Surveillance

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Editor: Michael Bradstock
Technical Editors: Jonathan Watts, Lora Peacock

Correspondence and requests to receive *Surveillance* should be addressed to:
Editor
Surveillance
Ministry for Primary Industries
PO Box 2526
Wellington, New Zealand
email: surveillance@mpi.govt.nz

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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

Highlights of diagnostics and surveillance

In the last year, a number of projects and initiatives that took place in the post-border area served to strengthen the diagnostic, incursion investigation and surveillance functions of the biosecurity system. These included:

- the continued construction of the National Biocontainment Laboratory;
- development of applications for new technologies (including the acquisition of new technologies to enhance the service of our accredited plant and animal health laboratories);
- the enhancement of MPI's laboratory information management systems;
- the launch of Biosecurity 2025; and
- continued work with the New Zealand science community.

During 2016, construction has continued on the $87m National Biocontainment Laboratory at Wallaceville. The new lab will have a floor area of more than 3 400 square metres on three levels and will provide high- and medium-containment lab space. Soon we will see the completion of steel framing and concrete floor slabs, culminating in the building being weathertight in late 2017, and building fit-out will begin. Once construction is completed in mid-2018 the laboratory will need to be certified and operations transferred before it opens in early 2019. The November 2016 earthquake did not have any impact on the building – as expected, since the lab is supported on base-isolation bearings that can accommodate movement between ground and building of up to 900 mm.

This project will ensure that laboratory surveillance and diagnostic capability remains strong well into the future, providing a much-improved capacity for emergency animal disease responses such as an outbreak of foot-and-mouth disease. The lab will also provide specific containment space for processing key samples of concern to the Ministry of Health.

For both ISO 17025-accredited Animal and Plant Health & Environment Laboratories, it is critical that we continue to implement and optimise modern diagnostic technologies, not only so that MPI can obtain high-quality, credible diagnostics, but also to understand and interpret information provided to us by our trading partners and the scientific community. To this end, we have continued to implement and expand our understanding of Next Generation sequencing for both general applications and use in the regulatory context. This year we will also start using MALDI-TOF (Matrix Assisted Laser Desorption/Ionisation-Time of Flight), which is now a key technology for identifying bacteria and also used increasingly for related micro-organisms such as yeasts, fungi and mycoplasmas. This technology has already been adopted in New Zealand and significantly improves turn-around times for presumptive identification. MPI will be using MALDI-TOF to provide results more quickly during biosecurity investigations and responses, and to verify and expand the databases for NZ organisms.

General surveillance, which is critical to confirm pest-free status and for early detection, has been steadily increasing over the past 4–5 years and remains relatively high. A continuing 4-year trend analysis of biosecurity risk notifications and incursion investigations has noted a significant increase in incursions, with a peak in late 2015.

A significant opportunity to improve the general surveillance system is provided by Biosecurity 2025 (launched in November 2016) through the first of five key strategic directions: "A biosecurity team of 4.7 million". This highlights the importance of citizens and residents actively participating in mitigating biosecurity risks. However, it is anticipated that this will also increase considerably the volume of notifications to MPI. Consequently, specific tools, processes, systems and resources will need to be deployed to ensure that triage remains effective.

The one constant with biosecurity is change. New pests are discovered, old pests can become more significant and trade patterns and volumes are constantly shifting. To ensure that MPI can meet the challenge of these changes requires a good understanding of science and linkages with the most up-to-date research in New Zealand and overseas.

For this purpose MPI has continued to work in close collaboration with the New Zealand science community during the last year, in particular with CRIs and universities through the Better Border Biosecurity (B3), Biological Heritage Challenges and marine biosecurity research. Several of these initiatives are bringing together more user groups with an interest in biosecurity, e.g., DOC, EPA, industry and regional councils. Highlights have included collaborative work on brown marmorated stink bug, fruit fly and myrtle rust, use of new technologies such as smart apps and unmanned aerial vehicles, and social science.

Significant international collaborations have also continued through international fora such as the International Plant Protection Convention (IPPC) and the World Organisation for Animal Health (OIE), and by participation in bilateral interaction and multi-country initiatives or working groups such as the Plant Health or Animal Health Quadrilaterals (Australia, Canada, USA and NZ).

In the animal health area, a recent example is the MPI–China Ministry of Agriculture work plan, which covers co-operation in animal disease prevention and control. Partners in this collaboration are MPI, Massey University's EpiCentre and the Chinese Animal Health and Epidemiology Center. New Zealand is also providing co-ordination and scientific

expertise through the OIE/FAO South-East Asia and China Foot-and-Mouth Disease Control Programme (SEACFMD). This programme recently provided training of laboratory personnel in performing, assessing and analysing a serological FMD test in Laos.

In the plant health area, MPI has worked for a number of years with Asian and Pacific Island countries delivering diagnostic training, participating in regional diagnostic networks such as the ASEAN Regional Diagnostic Network (ASEANET) and in leading or contributing to IPPC diagnostic and surveillance protocols or guidelines.

This work shares technical information and research outcomes to enhance best practice in surveillance and diagnostics for exotic pests or diseases.

During 2017 we will continue to enhance capacity and capability, working in close collaboration with our domestic and international stakeholders so we can be better prepared to deal with present and future challenges in the biosecurity system.

Veronica Herrera
Director Diagnostic & Surveillance Services
Ministry for Primary Industries

ANIMALS

Notifiable organisms list revised

The list of organisms declared to be notifiable organisms under the Biosecurity Act 1993 has recently been revised. Notifiable organisms are generally limited to those organisms that cause, or have the potential to cause, serious harm to natural and physical resources or human health.

Section 46 of the Biosecurity Act 1993 requires that every person who:

- suspects the presence of a notifiable organism in any place in New Zealand; and
- believes that it is not established in that place; and
- believes that a chief technical officer is unaware of its presence in that place at that time

must, without unreasonable delay, report the organism's presence, or possible presence, to the Ministry for Primary Industries (MPI). The obligation to notify the presence or suspected presence of any of these organisms applies to everyone in New Zealand. Notification may be made by contacting the Ministry's 24/7 toll-free emergency number, 0800 809 966.

Penalties for failure to do so for an individual are a fine of up to $100,000 and/or up to five years in prison, and for a corporation a fine of up to $200,000.

The review was an opportunity to add new organisms significant to animal, plant or human health or to trade; to take into account name changes and to remove organisms that no longer meet the criteria for inclusion in the list. The revised list of notifiable organisms is set out in the Biosecurity (Notifiable Organisms) Order 2016, which came into effect on 5 May 2016. The revised list is as follows.

Invasive plants

Scientific name	Common name
Bryonia cretica	White bryony
Ehrharta villosa	Pyp grass
Eichhornia crassipes	Water hyacinth
Moraea flaccida	Cape tulip
Myrica faya	Fire tree; candle-berry myrtle
Phragmites australis	Phragmites
Pistia stratiotes	Water lettuce
Salvinia molesta	Salvinia; kariba weed
Sorghum halepense	Johnson grass
Zizania latifolia	Manchurian wild rice

Organisms affecting amphibians

Scientific name	Common name
Ranavirus (Iridoviridae)	Infection with ranavirus

Organisms affecting crustaceans

Scientific name	Common name
Aphanomyces astaci	Crayfish plague
Infectious hypodermal and haematopoietic necrosis virus	Infectious hypodermal and haematopoietic necrosis
Infectious myonecrosis virus	Infectious myonecrosis
Macrobrachium nodavirus	White tail disease
Necrotising hepatopancreatitis bacteria	Necrotising hepatopancreatitis
Taura syndrome virus	Taura syndrome
White spot syndrome virus	White spot disease
Yellowhead virus	Yellow head disease

Organisms affecting honey bees

Scientific name	Common name
Acarapis woodi	Tracheal mite
Aethina tumida	Small hive beetle
Apis mellifera capensis	Cape bee
Apis mellifera scutellata and its hybrids	Africanised honey bee
Euvarroa sinhai	Varroa
Melissococcus pluton	European foulbrood
Tropilaelaps clareae	Tropilaelaps
Tropilaelaps koenigerum	Tropilaelaps
Varroa underwoodi	Varroa

Organims affecting marine or freshwater environments

Scientific name	Common name
Asterias amurensis	Northern Pacific seastar
Carcinus maenas	European shore crab; green crab
Caulerpa taxifolia	A green seaweed
Cherax quadricarinatus	Red-claw
Cherax tenuimanus	A marron
Eriocheir sinensis	Chinese mitten crab
Haliotis rufescens	Red abalone
Ictalurus punctatus	Channel catfish
Penaeus orientalis (P. chinensis)	Chinese prawn
Potamocorbula amurensis	Asian clam
Sabella spallanzanii	Mediterranean fanworm

Organisms affecting molluscs

Scientific name	Common name
Abalone viral ganglioneuritis virus	Abalone viral mortality
Bonamia ostreae	Bonamiosis
Bonamia roughleyi	Winter mortality or B. roughleyi
Marteilia maurini	Marteiliosis
Marteilia refringens	Marteiliosis
Marteilia sydneyi	Marteiliosis
Mikrocytos mackini	Mikrocytosis
Perkinsus marinus	Perkinsosis
Perkinsus olseni	Perkinsosis
Xenohaliotis californiensis	*Xenohaliotis californiensis*

Organisms affecting multiple animal species

Scientific name	Common name
Amblyomma spp.	An animal tick
Anaplasma spp.	Anaplasmosis
Aujeszky's disease virus	Aujeszky's disease
Babesia spp. (exotic)	Babesiosis
Bacillus anthracis	Anthrax
Bluetongue virus	Bluetongue
Boophilus spp	An animal tick
Chrysomya spp.	Old World screw-worm fly
Cochliomyia spp.	New World screw-worm fly
Coxiella burnetii	Q fever
Crimean-Congo haemorrhagic fever virus (nairovirus)	Crimean-Congo haemorrhagic fever
Dermacentor spp.	An animal tick
Echinococcus spp.	Hydatids
Ehrlichia ruminatium	Heartwater
Epizootic haemorrhagic disease virus	Epizootic haemorrhagic disease
Foot-and-mouth disease virus	Foot-and-mouth disease
Francisella tularensis	Tularemia
Ixodes spp. (exotic)	An animal tick
Leishmania spp.	Leishmaniosis
Rabies virus	Rabies
Rhipicephalus spp.	An animal tick
Rift Valley fever virus	Rift Valley fever
Salmonellae (exotic serovars and phage types)	Salmonellosis
Transmissible spongiform encephalopathy agents	Scrapie; bovine spongiform encephalopathy; chronic wasting disease; feline spongiform encephalopathy
Trypanosoma spp	Trypanosomosis
Vesicular stomatitis virus	Vesicular stomatitis
West Nile virus	

Organisms primarily affecting birds

Scientific name	Common name
Anatid herpesvirus-1	Duck virus enteritis; duck plague
Avian metapneumovirus	Turkey rhinotracheitis
Avian paramyxovirus-1 (exotic strains)	Newcastle disease
Duck hepatitis virus	Duck virus hepatitis
Infectious bursal disease virus	Infectious bursal disease
Influenza A virus in birds	Avian influenza
Salmonella Gallinarum	
Salmonella Pullorum	

Organisms primarily affecting camelids

Scientific name	Common name
Camel pox virus	Camel pox

Organisms primarily affecting cattle

Scientific name	Common name
Bovine herpesvirus-type 1 (abortifacient strain) (1)	Infectious bovine rhinotracheitis abortion
Bovine leukaemia virus	Enzootic bovine leukosis
Brucella abortus	Bovine brucellosis
Campylobacter fetus subsp. *venerealis*	Bovine genital campylobacteriosis or bovine venereal campylobacteriosis
Cysticercus bovis (synonym *Taenia saginata*)	Bovine cysticercosis
Lumpy skin disease virus	Lumpy skin disease
Mycoplasma mycoides subsp. *mycoides* SC	Contagious bovine pleuropneumonia
Pasteurella multocida B:2 and E:2	Haemorrhagic septicaemia
Rinderpest virus	Rinderpest
Theileria annulata	
Theileria parva	

Organisms primarily affecting dogs

Scientific name	Common name
Brucella canis	Canine brucellosis
Canine distemper virus	Canine distemper
Dirofilaria immitis	Heartworm

Organisms primarily affecting fish

Scientific name	Common name
Aeromonas salmonicida	Furunculosis
Aphanomyces invadans	Epizootic ulcerative syndrome
Gyrodactylus salaris	Gyrodactylosis
Epizootic haematopoietic necrosis virus	Epizootic haematopoietic necrosis
Infectious haematopoietic necrosis virus	Infectious haematopoietic necrosis
Infectious pancreatic necrosis virus (exotic strains)	Infectious pancreatic necrosis
Infectious salmon anaemia virus	Infectious salmon anaemia
Koi herpesvirus	Koi herpesvirus disease
Myxobolus cerebralis	Whirling disease
Oncorhynchus masou virus	Oncorhynchus masou virus disease
Red sea bream iridovirus	Red sea bream iridovirus disease
Renibacterium salmoninarum	Bacterial kidney disease
Spring viraemia of carp virus	Spring viraemia of carp
Viral haemorrhagic septicaemia virus	Viral haemorrhagic septicaemia
Yersinia ruckeri (exotic strains)	Enteric red mouth disease

Organisms primarily affecting forestry

Scientific name	Common name
Anoplophora glabripennis	Asian longhorn beetle
Buprestis aurulenta	Golden buprestid
Bursaphelenchus xylophilus	Pinewood nematode
Coptotermes acinaciformis	Australian subterranean termite
Coptotermes formosanus	Formosan subterranean termite
Cryptotermes brevis	West Indian powderpost drywood termite
Dendroctonus valens	Red turpentine beetle
Endocronartium harknessii	Western gall rust
Fusarium circinatum	Pitch canker
Gremmeniella abietina	Scleroderris canker
Grosmannia wageneri	Black stain root disease
Heterobasidion annosum	Annosus root rot
Hylobius abietis	Pine root weevil
Hyphantria cunea	Fall webworm
Lymantria dispar	Gypsy moth
Lymantria monacha	Nun moth
Melanophila californica	Flat-headed borer
Monochamus spp.	Sawyer beetle
Neodiprion lecontei	Red-headed pine sawfly
Ophiostoma novo-ulmi	Dutch elm disease
Orgyia thyellina	White-spotted tussock moth
Orthotomicus erosus	European bark beetle
Phytophthora lateralis	Brown rot
Phytophthora ramorum	Sudden oak death
Pissodes nemorensis	Northern pine weevil
Puccinia psidii	Eucalyptus rust
Rhyacionia buoliana	European pine shoot moth
Teia anartoides	Painted apple moth
Thaumetopoea pityocampa	Pine processionary caterpillar
Tomicus piniperda	Pine shoot beetle

