursion Investigator sought the input of an AssuranceQuality Apiculture Technical Adviser (ATA), who strongly suspected a case of poisoning. However as this could not be confirmed, the ATA suggested submitting dead bees to rule out tracheal mite (*Acarapis woodi*), an exotic disease differential for mortalities seen on such a scale. Bees were submitted to MPI's Plant Health and Environment Laboratory (Tamaki). Tracheal mite was ruled out and the investigation was closed.

An apiary consultant contacted MPI to advise that a bee die-off had been reported to him by the experienced manager of a large bee operation in the Waikato. One apiary only had been affected, with 60 out of 270 hives dying acutely, and all bees were affected. The apiary was not located near agricultural

land, but possum baits containing pindone had recently been placed near the hives, and bees had been seen in contact with the bait stations. Pindone is not a reported cause of death in bees, but given the proximity and timing, it was considered a possible differential. Other toxins were considered such as agricultural insecticides, and infectious agents such as *Lotmaria passim* and *Nosema* spp., especially *N. ceranae*. Dead bees, live bees and nectar were submitted for toxin and disease screening. Pindone-specific and broad-spectrum toxicology testing showed detectable levels of fluvalinate (0.023 mg/kg) and tebuconazole (0.038 mg/kg). Fluvalinate is the active ingredient in anti-mite strips, and some detection was to be expected. Tebuconazole is an agricultural antifungal product. The levels of both were considered too low to be the likely cause of death. PCR testing for *L. passim* was negative but PCR testing for *Nosema* showed extremely high levels of *N. ceranae*. Spore counts indicated that the dead bees averaged 133.2 spores per bee, while live bees had very high levels of 33.8 million spores per bee. One million spores per bee is thought to be the cutoff for pathogenicity of this agent. While the spore count did not differentiate between the two species of *Nosema*, the very high PCR quantification for *N. ceranae* suggested that most of the spores were of that species. The cause of death was considered to be *N. ceranae*, and the investigation was closed.

Exotic ticks investigated

A dog owner in Picton called the exotic pest and disease hotline to report finding two very small red tick-like organisms on his dog. Only one tick species of domestic animals is considered endemic to New Zealand, and interceptions of the brown dog tick (*Rhipicephalus sanguineus*) and other ticks occur commonly at the border. Neither dog nor owner had travelled recently. The dog had had access to local trails around the town. One of the organisms was sent to MPI's Plant Health and Environment Laboratory (Tamaki), where it was identified as the mite *Macrocheles hyatti*

(Acari: Macrochelidae), an endemic species found in leaf litter and soil. The investigation was closed.

An MPI entomologist contacted Incursion Investigators to report the identification of an Australian paralysis tick, *Ixodes holocyclus* (Acari: Ixodidae), on a child's head. The tick was received by MPI's Plant Health and Environment Laboratory (PHEL) after it was submitted by a human pathologist who had obtained it from the submitting medical doctor. The child from which it came had recently travelled to the Sydney coastal area. This species is considered to be the most important tick pest, and can cause paralysis by injecting neurotoxins into its host. Finds such as this demonstrate a pathway of entry for this species into New Zealand. As the specimen was dead upon submission, it presented no risk. The investigation was closed.

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Quarterly report of investigations of suspected exotic marine and freshwater pests and diseases

Sick scallops in Kaipara investigated

The Auckland MPI fisheries office contacted the MPI Animal Health Laboratory (AHL) after a survey of New Zealand scallop (*Pecten novaezelandiae*) beds in the Kaipara Harbour showed that the population had declined substantially. They believed this could be due to a disease. Samples from two different sites in the harbour were sent to the AHL for disease testing. Histopathology indicated an extreme degradation of the digestive glands in all scallops submitted, which appeared to be associated with *Rickettsia*-like organisms (RLOs). Some very small virus-like particles (VLPs), which have been described previously in New Zealand scallops by Hine & Wesley (1997), were also found. *Perkinsus olseni*, a mollusc parasite endemic to the Auckland region was found in many (65 percent) of the scallops submitted. The pathology associated with RLOs is consistent with that seen in two previous investigations of ill-thrift in New Zealand scallops, in Pelorus Sound and near Great Barrier Island. Extreme degradation of the digestive gland and of the gill epithelium effectively meant that the scallops were starving to death and/or unable to respire. A high prevalence of *P. olseni* was found in the Kaipara scallops compared with those from Great Barrier Island and Pelorus Sound, in which it was considered an opportunistic or incidental occurrence. This suggested that *P. olseni* may play a bigger role in the ill-health seen in the Kaipara scallop population, even if still unlikely to be the primary pathogen. Little is known about the role RLOs and VLPs play in shellfish health in New Zealand. Some research has been initiated into the role of RLOs in shellfish mass mortalities, but more research is also needed on VLPs. Further work on the health of scallop populations in New Zealand is recommended.

Jack mackerel mortality investigated

The Northland Regional Council (NRC) reported large numbers of jack mackerel

Exotic marine pest and aquatic disease investigations are managed and reported by MPI's Diagnostic and Surveillance Services Directorate, Wallaceville. The following is a summary of investigations of suspected exotic marine diseases and pests during the period from October to December 2017.

