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

What universities have brought to biosecurity

New Zealand universities are probably among the rare examples worldwide offering undergraduate and postgraduate programmes in biosecurity. They recognise the increasing need to produce a new generation with skills to deal with risks presented by new pests and diseases crossing the border, as well as managing those that are already here. They are not alone: B3 (Better Border Biosecurity) and the Ministry for Primary Industries (MPI) sponsor many of the biosecurity programmes available in several universities. Decisions to manage New Zealand's biosecurity need to be based on sound science, and universities contribute to the development of the necessary skills in future scientists. The new generation of veterinarians will be familiar with biohazards associated with microorganisms, plants and animals; in many cases the new generation of biologists will be familiar with modern techniques to identify and detect exotic species. Some will even have the knowledge and experience necessary to plan eradication and management schemes. Universities will provide new staff for MPI, DOC, Crown Research Institutes, regional and local authorities and industry organisations working in border control, and for post-border biosecurity, surveillance, eradication and management of pests and diseases.

Additionally, university academics, scientists and postgraduate students contribute directly to New Zealand's biosecurity system through their research. A wide array of projects exist among universities, targeted at understanding invasions and their impacts and finding strategies to prevent and control invasive species. Unravelling the mechanisms of invasion and estimating their impacts is the basis of biosecurity policy that is centred on prevention, prioritisation and management. Basic research to address these questions is being carried out in a number of New Zealand universities. For example, at Lincoln University there are PhD research projects that range from developing models and frameworks to assess the potential establishment, spread and impact of pests, to developing genetic tools and stable isotopes to identify insect pests and trace their origins. Such research will help prevent future arrivals of pests such as the Queensland fruit fly and target potential entry pathways.

Other highlights of new research at Lincoln University include developing analytical tools to detect volatile organic compounds emitted by unwanted species such as the brown marmorated stink bug in shipping containers. Similarly, at the University of Canterbury, students are investigating new technology such as acoustic detection of insects in import pathways and the dynamics of establishment success of small founder populations of invasive species. Projects by Auckland University postgraduate students include using web-based knowledge to determine biosecurity risks from China and finding ways of combining eradication tools to make insect eradication strategies more efficient. For invasive insects that cannot be eradicated, some researchers are working to improve host-specificity testing of parasitoids introduced to control them.

Many of these university research projects are in collaboration with industry organisations and Crown Research Institutes and it is not uncommon to see joint supervision of postgraduate students between these organisations. This inter-organisational joint effort brings a more practical insight to university research and practitioner needs. As the universities become increasingly involved with the end-users of their research, the direct feedback helps improve research outcomes. Greater co-operation between research providers, practitioners and stakeholders should be encouraged as this brings together complementary skills to protect New Zealand's environment, economy, human and animal health for the future.

Ursula Torres
PhD student
Bio-protection Research Centre
Lincoln University
Ursula.torres@lincolnuni.ac.nz

Exotic pest and disease focus for companion animal vets

This article describes a number of exotic pests or diseases affecting dogs or cats that may be encountered in imported companion animals. It also describes the measures in place to ensure biosecurity threats are managed effectively.

The Ministry for Primary Industries (MPI) ensures New Zealand's plants, animals and natural resources remain free from harmful pests and diseases. Our biosecurity system includes:

- pre-border measures (import health standards – IHSs) that detail the testing and inspection of animals required before importing them;
- border measures, including inspection and quarantine, carried out on arrival or soon after arrival at registered Transitional Facilities; and
- post-border surveillance to inform investigation and response to biosecurity threats.

Pre-border and border controls

Import risk analysis (IRA) is a scientific discipline that transparently accommodates known facts, knowledge gaps and uncertainty (Vose, 2008; World Organisation for Animal Health, 2010). MPI uses IRA to identify pre-border hazards such as pathogens that may be associated with imported animals, and to assess the likelihood and consequences of introducing those hazards. IRA also informs control measures to manage the identified risks, and helps communicate the risks to others (Cobb & MacDiarmid, 2014).