Organisms primarily affecting horses

Scientific name	Common name
African horse sickness virus	African horse sickness
Burkholderia mallei	Glanders
Equine arteritis virus	Equine viral arteritis
Equine encephalitis viruses	Eastern equine encephalitis; western equine encephalitis; Venezuelan equine encephalitis; Japanese encephalitis
Equine infectious anaemia virus	Equine infectious anaemia
Hendra virus	
Histoplasma capsulatum var. *farciminosum*	Epizootic lymphangitis
Influenza A virus in animals of the family Equidae	Equine influenza
Taylorella equigenitalis	Contagious equine metritis
Theileria equi	

Organisms primarily affecting horticulture

Scientific name	Common name
Achatina fulica	Giant African land snail
Anastrepha fraterculus	South American fruit fly
Anastrepha ludens	Mexican fruit fly
Anastrepha obliqua	West Indian fruit fly
Anastrepha serpentina	Sapote fruit fly
Anastrepha striata	Guava fruit fly
Anastrepha suspensa	Caribbean fruit fly
Bactrocera aquilonis	Northern Territory fruit fly
Bactrocera carambolae (formerly *B.* sp. near *B. dorsalis* (Taxon A))	Carambola fruit fly
Bactrocera cucumis	Cucumber fly
Bactrocera cucurbitae	Melon fly
Bactrocera curvipennis	Banana fruit fly
Bactrocera dorsalis	Oriental fruit fly
Bactrocera facialis	A fruit fly
Bactrocera frauenfeldi	Mango fruit fly
Bactrocera jarvisi	Jarvis' fruit fly
Bactrocera kirki	A fruit fly
Bactrocera latifrons	Solanum fruit fly
Bactrocera melanotus	A fruit fly
Bactrocera neohumeralis	Lesser Queensland fruit fly
Bactrocera papayae (formerly *B.* sp. near *B. dorsalis* (Taxon B))	Papaya fruit fly
Bactrocera passiflorae	Fijian fruit fly
Bactrocera philippinensis (formerly *B.* sp. near *B.dorsalis* (Taxon C))	A fruit fly
Bactrocera psidii	South Sea guava fruit fly
Bactrocera trilineola	A fruit fly
Bactrocera trivialis	A fruit fly
Bactrocera tryoni	Queensland fruit fly
Bactrocera xanthodes	Pacific fruit fly
Bactrocera zonata	Peach fruit fly
Cacopsylla pyricola	Pear psyllid
'*Candidatus* Phytoplasma mali'	Apple proliferation phytoplasma
'*Candidatus* Phytoplasma pyri'	Pear decline phytoplasma
'*Candidatus* Phytoplasma solani'	Bois noir phytoplasma
Ceratitis capitata	Mediterranean fruit fly
Ceratitis rosa	Natal fruit fly
Clavibacter michiganensis subsp. *sepedonicus*	Bacterial ring rot of potato
Conotrachelus nenuphar	Plum curculio
Drosophila suzukii	Spotted wing drosophila
Flavescence dorée phytoplasma	
Gymnosporangium asiaticum	Japanese pear rust
Gymnosporangium juniperi-virginianae	Cedar apple rust
Halyomorpha halys	Brown marmorated stink bug
Helicobasidium mompa	Violet root rot
Homalodisca vitripennis (formerly *Homalodisca coagulata*)	Glassy-winged sharpshooter
Hyalesthes obsoletus	A leaf hopper
Leptinotarsa decemlineata	Colorado potato beetle
Lobesia botrana	European grapevine moth
Monilinia fructigena	Apple brown rot
Pepino mosaic virus	PepMV
Plum pox virus	Plum pox
Popillia japonica	Japanese beetle
Potato mop-top virus	PMTV
Rhagoletis pomonella	Apple maggot fly
Scaphoideus titanus	A leaf hopper
Synchytrium endobioticum	Potato wart
Tilletia controversa	Dwarf bunt
Tilletia indica	Karnal bunt
Trogoderma granarium	Khapra beetle
Xanthomonas axonopodis pv. *citri* (synonym *X. campestris* pv. *citri*)	Citrus canker
Xanthomonas fragariae	Angular leaf spot of strawberry
Xylella fastidiosa	Pierce's disease

Organisms primarily affecting human health

Scientific name	Common name
Aedes aegypti	Yellow fever or dengue mosquito
Aedes albopictus	Asian tiger mosquito
Aedes atropalpus	Rockpool mosquito
Aedes camptorhynchus	Southern saltmarsh mosquito
Aedes japonicus	Japanese rockpool mosquito
Aedes polynesiensis	Polynesian mosquito
Aedes scutellaris	
Aedes sierrensis	Western tree hole mosquito
Aedes togoi	

Aedes vigilax	Saltmarsh mosquito
Anopheles spp.	Malarial mosquitoes
Culex annulirostris	Common banded mosquito
Culex gelidus	Frosty mosquito
Culex pipiens pallens	Common house mosquito
Culex sitiens	

Organisms primarily affecting native ecosystems

Scientific name	Common name
Anoplolepis gracilipes	Yellow crazy ant
Paratrechina longicornis	Crazy ant

Organisms primarily affecting pigs

Scientific name	Common name
African swine fever virus	African swine fever
Brucella suis	Porcine brucellosis
Cysticercus cellulosae (synonym *Taenia solium*)	Porcine cysticercosis
Hog cholera virus	Classical swine fever
Nipah virus	Nipah virus encephalitis
Pasteurella multocida (toxigenic strains)	Atrophic rhinitis
Porcine reproductive and respiratory syndrome virus	Porcine reproductive and respiratory syndrome
Swine vesicular disease virus	Swine vesicular disease
Teschovirus A	Teschovirus encephalomyelitis
Transmissible gastroenteritis virus	Transmissible gastroenteritis
Trichinella spiralis	Trichinellosis

Organisms primarily affecting sheep and goats

Scientific name	Common name
Brucella melitensis	Brucellosis
Chlamydophila abortus	Enzootic abortion of ewes
Maedi-visna virus	Ovine progressive pneumonia
Mycoplasma agalactiae	Contagious agalactia
Mycoplasma capricolum subsp. *capripneumoniae*	Contagious caprine pleuropneumonia
Nairobi sheep disease virus	Nairobi sheep disease
Peste des petits ruminants virus	Peste des petits ruminants
Psoroptes ovis	Sheep scab
Pulmonary adenomatosis virus	Pulmonary adenomatosis
Sheep pox and goat pox viruses	Sheep and goat poxes
Theileria lestoquardi	

Other organisms

Scientific name	Common name
Myxoma virus	Myxomatosis
Solenopsis geminata	Tropical fire ant
Solenopsis invicta	Red imported fire ant
Spilopsyllus cuniculi	European rabbit flea
Wasmannia auropunctata	Little fire ant

For further information on notifiable organisms, see MPI's website, www.mpi.govt.nz, or https://www.mpi.govt.nz/protection-and-response/finding-and-reporting-pests-and-diseases/registers-and-lists.

Toni Tana
Senior Adviser
Animal Health
Biosecurity Surveillance & Incursion Investigation
Diagnostic & Surveillance Services
Ministry for Primary Industries
toni.tana@mpi.govt.nz

Gina Chamberlain
Policy Analyst
Readiness and Response Policy
Biosecurity and Animal Welfare Directorate
Ministry for Primary Industries
gina.chamberlain@mbie.govt.nz

Quarterly report of diagnostic cases: October to December 2016

Gribbles Veterinary Pathology

Bovine

After morning milking on an Otago dairy farm seven cows were found recumbent and five were dead in a new grass paddock. The recumbent cows did not respond to treatment for metabolic disease. A serum sample taken from one of the recumbent cows prior to treatment showed slightly low calcium (1.81 mmol/L; reference range 2–2.7), high sodium (181 mmol/L; reference range 136–146) and high chloride (129 mmol/L; reference range 90–104). High serum sodium and chloride concentrations are consistent with **salt toxicity**. It was later found that early the same morning a farm worker had accidently left an open bag of salt in the lane that led to the affected paddock.

Six mature crossbred cattle were set-stocked in a paddock on a smallholding in Central Otago. This paddock had been used by cattle for many years without problems. One day in late November the owner found four of the six animals recumbent and convulsing. Two died rapidly and the other two did not respond to supportive treatment and died within the hour. An EDTA blood sample taken from one of the recumbent cattle before death contained a high concentration of lead (1.7 mg/L; toxic level > 0.3) consistent with **lead toxicity**. The source was found to be a broken lead-acid battery that had emerged from rubbish dumped and buried in the same paddock many years before.

Nine of a mob of 65 six-month-old calves were found dead over a period of several days on a Southland dairy farm. The affected calves showed depression, pyrexia and abdominal pain before dying. Necropsy of one calf revealed abundant fibrinous fluid in the abdominal cavity and a thickened, congested omentum. Histology confirmed an acute fibrinosuppurative peritonitis. ***Pasturella multocida*** was cultured from the liver.

Fixed tissues from calves with diarrhoea are sometimes submitted to confirm a clinical suspicion of coccidiosis. Tissues were received from six-week-old calves from two Canterbury farms. The calves had a bloody scour. The large intestine in the calves had severe lesions of **coccidiosis** with marked destruction of colonic crypts. In one case the crypt epithelium was completely absent and the outline of the crypt was preserved by oocysts that had been infecting the epithelial cells. There was a granulomatous response to the oocysts.

Fixed kidney was received from a yearling heifer that was depressed and had melaena. It was one of four that died from a mob of 50 on a South Canterbury farm during one week in late September. The animals had been grazing a small area of oak trees beside a railway line three weeks previously. Histological findings were typical of toxic renal tubular damage as occurs in **acorn toxicity**. This case was surprisingly late in the year: mostly this disease is seen in autumn, when acorns are plentiful and stock have less feed to eat, especially after a dry summer and autumn. In this case the ground was covered with a large quantity of acorns.

Polioencephalomalacia in calves, often in outbreak form, occurs each year in Canterbury from November to February. Cases are usually first seen in the laboratory in early to mid-November but the first case was not seen in 2016 until late December. A South Canterbury dairy farm lost five calves in a mob of 130 and three more showed acute neurological signs. Fixed brain from one of these calves had histological lesions typical of polioencephalomalacia.

A heifer from the Auckland region had a friable 10-cm-diameter mass on a distal forelimb, just above the hoof, and multiple similar growths were noted all over its body. Histopathology of the mass revealed a papillary epithelial neoplasm with viral cytopathic changes in epithelial cells, consistent with a **viral papilloma**.

A mob of 3-month-old bull calves from the Bay of Plenty had acute diarrhoea and dyspnoea, and two died. Faecal egg counts on three calves revealed moderate numbers of coccidial oocysts in each, consistent with a diagnosis of **coccidiosis**.

Two of 70 three-year-old Angus steers were found dead on a farm in the Rangitikei district. The steers had been on a diet of fodder beet and baleage for more than 60 days and had been administered a course of clostridial 10-in-1 vaccine as weaners. Both carcasses were severely blown-up despite being still warm when discovered. There was subcutaneous gas over the thorax and abdomen. The most significant gross finding was the bloat line – a distinct demarcation between the thoracic and cervical portions of the oesophageal mucosa, the latter being red and congested while the former was pale and blanched. Histological examination of multiple tissue samples excluded significant inflammatory or necrotising changes that might suggest clostridial disease or other toxic or infectious processes. The final diagnosis based on clinical, gross and histological findings was **bloat (ruminal tympany).**

An outbreak of diarrhoea was reported among a group of fifteen 2-month-old beef calves on a Hawke's Bay farm**.** Nine developed severe diarrhoea and two had died by the time veterinary attention was sought. Intestinal samples were collected from a recently dead calf for histopathology and culture. Microscopic changes in the small intestine included mucosal necrosis, fibrinosuppurative inflammation and fibrin thombi. Culture of intestinal contents produced a heavy growth of ***Salmonella*** **Bovismorbificans**, confirming a diagnosis of **salmonellosis.**

Six 3–4-month-old heifer calves died over a 24-hour period on a Taranaki dairy farm. Post-mortem examination revealed fibrinous peritonitis in four calves, fibrinous pleuritis in one, and a combination of pleuritis and peritonitis in another. Histological assessment confirmed the presence of fibrinosuppurative polyserositis with fibrin thrombi and intralesional Gram-negative bacilli. Samples from the peritoneum and pleura of two calves were cultured and produced heavy growths of *Pasteurella multocida.* These

findings were consistent with ***Pasteurella multocida* capsular type B infection**. Several similar outbreaks were diagnosed from other Taranaki farms during late 2016 but it is not known what triggered them. Given that the organism may be harboured in the upper respiratory tract, it is likely that environmental or management stressors promote systemic spread in individual calves (McFadden *et al.*, 2011).

OVINE

A large number of lambs in the first month of life were found dead on a Southland farm. They had abscesses in the lungs and liver, painful, swollen joints or hindlimb paralysis. A number of samples were submitted for culture, initially with negative results until a leg with an unopened, swollen joint taken from a freshly dead lamb was sent to the laboratory. On dissection the articular cartilage and synovial fluid appeared normal but the joint capsule was very swollen and contained multiple, often large foci of semi-solid green purulent exudate. A Gram stain showed large numbers of Gram-negative bacilli, often in long chains. No bacteria were isolated on aerobic culture but a heavy, pure growth of ***Fusobacterium necrophorum*** was isolated from an anaerobic culture. This bacterium also causes foot abscesses and ovine interdigital dermatitis and is involved in footrot. The cause of the epidemic on this farm was not apparent at the time, but the farmer recalled that it had been very hot at lambing time and the ewes and their lambs had spent a lot of time in sheep camps under trees. This behaviour would have likely exposed newborn lambs to a large faecal load containing this bacterium.

Thirty lambs in a mob of 2 000 died two days after tailing on a North Canterbury farm. They had been accidentally given a vaccine containing an adult (5.0 mg) dose of selenium. Liver samples from two dead lambs had selenium levels of 81 190 and 65 230 nmol/kg (reference range 250–450), consistent with a diagnosis of **acute selenium toxicity.**

CANINE

An 8-year-old dog of unspecified breed from a rural property in the Whanganui region was anorexic, lethargic and showed some abdominal discomfort. There was no vomiting or diarrhoea. Routine biochemistry revealed azotaemia (creatinine 192 umol/L, reference range 42–109; urea 44.2 mmol/L, reference range 2.5–9). Liver enzymes and other biochemical parameters tested were normal, as were the haematology results, but serology revealed a *Leptospira interrogans* Pomona titre > 1:1600, a Hardjo titre of 1:100 and a Copenhageni titre of 1:200, consistent with a diagnosis of ***Leptospira interrogans* serovar Pomona infection**.

A 3-month-old German Shepherd dog from Auckland had diarrhoea. Endoscopic biopsies of the stomach and duodenum showed mild eosinophilic gastritis and mild eosinophilic and neutrophilic duodenitis, with occasional spindle-shaped or pear-shaped objects seen singly or in groups near villi; these had basophilic cytoplasm and small paired nuclei, consistent with a diagnosis of **giardiasis**.