(*Trachurus novaezelandiae*) on the shores of the tidal lower reaches of the Raumanga Stream, Whangarei. This had initially been reported to the NRC by a member of the public. The NRC visited the site and about eight jack mackerel were seen spread over large area. No other dead fish were seen but it was suspected that some had already been removed by scavenging birds. One fish was retrieved and sent to the AHL for testing. Unfortunately the specimen was autolysed by the time it arrived, so the lab was not able to perform histopathology. Pilchard herpesvirus was ruled out by molecular testing. Whangarei had received 42 mm of rain in the 2 days prior to the notification. The tidal range at the time was 2.6 m, which was not out of the ordinary. Four other similar incidents have been reported in the last 4 years, always between September and November. In three cases the fish were definitely also jack mackerel and the fourth is also likely to have involved the same species but the description provided was too vague to confirm. Looking back through rainfall data, only one of these suspected fish kill events was accompanied by high rainfall. Significant drops in dissolved oxygen levels in the Hatea River, which is near the Raumaunga Stream, has been observed in the past. No cause was determined but it was considered most likely to be associated with an environmental cause, and the investigation was closed.

Crustacean parasites investigated

An MPI fisheries analyst was contacted by a commercial fisher who was longlining in Hawke Bay at about 200 m depth. A live hapuku (*Polyprion oxygeneios*) and a gemfish (*Rexea solandri*) were landed that were covered

in what were described as “bugs” on the skin, in the mouth and in the gills. The fisher was unable to wash them off. The skin of the gemfish looked as though it had small welts on it and the skin of the hapuku looked red and irritated. The analyst referred the report to MPI Incursion Investigation and the two fish were submitted to the AHL for examination. The fish arrived in a decomposing state but amphipods of the family Lysianassidae were able to be identified. Lysianassids are widespread and common in the marine environment, including in New Zealand. Some species are opportunistic scavengers and carrion feeders, and can quickly swarm on dead and dying marine animals. No biosecurity risk was identified and the investigation was stood down.

Exotic *Yersinia ruckeri* ruled out

A veterinary pathology laboratory called the pest and disease hotline to report that two kidney samples from 10 farmed chinook salmon (*Oncorhynchus tshawytscha*) that had been submitted to the laboratory were suggestive of *Yersinia ruckeri*. While there are endemic strains of this bacterium in New Zealand, exotic strains are Unwanted Organisms and Notifiable Organisms. The manager of the salmon farm advised that the samples had been submitted for routine health monitoring of 12-month-old broodstock that averaged 1.22 kg in weight. No unusual mortality or clinical signs had been observed among the fish. Bacterial cultures were referred to the AHL and *Y. ruckeri* was confirmed by real-time PCR. Because there were no clinical signs or unusual mortality and the farm had tested positive to the endemic strain of *Y. ruckeri* in the past, exotic *Y. ruckeri* was ruled out and the investigation stood down.

Anchovy mortality investigated

The Waikato Regional Council (WRC) contacted MPI to report thousands of dead anchovies above the tidal reaches of the Tapu River. Photos submitted confirmed this. WRC submitted fish samples to its resident freshwater ecologist, who confirmed them to be anchovies (*Engraulis australis*), which are regarded as a saltwater-only species. No other fish or crustaceans appeared to be affected. WRC continued to monitor the area and no further issues were observed in the following week so the investigation was stood down by both MPI and WRC, with the expectation that WRC would notify MPI should any other mortalities be observed.

Reference

Hine PM, Wesley B (1997). Virus-like particles associated with cytopathology in the digestive gland epithelium of scallops *Pecten novaezelandiae* and toheroa *Paphies ventricosum*. *Diseases of Aquatic organisms* 29, 197–204.

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Exotic plants and environment investigation report: October to December 2017

Agricultural pests

The notifier found a weed growing on her property that she believed was velvetleaf (*Abutilon theophrasti*). However, the description given was inconsistent with velvetleaf and a sample was identified by a PHEL botanist as hedge woundwort (*Stachys sylvatica*), a common field weed. Hedge woundwort is common in the southern North Island and regarded as established in New Zealand. There was no biosecurity issue.

Forest and timber pests

A wooden table and set of six chairs purchased from an Auckland furniture shop about 15 months previously were found to have wood dust on the floor under one of the chairs. On closer examination signs of wood damage were found, along with a number of dead borer beetles. The furniture had been installed in a holiday home on Waiheke Island, so there was concern as to whether the borer was a local contaminant or had come from overseas with the furniture. The beetles were identified as *Lyctus sinensis* (Chinese powderpost beetle), exotic to New Zealand. The borer damage appeared to be confined to the wooden seat pad of one chair. The seat pad was placed in the freezer at the PHEL laboratory for two weeks to kill any live organisms and mitigate any biosecurity issue. The notifier was told to let off an insecticide bomb in the house in case any live organisms had dispersed.

A member of the public collecting goods from an Auckland Transitional Facility noticed that the facility was de-vanning what appeared to be untreated timber. However, a search of the MPI database QuanCargo by the Incursion Investigator revealed that no timber had been imported by the logistics company in the previous year. Border staff were directed to inspect the containers and all relevant paperwork. There was no biosecurity issue as all items and paperwork were compliant.