As a signatory to the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures, New Zealand can employ control measures to imported animals, but these measures must not be applied arbitrarily, or result in discrimination between countries where similar conditions prevail, or constitute a disguised restriction on trade (World Trade Organisation, 1995). WTO members agree to base their control measures on international standards, guidelines and recommendations, such as the Terrestrial Animal Health Code (World Organisation for Animal Health, 2013). However, WTO members can choose to adopt measures that result in a higher level of protection than that provided by international standards, provided these are supported by an IRA.

MPI's IRA for cats, dogs, and canine semen was published in November 2009 and provides the scientific basis for the measures currently applied to imported companion animals. This document is publicly available at www.mpi.govt.nz/document-vault/2796.

Post-border controls

New Zealand's exotic pest and disease control measures are among the best in the world, although no system can eliminate all risk. Maintaining our animal health status also requires reliable systems to investigate and respond to suspect incursions of exotic disease. Practising veterinarians seeing and reporting unusual signs and events underpin New Zealand's animal disease surveillance system (Tana, 2014).

MPI's Investigation and Diagnostic Centre (IDC) at Wallaceville manages the investigation of, and initial response to, any suspected exotic animal disease or pest, as well as new or emerging syndromes. Animal Incursion Investigators are veterinarians with postgraduate training in epidemiology and/or pathology, and relevant further training in exotic diseases and pests. They are supported by expert bacteriologists, virologists, immunologists and parasitologists at MPI's Animal Health Laboratory (AHL) and Plant Health and Environment Laboratory (PHEL).

Veterinary Incursion Investigators respond to calls to the MPI pest and disease hotline (0800 809 966), typically from farmers, veterinarians or veterinary pathologists. MPI investigators are willing to hear and discuss any cases and concerns, however insignificant they may seem at first, to maximise the likelihood of detecting exotic diseases. They are not concerned if cases under discussion turn out to be false alarms, and are happy to provide consultancy to help rule out any suspected exotic, new or emerging diseases.

Exotic disease case notes for veterinarians in practice

Following are details of imported pests and diseases that may present in first-opinion companion animal veterinary practice. Cases of three of these diseases (all of which are notifiable under the Biosecurity Act 1993) have recently been diagnosed in New Zealand: ehrlichiosis, leishmaniasis, and brown dog ticks. Attending veterinarians and pathologists worked closely in partnership with MPI to investigate and manage these cases.

Ehrlichia canis – Canine monocytic ehrlichiosis

Worldwide situation: E. canis is widespread in tropical and semi-tropical regions. This intracellular bacterium is transmitted by the brown dog tick, *Rhipicephalus sanguineus*. There are no reports of natural transmission by any other means.

New Zealand context: E. canis testing is not a requirement of New Zealand's IHS for dogs because the vector is not present here. The endemic tick *Haemaphysalis longicornis* may feed on dogs, but is not an *Ehrlichia* vector. At present, owing to the lack of any vector, *E. canis* is unlikely to become established in New Zealand, so it is important to ensure that ticks that could be vectors are not introduced on imported cats and dogs (MPI, 2009).

Clinical presentation: Acute infection is characterised by fever, generalised lymphadenopathy, splenomegaly and thrombocytopenia. New Zealand veterinarians are unlikely to see acute cases because sick animals should not have been cleared to leave their country of origin. Some dogs that recover from the acute phase can remain subclinically infected for months or years, during which they may clear the organism, remain infected or develop chronic disease. It is therefore more likely that chronic-stage infection could be presented to a veterinarian in New Zealand. Chronic infection is characterised by progressive weight loss,

bleeding disorders and renal failure. Clinical findings may also include anaemia, splenomegaly, interstitial pneumonitis, ocular lesions (e.g., anterior uveitis, hyphema – see **Figure 1**) and meningitis (McQuiston, 2014).