CAPRINE

A one-year-old female goat from the Whanganui region was intermittently lame for 4–5 months and had swollen and clicking joints. Both carpi and both stifle joints were affected and she was lame on all four legs. She tested positive for the **caprine arthritis encephalitis virus** by an ELISA test on a serum sample. No other tests were requested.

Two 2-week-old goat kids from the Auckland region had generalised scaly lesions on the torso, face, eyes and lips. Scrapings and hair submitted to the laboratory were found to contain organisms typical of ***Dermatophilus congolensis*** when examined microscopically, confirming a diagnosis of **dermatophilosis.** This disease is seen reasonably often in horses, cattle and occasionally sheep throughout the country, but is less commonly diagnosed in goats.

CERVINE

An adult stag on a mid-Canterbury property had a bloody scour and died. The farmer had had seven other animals die recently and malignant catarrhal fever was suspected. A range of tissues was collected from the dead stag and histological examination demonstrated vasculitis typical of **malignant catarrhal fever** in the brain, liver, kidneys, lymph nodes and small intestine.

Samples were received from an 18-month-old stag from a North Canterbury property. It was one of a group of five, of which three had wasted. The three had been bled and tested positive to the Johne's para-ELISA test. A postmortem was done as a further check and granulomatous lesions with acid-fast bacteria within macrophages, typical of **paratuberculosis (Johne's disease)**, were present in the intestine and draining nodes.

EQUINE

Septic joint fluid was received from a 16-day-old Thoroughbred filly foal and bacterial culture was the only test requested. ***Salmonella* Typhimurium phage type 56** was isolated as a cause of the arthritis. This phage type is very common in a wide range of species. In 2015 (the most recent year for which there is a full year of data available) it was the predominant serotype in humans in New Zealand (8.5 percent of all isolations). It was also the most common phage type of *Salmonella* Typhimurium in animals in 2015. Seven cases were recorded in horses specifically during 2015.

A three-week-old Standardbred foal from Canterbury became recumbent and on clinical examination was found to have stiff muscles. The attending veterinarian suspected white muscle disease. Muscle enzymes were markedly elevated, with aspartate aminotransferase 35 702 IU/L (reference range 0–590) and creatine kinase was > 22 000 IU/L (reference range 0–312). Blood selenium was low at 170 nmol/L (reference range 1 600–3 200). This prompted testing of the foal's dam and other animals on the same property, where 20 mares (some resident, some recently transported from other properties for foaling) foaled this season. Selected permanent and temporarily resident mares were tested and all had blood selenium results below the reference range. The dam's blood selenium was 160 nmol/L and six others ranged from 120 to 790. Another foal on the property from one of these mares had a blood selenium level of 160. **Selenium deficiency** associated with **myonecrosis/white muscle disease** is uncommon in New Zealand as most horses are supplemented with selenium.

A three-year-old Arab mare from the Auckland region had a year-long history of multifocal raised mildly pruritic crusted skin lesions over the dorsum and

flanks. These had been poorly responsive to treatment including environmental changes, topical washes and antibiotics. Culture of a skin biopsy yielded a growth of *Serratia marcescens* but this was considered likely to be a contaminant. Histopathology of skin biopsies revealed coalescing inflammatory foci composed mainly of eosinophils and macrophages arranged around flame figures, consistent with **eosinophilic granulomas**. The cause of these is often unknown and may be multifactorial; they may be associated with ectoparasitism or allergic skin disease (e.g., atopy, insect-bite hypersensitivity or food allergy). Because the lesions are commonly found in the saddle region, trauma has been suggested as a cause. Eosinophilic granulomas have been reported at the sites of injections using silicone-coated needles. Body clipping may also precede lesions.

A colt from Northland died the evening after being gelded. There were no abnormalities detected at gross necropsy. Histopathology of a range of organs showed no significant abnormalities related to the cause of death, with only splenic lymphoid necrosis/apoptosis identified (consistent with acute stress). However, in sections of kidney, occasional tubules or tubular epithelium were found to contain protozoal life stages consistent with ***Klossiella equi***. This is a rare kidney parasite of horses causing subclinical infection, and was considered an incidental finding.

A seven-year-old Arab horse from Northland had a nodule in the nasal cavity. Biopsies of this grossly exuded viscous, stringy fluid. Histopathology revealed myxoid fibrovascular tissue with an ulcerated or hyperplastic mucosa and mixed inflammatory cell infiltrates, consistent with a **myxomatous nasal polyp**. Nasal polyps arise insidiously in adult horses, usually in a unilateral manner from the mucosa of the nasal septum or conchae. They are thought to be a response to chronic nasal irritation/inflammation. The ease with which nasal soft tissues become congested and oedematous, combined with limited nasal drainage owing to anatomical constrictions at the base of conchae, is thought to contribute to the persistence or progression of nasal polyps.

A 10-year-old pregnant Thoroughbred mare on a Canterbury property developed chronic generalised dermatitis characterised by scaling, crusting and pain. Lesions were most severe over pressure points. There was no response to treatment with Vetadine, Hexadine and Malaseb shampoos. Histological evaluation of skin biopsies was remarkable for the presence of granulomatous dermatitis and folliculitis with striking multinucleated giant cells, strongly suggesting a diagnosis of **equine sarcoidosis.** This is an idiopathic disease with a presumed delayed hypersensitivity basis. Various theories have been suggested as to its aetiology (e.g., EHV-1 & 2, mycobacteria, environmental allergens and genetic disorders), but none have been definitively proven. The disease may be confined to the skin, or involve both skin and internal organs. Response to immunosuppressive treatment varies, but generalised disease typically has a poor prognosis.

FELINE

A 14-year-old castrated male domestic shorthaired cat from the Wellington region presented with a large retrobulbar mass. Smears submitted for cytology showed many multinucleated giant cells resembling osteoclasts. These were irregular in size and shape and varied in the number of nuclei within each cell. There were also small numbers of round-to-oval mesenchymal cells resembling osteoblasts, with eccentric, round nuclei, reticular chromatin and one or two faint nucleoli. Small numbers of very large cells with reticular chromatin and large, irregular nucleoli, suggestive of a carcinoma, were seen. Differentials were carcinoma with necrosis and inflammation, or a giant cell osteoclastic osteosarcoma of the skull, a very rare tumour in cats. Histopathology confirmed this was an **adenocarcinoma**, possibly from the salivary gland.

A five-year-old Bengal cat from Auckland had a firm, mildly painful swelling on the lateral carpal region, which had draining tracts and did not improve with clavulanic acid-amoxicillin treatment. The cat was well and eating but had a mild pyrexia at 39.2ºC. Cytological examination showed mainly degenerate neutrophils. A biopsy from the lesion contained diffuse sheets of inflammatory cells, mainly neutrophils and macrophages that frequently contained coccobacillary bacteria. Culture yielded ***Rhodococcus equi***, indicating a diagnosis of **pyogranulomatous dermatitis** caused by that organism. *R. equi* is a soil saprophyte that can cause opportunistic infections. Immunosuppression could play a role, especially in systemic infections. Pneumonia, skin lesions (often on the distal limb), visceral lymphadenitis and splenic lesions have been reported in cats.

A 10-year-old male neutered domestic shorthaired cat from the Wellington region presented with a chronic ulcerated wound with draining sinus tracts over the left front leg dew claw region. The wound had been present for about 12 months. Biopsy evaluation revealed extensive pyogranulomatous dermatitis and cellulitis with draining sinus tracts, granulation tissue and large colonies of tangled bacterial rods and elongated filaments. The bacteria were Gram-positive, somewhat beaded and non-acid-fast. Aerobic culture of a fresh tissue sample produced a light growth of ***Aeromonas* sp.** and a heavy growth of ***Nocardia* sp**. Immunoassays for FIV antibody and FeLV antigen were negative and complete blood count was unremarkable. The final diagnosis was **nocardiosis.**

AVIAN

A routine cloacal swab from a 10-day-old Haast tokoeka kiwi (*Apteryx australis*) from Westland yielded a moderate growth of ***Yersinia kristensenii*.** This organism is not usually considered to be a pathogen but its epidemiology in kiwis is unclear. It has been reported previously in kiwi creches. (Newton, 2012).

Six finches out of a flock of 30 in Northland died after a short period of puffing up. Canaries kept in the same aviary appeared unaffected. A necropsy on one finch showed no gross signs but histopathology revealed multifocal necrotising hepatitis and myositis with thrombosis, suggestive of septicaemia and possible **salmonellosis**.

The owner of a flock of Langshan chickens in the Manawatu district reported increased mortality in two groups of chicks. By six days of age, the chicks had stopped growing and had started showing leg and wing weakness, which progressed to complete recumbency. By two weeks of age 18 out of 24 chicks had died. One of the remaining chicks was sacrificed for diagnostic purposes and feed samples were analysed. Apart from being small

for its age and in poor body condition, gross findings were unremarkable. Histological changes included scattered individual cell necrosis in the pancreas, gizzard erosion, and inflammatory foci in the pancreas, crop, proventriculus and spleen. Evaluation of a representative feed sample for mineral concentrations using inductively coupled plasma optical emission spectrometry showed a remarkably high zinc concentration of 6 083 ppm, far above the recommended rate of 40 ppm for growing poultry. Concentrations of zinc over 500 ppm cause anorexia, depressed growth, gizzard and pancreatic lesions and haematological abnormalities (Fulton, 2008). These findings confirmed a diagnosis of **zinc toxicity** with possible opportunist bacterial infection. Further information from the owner suggested that other poultry owners had experienced similar problems while using the same feed. The problems resolved when the feed supply was changed.

LAGOMORPH

A faecal sample from a two-year-old Lop rabbit from Dunedin with large soft faecal pellets was found to contain strongyle-type eggs. The rabbit had previously been treated with the coccidiostat toltrazuril and the anthelmintic fenbendazole. It is most likely that the parasite involved was ***Graphidium strigosum***. While these worms may penetrate deeply into the stomach wall and can cause serious lesions in hares, they are generally considered to be of little importance as pathogens of domestic rabbits. The other possibility was *Trichostrongylus retortaeformis* but although this is a very common parasite of wild rabbits, it is less likely to be found in domestic rabbits.

RODENT

A two-year-old male rat from Christchurch had an ulcerated 1.5 x 1.5-cm mass on the inner/buccal aspect of the right cheek, which did not respond to antibiotic therapy. Four biopsies 47 mm in diameter were collected from the mass and revealed a densely cellular neoplasm composed of anastomosing cords and islands of epithelial cells. A diagnosis of **squamous cell carcinoma** was made.

SVS Laboratories

BOVINE

A 2-year-old Ayrshire dairy cow in the South Waikato district with anaemia and milk drop was suspected clinically to have theileriosis. Blood samples confirmed a marked anaemia (HCT 0.19; reference range 0.24–0.40). No *Theileria* organisms were seen but there were many nucleated RBCs. Low serum magnesium (0.22 mmol/L; reference range 0.49–1.15) with normal albumin levels confirmed the diagnosis of **chronic hypomagnesaemic anaemia** (also known as **Taranaki anaemia)**. This illness is rarely seen nowadays owing to routine in-feed supplementation of magnesium oxide to dairy cows, which had not been carried out on this farm.

Seven South Waikato dairy cows went down overnight and three of them died. Serum calcium in two of the live cows sampled confirmed severe **hypocalcaemia** (0.54 and 0.66 mmol/L; reference range 2.0–2.6), in the face of high or normal serum albumin of 41 and 36 g/L respectively (reference range 25–40). Magnesium levels were within reference ranges. The cows' in-feed mineral supplement mixture had run out 48 hours previously.

A ketotic downer cow in South Taranaki had responded poorly to intravenous calcium therapy. Clinical pathology results confirmed persistent **hypocalcaemia** (1.12 mmol/L; reference range 2.0-2.6) despite a high serum albumin (44g/L; reference range 25–40) caused by dehydration. There was also moderate **hypokalaemia** (3.4 mmol/L; reference range 3.9–5.8), a **hypochloraemic metabolic acidosis** (chloride 82 mmol/l, bicarbonate 22.8 mmol/L, anion gap 32 mmol/L; reference ranges 96–104, 26–34 and 18–24 respectively) and **acute inflammation** on haematology. Hypocalcaemic ileus and possible gastroenteritis were considered the most likely causes of the electrolyte and acid/base derangements. The hypokalaemia may have clinically exacerbated the muscle weakness.

Fifteen 3-month-old calves from a dairy/beef unit in the Opotiki district had green scours and three of them died. Faecal samples from several calves had high numbers of strongyle eggs (> 1 000 epg), confirming a diagnosis of **parasitic gastroenteritis**. In addition, faecal cultures isolated ***Campylobacter jejuni***, a likely opportunist organism that was exacerbating the scour.

A one-month old Matamata calf had dysentery. Faecal examination revealed a heavy coccidial infestation giving a diagnosis of **enteric coccidiosis**.

Forty dairy calves aged 4 months in a mob of 90 on an Opotiki dairy farm showed ill-thrift and scour 2 weeks after being drenched. Faecal examination revealed low counts of coccidial oocytes only, but such counts do not always correlate well with the clinical signs, depending on the stage of the coccidial life cycle at the time of sampling. Most calf meal contains coccidiostats, so when this feed is stopped the calves are at risk of coccidiosis. This was particularly true in the wet spring of 2016. **Coccidiosis** in this case was considered to be the underlying cause of the diarrhoea observed.

Salmonellosis was diagnosed in a 9-year-old Waipa dairy cow with scours, after ***Salmonella* Typhimurium type 108/170** was isolated from a faecal sample. Clinically she also had a marked milk drop and weight loss of 25 kg over 3 days.

***Salmonella* Bovismorbificans** was isolated from faecal cultures of a young Matamata calf (< 1 month) with scours, giving a diagnosis of **salmonellosis**.

Yersiniosis was diagnosed in dairy calves (mostly aged 3 to 5 months) and young cattle (including yearling heifer replacements and R2 beef steers) in multiple cases of diarrhoea. The high incidence of this disease was linked to the wet spring of 2016 in the Waikato region and was particularly notable when calves were weaned off supplementary meal.

Poor performance in a group of 100 bought-in 2-to-3-year-old dairy heifers in the Rotorua district was reported to a veterinarian, who examined eight to 10 heifers. Initial serum tests identified low albumin levels, alerting the clinician to a potential protein-losing enteropathy. As a result, despite the young age of the animals, a Johne's antibody ELISA test was carried out on four of the most severely affected heifers. Positive results for ***Mycobacterium avium* ssp. *paratuberculosis*** antibody confirmed the diagnosis of **Johne's disease** in all four heifers. The line of heifers had been

bought at a Waikato herd sale in January 2016. This case highlights the apparently increasing incidence of this disease in younger age groups. At least 60 percent of New Zealand dairy herds now have Johne's disease (Brett, 2016).

Johne's disease was diagnosed with a positive Johne's antibody ELISA in another 2-year-old heifer with chronic diarrhoea in the Bay of Plenty region.