A member of the public noticed borer holes in an imported bamboo chopping board purchased from a department

The Ministry for Primary Industries' (MPI) Incursion Investigation teams and the Plant Health Environment Laboratory (PHEL) teams investigate and diagnose suspect exotic pests and diseases in the plant and environment sectors. Investigators and scientists are based in Auckland and Christchurch. These teams provide field investigation, diagnostic testing and technical expertise on new pests and diseases affecting plants and the environment. They also have surveillance and response functions and carry out research and development to support surveillance and incursion response activities.

store, and after noticing sawdust in the packaging concluded that the board was the source. A specimen was submitted to PHEL and identified as *Dinoderus minutus*, a boring insect sometimes intercepted on bamboo products from Asia. The goods had been fumigated overseas before export. The store was asked to remove the 163 units from its shelves and the 726 units at the distribution centre. These were then incinerated, mitigating the biosecurity issue.

An MPI Quarantine Officer (QO) reported borer damage in bamboo toys that had been cleared at the border and were on sale in a shop. A QO visited the shop and after inspecting all the toys submitted five items with suspected borer damage to PHEL for destructive sampling. One bamboo toy had borer damage and tunnelling, and a fragment of a wing case was found in the box that the toy came in, but no insects were found. The age of the borer damage could not be confirmed. All bamboo toys similar to the damaged one were frozen for a week to mitigate any biosecurity issue.

Horticultural pests

A horticulturist with experience in the Ya pear trade found unusual markings on the skin of Ya pears purchased from a Havelock North supermarket. PHEL mycologists isolated the fungus *Alternaria alternata* from the pear lesions. This fungus is present in New Zealand, has a cosmopolitan distribution and does not pose a biosecurity issue.

A suspect fruit fly was found on the wall of a warehouse in Penrose, Auckland.

A photo sent to MPI showed it to be a hover fly, *Eristalis tenax*. This species is widely distributed in New Zealand.

A notifier found a suspect Queensland fruit fly on a lemon tree in his garden. The fly was identified by PHEL from photos as the Australian leaf roller fly (*Trigonospila brevifacies*), which was introduced to New Zealand in the 1960s and 1970s as a biocontrol agent.

A suspect fruit fly was found on an apple tree in a garden near Auckland International Airport. A PHEL entomologist identified the specimen as *Gelis* sp., a wasp that is established in New Zealand.

A suspect fruit fly was found on a tomato plant in a residential garden. Photos examined by a PHEL entomologist ruled out Queensland fruit fly and identified a local species of hover fly in the family Syrphidae.

A suspect fruit fly was found on a wall inside a house in Queenstown and then captured and placed in a specimen jar. The fly was described as about 7 mm long with a dark brown abdomen with faint tail stripes, lighter brown thorax, brown eyes and wings about twice the body length. No occupants of the house had recently been overseas but the notifier advised that a neighbour operated an Airbnb that had had visitors from China, Malaysia, Texas and the UK during the previous fortnight. A PHEL entomologist identified the fly as *Sapromyza simillima*, a species that is established throughout New Zealand. The specimen may have been associated with fruit purchased from a local supermarket.

General biosecurity pests and contaminants

A commercial calendar importer received seven wooden pallets of calendars and found significant fungal contamination in the wood. Samples were collected and identified as the cosmopolitan bracket fungus, *Trametes versicolor*, a species established in New Zealand. The notifier subsequently also found several arachnids on the pallets. One specimen was identified as a **cellar spider** (*Pholcus phalangioides*); another spider could not be identified but was considered likely to be a local species, based on the time elapsed between arrival and detection. The poor condition of the pallets was a concern and that it was noted that none of the seven pallets were ISPM15-stamped, so they did not comply with the Import Health Standard. The pallets were destroyed as a precautionary measure.

Books purchased from Amazon.com were found to have live ants in the box they arrived in. The box was not insect-proof. From photos they were identified by PHEL as the black house ant, *Ochetellus glaber*, a species established in New Zealand and not considered a biosecurity issue.

Live snails were found associated with a car radiator that had been imported from Melbourne a month previously. The snails were identified as immature *Cornu aspersum*, the common garden snail, which is established throughout New Zealand.

Several ants were found in luggage by a traveller recently arrived from Tonga. The notifier had posted photos of the insects on the Facebook NZ Bug Identification page. An Incursion Investigator suspected that they were the exotic **ghost ant**, *Tapinoma melanocephalum*. MPI contacted the notifier via a private message on Facebook and was advised that the suitcase and surrounding area had been heavily sprayed with insecticide. The notifier was asked to place the suitcase in a plastic bag and spray it again with insecticide. An investigator visited the property and inspected the bedroom where the

suitcase was kept. No ants were found in the actual room, but live ants were found in the suitcase and PHEL entomologists confirmed they were *T. melanocephalum*. Flybusters AntiAnts was contracted to conduct surveillance and to place baited traps at the house but no more ants were found.

Photos of a single spider suspected to be a **redback** (*Latrodectus hasselti*) were sent to the PHEL entomology team, who subsequently confirmed the identification. The spider was found while moving a henhouse at the notifier's property in Nelson, on an isolated hillside with unkempt vegetation and long grass behind his house. The property was in a residential area some distance from neighbouring properties and not close to any Transitional Facility. No one in the household had recently returned from overseas and no association with imported goods could be established. The henhouse was of local origin and had not been used for several years. Populations of redback spiders are present in some parts of New Zealand, but they are not known to be established in the Nelson area. The notifier was advised that redback spiders are not a new find or an Unwanted Organism under the Biosecurity Act 1993 and was asked to inspect the henhouse (while wearing gloves) before selling or removing the structure from his property, in order to limit spread.