Laboratory findings and confirmation: Routine bloodwork in chronic-stage *E. canis* infection will typically identify a non-regenerative anaemia, thrombocytopenia, lymphocytosis and neutrophilia. Serum biochemistry changes often include azotaemia, hyperglobulinaemia and hypoalbuminaemia (McQuiston, 2014). Parasites seen within lymphocytes in acute-stage infection are rare in chronic stage ehrlichiosis. *Ehrlichia* infection can be confirmed by PCR testing; IFAT testing is unhelpful on its own as titres in dogs that have cleared infection may remain high for many years.

Treatment options: Doxycycline therapy at 10 mg/kg for 28 days is sufficient to sterilise chronic infection (Neer *et al.*, 2002). There is a potential onward transmission risk associated with bone marrow transplants and blood transfusions, so chronically infected animals should not be used as donors.

Leishmania infantum – Canine leishmaniasis

Worldwide situation: The protozoan parasite *Leishmania infantum* is found in more than 70 countries, including southern Europe (especially Spain), Africa, Asia, South and Central America (where it is called *L. chagasi*) and sporadically in the US.

New Zealand context: Import requirements for dogs do not include testing for *L. infantum* because New Zealand does not have phlebotomine sandflies, which are the primary vectors of the disease and necessary for completion of the parasite's life cycle.

Clinical presentation: Dogs may present with skin lesions, generalised lymphadenomegaly, progressive weight loss, muscular atrophy, exercise intolerance, decreased appetite, lethargy, splenomegaly, polyuria and polydypsia, ocular lesions, epistaxis, onychogryphosis (overgrowth and curling of the nails), lameness, vomiting and diarrhoea. Cytology of enlarged lymph nodes reveals the characteristic organisms (**Figure 2**).

Diseased dogs also have impaired immunity. This is thought to be caused by the parasite, as decreased cellular immunity coincides with escape and replication of *Leishmania* from macrophages. Sick dogs are likely to have high levels of parasitaemia and spread the protozoan back to the sandfly vector. Dogs with healthy immune systems will experience a lag of weeks to years between exposure and development of disease (Solano-Gallego *et al.*, 2009). During this time individuals will often be seronegative, because the parasite is adapted to hide within macrophages. Conversely, clinically ill dogs usually have high antibody titres.

Laboratory findings and confirmation: IFAT testing at the MPI AHL may confirm a diagnosis in the face of a suitable travel history, suspicious clinical signs, or presence of suspicious organisms on cytology. PCR on blood and lymph-node aspirates is performed to identify the organism to species level.

Treatment options: Leishmaniasis can be treated but is not considered curable. Treatment with meglumine antimoniate and allopurinol is the preferred option for most stages of the disease, but meglumine antimoniate is not available for veterinary use in New Zealand and importation requires ACVM approval. Successful treatment results in decreased parasitaemia, but treated dogs are still considered carriers (Solano-Gallego *et al.*, 2009).

Exotic ticks

Worldwide situation: Recent estimates are that 390 of the 900 species of tick across the world can infest people and their companion animals (Heath and Hardwick, 2011). Many carry a variety of blood-borne pathogens. Their ability to vector exotic diseases is the reason that all exotic tick species are notifiable under the Biosecurity Act 1993.

Figure 1: Anterior uveitis and bleeding disorders such as epistaxis and hyphema are potential sequelae to chronic *Ehrlichia canis* infection. Photo: K Gelatt, www.merck.com