A dairy cow from an Opotiki district dairy herd was euthanased after severe colic, head-pressing and collapse. Another cow on the property died after showing similar signs. Necropsy samples of liver from the euthanased cow were examined histologically and revealed a marked diffuse chronic cholangitis consistent with severe chronic **sporidesmin toxicity (facial eczema)**. Other rule-outs considered included chronic fluke infestation. The farm had been badly hit by the severe facial eczema season of autumn 2016 and this was considered to be a spring flare-up of the disease.

Decreased liveweight gain in a mob of R2 beef steers on a finishing block in the Waikato was associated with low serum levels of copper and selenium. Known high soil iron on the property was thought to be linked to this diagnosis of **copper deficiency**. Soil sulphur/zinc, heavy fertiliser application or rapid forage growth can interfere with plant selenium, causing **selenium deficiency**.

An anaemic tachycardic Waikato dairy cow had a moderate non-regenerative anaemia on haematology. Owing to a lack of response to treatment, the cow was euthanased. Field necropsy revealed ascites and fibrinous pericarditis. Histopathology confirmed a diffuse **chronic fibrinosuppurative pericarditis** and a **valvular bacterial endocarditis** with numerous Gram-positive bacterial colonies in both tissues (no fresh tissue was available for culture.) Pericarditis in cattle is a common sequel to traumatic reticuloperitonitis, although the reticular hardware is not always recovered (owing to retraction into the reticulum). Valvular endocarditis is a sequel to the ensuing bacteraemia.

A Bay of Plenty cow with vulval petechial haemorrhages showed sudden onset of blindness caused by intra-ocular bleeding. Haematology revealed a marked thrombocytopenia (< 10 x 10^9/L; reference range 220–640 x 10^9). The diagnosis was **immune-mediated thrombocytopaenia**.

On a Matamata dairy farm, a recumbent 4-month-old calf with opisthotonus was euthanased and the brain submitted for histology. Microscopic examination revealed changes consistent with **polioencephalomalacia.**

Six Waikato dairy cows from two adjoining Waikato properties died. Of these, two died suddenly, two had shown neurological signs (circling) and two had initially shown some response to thiamine injections. A further cow showed weakness and milk drop in the morning and died 6 hours later. Necropsy revealed scouring and icteric tissues. Histological changes in the brain were consistent with **polioencephalomalacia.** There was also intestinal lymphangiectasia and mild to moderate hepatic biliary hyperplasia in the liver tissues, consistent with previous sporidesmin toxicity (though not of a severity to cause such gross tissue icterus) and a suppurative interstitial pneumonia.

Blood samples from a Waikato dairy cow with profuse diarrhoea revealed **elevated magnesium** (1.29 mmol/L; reference range 0.49–1.15,with normal albumin) following excess magnesium supplementation. Excess magnesium interferes with calcium action in smooth muscles, causing ileus and abomasal hypomotility and pooling of chloride, which result in metabolic alkalosis and diarrhoea. This cow was also positive for **bovine viral diarrhoea virus** by PCR on the serum.

Several cases of **theileriosis** were diagnosed in dairy cows in the Waikato, Bay of Plenty and Taranaki regions. A high-producing South Waikato cow showed a sudden drop in milk production and anaemia one month after calving. A *Theileria* screen (HCT and blood smear examination) confirmed severe anaemia (haematocrit 0.09; reference range 0.24–0.40) and *Theileria* spp. organisms were seen on RBCs, consistent with ***Theileria orientalis* infection.** Another cow on the same property with similar signs died overnight.

In another case of **theileriosis**, a Waikato dairy cow had a haematocrit of 0.14 (reference range 0.24–0.40), with ***Theileria* spp.** organisms seen on RBCs. Full haematology also revealed a marked neutrophilia with left shift and mild monocytosis, indicative of the tissue inflammatory reaction to the tissue hypoxia, which was caused by the severe anaemia.

Theileriosis was diagnosed in a group of 3-year-old Waikato cows amongst which a persistently infected bovine viral diarrhoea (BVD) virus shedder was diagnosed by PCR on serum. Haematocrits on two of the affected cows with severe anaemia were 0.14 and 0.11 (reference range 0.24–0.40), both with ***Theileria* spp**. seen on RBCs. It is considered likely that the BVD infection affecting this mob had caused immunosuppression and increased susceptibility to *Theileria*.

In the Western Bay of Plenty district, a PCR test on a blood sample from a 3-year-old Friesian cross dairy cow was used to provide a definitive diagnosis of **theileriosis** caused by***Theileria orientalis* Ikeda**. In another case, from Taranaki, PCR was used to provide a definitive diagnosis of **theileriosis** caused by ***T. orientalis* Ikeda** in a jaundiced lethargic dairy cow, since the farm had not previously been affected by this disease.

CAPRINE

A housed male goat in the Waikato region with acute ascites diagnosed on ultrasound was euthanased owing to the intractable colic. Necropsy revealed a ruptured urethra, uroperitoneum and urinary sediment in the bladder. Microscopy of the latter showed it to be composed of an amorphous urinary sludge, confirming a diagnosis of **urolithiasis**. This is typically due to urinary phosphate aggregation associated with grain-based diets, together with the decreased saliva production seen with high-concentrate diets. A review of the diet was recommended, including increasing the forage component to increase saliva production and phosphate excretion.

EQUINE

A 3-year-old Thoroughbred gelding in the Waikato region showed poor racetrack performance and weight loss. Further clinical workup led to laparoscopy and harvesting of jejunal samples for histopathology. Microscopic findings revealed a severe chronic-active, diffuse granulomatous enteritis,

negative on special stains for acid-fast organisms, spirochaetes and fungi. This resulted in a diagnosis of **idiopathic granulomatous enteritis**.

New Zealand Veterinary Pathology

BOVINE

Two mature dairy cows in Northland had fevers of 40°C. One had bloody diarrhoea. Faeces from both animals were submitted for culture and ***Salmonella* Typhimurium** was isolated.

A four-month-old dairy calf from the Waikato had ill-thrift and scour with fever. Other calves on the property remained normal, but ***Yersinia pseudotuberculosis*** was isolated from this animal. **Yersiniosis** was diagnosed.

Three four-month-old dairy calves from the Hauraki district exhibited marked scour and were skinny and dehydrated. The animals were mildly to moderately hypoproteinaemic and some had electrolyte abnormalities as a result of the scour. Testing for BVD (antigen) was negative, as were faecal egg count and coccidia examinations. All three calves cultured positive for ***Yersinia pseudotuberculosis***.

A calf from the Waikato had a dermatitis that featured numerous crusts with dry skin beneath. Gram-staining of a crush preparation made from one of the crusts revealed numerous "railway track" organisms consistent with ***Dermatophilus congoliensis***. **Dermatophilosis** was diagnosed. The natural habitat of *D. congoliensis* is not established, but it appears to spread via direct contact between animals, contaminated environments, or biting insects. Animals whose skin is compromised by wetting are predisposed to clinical disease.

An aged (9-year-old) dairy cow in the Waikato exhibited chronic weight loss with ventral mandibular oedema (bottle jaw). ELISA testing for antibodies to ***Mycobacterium paratuberculosis*** was positive, consistent with **Johne's disease**.

A group of young first-calvers in a dairy herd in the Waikato experienced a rapid drop in milk production accompanied by a cough and harsh lung sounds on auscultation. Examination of pooled faeces by the Baermann method revealed moderate numbers of lungworm larvae. **Lungworm infection** caused by ***Dictyocaulus vivaparus*** was diagnosed.

Three calves from a group of 60 animals exhibited severe neurological signs including opisthotonus, bruxism and blindness. Three animals from the same mob had died the previous week. Examination of a brain removed post-mortem from an affected animal revealed multifocal fluorescence of the grey matter under UV light. **Polioencephalomalacia** was confirmed on histologic examination.

A small group of dairy calves in the Waikato lost weight rapidly over a 2–3-week period. The calves were thin. One died and was necropsied and tissues were forwarded for histopathology and culture. Faeces from three other animals were also submitted for culture. Histopathology revealed a relatively mild mucosal enteritis in the dead animal, but culture from all four animals was positive for ***Yersinia pseudotuberculosis***, suggesting that this was the cause of the enteritis.

Eight calves on a property in Northland died suddenly over about two months. The animals had been routinely vaccinated for clostridial diseases using a 5-in-1 vaccine. Necropsy of the animal that had most recently died revealed a region of dark discolouration and necrosis in the neck muscles. Histologic examination of this area showed an acute necrotising and suppurative myositis with numerous intralesional Gram-positive bacilli, consistent with ***Clostridium* spp**. **Clostridial myositis** was diagnosed. It is unknown whether vaccination in this case was undertaken according to label instructions; possibly a booster had not been performed. Five-in-one vaccines, while typically effective, are available without prescription.

A six-month-old calf from a property in Palmerston North exhibited an acute onset of blindness, ataxia, bruxism, hypersalivation and seizures. The calf had a history of access to old outbuildings, which may have been painted with a lead-based paint. Lead toxicity was suspected, and liver lead levels were 90 mg/kg. (toxic level > 10), consistent with **lead toxicity** (Meldrum & Ko, 2003).

A three-week-old dairy calf from the Kaipara district started scouring just after being moved outdoors. The calf also had a marked nasal discharge, and appeared weak on physical examination. Culture was negative for *Salmonella* and faecal antigen testing was negative for rotavirus and coronavirus, but there were small numbers of *Cryptosporidium parvum* visible on examination of the faeces. PCR for **bovine viral diarrhoea** was positive, suggesting that this was the likely underlying cause of the calf's poor health.

Seven out of 90 autumn-born calves in the Rodney district were losing condition, with scouring and rough coats. The animals had been brought in from Taranaki about six weeks prior. There was no evidence of parasitism on examination of a faecal egg count. Culture for *Yersinia* and *Salmonella* was performed and ***Yersinia pseudotuberculosis*** was isolated. **Yersiniosis** was diagnosed.

Eight cows from a dairy herd of 400 animals had evidence of diarrhoea. Four samples were submitted from five animals (one was a composite sample). ***Salmonella* Typhimurium phage type 42** was cultured from all of these samples.

Salmonellosis was a common diagnosis during this quarter in dairy cattle and calves. In dairy cattle, ***Salmonella* Tymphimurium** and ***S.* Bovismorbificans** were diagnosed with approximately equal frequency, with a single case due to ***Salmonella* Brandenburg**.

A group of young calves in the Ashburton region experienced scour coupled with sudden deaths. Three dead animals were necropsied. Histology revealed the presence of a marked fibrinous peritonitis coupled with multifocal necrosuppurative hepatitis, suspicious for septicaemia. ***Pasteurella multocida*** was isolated from the liver and kidney of two of the calves. **Septicaemic pasteurellosis** was diagnosed.

A herd of beef cattle in the Waitaki district experienced a high percentage of stillborn and weak-born calves. Selenium deficiency was suspected, and analysis of serum selenium on cows revealed levels ranging from < 50 to 130 nmol/L (normal 150–3500). **Selenium deficiency** was diagnosed.

A dairy property in the Waikato experienced three sudden deaths in calves aged 2–4 weeks. The calves were scouring and faeces was submitted for analysis by *Salmonella* culture, rotavirus/coronavirus antigen ELISA

and modified acid-fast staining for *Cryptosporidium*. One calf was positive to coronavirus antigen and ***Salmonella* Bovismorbificans** was isolated from another. **Coronavirus infection complicated by salmonellosis** was considered the cause of the enteritis.

Five beef cows in the Waikato gave birth to stillborn or weak-born calves, which died within 10 days. There was no obvious cause of death visible on examination in the field. Serological testing of the dams for leptospirosis revealed no significant titres against *Leptospira* serovar Pomona, but MAT testing for *Leptospira* serovar Hardjo showed titres ranging from 1:100 to 1:1600. Titres above 1:800 are considered likely to be clinically significant. A pooled serum antibody test for bovine viral diarrhoea (BVD) also suggested exposure to this virus. The high titres suggested that ***Leptospira* serovar Hardjo,** possibly in conjunction with **bovine viral diarrhoea exposure,** may have contributed to the deaths of the calves.

A group of five-week-old calves in the Western Bay of Plenty had severe scour with blood. Faecal examination of two of the calves revealed numerous coccidial oocysts, suggesting that **coccidiosis** was the underlying cause.

Two yearling beef cattle from a property in Rotorua had high temperatures, accompanied by increased heart rate and respiratory rates suggestive of pneumonia. The animals were in poor condition, with scruffy coats. Mineral deficiencies were suspected, but the only abnormality on trace element serum chemistry was slightly decreased serum selenium in both animals (120 nmol/L; reference range 150–3 500). However, **bovine viral diarrhoea (BVD)** antigen testing of both animals was positive, suggesting that they were likely persistently infected, and this was the underlying cause of their poor condition and pneumonia.

An outbreak of conjunctivitis affected a group of two-month-old calves in the Western Bay of Plenty. ***Moraxella bovis*** was isolated from one of the animals, confirming **infectious bovine keratoconjunctivitis**. *M. bovis* is the only bacterium associated with infectious bovine keratoconjunctivitis. Strains of the organism vary in pathogenicity, and not all strains will cause a keratitis. Flies are an important vector and UV light from sunlight may exacerbate disease.

A large mass on the side of the neck of an animal in a breeding facility at Waipa was ulcerated and unresponsive to antibiotics. Samples submitted for histology revealed the presence of numerous "club colonies" accompanied by marked pyogranulomatous inflammation within the subcutaneous tissues**. Actinobacillosis,** likely due to ***Actinobacillus lignieresi*** (the causative agent of woody tongue), was diagnosed. Infection by this organism is typically the result of small contaminated penetrating puncture wounds caused by thorns or prickles in the mouth or surrounding soft tissues.

CAPRINE

A 14-month-old goat in the Nelson area had sudden, complete and widespread hair loss accompanied by marked formation of scale and scab. There was mild pruritus and self-trauma also present. Samples were taken for cytologic and histologic evaluation. There was little evidence of bacterial infection or parasitism but histology revealed numerous superficial intracorneal pustules with acantholytic cells. **Pemphigus foliaceous** was diagnosed. This immune-mediated disease is rarely observed in goats and can mimic infectious causes of dermatitis.

Several goats in a research facility in the Waikato had multiple subcutaneous abscesses. Culture from one animal yielded a pure growth of *Trueperella pyogenes* and another goat was positive for *Corynebacterium pseudotuberculosis*. **Caseous lymphadenitis**, as well as **abscess caused by *Trueperella pyogenes***, was diagnosed.

EQUINE

A three-week-old Thoroughbred foal from a property in the Waikato had an acute onset of diarrhoea accompanied by marked, rapidly progressing pulmonary consolidation and evidence of sepsis. Histology of the lung revealed a suppurative interstitial pneumonia. Culture of the lung revealed a heavy growth of *Staphylococcus aureus*. ***Staphylococcus aureus*** sepsis with secondary embolic pneumonia was diagnosed. The cause of the diarrhoea was not investigated.

A 22-year-old Thoroughbred horse had patchy hair loss visible on the muzzle. Fungal culture of a hair pluck revealed the presence of ***Trichophyton equinum***, an important cause of **ringworm** in horses.