A spider was found in bananas from Ecuador that were purchased from a Queenstown supermarket. A photo of the spider showed distinctive red markings on the abdomen, from which a PHEL entomologist identified it as the North American **red-backed jumping spider**, *Phidippus johnsoni*, a species not considered present in New Zealand. The literature cites *P. johnsoni* as common from southern Canada to Mexico but there is no record of its presence in the banana-producing regions of Central America. The spider was likely a hitchhiker, but its origin was unclear and it was destroyed to mitigate any biosecurity issue.

An importer received 19 tonnes of palm fat from Jakarta, Indonesia, in early October 2017, for use in animal-feed production. The fat arrived in 25-kg bags, of which 12 tonnes were delivered to agricultural warehouses in Winton and Christchurch. During processing, the Winton warehouse found a live moth in a bag of the fat. The moth was sent to a PHEL entomologist, who identified it as *Wiseana umbraculata* (bog porina), a native moth that feeds on grass.

An unusual insect with a red abdomen and dark wings and thorax was found in a house after the notifier had received a box of wine from Spain. A PHEL entomologist identified it from a photo as a sphecid wasp, *Pison ruficornis*, a species that is established in New Zealand.

A shipping container that was devanned after arrival at Lyttelton was found to have ants inside after it was moved to a Transitional Facility. Specimens were identified by PHEL as *Technomyrmex jocosus* (white-footed house ant), a species that is established in New Zealand and not a biosecurity issue.

While tending a home garden that had been neglected for two years, the notifier found strawberry plants infested with tiny larvae about 1 mm long, and swarms of small reddish-coloured flies that emerged from under the foliage. The larvae were described as having legs. The notifier had been to a garden centre where the staff asserted that the larvae were the exotic Chinese spotted fruit fly (*Drosophila suzukii*) and that she should call MPI. However, specimens were identified by PHEL as the vinegar fly, *Drosophila melanogaster*, a species that is established in New Zealand.

A larval feeding tunnel was found in the calyx of a pear imported from Australia, after the fruit was cut open. Photos showed what appeared to be a dead larva in a feeding tunnel that extended from the calyx to the seeds. The colour of the dead larva and the presence of secondary fungal rot in the cavity suggested that the larva had long been dead, which was consistent with its having died from

post-harvest treatment prior to export, so there was no biosecurity issue.

An Auckland Metro Quarantine Officer visiting a Transitional Facility (TF) noticed that straw had been used as packaging material with a consignment of 1,450 steel pipes imported from China. The straw wrapping had apparently been overlooked as biosecurity risk material by the Accredited Person (AP) when the container was checked upon arrival. The AP had not notified MPI or recorded the plant material as a contaminant on the container log sheet. The AP initially advised that no pipes had been sold or removed from the site, but later realised that 16 of them had been sold to walk-in customers. The AP also advised that no straw had left the TF with any pipes in the 6 months during which the pipes had been sitting in the yard. The TF operator immediately removed two TradeMe listings advertising the pipes. An investigator and an MPI botanist found fungi growing on the straw, and there were also seeds and insects present. Fungal testing by PHEL mycologists identified *Fusarium incarnatum* (widespread in New Zealand), *Hohenbuehelia atrocoerulea* (status in New Zealand unclear) and *Alternaria* sp. (present in New Zealand and likely to have been an environmental contaminant).

Seeds and straw were identified and seed viability was tested using tetrazolium. Straw was removed from the pipes over a hardstand area, then steam-sterilised and deeply buried. Pesticide was sprayed wherever the straw had been in contact with soil, and it was noted that the problem would be further managed by the TF's monthly spray programme to control weeds. The straw was identified as rice straw (*Oryza sativa*), which in commercial quantities would require heat treatment or irradiation to meet the Import Health Standard "Dried and preserved plant material, and fresh plant material for testing, analysis or research". Seeds were identified as *Oryza sativa* (rice), *Cortaderia jubata* (pampas grass), *Conyza* sp. (fleabane) and *Crespis capillaris* (hawkbeard), all

of which are present in New Zealand. *Cortaderia jubata* competes with native toetoe (*Austroderia* spp.); it is listed on the Plants Biosecurity Index as "entry prohibited" and is also listed on the National Pest Plant Accord to discourage sale and further dispersal. Fleabane and hawkbeard are common weeds in most of the world, including New Zealand. Tetrazolium results showed the seeds tested were non-viable. It is possible that some of these seeds became associated with the straw after it arrived in New Zealand, as it was exposed to the environment for around six months. Rice seeds are listed on the Plant Biosecurity Index. MPI entomologists identified *Cryptamorpha desjardinsi* (Desjardin's beetle) and *Orthoperus atomarius*, both being beetles that are established in New Zealand and therefore not a biosecurity issue; they may have been of local origin. Once the biosecurity risk had been mitigated by destroying the straw, this case was referred to the Transitional Facility team to investigate the failure of both the TF operator and the AP to log the plant material and notify MPI when the containers were first opened.

Small black insects were noticed on a large quantity of Chinese garlic 5 days after it was purchased from a supermarket for feeding to chickens and cows. The insects were suspected to be aphids from China. The notifier was concerned that they had spread throughout the house and was advised to freeze the remaining garlic and use insect spray in the house. The specimens were identified by a PHEL entomologist as *Neotoxoptera formosana* (onion aphid), which is established in New Zealand and is not a biosecurity issue.