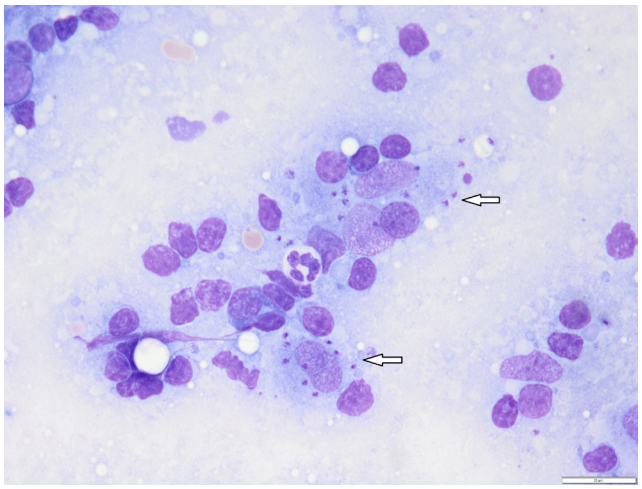

Figure 2: Lymph node aspirate showing macrophages containing characteristic intracellular *Leishmania infantum* amastigotes (arrows) with characteristic perpendicularly-orientated kinetoplasts. Photo: Rebecca Cairns & Janice Thompson, Gribbles Veterinary Pathology. Scale bar: 20µ.

New Zealand context: Only 11 species of tick are present in New Zealand. Most parasitise wild birds, but one, the cattle tick *Haemaphysalis longicornis,* is associated with domestic animals. Despite stringent IHS measures against ticks, there have been increasing numbers of exotic tick interceptions at the border in recent years and at least 17 species have been identified and eradicated. Most of these parasitic hitchhikers originate from Australia, the Pacific Islands, Asia and North America (Heath and Hardwick, 2011). Most commonly they are carried into New Zealand on people or dogs and they can also arrive with imported goods (Loth, 2005).

The two most commonly intercepted exotic ticks on dogs are the brown dog tick *(Rhipicephalus sanguineus)* and the

paralysis tick *(Ixodes holocyclus).* Both are present in Australia: *R. sanguineus* is common in the north and also found in the west and east, while *I. holocyclus* is confined to the eastern seaboard.

Clinical presentation: In the veterinary clinic these ticks may not be easy to spot. Although engorged, adult female brown dog ticks can reach 12 mm in length, the larval and nymph stages can be as small as 1 mm. Common areas of attachment are the dog's ears, neck and shoulders, and larvae can also be found on the belly and flank. Cats are not the preferred host for many tick species and are less likely to carry ticks.

There is a possibility that a dog or cat infested with *I. holocyclus* could present with tick paralysis caused by the potent neurotoxins in the tick's saliva. Clinical signs include a rapid ascending flaccid muscular paralysis that can manifest as a progressive deterioration in the ability to vocalise, coordinate the hind limbs, breathe or eat (Barker *et al.*, 2014). Affected cats may also become extremely anxious.

Laboratory findings and confirmation: Tick species are distinguished by their morphological characteristics: see **Figures 3, 4 and 5**. These are guides only and confirmation of species requires microscopic examination. If you find a tick on an animal and you are not confident that it is a cattle tick, please call the exotic disease and pest hotline and discuss the case with one of our veterinarians.

Treatment: Removal of brown dog ticks and acaracide treatment of the dog and its place of residence are adequate control measures.

For cases of tick paralysis associated with *I. holocyclus*, early administration of tick antitoxin serum can result in improvement of clinical signs within 6–12 hours. Tick paralysis can be fatal: an Australian survey showed that death was the outcome in 5 percent of cases and was usually due to paralysis of the respiratory muscles (Atwell, 2008).

Dirofilaria immitis – Heartworm

Worldwide situation: Heartworm (*Dirofilaria immitis)* is present in most countries with temperate, semitropical or tropical climates, including Australia, North America, Latin America and southern Europe. It is seen more commonly in dogs than cats, and more than 70 species of mosquito can serve as intermediate hosts.

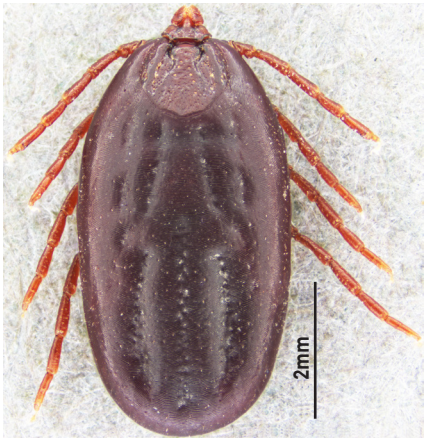

Figure 3: Dorsal view of a semi-engorged *Rhipicephalus sanguineus* (brown dog tick), showing the visible eyes either side of the scutum that can distinguish this species from the New Zealand cattle tick. Photo: Qing Hai Fan, MPI.