A yearling Thoroughbred colt from Auckland had an abscess in the axillary region. ***Rhodococcus equi*** was isolated from a swab taken at the abscess site. This is a common soil-borne organism frequently observed on properties with horses and pigs. Infection can take place through direct contamination of wounds. Systemic infection occurs through inhalation of contaminated dust and soil.

A two-year-old Standardbred filly in Auckland had marked greenish nasal discharge. Tracheal wash cytology revealed a moderate suppurative tracheobronchitis and ***Streptococcus zooepidemicus*** was isolated. *S. zooepidemicus* is a commensal of the upper respiratory tract in horses and can behave as an opportunistic pathogen. Rarely, it can also behave as a zoonosis and cause disseminated infections in humans (Pelkonen *et al*., 2013).

A mixed-breed horse in the Rodney district developed multiple small 5–10-mm diameter nodules over the face and neck over a period of several months. The nodules were non-pruritic. Histology showed that they were composed of pyogranulomatous and lymphocytic inflammation, with numerous branching septate fungal hyphae visible within macrophages. **Mycotic dermatitis** was diagnosed. Equine fungal granulomas are not uncommon and comprise 2–3 percent of equine cutaneous nodular submissions in Queensland and the northwestern United States. In New Zealand they are rarely differentiated to the species level, although there are descriptions of equine fungal granulomas caused by *Alternaria* spp. (Dicken *et al.*, 2015).

A property in the Waikato had issues with ongoing diarrhoea in young foals. Faecal samples were submitted for microscopic examination for cryptosporidia, but none were found. However, PCR testing on the same samples found *Cryptosporidium* DNA, as well as DNA from *Clostridium difficile* toxin B. This suggested **cryptosporidia** combined with *C. difficile* might have had a role in the enteritis. Some recent work suggests that A-/B+ strains of *C. difficile* may be more common in animals than in humans. This finding is relevant because many of the commercial

enzyme immunoassay tests commonly used to detect toxins in humans (and also frequently used in the veterinary field) only detect toxin A (Arroyo *et al.*, 2007).

A Thoroughbred yearling on a property in the Waikato showed clinical evidence of respiratory disease. A transtracheal wash was performed and the fluid submitted for cytologic examination and microbiology. Cytology revealed moderate to severe neutrophilic inflammation. A heavy growth of *Rhodococcus equi* was cultured from the transtracheal wash. **Bronchopneumonia** caused by ***Rhodococcus equi*** was diagnosed, likely the result of inhalation of soil contaminated with this organism.

FELINE

A domestic shorthaired cat from the Western Bay of Plenty exhibited very abnormal behaviour for about a month, with growling, depressed appetite and dilated pupils. The nervous signs progressed to include blindness, with running into walls and self-trauma. The cat was euthanased because of the worsening disease. Histology of the brain revealed widespread malacia and cavitation affecting the cerebral cortex, thalamus and hippocampus. There was also a marked presence of lymphocytic infiltrates and gliosis. Numerous large protozoal cysts were scattered throughout the lesions. ***Cerebral toxoplasmosis*** was diagnosed.

CANINE

A pet dog in the Rodney district had diarrhoea for about 4 weeks. ***Campylobacter jejuni***, an important zoonosis, was isolated from the faeces.

AVIAN

A captive North Island saddleback (*Philesturnus rufusater*) in an Auckland facility showed worsening respiratory signs and dypsnoea over four weeks. The animal was euthanased and on post-mortem examination there were two granulomas visible grossly: one in the syrinx and one in the thorax. Histology confirmed the presence of fungal hyphae consisistent with ***Aspergillus* spp**. within the granulomas.

A dove (family Columbidae; species not stated) died suddenly in a Waikato aviary. Necropsy findings were unremarkable except for a slightly reddened intestine. Cultures for enteric pathogens (*Yersinia*, *Salmonella*) were negative, but histology revealed evidence of myocardial degeneration, with scattered hypereosinophilic and granular-appearing myocytes. **Acute cardiomyopathy** was diagnosed, which has been associated with **vitamin E deficiency** in this species.

An adult sulphur-crested cockatoo (*Cacatua galerita*) in Auckland had a two-day history of weakness, depression and poor balance. The bird had a history of previous zinc toxicosis from chewing on a battery in 2008, when the blood zinc level tested at 42 umol/L. While cockatoos are considered to have higher normal serum zinc levels (up to 46 umol/L), at the level measured this can be regarded as a case of **zinc toxicity**. (Puschner *et al.*, 1999)

One chicken out of a group of seven backyard hens in Huntly exhibited diarrhoea. A faecal sample was submitted for examination. Large numbers of *Capillaria* (3 000 epg) and *Heterakis* eggs (2 400 epg) were present and **intestinal parasitism** was diagnosed.

PORCINE

Five piglets from a litter of 19-day-old piglets in Palmerston North exhibited marked scour from 11 days of age. They had no fever. Faeces from all five were positive to a rotaviral antigen ELISA test. **Rotaviral diarrhoea** was diagnosed.

ZOO ANIMAL

A giraffe from a facility in the Waikato had a large abscess on the face. ***Truperella pyogenes*** was isolated from swabs taken at the abscess site, suggesting that this organism likely had a role in the formation of the abscess.

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Quarterly report of investigations of suspected exotic diseases

Exotic disease investigations are managed and reported by MPI Investigation and Diagnostic Centre (IDC) and Response, Wallaceville. The following is a summary of investigations of suspected exotic disease during the period from October to December 2016.

Exotic vesicular diseases ruled out

A veterinarian in Northland notified MPI via the exotic pest and disease hotline of a yearling Jersey heifer with mouth ulcers. The animal was smaller than the other 90 in the herd, which were reported to be healthy. Photographs of the lesions were examined by the Incursion Investigator, who excluded vesicular disease based on the clinical presentation, history and epidemiology within the herd. Two erosive mouth ulcers were seen but chronic nasal plane infection was also present. PCR testing done at the Animal Health Laboratory (AHL), IDC Wallaceville was negative for bovine viral diarrhoea (BVD), malignant catarrhal fever and infectious bovine rhinotracheitis (IBR).Testing for infectious bovine rhinotracheitis was negative by ELISA. Bacterial culture isolated a *Streptococcus* sp. which was sequenced as *S. pluranimalium*, and *Actinobacillus lignieresii* was confirmed by DNA sequencing, meaning that the underlying cause of the clinical presentation was woody tongue.

A veterinarian called the MPI exotic pest and disease hotline to report that a single calf in a mob of 130 from east Waikato had ulceration of the nasal planum, tongue and coronary bands of all four limbs. The Initial Investigating Veterinarian (IIV) system was activated and an IIV arrived on the farm, examined the mob and interviewed the farmer to determine possible risk factors. The calf had been seen rubbing its nose on stationary objects as though from pruritus, and had been seen sniffing and licking various objects. The foot lesions were considered to be traumatic; no intact or ruptured vesicles were observed. No lesions were seen in other animals or reported on the farmer's main dairy property. The epidemiological and clinical picture was not consistent with infectious vesicular diseases such as foot-and-mouth disease, and hypersensitivity (e.g., contact dermatitis or allergy), photosensitivity or bovine viral diarrhoea virus (BVDv) were considered likely causes. Blood serum was taken for exclusion of BVDv and to evaluate possible liver damage leading to secondary photosensitivity. Antigen ELISA was negative for BVDv, although GGT and bilirubin were elevated, along with fibrinogen. These point to a possible photosensitivity or underlying inflammatory cause of the skin lesions. Exotic disease was excluded and the investigation was closed.

A veterinarian contacted MPI via the exotic pest and disease hotline to report a cow with mouth ulcers on a 550-strong dairy farm in Northland. The 3-year-old cow had ill thrift, was scouring and had severe ulceration on the side of the tongue and a smaller erosion on the gum. The animal had improved on antibiotics, but testing for BVD by antigen ELISA had been negative, prompting the notification to MPI. One other cow had recently started displaying similar clinical signs. An IIV visited the farm and examined the two unwell cows and a selection of herdmates. Both animals were confirmed to have severe mouth ulcerations and erosions, but these were not vesicular in nature. No lesions were found on the feet or any muco-cutaneous junctions. The cows did not have raised temperatures and were very underweight, suggestive of a chronic disease process. Milk production on the farm had not decreased recently and all other cows examined were healthy. There was no history of animal movements onto the property. Vesicular disease was ruled out on epidemiological and clinical grounds.

A veterinarian called the MPI exotic pest and disease hotline to report a 5-week-old calf with erosive interdigital lesions on all feet. The calf was mildly lame on one foot, lethargic, pyrexic, and was not growing as well as its herdmates. The property was a smallholding in Oxford, Canterbury, with small numbers of beef cattle and calves, ewes and lambs, horses and a pet goat. All these animals appeared healthy and there was no history of animal movements onto the property, or overseas travel by the owners. When photographs were examined by the Incursion Investigator the possibility that a vesicular ulcerative process had caused the lesions could not be ruled out. An IIV was dispatched to the farm. Clinical examinations were conducted on the calves and some cows. All were normal except there was one other calf with similar but milder lesions on its feet. Both animals had erosive lesions between the digits and on the heel bulb areas; these lesions were a few weeks old and healing. There were no lesions in the mouth or elsewhere. All animals had mildly elevated temperatures but this could be explained by the warm day, the animals being black in colour and being stressed from yarding. A probable cause of the lesions was established as trauma from blackberry bushes that had been cut recently, the branches having been left in the paddocks the cattle were in, with secondary infection. The timing of this exposure matched the apparent age of the lesions and their appearance. Also, the animals had been placed on shingle two weeks previously, which may have exacerbated the traumatic lesions and induced the calf's limp, which was the first sign noticed by the farmer. The sick calf appeared to have a systemic illness that was unlikely to have been caused by infection of the foot lesions. Antigen ELISA for bovine viral diarrhoea returned a high positive result, indicating that the calf was probably persistently infected. Cattle can suffer from erosions of the interdigital cleft from BVD infection, so this may also have been a causal or aggravating factor. Vesicular disease was excluded and the investigation stood down.

A private veterinarian notified MPI of calves that were ill-thrifty, some presenting with what appeared to be oral erosions. The affected property reared dairy beef calves. There was a mixture of 70 calves from the 2016 season and 80 rising-one-year-old animals from the previous season. From a single mob of 35 calves, 12 (34 percent) had oral lesions, while none in the other mob of 35 were affected.

An IIV was sent to the property to exclude vesicular disease. On clinical examination calves from the affected mob were in poor body condition and afebrile, with evidence of diarrhoea. A small proportion had erosive and proliferative lesions on the ventral tongue region. A yellowish, thickened material was apparent in a number of lesions on the tongue of affected calves.

Given the clinical presentation, including the absence of a fever and the nature and distribution of the lesions, vesicular disease was excluded. Laboratory testing of samples collected from about 10 affected calves did not suggest a specific endemic agent. All samples were negative by PCR for BVD and malignant catarrhal fever. Blood biochemistry was relatively normal from three of the affected calves tested.

Enzootic bovine leukosis excluded

Using the exotic pest and disease hotline, a veterinarian notified MPI of a 2-year-old cow with multiple 2–3-cm-wide single to coalescing lumps all over the body. On cytological aspiration these were found to contain bloody fluid and erythrocytes. Biopsied sections of skin were submitted for histopathological examination by MPI's veterinary pathologist, who diagnosed cutaneous haemangiomas. Multiple cutaneous haemangiomas are usually thought to be a congenital condition and are mostly seen in calves, which also have internal lesions. The animal was euthanased and on post-mortem examination it was found to have widespread internal haemangiomas. Concurrent PCR testing of the tissue at AHL IDC (Wallaceville) was negative for poxviruses (the cause of the exotic diseases cowpox and lumpy skin disease), parapoxviruses (the cause of pseudocowpox) and herpesviruses (bovine herpesvirus 2 causes pseudo-lumpy skin disease). Haematology did not find evidence of lymphocytosis, atypical lymphocytes or other abnormalities that could indicate enzootic bovine leukosis (EBL). ELISA and PCR testing for EBL was cancelled when the lumps were confirmed not to be lymphomas.

An export veterinarian called the MPI pest and disease hotline to report that five cattle ready for export had tested positive for EBL virus antibodies on initial export testing using an ELISA antibody test. Four animals were dairy animals, and one was a beef animal. The New Zealand dairy herd is considered free from EBL. Confirmatory testing had been requested but had not been completed at the time of notification. Confirmatory testing came back as negative for all animals. EBL was ruled out and the investigation was stood down.

Anthrax ruled out

A veterinarian called the MPI exotic pest and disease hotline to report sudden death and bleeding in a heifer from a dairy farm in the Waikato. Notably, there was frank blood coming from the medial canthi of the eyes, as well as the nose and anus. The main exotic differential for sudden death and frank haemorrhage in adult cattle is anthrax (caused by *Bacillus anthracis*, the last recorded case of which in a New Zealand bovine occurred in 1954). The heifer was discovered dead in the morning and a post-mortem examination was performed that afternoon following a risk assessment that included the history of the farm. The farm had been converted to dairy a few years previously, and prior to that had for 60 years been in forestry. Based on this, the lack of earthworks or other digging, and death of only one animal in a large mob, the risk of anthrax was determined to be very low. The veterinarian performed a post-mortem examination and the heifer was buried. Anthrax was excluded at the MPI AHL after examination of stained smears by microscopy and after bacterial culture. Following exclusion of *B. anthracis*, post-mortem tissues and bloods were processed routinely at a commercial laboratory. Unfortunately, the autolysis of the tissues prevented meaningful interpretation and no cause of death could be determined. Since anthrax had been excluded as the cause of death, the case was closed.

A veterinary pathologist contacted MPI to request exclusion of anthrax from three rising-two-year-old beef bulls that had died acutely, presenting with a bloody discharge from the nostrils and anus. A whole-blood EDTA sample was collected from one of the bulls and blood smears were made. No organisms consistent with *B. anthrasis* were seen after staining with polychrome methylene blue at the MPI AHL. No historic cases of anthrax (> 50 years ago) had occurred in the same region or on the property. Anthrax was excluded as a cause of the clinical signs observed.

Calf deaths investigated

A private veterinary practitioner contacted MPI via the exotic pest and disease hotline to report a large mortality event in beef calves. The farm operation involved sourcing 4–5-day-old calves from about 40 dairy operations in the Waikato region, as well as calves from its own dairy operation. Of about a thousand calves, 140 had died (14 percent), 80 of them pre-weaning. Numerous gastrointestinal agents had been found in laboratory testing initiated by the private veterinarian before weaning. These agents, which were determined to be potential causes of deaths, included rotavirus, *Salmonella* spp. and *Cryptosporidium* spp. After weaning, calves had failed to thrive and mortalities continued. Because of the scale of these mortalities an MPI investigation was undertaken to determine whether there was any likelihood that an emerging pathogen was involved.