Several large ants were found at a business premises in Christchurch and the property owner suspected that they were coming from a nearby shipping container. The container belonged to a sculptor who was using an adjacent premises. Ants with a black head, black abdomen and reddish-brown thorax were found roaming a 20 m radius when the Initial Investigator visited. A PHEL entomologist identified specimens as

carpenter ants (*Camponotus* sp.), an Unwanted Organism. Flybusters Antians was contracted to destroy the ants. The container was found to contain grass, seed, leaves and quantities of soil around a sculpture that had been shipped from Victoria, Australia, three months previously. Before inspection by a Quarantine Officer, an insecticide was applied both outside and inside the container, and carpenter ants immediately emerged from underneath. Tent fumigation using methyl bromide was undertaken and after this the container was lifted in the presence of a Quarantine Officer for a six-side inspection, which showed further evidence of grass, seeds, leaves, quantities of soil and many empty spider egg sacs. The container was then sent for an exterior and interior clean at a Transitional Facility. Post-treatment monitoring was conducted 4 weeks after fumigation to check the efficacy of the treatment, and no further carpenter ants were found. The site was added to the 2018 National Invasive Ant Surveillance (NIAS) programme as a precautionary measure.

Plant diseases

As part of a university student's PhD research, *Phytophthora pini* was reported by Scion, in association with other *Phytophthora* spp. and other fungi in soil samples collected from unimproved pasture adjacent to Waipoua Forest, Northland. The identification was confirmed by PHEL mycologists using DNA barcode technology. Investigation revealed that there was no association with kauri trees (*Agathis australis*) as originally reported. Previous finds of this pathogen are likely to have been recorded as *P. citricola*, which is now recognised as a species complex that includes *P. pini*. By whatever name, this species is known internationally to be a minor pathogen with a wide host range, but its impact in New Zealand is not clear. However, no significant impacts have previously been recorded here from the *P. citricola* complex. The environmental and economic impacts of *P. pini* are not considered a biosecurity issue.

Suspect stink bugs

A live stink bug was found under the carpet in a newly imported car during inspection for compliance. Photos of the insect were consistent with the **yellow spotted stink bug** (*Erthesina fullo*), an Unwanted Organism. The vehicle was thoroughly inspected by a Quarantine Officer and sprayed with insecticide. No further insects were found.

MPI received notification of a Facebook page associated with a Westport tractor museum that had photos of an insect suspected to be BMSB. The site described the museum as importing tractors and machine parts from the US. Photos of the suspect BMSM were identified by PHEL as an elephant weevil, *Orthorhinus cylindrirostris*, one of New Zealand's largest endemic weevil species.

A cluster of eggs and shield bug nymphs found on a grapevine in the notifier's glasshouse were suspected to be BMSB. However, the nymphs were identified by PHEL entomologists as green potato bug, *Cuspicona simplex*, a species present in New Zealand.

A suspect **Erthesina fullo**, **yellow spotted stink bug** (YSSB) was found by a car salesyard staff member collecting vehicle parts from a supplier in Wiri, Auckland. It was found outside the dispatch office, on top of a large open box containing wheel covers. A PHEL entomologist confirmed that it was an adult male YSSB. Staff checked the box and three more boxes of wheel covers at another yard in Richmond, Auckland, but no more bugs were found. Staff at the sites were asked to be extra vigilant for YSSB and brown marmorated stink bug (BMSB). To heighten awareness, the car dealer was given MPI YSSB and BMSB fact sheets and reminded its staff to be vigilant and report anything they suspected might be exotic.

Reports of brown marmorated stink bug

A traveller from the US who had arrived about a week previously found a suspected brown marmorated stink bug (BMSB, *Halyomorpha halys*) in his

apartment. Windows had been left open in the apartment during the intervening days. From photos PHEL entomologists identified the brown soldier bug, *Cermatulus nasalis*, a native species. In another case, a suspect BMSB was found on the notifier's back after she had been in her Te Puke garden, which backed on to a kiwifruit orchard, but this too was identified from photos as a brown soldier bug.

The notifier found suspect dead BMSBs while unloading vehicles from a vessel that had arrived in Auckland from Japan. A specimen was described as being dry, with legs and antennae easily breaking, suggesting that it had been dead for some time. Local Quarantine Officers inspected the vehicle hold and collected specimens for identification. The submitted specimens were identified as one dead **BMSB** and two dead **polished green shield bugs**, *Glaucias subpunctatus*, a species not present in New Zealand. No live insects were found.

A suspect BMSB was found on the floor of the Auckland International Terminal arrivals hall. As the hall was empty at the time, the bug could not be associated with any specific flight or passenger. The bug was confirmed to be an adult unmated non-reproductive female **BMSB**. The arrivals hall has a disinsection programme in place, with a check undertaken at regular intervals to determine the efficacy of the insecticide. A thorough search of the hall was conducted by Quarantine Officers, with no further BMSB found.