The investigation determined that *Theileria*-associated bovine anaemia (TABA) caused by *Theileria orientalis* Ikeda was likely to be a risk factor in the mortalities. Five of 13 calves tested (38 percent) were clinically anaemic as measured by blood haematocrit (HCT < 0.24; reference range 0.24–0.4) and a number of the others had suboptimal HCT levels (mean = 0.25). None of the calves had a regenerative anaemia as is usually seen in cases of intravascular haemolysis, including TABA.

When calves were re-tested two weeks later the mean HCT had increased to 0.29, which statistically was significantly higher than that from the first test (ANOVA; $p = 0.04$) and a likely indication that the calves were recovering. Real-time PCR of blood collected at the first sampling showed that all calves were positive to *T. orientalis*

Ikeda. In addition, the amount of *T. orientalis* Ikeda DNA, as measured by cycle threshold values (Cq), was high for all animals tested. Regression analysis of Cq against HCT showed that the amount of Ikeda DNA was positively associated with HCT ($p = 0.01$; $R2 = 0.38$), indicating that the more *T. orientalis* Ikeda present, the lower the HCT. Therefore this agent was most likely the cause of the anaemia observed, even though the anaemia was not classified as regenerative at the time of testing.
There was further evidence that *T. orientalis* Ikeda was a determinant for the calf mortality. Under the management regime calves were only housed for 7–10 days, which perhaps increased their exposure to the TABA vector, the tick *Haemaphysalis longicornis*. An outbreak of TABA Ikeda had occurred in the dairy cattle during the calving period, indicating TABA was an issue in the wider farm enterprise. Therefore the mortality event was likely to be multifactorial, with *T. orientalis* Ikeda an important factor in the deaths observed.

BVD type II ruled out

A veterinary pathologist informed MPI of a 6-week-old dairy heifer calf with severe anaemia (PCV 0.09) and petechiae present on the buccal mucous membranes. The calf had been yarded with no access to pasture except when newborn. No haemoparasites were visible on examination of a blood smear by light microscopy. Given this negative finding, the case was then investigated for potential exotic causes of anaemia including pathogenic *Theileria* and bovine viral diarrhoea virus (BVDv) type 2. Blood samples were submitted to the IDC (Wallaceville) for molecular screening, which confirmed the presence of both *T. orientalis* Ikeda and BVD type 1. The sample was negative for the buffeli and chitose strains of T. orientalis, and also negative for BVD type 2 and the haemotrophic mycoplasmas (McFadden *et al.*, 2016). The presentation was considered to be due to overwhelming *Theileria* infection in a calf immunocompromised by persistent BVD type 1 infection. No other calves were affected and the investigation was stood down.

Hydatid cyst excluded

A farmer called the MPI exotic pest and disease hotline after doing a home kill of a 2-year-old Friesian cross cow and discovering several golfball-sized cysts in the liver. It was arranged by the Incursion Investigator for the liver to be taken to the local veterinary clinic, where the veterinarian examined it and took samples for testing at AHL IDC (Wallaceville). Histopathology conducted by the MPI veterinary pathologist confirmed multiple hepatic abscesses, and concurrent severe peribiliary fibrosis consistent with chronic facial eczema. There was no sign of hydatid worm remains in the abscesses, and no evidence of the foreign-body granulomatous inflammation that would be expected in resolving hydatid lesions. Based on the presence of neutrophils, the abscesses were likely to be bacterial. Hepatic abscessation is relatively common following rumenitis, during which bacteria can invade the blood and lodge within the liver. In such cases, enteric and normal commensal bacteria predominate. Bacteriological culture of liver tissue yielded a heavy mixed bacterial growth with a slight predominance of *Lactococcus* species, including *L. lactis* ssp. *lactis*. It is very unusual for this species of bacteria to produce an infection in animals, although it has been isolated from intramammary infections in cows. It is associated with plant material, especially grasses, and is therefore a normal commensal in the digestive tract of cows and can be found in milk. *L. lactis* ssp. *lactis* is used in the manufacture of many varieties of cheese and other fermented milk products as it ferments lactose in milk to lactic acid.

Bovine conjunctivitis outbreak investigated

A veterinary pathologist notified MPI of calves presenting with severe conjunctivitis within the first few weeks of life. A swab of conjunctival fluid from one of the affected calves had tested positive by PCR for infectious bovine rhinotracheitis virus (IBR). Because the reporting pathologist had not previously seen such severe lesions, further investigation was carried out to quantify what had occurred and confirm the diagnosis.
The outbreak resulted in almost all 80 calves being affected by conjunctivitis but the severity was variable. Of the six 2–3-week-old calves initially swabbed, five were positive for IBR by PCR (83 percent). All six calves were positive by PCR to *Mycoplasma bovoculi*. Ten days later, another four affected 2–3-week-old calves were swabbed but none of these were positive for IBR, though again all were positive for *M. bovoculi*.
The affected herd had been assimilated from a Southland dairy herd and a North Island herd that had been transported south. The Southland herd had been managed as a closed unit, with no introductions for at least a decade. This history suggested that the outbreak of conjunctivitis caused by IBR was the result of a presumably infected herd being mixed with a naïve one. Unfortunately data was not available to determine whether the calves born to Southland cows were more severely affected than those born to North Island dams. Colostrum fed to the calves was a mixture that originated from both herds.

Sporadic bovine encephalomyelitis excluded

A veterinary pathologist contacted MPI to report possible sporadic bovine encephalomyelitis (SBE) in a mob of 4-week-old calves. Six of 30 calves were affected. SBE is a bacterial disease caused by *Chlamydia pecorum*, which can result in neurological disease, polyserositis and death in calves. SBE has emerged in NZ during the past few years, with the first cases confirmed in 2014 and some historical cases from 2011 and 2012 (Buckle & Ha, 2015). Other causes of neurological disease in calves, including thiamine deficiency, lead toxicity and protozoal parasites (toxoplasmosis, neosporosis) were ruled out based on history and presumptive supplementation (for thiamine deficiency). Whole blood from six calves, and fresh frozen tissues (including brain, heart, and others) from post-mortem examination of an affected calf were submitted for PCR testing for *Chlamydia* spp. All tissues were negative for *Chlamydia* spp. Some calves had been previously treated with broad-spectrum antibiotics, so it is possible that treatment interfered with testing. Alternatively, another unknown aetiology could be the cause of this disease outbreak. SBE and exotic differentials were excluded, and the investigation was closed.

Caprine herpesvirus-2 confirmed

A veterinarian notified MPI via the exotic pest and disease hotline that three out of a herd of six goats had corneal oedema and the first animal afflicted had developed corneal ulceration. None of them had concurrent conjunctivitis or systemic illness. The first goat affected had been non-responsive to antibiotic treatment but surgery had improved the condition. Swabs were obtained from the latter two goats' eyes for testing at the AHL IDC (Wallaceville), before they were started on antibiotic treatment. The samples consisted of dry swabs, Amies swabs, swabs stored in Friis broth and others in virus transport media. Bacterial, *Mycoplasma* spp. and fungal culturing was conducted, with no significant growth detected or organisms isolated. *Chlamydia* and *Mycoplasma* PCRs were also negative. One of the two goats tested returned a positive PCR result for herpesvirus on swabs from both eyes. This was sequenced as caprine herpesvirus-2. Caprine herpesvirus is endemic in goat herds in New Zealand, has caused outbreaks of vulvovaginitis and balanoposthitis, and has been associated with an ulcerative gastrointestinal syndrome in young kids. It appears this is the first report of caprine herpesvirus being associated with keratitis in goats in New Zealand, but it is not unexpected given that herpesviruses in other species can cause corneal oedema and/or ulceration, for example feline viral rhinotracheitis, malignant catarrhal fever and infectious bovine rhinotracheitis. The goats continued on antibiotic therapy to prevent secondary infections, and within 3 weeks two had improved substantially and the other had not deteriorated further. No new cases had occurred within the herd.

EHV-1 myeloencephalitis excluded

An equine clinician in the Manawatu contacted MPI to report signs of neurological disease in a 10-year-old Warmblood stallion. The horse had developed a fever of 41°C, then several days later developed a cough and simultaneously became ataxic in all four limbs. The horse had been imported from Australia as a 2-year-old. Infectious diseases causing neurological signs in horses include the endemic equine herpesviral meningoencephalopathy (EHM, primarily caused by equine herpesvirus-1), exotic causes including arboviruses such as alphaviruses of the Togaviridae family (including eastern equine encephalitis virus, western equine encephalitis virus and Venezuelan equine encephalitis virus), and flaviviruses (Flaviviridae family, including West Nile virus and Murray Valley encephalitis virus). Whole blood (EDTA) and serum from the horse were tested for antibodies to equine herpesvirus-4 (EHV-4), EHV-1, the exotic diseases equine infectious anaemia and equine viral arteritis, and PCR was done to test for the presence of the antigens to EHV-1, EHV-4, alphaviruses, flaviviruses and generic herpesviruses. All tests were negative except for herpesvirus PCR (where the sequence was consistent with EHV-2) and for EHV-4 antibodies. Although EHV-2 was detected in the blood and serum, it is not known to cause neurological effects in horses. On follow-up 4 weeks later it was reported that the horse had fully recovered and was healthy, with no lasting neurological effects. The cause of the illness was not determined, but exotic disease was ruled out and the investigation was closed.

EVA and EIA ruled out

A veterinary pathologist contacted MPI via the exotic pest and disease hotline to report a 25-year-old New Zealand-born gelding with a history of weight loss and dependent oedema. Haematological examination identified mild anaemia (PCV 0.21; reference range 0.24–0.44). Five in-contact horses remained healthy. Equine infectious anaemia (EIA) and equine viral arteritis (EVA) are exotic differentials for oedema and/or anaemia in New Zealand. Serum samples were submitted to the MPI AHL (Wallaceville) and EIA and EVA were ruled out by AGID and VNT tests respectively. Exotic disease was ruled out and the investigation stood down.

EVA ruled out

A veterinary pathologist reported to MPI via the exotic pest and disease hotline a horse under surveillance for equine viral arteritis (EVA). The horse was a New Zealand-born 17-year-old of mixed breed with oedema of the distal limbs. It had been mildly off-colour for at least 10 days prior to the report. Blood collected from the affected horse 10 days after clinical signs were first observed tested negative for EVA. There were no major abnormalities in the haematology or blood biochemistry. The private veterinarian attending the horse stated that the presumptive diagnosis was likely to be a bacterial infection of the skin. The horse's condition responded to antibiotics, providing evidence for a bacterial aetiology.

Brucella canis excluded

A veterinarian notified MPI via the exotic pest and disease hotline of an 8-month-old German Shepherd dog with chronic balanoposthitis that had not responded to treatment. The dog was otherwise well and had no history of travel or contact with dogs from overseas. Testing was arranged to rule out *Brucella canis* or *Mycoplasma* infection, but the dog's condition spontaneously resolved. It was considered that the animal had a case of juvenile balanoposthitis, which is of no clinical significance.

A pathologist reported an 11-year-old dog with severe suppurative epididymitis in one testicle. The dog was systemically ill and presented at a veterinary clinic lethargic, struggling to stand and inappetant. The veterinarian had found an asymmetric swollen testicle and castrated the dog. Abscesses were seen along the spermatic cord of one testis and the epididymis was thickened and contained caseous pus. Histologically the testes were both normal but the affected epididymis had areas of liquefactive necrosis, oedema, haemorrhage and inflammatory changes that could be consistent with brucellosis. The dog had no travel history or contact with dogs from overseas. Fresh epididymal tissue was tested by PCR at the AHL IDC (Wallaceville) for *Brucella canis*, with negative results. The causal organism was not determined but the dog recovered with antibiotic therapy.

Canine *Leishmania* confirmed

An MPI veterinarian who was responsible for import of live animals made a notification via the exotic pest and disease hotline of a sick 2-year-old male Belgian Shepherd dog that had been imported from the Netherlands. The dog had been released from post-export quarantine only days before the report and was showing clinical signs

of polyarthropathy. Because of the dog's recent travel history it was tested for a number of exotic agents capable of causing these signs. A diagnosis of canine leishmaniasis (a disease exotic to New Zealand) was confirmed after a positive IFAT test and a positive PCR test on blood in EDTA. *Leishmania* amastigotes were also seen in a fine-needle aspirate from the peripheral lymph nodes. Polyarthropathy is common in dogs affected by canine leishmaniosis caused by *Leishmania infantum*. The affected dog subsequently underwent treatment for the condition at a specialist veterinary clinic and the investigation was stood down.

Canine *Ehrlichia* excluded

A 7-year-old West Highland White Terrier dog imported from Greece 4 years previously was reported to MPI via the exotic pest and disease hotline after contracting severe renal disease. The veterinarian had sought a specialist opinion on the renal failure, which was considered likely to be the result of an immune-mediated process or neoplastic condition, or possibly exotic tick-borne diseases or leishmaniasis. The dog had blood changes that could be consistent with chronic ehrlichiosis. On import into New Zealand the dog had tested negative for *Babesia gibsoni, Babesia canis*, *Leptospira canicola*, *Brucella canis* and heartworm, and it showed no related signs of ill-health before this episode. Although uncommon, organisms with the potential to be latent and then cause acute disease were tested for at the AHL IDC (Wallaceville). IFAT antibody testing for *Ehrlichia canis* and *Leishmania* spp. were negative, as were PCRs for *Anaplasma phagocytophilum* and *Babesia* spp. Other diseases present in dogs in Greece were considered extremely unlikely to exhibit such a long latent or subclinical period. The owners chose to euthanase the dog as it continued to deteriorate.

An MPI Official Veterinarian contacted the MPI exotic pest and disease hotline to report pyrexia in a five year old, neutered female Staffordshire bull terrier recently imported from South Africa. The elevated temperature was identified during a routine clinical examination carried out towards the end of the dog's quarantine period. No other abnormalities were identified during the veterinary inspection. Diseases such as ehrlichiosis, babesiosis, and brucellosis were considered potential exotic causes of the pyrexia. To rule out exotic diseases on the differential diagnosis list, haematology and biochemistry profiles and molecular assays for *Ehrlichia* spp. and *Babesia* spp. were carried out on two occasions four weeks apart. Haematology was normal with no haemoparasites identified in peripheral blood smears. Biochemistry was unremarkable apart from a marginal elevation in the muscle associated enzymes, creatine phosphokinase (CPK) and aspartate aminotransferase (AST) on initial testing. The levels of both enzymes reduced and were only marginally elevated at the second test. Molecular assays were negative for exotic haemoparasites on both occasions. The biochemistry changes were considered a feature of the dog's very muscled build along with its excitable nature and jumping behaviour observed while in the quarantine kennels. In consultation with MPI's Verification Service veterinarians, it was considered that exotic diseases were not a factor in the episode of pyrexia. The investigation was stood down.