A Chief Quarantine Officer in Christchurch was contacted by an Approved Person at a Transitional Facility, regarding a suspect BMSB found on a mobile concrete batching plant imported from Italy. Live **BMSB** were found in the machine, which had arrived in Auckland by sea freight on 25 November 2017, been cleared and then towed to Christchurch the next day, arriving on the 27th. During pre-commission checks on the machine two days later, 15 live and four dead BMSB were found inside control panels

by the approved TF operator. The duty Incursion Investigator was notified and the machine was inspected and sealed by an investigator and a Quarantine Officer (QO) that evening. Fumigation with methyl bromide began at midday on the 28th and was completed 24 hours later. The investigator and a QO carried out a post-fumigation inspection, during which a further 55 dead BMSB were collected. All the bugs were females and were confirmed by PHEL as non-reproductive. The machine had been fumigated with sulphuryl fluoride in Italy before shipping. The biosecurity issue was contained under urgent measures and the methyl bromide fumigation mitigated any immediate biosecurity issue. During the commissioning of the machine, 16 more dead BMSB were found on opening stainless-steel panels towards the rear of the machine. Further investigation into MPI border process and pre-entry target evaluation for this type of machine was carried out by MPI Senior Advisers and the investigation was closed.

An express courier parcel received from Orléans, France, which contained four carpet tile samples, was found to contain a stink bug when opened by the importer. The bug had stripes on the antennae and was thought to resemble BMSB. PHEL identified the specimen as **Rhaphigaster nebulosa** (**mottled shield bug**), a regulated pest not established in New Zealand. The importer searched the room where the package had been kept since its arrival three days previously and sprayed an insecticide as a preventative measure. This find was assessed as a lone hitchhiker.

On returning from a holiday in Italy a traveller found a suspect BMSB in her suitcase and had placed it in a freezer to kill it. Photos were examined by a PHEL entomologist, who indicated that the bug was likely to be a **BMSB**, and this was later confirmed by PHEL. The suitcase and another one used by the traveller were shrink-wrapped and returned to the Auckland International Terminal for a thorough inspection by Quarantine

Officers. No further BMSB were found, though one dead *Nezara viridula* (green vegetable bug, a species present in New Zealand) was found. An investigator collected the BMSB specimen and conducted a site inspection to check areas in the house where the suitcases had sat unopened for several hours after arrival. No BMSB were found but the notifier used insecticide bombs in the house and garage as a precautionary measure.

A commercial kiwifruit grower reported that his orchard manager had found a suspect BMSB in his orchard. They had identified the bug using photos from the MPI website and posters supplied by Kiwifruit Vine Health. However, the specimen was identified by PHEL as *Cermatulus nasalis*, the brown soldier bug, a species established in New Zealand.

A live suspect BMSB was found in the door seal of a new Toyota van imported by a Wellington dealership. However, an image of the bug was identified by PHEL as *Erthesina fullo*, the **yellow spotted stink bug**. The notifier was told not to move the van before Quarantine Officers could inspect it for other contaminants and arrange fumigation. Fumigation with methyl bromide was carried out that afternoon and the vehicle was released the next day.

A Quarantine Officer was carrying out an audit on a shipping container situated outdoors at a freight-forwarding company in Lower Hutt. The container originated from Venice, Italy, and contained two chiller units and two boxes of chiller parts. Upon opening the container a number of active stink bugs were seen; one bug of unknown species was thought to have escaped. The ground outside and under the container was sprayed with insecticide and the container was sealed and fumigated with methyl bromide. Seven live bugs were collected; six were identified by PHEL as *Nezara viridula*, the green vegetable bug, and one was an adult male **BMSB**. A site visit by two Incursion Investigators yielded no further stink bugs. Staff and neighbouring businesses were given

information leaflets and posters about BMSB and yellow spotted stink bug to increase awareness. Devanning and post-fumigation inspections of the container and contents were carried out under MPI supervision, and one dead green vegetable bug and one dead BMSB were collected. The container was described as being in poor condition, with rust around the doors and possibly damaged seals providing potential escape routes for insects, but after devanning and internal examination the container was confirmed to be insect-proof.

Suspect new to New Zealand organisms

During a review of its culture collection, Plant and Food Research Ltd (PFR) found that two fungal cultures isolated in 2004 from blueberry fruit in the Waikato region were species not listed in the Landcare Research culture collection. This suggested that they were new records for New Zealand that had not been recognised as such at the time and therefore had not been reported to MPI. PFR staff thought that the new to New Zealand species was the fungus *Mycosphaerella gregaria* (Ascomycetes: Mycosphaerellaceae). Further inspection of New Zealand fungal collection records failed to find any additional records of *M. gregaria* prior to 2004, or since. Laboratory notes made in 2004 said the cultures had been isolated from small circular to irregular coalescing spots on the surface of blueberries at harvest. The spots were 1–2 mm in diameter with depressed reddish-brown centres. Various other fungi also grew out of the plated tissue, including *Botryosphaeria* sp. and *Cryptosporiopsis actinidiae* (identified by ITS sequencing), both known as primary pathogens causing fruit spots on other hosts in New Zealand. The sample collection data stated that the material originated from Hamilton in 2004 and had been sent to a HortResearch mycologist for identification. While the sample may have originated from a blueberry grower, it may equally have been an internal submission from the Ruakura HortResearch blueberry breeding programme.

Isolates were sent to MPI for sequencing, which revealed that showed the isolates were not in fact *M. gregaria* but were more similar to *M. endophytica* and *M. ellipsoidea*, which are endophytes or secondary pathogens of eucalyptus. Although the actual species could not be determined, these species are not considered to be a biosecurity risk.