Feline heartworm excluded

A 3-year-old domestic shorthaired cat became unwell in quarantine after arriving in New Zealand from Alabama, USA. It was showing signs of respiratory distress, lethargy and inappetance, and X-rays detected a possible mediastinal mass and dilated heart. MPI Verification Services called the exotic pest and disease hotline to report the case, and the Incursion Investigator identified feline heartworm as a potential exotic disease of concern. However, cats are a dead-end host for this organism and there was negligible risk to the local cat population if the cat was released from quarantine. Diagnosing heartworm in cats is usually done through a combination of thoracic radiography, echocardiography, clinical presentation, history and serology. The cat was cleared to be transferred to a veterinary clinic for further diagnostic examination and treatment, but died under anaesthesia during echocardiography (which the owner had elected to have done). On necropsy the cat had a large amount of fluid present in the thoracic cavity, and the walls of the heart appeared thin and distended. No evidence of heartworm was found. Tissue and fluid samples taken for analysis confirmed the tentative diagnosis of dilated cardiomyopathy.

HPAI/ND ruled out

A veterinarian called the MPI exotic pest and disease hotline to report a large flock of backyard speciality-breed chickens with respiratory disease. They were housed in separate but in-contact wire-netting enclosures (one for each breed) and about 80 of the 100 birds had been ill over the course of the outbreak, which had been going for about 3 weeks. The owner had reported all birds to be healthy until a rooster that was sneezing was brought into the flock. Since then, birds had exhibited sneezing, swollen eyes and mucus discharges from eyes and nares. Some younger birds had died. Antibiotics had been added to the chickens' water but had not improved the clinical disease presentation. Two choanal swabs cultured at a regional veterinary pathology laboratory yielded mixed bacterial growths but no predominant organism was found. For the MPI investigation, choanal swabs, both dry and in avian virus transport media (ATM), and cloacal swabs in ATM, were obtained from 10 unwell birds. In addition, the swabs from the two birds at the regional laboratory were obtained, as these had been taken before antibiotic treatment. Testing at the AHL IDC (Wallaceville) was negative for the exotic diseases avian influenza and Newcastle disease (avian paramyxovirus type 1) by PCR. Endemic viral agents causing infectious laryngotracheitis and infectious bronchitis were excluded by PCR. The endemic bacterial agents *Avibacterium paragallinarum* (infectious coryza) and *Ornithobacterium rhinotracheale* were positive by PCR in seven and 10 respectively of the 12 chickens sampled. Of the 10 recently sampled birds, five had a dual *Mycoplasma* infection with *M. synoviae* and *M. gallisepticum*, and two more were positive by PCR for *M. gallisepticum*. Most birds had mixed bacterial infections and of the 10 recently sampled ones, two were infected with all four organisms. All samples were negative for *M. meleagridis, M. iowae* and *Pasteurella multocida*. The concurrent infections seemed to have produced a particularly significant outbreak of respiratory illness on this occasion, but overall the flock was starting to recover, with no recent mortalities and reduced clinical presentations.

Pacheco's disease excluded

An African Grey parrot (*Psittacus erithacus*) with inclusion body hepatitis was reported by a pathologist via the MPI exotic pest and disease hotline. The owner had recently bought three juvenile birds and two of these had become ill, with one of them dying. Liver histology found multifocal necrosis with intranuclear inclusion bodies. Polyomavirus PCR testing had already been conducted and was negative. The differential diagnosis of concern was Pacheco's disease, an exotic disease caused by a herpesvirus. DNA from blood samples was available from the two live parrots, and fixed liver from the dead one. Pacheco's disease PCR was negative for all three birds. PCR for adenovirus (which also characteristically produces hepatic intranuclear inclusion bodies) was positive on the liver sample. The DNA product was sequenced to psittacine adenovirus 1. A number of avian adenoviruses of fowl are endemic in New Zealand poultry, and a serological survey of pigeons in New Zealand found positive titres to be common in all the geographical areas sampled (MAF Biosecurity NZ, 2010). There have also been reports of suspect cases of adenovirus in parrots, including a 2010 exotic disease investigation (MAF Biosecurity NZ, 2010a) into an African Grey parrot that had a positive psittacine adenovirus PCR result and consistent histopathology. However, the present investigation appears to be the first characterisation through sequencing of psittacine adenovirus in parrots in New Zealand.

Exotic honey bee diseases excluded

A commercial beekeeper in North Canterbury called the MPI exotic pest and disease hotline to report that 40 of his hives (the entire population at a single apiary) were sluggish, with poor growth and fewer adult bees than expected. The hives had reportedly entered winter in a strong state, but came out of the winter quite weak. The diet available during autumn and winter was known to be low in protein but hives had been supplemented with syrup and pollen after the poor condition was noticed in late winter. Exotic diseases such as infestation with tracheal mites (*Acarapis woodi*), and endemic and emerging diseases such as *Nosema ceranae* and *N. apis,* have been associated with poor hive growth and increased adult bee loss. Bee samples were submitted to exclude tracheal mites, *N. ceranae*, *N. apis*, and deformed wing virus (DWV). Results indicated that bees had high levels of *N. ceranae*, moderate amounts of *N. apis* and moderate amounts of DWV, all of which are endemic in New Zealand. Poor nutrition can lead to increased susceptibility to disease, and it is likely that a combination of factors resulted in the poor growth seen in this case. Exotic disease was ruled out and the investigation was closed.

European foulbrood excluded

An apiary advisory officer reported that larvae in a diseased hive had signs consistent with European foulbrood (EFB) caused by the exotic bacterium *Melissococcus plutonius*. The affected hive was located in the Canterbury region. Signs observed included larvae with discolouration and corkscrew larvae within the cells of the honeycomb. Samples of affected larvae were collected and sent to the AHL IDC (Wallaceville), where *M. plutonius* was excluded by PCR testing.

A beekeeper advised MPI via the exotic pest and disease hotline that one out of seven hives had unhealthy-looking brood. A member of the local beekeeping club had examined the hive and believed the problem was due to sacbrood, but advised the beekeeper to notify MPI. Samples were sent to the AHL IDC (Wallaceville) for European foulbrood testing but were lost by the courier company. When asked to send some more brood for testing, the beekeeper reported that the problem had resolved.

Exotic ticks excluded

A veterinary practitioner contacted MPI via the exotic pest and disease hotline to report finding numerous ticks on two horses near Christchurch. This would be an unusual finding in the Canterbury region. The horses had not travelled outside Canterbury. Seven of the ticks were submitted to the MPI Plant Health and Environment Laboratory (Christchurch), where they were identified as *Haemaphysalis longicornis* (New Zealand endemic cattle tick) nymphs. This finding provides additional confirmation of the presence of a thriving *H. longicornis* population on the outskirts of Christchurch and explains the puzzling and unsubstantiated rumours of such a population in the past.

A member of the public from Hawke's Bay called the MPI exotic pest and disease hotline to report finding a tick on her dog. She was advised by her vet clinic that it was a New Zealand cattle tick, *Haemaphysalis longicornis*. However, following a Google search the notifier believed that it was more likely the exotic brown dog tick. The dog had not been imported but it had mixed with other dogs at a local park. The notifier submitted a photo of the tick to an MPI Incursion Investigator. This was also seen by an entomologist who, from the high quality of the photo, was able to confirm that it was indeed an adult female New Zealand cattle tick. An exotic tick incursion was ruled out and the investigation closed.

Exotic ticks intercepted

A senior scientist at the MPI Plant Health and Environment Laboratory called the exotic pest and disease hotline to report a possible exotic tick found on a 64-year-old man. The man had seen a doctor about a skin lesion, which had been removed, submitted for histopathology and identified as a tick. The paraffin block containing the partially sectioned tick was sent to the MPI Plant Health and Environment Laboratory by the pathologist for further identification. The head and thorax were mostly absent (having been sliced into sections for microscopy) but ventral markings were consistent with the exotic paralysis tick, *Ixodes holocylus*. At this point the Incursion Investigation team was notified. Follow-up with the patient revealed that he had visited an area of bush at Burleigh Heads on the Gold Coast, Queensland, 12 days before seeing the doctor, and that he had not been in the New Zealand bush since his return. This meant he most probably had picked up the tick in Australia, where this species is endemic. The risk of the patient's having picked up the paralysis tick in New Zealand was considered negligible and the investigation was closed.

A member of the public from Dunedin contacted MPI via the exotic pest and disease hotline to report finding a tick on his person four days after returning from a holiday in Australia. The tick

was identified by the Plant Health & Environment Laboratory (Christchurch) as a nymph of the exotic *Amblyomma triguttatum* (ornate kangaroo tick). This tick is native to Australia and has been reported in Queensland, New South Wales, South Australia and Western Australia. From what is understood about this species' behaviour and climatic requirements it is unlikely to establish in New Zealand. Macropods, including kangaroos, are its preferred final host. In Australia the tick has been identified as a carrier of *Coxiella burnetii* (the causal agent of Q fever). The notifier was informed. He reported that he was in good health but was advised to contact his doctor should he develop symptoms that could be consistent with Q fever. The investigation was closed.

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Paul Bingham
Team manager
Animal Health
Biosecurity Surveillance & Incursion Investigation
Diagnostic & Surveillance Services
Ministry for Primary Industries
paul.bingham@mpi.govt.nz

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

Exotic marine pest and aquatic disease investigations are managed and reported by MPI Investigation and Diagnostic Centre and Response, Wallaceville. The following is a summary of investigations of suspected exotic marine diseases and pests during the period from October to December 2016.

Megalocytivirus in salmon excluded

A veterinarian contacted MPI after noticing some unusual pathology in the spleen of Chinook salmon (*Oncorhynchus tshawytscha*) fingerlings. The samples had come from a freshwater hatchery in Canterbury and the fish were being monitored following a suspected toxicity event. Fish were otherwise clinically normal and no unusual mortality or disease had been reported from the raceway at the time of sampling. Pathology was described as enlarged cells in the spleen and heart. There was some concern that it might be a megalocytivirus infection, which causes cell enlargement, but this pathogen is not known to be present in fish in New Zealand. Representative photos of the signs were sent to the MPI fish pathologist, who ruled out megalocytivirus. The observed pathology was likely to be related to infection with microsporidians, which had been seen in the fish. Results were communicated back to the veterinarian and the investigation was stood down.

Pipi deaths investigated

A caller to the MPI pest and disease hotline reported thousands of juvenile pipi (*Paphies australis*) washed up on Okura Beach, Auckland, still alive. The caller suspected the cause might be sedimentation, but since this was the second time he had seen a mass juvenile shellfish stranding occur here, it was important that disease should be ruled out. Samples were submitted to the MPI Animal Health laboratory (AHL). *Perkinsus* was ruled out by PCR. Culture suggested that the pipi died of a bacterial infection, but whether the bacteria were the primary or secondary pathogen could not be determined. Vibriobacteria that were also found to be present can be both a primary and a secondary pathogen. The presence of *Rickettsia* was also reported – a bacterial parasite that lives inside the cells of the host. AHL was unable to identify this to species level, to confirm whether it might be a causal organism. It is likely that these pipi were immunocompromised, perhaps by the environmental conditions and maybe in part also by the presence of *Rickettsia* organisms, and were then invaded by a suite of opportunistic bacteria that ultimately caused them to die. The investigation was closed.

Exotic parasites of paua excluded

Two recreational divers called the MPI exotic pest and disease hotline to report a suspected parasite in the shell of a paua (*Haliotis iris*) they had collected from near Pencarrow Head, Wellington. The lesions were described as yellow-to-brown blisters with mucoid discharge affecting the underside of the paua and the inside of the shell. Of the 20 paua they collected, only one was affected with the lesions. Although shucked by the notifier, the shells, guts, mantles and soft tissue remnants were all retained frozen in storage. Samples were submitted to the AHL and molecular tests were performed to rule out *Perkinsus olseni* and other exotic organisms that have clinical signs consistent with the notifier's description. These tests returned negative results, but close examination of the shell revealed that the lesions were associated with fungal hyphae. The literature reports that internal shell lesions caused by fungal hyphae are found throughout the South Island at a low prevalence (Friedman *et al*., 1997; Grindley *et al*,. 1998). This investigation was closed since there was no evidence of an exotic organism.

Gaping oysters investigated

In September 2016 the manager of a Northland Pacific oyster (*Crassostrea gigas*) farm called MPI to report that, while grading oysters measuring 65–100 mm, a number were noticed to be gaping. About 10 percent of the oysters were affected, but no mortality had been observed on the growing racks.The farm had experienced mortality caused by oyster herpesvirus-1 (OsHV-1) in the past, but usually just during the warmer months. No significant environmental events were reported at the time and water temperatures were not abnormal, so this gaping was considered unseasonal and the manager was concerned that it might be the early signs of a disease event. The AHL tested five fresh and five frozen whole oysters that were submitted by the farm. Light mixed bacterial growth was observed from them all, and the shellfish pathogens *Vibrio splendidus* and *Pseudoalteromonas* spp. were common in all samples. However, histopathology revealed no lesions so it was considered that these bacteria were unlikely to be a factor. All oysters tested by real-time PCR for OsHV-1 were negative. The cause of the gaping could not be determined but it may have been related to the stress associated with grading. Exotic disease was ruled out and the investigation was stood down.

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Mike Taylor
Team Manager
Aquatic & Environment Health
Diagnostic & Surveillance Services
Ministry for Primary Industries
Mike.Taylor@mpi.govt.nz

Exotic plant and environment investigations report: October to December 2016

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.

New to New Zealand organisms – positive reports

A new to New Zealand virus, **snowdrop virus Y,** was identified on a *Clivia gardenii* sample. Snowdrop virus Y is a member of the genus *Potyvirus*. The virus was recently isolated and named by Fera Science Limited (Fera) in the UK. No reports of this virus are available from elsewhere and only one piece of partial genome sequence is available in GenBank. The *C. gardenii* sample was collected from the Auckland Botanic Gardens. Early indications suggest that the virus is of low biosecurity risk. As a potyvirus, snowdrop virus Y is assumed to be vectored by aphids, with a host range within the plant family Amaryllidaceae.

A new to New Zealand virus, **Japanese holly fern mottle virus,** has been identified in a native fern, *Asplenium oblongifolium* (shining spleenwort), collected from the Auckland Botanic Gardens. This is also a new host record for this virus. Japanese holly fern *Cyrtomium falcatum* is also a host of this virus. Both species of fern are common at the Auckland Botanic Gardens and have been present there for many years. The virus has never been associated with symptoms on the Japanese holly fern and is therefore thought to be non-pathogenic. Given the incidental nature of the detection and the simultaneous presence of the virus in Japanese holly fern, the virus has likely been present and undetected in the population for many years.

Four sticky boards was placed around a house on the North Shore, Auckland, for a fortnight after the notifier reported getting bites and skin rashes and feeling a crawling sensation. Four species of mites were identified: ***Cheyletus trux*** (Acari: Cheyletidae), a new to New Zealand species, and three others known to be present in New Zealand: *Chortoglyphus arcuatus, Dermatophagoides pteronyssinus* and *Glycyphagus destructor*. *C. trux* was originally described from grain in Russia and has been recorded from the nests of birds and mammals, house dust and grain supplies in Belgium, Israel, Kyrgyzstan, Russia, Switzerland, Ukraine and the US. There is no other published biological information. The economic or environmental significance of this species should be very low, based on studies of other species of the same genus, which are predators of mites and small insects in stores and houses.

A new to New Zealand mite was found on a Three Kings cabbage tree (*Cordyline obtecta*) during High Risk Site Surveillance Programme work in Kilbirnie, Wellington. The mite was identified as ***Carpoglyphus* sp**. and is to be described by an entomologist from MPI's Plant Health and Environment Laboratory, Tamaki. It is likely to be of low economic importance.

New to New Zealand organisms – negative reports

A suspect new to New Zealand scale insect, suspected to be *Acanthococcus aceris,* was reported through the High Risk Site Surveillance Programme. However, it was confirmed to be ***Eriococcus leptospermi*** (Hemiptera: Eriococcidae), a species of Australian origin and established in New Zealand. It is recorded on a number of *Leptospermum* spp., but in this instance the host was *Myrtus communis,* an introduced European species of myrtle used for hedging. This is a new host record for this scale insect.

A distinctive male *Psyllaephagus* wasp, most similar to *P. breviramus* but with different antennae, was found in Colin Maiden Park, Auckland, by an independent entomologist. The wasp did not appear to be a known Australian species. The specimen was unfortunately destroyed while being photographed, but appeared to be distinctive, so it was considered necessary to collect further specimens to confirm the identity. The wasp had been found on acacia trees infested with psyllids of the genus *Acizzia*, which suggested a new host record for *Psyllaephagus* in New Zealand. A further search found a group of six males on the same trees and these were submitted to MPI for identification. The wasps were provisionally identified as ***Psyllaephagus breviramus*** (Hymenoptera: Encyrtidae), by comparison with a paratype held in the New Zealand Arthropod Collection. This species is present in New Zealand and other experts agreed that the specimen was likely to be *P. breviramus*. Conclusive identification is not possible because the taxonomy of *Psyllaephagus* is insufficiently known.

Biosecurity pests

A caller found a live black spider in a grain mix purchased from a supermarket and stored in a pantry. They believed that the spider might have be imported with the goods, which originated in Australia. The spider was killed and identified from photos by MPI entomologists as a male white-tailed spider, ***Lampona murina,*** which is established in New Zealand.

A single spider egg mass was found on a banana imported from Panama.

Photos of the egg mass supplied by the notifier showed apparently healthy eggs. Same-day collection of the egg mass and submission to MPI enabled alive/dead testing. All individual eggs tested were dead. This result demonstrated that despite an egg mass (and individual eggs) appearing healthy, it may in fact be dead.

A pest controller found several unusual ants on a foreign super yacht. Samples were submitted to MPI for identification. Two exotic species were identified: ghost ants ***Tapinoma melanocephalum*** and carpenter ants ***Camponotus* sp.**, including a live queen. Ghost ants are a common tramp ant and are often found on goods from Southeast Asia but are not established in New Zealand. Carpenter ants are large predatory ants that are not established in New Zealand and pose a risk to native invertebrate fauna. Additionally, carpenter ants tunnel into wood to create nests. Surveillance showed that ghost ants were located in several areas of the vessel. Flybusters Consulting Ltd applied toxic bait to these areas and observed good ant recruitment to the bait. No carpenter ants were seen but carpenter ants were caught in dome traps baited with honey and crickets. Follow-up treatment by Flybusters yielded no further ants. Flybusters also provided equipment for the crew to conduct surveillance at a rented property as a further precaution. No exotic ants were found.

An email notification was received by MPI from an Auckland resident who believed she had found red imported fire ants *(Solenopsis invicta)* in her garden The ants were orangey-brown in colour and were biting the notifier. An Incursion Investigator visited the site and collected specimens, but these were identified as ***Pheidole rugosula***, the coastal brown ant, a species that is established in New Zealand.

A police officer visited the Department of Conservation office in Kerikeri to report giant flying ants seen at a local backpackers. There was concern that seasonal workers from the Pacific Islands might have introduced the ants. Flybusters Consulting Ltd investigated and submitted specimens for identification. The ants were identified as ***Rhytidoponera chalybaea*** (the blue pony ant), which is present in Northland.

Ants were seen on a footpath near Christchurch Airport by a contractor who thought they might be exotic crazy ants (*Paratrechina longicornis* or *Anoplolepis gracilipes*). The ants were moving in an erratic manner. A sample collected by an Incursion Investigator was identified as ***Iridomyrmex suchieri***, a species established in New Zealand.

Ants and brood were found on a parcel delivered from Australia. The parcel was frozen immediately to kill the ants. A sample was requested for identification. The ants were identified as the black house ant, ***Ochetellus glaber,*** a species established in New Zealand. It is possible that this infestation came from a local source.

A caller to the exotic pest and disease hotline had received a parcel of new machine parts from Italy which had ants on it. These were identified as ***Technomyrmex jocosus*** (the white-footed house ant), a species established in New Zealand.

A secondhand bed was purchased and had some strange bugs that were living in the seam of the base of the mattress. Specimens submitted were confirmed as bed-bugs, ***Cimex lectularius***, a species present in New Zealand. This cosmopolitan bed-bug hitch-hikes its way around the world with travellers.

A necklace imported from Niue in hand luggage and declared on entry was found to contain seed-feeding insects. The necklace was composed of various types of seeds, including corn kernels. Treatment of the necklace to kill any insects present was undertaken by freezing.

Suspect forest and timber insects

Dust and holes were seen in a table lamp about a week after it was purchased from a furniture shop in Hamilton. A few weeks later more holes and dust around the lamp were seen. The origin of the lamp was not known. It was submitted for inspection and several beetles were extracted and identified as ***Lyctus africanus***, which is not present in New Zealand. The lamp was frozen to kill all beetles present.

The notifier advised that in early 2016 she purchased a tallboy and side-cabinet from a furniture shop and recently noticed decay and borer holes in the back of the tallboy. The notifier contacted the furniture shop, who collected the goods. The products were imported via Australia and made in India. Fumigation of the furniture was arranged.

A pest control operator reported that borer emergence holes had appeared in the exterior timber cladding of a Waikanae beachside house. The cladding was imported cedar that had been in place for about 2 years and a large number of holes were noticed when it was being painted. The pest control operator considered the exit holes too small for *Anobium punctatum*, the common house borer, and more consistent with a *Lyctus* species. A section of the timber cladding with the exit holes was removed and sent to MPI. Examination of the timber sample clearly showed an absence of wood borer galleries and that the holes were not insect exit holes but indentations from some unknown particle hitting the timber. Subsequent discussions with the owner have been unable to determine the cause. The indentations examined on the submitted sample were consistent in size and shape, suggesting that whatever caused the indentations were relatively uniform in size, shape and impact force. Despite this, all biosecurity issues were excluded.

An unusual moth was found at a Transitional Facility close to Auckland Airport, laying eggs on the roller-door. The caller had identified the moth from web photos as the polyphemus moth (*Antheraea polyphemus*). However, a photo supplied by the caller was consistent with the gum emperor moth, ***Opodiphthera eucalypti***, an Australian species already present in New Zealand.

Beetles believed to be *Paropsisterna beata* were found on eucalyptus trees. *P. beata* was ruled out using photos supplied by the caller, and the beetles were identified as the gumtree scale ladybird ***Rhyzobius ventralis,*** a predatory species present in New Zealand.

Suspect agricultural & horticultural pests

A dead brown stink bug was found in the plastic wrapping of cheese imported from Italy. The cheese had been air-freighted in cartons with dry ice and no other contaminants were found. A male brown marmorated stink bug (BMSB), ***Halyomorpha halys,*** was identified. BMSB was first reported from Italy in 2012. Populations are now

causing damage and are being found in imports to New Zealand. The importer was advised to remain vigilant when unpacking product from Italy.

Two vintage orchard bags imported for a film prop from Seattle, USA, had live insects inside. The photos supplied indicated BMSB (***Halyomorpha halys***). The orchard bags had been kept in the courier packaging until they were opened at the film studio. On finding the insects the film crew immediately wrapped everything in plastic bags and phoned MPI. All bags, wrapping and contents were frozen for 24 hours before the specimens were submitted to MPI for identification and the packaging was destroyed. Four BMSB specimens were received, one male and three females. When the females were dissected one was found to have likely been dead for some time, with no body contents, while the other two had immature oocytes. The quick action and subsequent inspection by the notifier mitigated the biosecurity risk.

The notifier received four pallets of cargo (ink cartridges) from a freight forwarder. After removing the plastic foil wrapping around one pallet he noticed live locusts and stink bugs, some dead and some alive. All four pallets were thoroughly re-inspected in the unpacking area and insecticide was sprayed on cargo, packing material and the unpacking area. Six specimens were collected from half the pallets inside the packaging material and identified as BMSB (***Halyomorpha halys***). Other bugs found were *Nezara viridula* (green vegetable bug, present in New Zealand) and the exotic **Egyptian locust, *Anacridium aegyptum***. All the pallets and packaging were destroyed by incineration.

Two live suspect brown mamorated stink bugs (***Halyomorpha halys***) were found at a Transitional Facility in goods that had arrived in a container from the US. Samples were confirmed as two un-mated BMSB females still in their overwintering phase. A site inspection was conducted and no further bugs were found.

In yet another case of suspect BMSB, the notifier's mother had recently visited New Zealand from Pennsylvania, USA. Two days after she left, a suspect bug was found in the house. The notifier thought the bug might have arrived in her mother's bags. However, the bug was identified as ***Cermatulus nasalis***, the brown soldier bug, a species that is established in New Zealand.

A live black beetle was found in a pawpaw imported from the Philippines and bought from a fruit retailer in a mall at Milford, Auckland. The specimen was identified as ***Heteronychus arator***, the black beetle, which is established in New Zealand. The fruit was openly displayed inside the store so this may have been a case of local contamination.

Fruit damage was seen on a single peach tree on an urban property, possibly indicative of fruit fly activity. Eggs were seen inside the fruit, together with damage. Entomologists ruled out fruit-fly damage and the pathologists concluded the symptoms were caused by ***Pseudomonas syringae* pv. *syringae*.** This pathogen is widely distributed throughout New Zealand on stonefruit. It causes cankers on trees and bacterial spot and ooze symptoms on fruit.

Bananas purchased in Hastings had small thin white worms in the packet. The bananas were over-ripe and rotting, and the worms were identified as vinegar fly larvae (***Drosophila* sp.**). The Import Health Standard requires all bananas to be unripe (hard and green) when exported to New Zealand. Given that these flies only lay their eggs in fermented/rotting fruits and are very common in New Zealand, it is likely that the infestation occurred locally.

Garlic bought from a supermarket in Lower Hutt was stored in a vegetable basket and the notifier observed some unusual black insects on it. The garlic was imported from China. The insects were killed by freezing and the vegetable basket sprayed with insecticide. The insects were identified as ***Neotoxoptera formosana*** (onion aphid), which is established in New Zealand.

Plant diseases

A Department of Conservation ranger at Nelson Lakes National Park noticed dieback in rata (*Metrosideros* sp.) trees near the lake edge. Some trees had a large infestation of scale insects. Insect, soil and leaf samples were sent to MPI for examination. The scales were identified *as* ***Anoplaspis metrosideri***, a native species known to infest rata trees. No pathogenic bacteria or fungi were identified from leaf or soil samples. The tree dieback may be due to environmental conditions.

Grapes imported from the US and bought from a supermarket were described as having "thick spider webbing" on them. Photos received by MPI showed that in fact the "webbing" was fungal mycelium. An MPI mycologist identified it as the early stage of ***Botrytis cinerea*** prior to developing the grey spores that give rise to its common name, grey mould. This fungus is very common on grapes worldwide, including New Zealand. It quickly produces a lot of mycelium with long, fluffy hyphae, hence there are many reports of this fungus on imported grapes.

Mark Bullians
Manager
Surveillance & Incursion Investigation (Plants)
Surveillance and Diagnostic Services
Ministry for Primary Industries
Mark.Bullians@mpi.govt.nz

PEST WATCH: 24 November 2016 – 3 February 2017

Biosecurity is about managing risks: protecting New Zealand from exotic pests and diseases that could harm our natural resources and primary industries. MPI's Diagnostic and Surveillance Services (DSS) 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 24 November 2016 – 3 February 2017. 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
chromist	*Phytophthora gregata* no common name	*Dacrycarpus dacrydioides* kahikatea	Auckland	PHEL (General Surveillance)	A new to science species described in 2011.
chromist	*Phytophthora pini* no common name	Soil	Northland	SCION (General Surveillance)	Isolated from pasture soil near a kauri forest; no direct association with any symptomatic plants.
chromist	*Phytophthora* taxon *personii* no common name	*Platanus* sp. plane tree	Auckland	PHEL (General Surveillance)	Isolated from the soil around a plane tree with dieback symptoms.
fungus	*Pestalotiopsis biciliata* no common name	*Hedyscepe canterburyana* umbrella palm	Auckland	PHEL (General Surveillance)	A new to science species described in 2014.
insect	*Coleophora deauratella* red clover case bearer moth	*Trifolium pratense* red clover	Auckland; Mid Canterbury	S Thorpe / PHEL (General Surveillance)	Larvae feed on red clover seed.
insect	*Dicyphus* sp. plant bug	*Pelargonium* sp.	Auckland	S Thorpe (General Surveillance)	First recorded in 2013.
insect	*Monopis icterogastra* wool moth	–	Auckland	Landcare Research (General Surveillance)	Caught in light trap
mite	*Cheyletus trux* no common name	–	Auckland	PHEL (General Surveillance)	Found on insect glue board
virus	Butterbur mosaic virus ButMV	*Daphne odora* winter daphne	Auckland	PHEL (General Surveillance)	Considered to be widespread in NZ on daphne bushes.
virus	Japanese holly fern mottle virus JHFMoV	*Asplenium oblongifolium* shining spleenwort; huruhuru whenua	Auckland	PHEL (General Surveillance)	Considered to have a narrow host range, i.e., confined to fern species.

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

Veterinary Diagnostic Laboratories

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

- AUCKLAND
  Courier: NZCCM, Gate 2, Auckland Zoo, Motions Road, Western Springs, Auckland 1022
  Postal: PO Box 44 422, Point Chevalier, Auckland 1246

- 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 LABORATORIES

- HAMILTON
  PO Box 10304
  Hamilton 3241
  Ph: 0800 SVS LABS (0800 787 522) or 07 444 5101
  Fax: 07 444 5102
  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

Investigation and Diagnostic Centre – Wallaceville
66 Ward Street
Upper Hutt
Tel: 04 526 5600

Investigation and Diagnostic Centre – Tamaki
231 Morrin Road
St Johns
Auckland
Tel: 09 909 3568

Investigation and Diagnostic Centre – Christchurch
14 Sir William Pickering Drive
Christchurch
Tel: 03 943 3209

New Zealand Government

Ministry for Primary Industries
Manatū Ahu Matua