Scion notified PHEL of nematodes associated with *Pinus radiata* var. *binata* samples collected near Rotorua during the High Risk Site Surveillance Programme from a tree showing signs of damage. MPI sent the specimens and tree samples to a Landcare Research nematologist. Two nematode taxa were found associated with the bark samples, and none from the wood samples. One of the two genera, *Myctolaimus* sp. (Nematoda: Cylicodorylidae), had not previously been recorded in New Zealand. *Myctolaimus* spp. are reported to be free-living in soil and to feed on decaying organic matter, although some are associated with beetles. They are not considered economically important and none have been reported to attack pine trees (Zeng Zhao, pers. comm.). It is likely that this species is well established in New Zealand but it has not previously been detected. As this nematode was unable to be identified to species (largely because the taxonomic uncertainty associated with this genus), it will not be reported in MPI's Plant Pest Information Network. The second nematode taxon found was *Aphelenchoides* sp., which is also considered saprobic and is not a biosecurity issue.

A scientist who leads the Plant and Food Research Ltd hop-breeding programme was told that there was a disease in a Canterbury-based plant nursery propagating and retailing hop plants. The disease was described as a powdery mildew, but no such pathogen of hops was known from New Zealand. However, since the exotic *Podosphaera maculari* causes a serious powdery mildew disease of hops overseas, an investigation to rule out its presence was initiated. The nursery was visited by an MPI Incursion Investigator to collect

samples of any diseased hop plants for molecular DNA testing, but no disease signs were seen. There were signs of leaf-yellowing on some young plants but these were considered likely to be of nutritional cause. Similarly, while burnt leaf margins were present on a very few established plants, these signs too were considered likely due to non-pathogenic causes such as wind burn. No fungal hyphae, powdery white colonies, lesions, shoot infection, leaf spotting or other signs associated with powdery mildew or other microbial pathogens were seen on any of the plants. No evidence was found to support the contention that a hop powdery mildew was present.

A recent study has clarified the taxonomic status of *Trichoderma* spp. by determining that this genus is indeed present in New Zealand. The study compared sequences derived from *Trichoderma* genomic DNA extracted from existing fungal collections held in New Zealand and overseas. These represented all *Trichoderma* species/strains recorded from New Zealand. Field collection dates ranged from the 1920s to 2013 and the samples had been collected from numerous localities. From the 336 *Trichoderma* strains sequenced, 71 species, both endemic and exotic, were determined to be present in New Zealand, and 14 of them were undescribed. Because 32 of these species had not previously been recorded in New Zealand, MPI reviewed their biosecurity risk. None of them had recently arrived in the country, so this notification represented no change to their associated risk. *Trichoderma* spp. are generally considered beneficial, with some strains used in commercial crop production. MPI reviewed all 32 species and concluded that there was no biosecurity risk. MPI is awaiting further information on the status of these 32 species under the Hazardous Substances and New Organisms Act 1996, as the original International Collection of Microorganisms from Plants data are incomplete for many of the isolates.

Storage pests

Coriander seeds purchased from an Indian grocery in Hamilton three weeks previously were found to have light brown beetles hatching inside the packet when it was opened. The seeds were thought to have been imported from India or Fiji. A resident had thrown the packet out on to the lawn but the insects were still evident when it was retrieved. The beetles were identified as the drugstore beetle, *Stegobium paniceum*, a cosmopolitan pest of stored products such as spices, herbs, pulses, biscuits and confectionery. This species is established in New Zealand. In another case, drugstore beetles were also found in coriander seeds purchased from an Indian grocery in Dunedin.

Several pale green caterpillars were found in a pantry among cracker biscuits imported from Australia. They were identified by a PHEL entomologist as the white-shouldered house moth, *Endrosis sarcitrella*. This species is found worldwide, including in New Zealand.

Live insects were found infesting hemp (*Cannabis sativa*) seeds imported from Canada for commercially growing hemp fibre. Specimens provided to PHEL were identified as the Indian meal moth, *Plodia interpunctella*, a stored-product pest common in New Zealand. Phytosanitary documentation was provided confirming the seeds had been imported according to the relevant Import Health Standard.

An insect pupa was found among pistachio nuts by a supermarket customer in Blenheim. The supermarket's food safety manager contacted the Senior Biosecurity Officer at the Marlborough District Council, who then contacted MPI. The specimen was identified as a dead and desiccated lepidopteran pupa of the family Gelechiidae (twirler moths). The supermarket staff were informed of the process for reporting suspect exotic pests to MPI.

A Wanaka resident reported an insect infestation in their pantry, possibly originating from imported foods. The

insects were in rice, sugar and jars, and on the pantry walls. They were described as fast-moving, winged, and ovoid in shape with a black head, striped abdomen and bronze body. The notifier was advised to spray knock-down insecticide in the pantry, to put everything into containers, and to freeze all foods that contained insects for 48 hours before disposal. Specimens were identified as the cowpea weevil, *Callosobruchus maculatus*, which is not present in New Zealand. This species is believed to originate from Africa and is widely distributed in warm and humid areas. Further investigation revealed that the pantry had recently contained chickpeas purchased from an organic store in Wanaka. The product was traced back to a consignment of chickpeas that had been the subject of a previous investigation. The retailer said they had not heard of any other customers finding insects in these chickpeas. Follow-up with the notifier confirmed that no further weevils had been found in the pantry after insecticide treatment. The cowpea weevil is considered unlikely to establish in New Zealand owing to unfavourable environmental conditions.

Seed contamination

A member of the Facebook group "New Zealand Vegetable Growers" was concerned that another member of the group was going to plant lavender (*Lavandula* sp.) seeds that had been imported online, by-passing the biosecurity process. The woman who made the posting had asked for planting advice for the seeds, which she had purchased from Amazon.com, and said that it been easy to obtain the seeds and she would import more. Members of the Facebook group had advised her not to use the seeds but were concerned that she still intended to plant them. The importer was contacted through Facebook by MPI to recall the seeds and to remind her of the biosecurity requirements. Initially she denied importing any seeds and said she had bought them locally, but further conversation revealed she had also imported the seed from AliExpress. She was warned that deliberately misleading

MPI over the importation of risk goods is an offence under the Biosecurity Act 1993. The importance of biosecurity in New Zealand was explained to the importer, who then was co-operative and sent the seeds to MPI for destruction. Seeds and the pot they were planted in were incinerated by the importer, who provided photographic evidence of their destruction. The importer was apologetic and said that she would not import seeds again.

An MPI Quarantine Officer advised that a vehicle had been driven off the wharf at the Ports of Auckland without MPI clearance and taken to a premises in Papakura, South Auckland. The vehicle was inspected and grass-seed contamination was found. A seed sample was collected and identified by a seed testing laboratory as *Juncus sp.* (rushes), which are listed as “Entry Prohibited” in the Plants Biosecurity Index. Tetrazolium testing revealed that none of the seeds were viable.

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Pest watch: 22 November 2017 – 26 February 2018

Biosecurity is about managing risks: protecting New Zealand from exotic pests and diseases that could harm our natural resources and primary industries. MPI's Investigation & Diagnostic Centres and Response (IDC & R) directorate devotes much of its time to ensuring that new organism records come to its attention, and to following up as appropriate.

This information was collected from 22 November 2017 to 26 February 2018. The plant information is held in the MPI Plant Pest Information Network (PPIN) database. Wherever possible, common names have been included. Records in this format were previously published in the now discontinued magazine *Biosecurity*.

To report suspect new pests and diseases to MPI phone 0800 80 99 66.

Validated new to New Zealand reports

Type	Organism	Host	Location	Submitted by	Comments
fungus	<i>Fusarium oxysporum</i> f. sp. <i>passiflorae</i> (No common name)	<i>Passiflora edulis</i> passionfruit	Mid Canterbury	AsureQuality (General Surveillance)	Plant pathogen causing wilting symptoms in passionfruit plants.
snail	<i>Hygromia cinctella</i> girdled snail	Inanimate host	Wellington	PHEL (General Surveillance)	A herbivorous land snail native to the Mediterranean region.

If you have any enquiries regarding this information please contact surveillance@mpi.govt.nz

GRIBBLES VETERINARY PATHOLOGY

- **AUCKLAND**
Courier: 37–41 Carbine Road, Mount Wellington, Auckland 1060
Postal: PO Box 12049, Penrose, Auckland 1642
Tel: 09 574 4701 Fax: 09 574 5304
- **HAMILTON**
Courier: 57 Sunshine Ave, Hamilton 3240
Postal: PO Box 195, Hamilton 3240
Tel: 07 850 0777 Fax: 07 850 0770
- **PALMERSTON NORTH**
Courier: 840 Tremaine Avenue, Palmerston North 4440
Postal: PO Box 536, Palmerston North 4440
Tel: 06 356 7100 Fax: 06 357 1904
- **CHRISTCHURCH**
Courier: 7 Halkett Street, Christchurch 8140
Postal: PO Box 3866, Christchurch 8140
Tel: 03 379 9484 Fax: 03 379 9485
- **DUNEDIN**
Courier: Invermay Research Centre, Block A, Puddle Alley,
Mosgiel, Dunedin 9053
Postal: PO Box 371, Dunedin 9053
Tel: 03 489 4600 Fax: 03 489 8576

NEW ZEALAND VETERINARY PATHOLOGY

- **HAMILTON**
Courier: Cnr Anglesea and Knox Streets, Hamilton
Postal: PO Box 944, Hamilton
Tel: 07 839 1470 Fax: 07 839 1471
- **PALMERSTON NORTH**
Courier: IVABS Building, 1st Floor, Massey University,
Tennant Drive, Palmerston North
Postal: PO Box 325, Palmerston North
Tel: 06 353 3983 Fax: 06 353 3986

SVS LABORATORY

- **HAMILTON**
Physical Address: 524 Te Rapa Road, Hamilton 3200
Postal Address: PO Box 10304, Hamilton 3241
Ph: 0800 SVS LABS (0800 787 522) or 07 444 5101
Email: info@svslabs.nz

To report suspected exotic land, freshwater and marine pests, or exotic diseases in plants or animals, call:

0800 80 99 66

PLANT HEALTH & ENVIRONMENT LABORATORY (TAMAKI)

Diagnostics and Surveillance Services (MPI)
Courier: 231 Morrin Road, St Johns, Auckland 1140
Postal: Freepost 120201, MPI DSS, PO Box 2095, Auckland 1140

ANIMAL HEALTH LABORATORY

Diagnostics and Surveillance Services (MPI)
Courier: 66 Ward Street, Wallaceville, Upper Hutt 5018
Postal: MPI DSS, PO Box 40742, Upper Hutt 5018

PLANT HEALTH & ENVIRONMENT LABORATORY (CHRISTCHURCH)

Courier: 14 Sir William Pickering Drive, Burnside, Christchurch 8544
Postal: Freepost 120201, MPI DSS, PO Box 14018 Christchurch 8544