Figure 4: Dorsal view of *Ixodes holocyclus* (Australian paralysis tick). Note the distinctive darker colouration of the first and fourth pairs of legs. Photo: Qing Hai Fan, MPI.

Figure 5: Dorsal view of a fully engorged *Haemaphysalis longicornis* (New Zealand cattle tick). Photo: Qing Hai Fan, MPI.

New Zealand context: New Zealand is free of *D. immitis* but has three potential vector mosquito species (*Aedes notoscriptus, Culex quinquefasciatus* and *Aedes australis*), so stringent IHS measures are in place against heartworm in dogs.

In regions where there is a high density of infested dogs, cats can also be infested with *D. immitis.* However, cats are aberrant, dead-end hosts because microfilaraemia is uncommon and the parasite rarely undergoes final maturation in cats (McSporran, 1994). Therefore IHS measures are not necessary for imported cats (MPI, 2009).

Clinical presentation: Infested animals may be sub-clinical. Mild and often transitory respiratory signs can occur 3–4 months post-infestation, when the juvenile worms arrive in the lungs. Later, when the animals harbour mature worms in the pulmonary vasculature, they may exhibit signs such as intermittent vomiting, lethargy, anorexia, coughing, episodic dyspnoea, epistaxis, or syncope. Ascites can be seen in some animals, owing to right-sided congested heart failure. Two to five years after infestation the death of adult heartworms can lead to acute respiratory distress, which may be fatal (Guerrero 2012).

Laboratory findings and confirmation: The suspicion of heartworm disease in a dog or cat in New Zealand would be based initially on clinical presentation and a relevant importation history. Findings that could support diagnosis include thoracic radiography (patchy parenchymal infiltrates, enlarged caudal lobar arteries), echocardiology (parallel hyperechoic lines in the right heart and pulmonary arteries, indicating the heartworm cuticle), routine haematology (eosinophilia, basophilia) and biochemistry (hyperglobulinaemia) (**Figure 6**).

Antigen-based diagnostic tests give negative results during the initial pneumonitis syndrome as circulating antigen and microfilaria are not present until 5–6 months or more after infestation (Ferasin, 2005). Antigen-test sensitivity can be low for cats because unisex infections are common and they rarely have mature worm

burdens; sensitivity can also be low in dogs with light *D. immitis* infestations (Guerrero, 2012). Antibodies are usually present by five months and can be used to confirm antigen test results, but titres persist for several months after worm death so they are not a reliable indication of active infestation.

Treatment options: Ivermectin and other macrocyclic lactone drugs are effective against larval worms, but not against mature adults (Ferasin, 2005). There is currently no satisfactory treatment for mature heartworm infestations. Arsenical drugs can be used to treat adult worms in dogs, but this must be done with caution as complications with pulmonary embolism can occur.

The adult heartworm lifespan in cats is shorter than dogs (usually about two years), so spontaneous recovery is possible. Many cats are managed conservatively with restricted activity and corticosteroid therapy, and 25–50 percent of them may survive with this approach (Guerrero, 2012).

Discussion

New Zealand's geographical isolation and robust biosecurity systems ensure that incursions of exotic diseases are rare. No international border is impenetrable and occasionally veterinary practitioners may be presented with an unusual case with an exotic disease differential diagnosis. Vets who work with companion animals, livestock and wildlife are the eyes and ears of MPI's animal biosecurity surveillance system and the country relies upon them to help keep it free of exotic pests and diseases.

If you suspect a notifiable disease or if you would like to discuss a case with a colleague who has exotic disease expertise, please call MPI's exotic disease and pest hotline.

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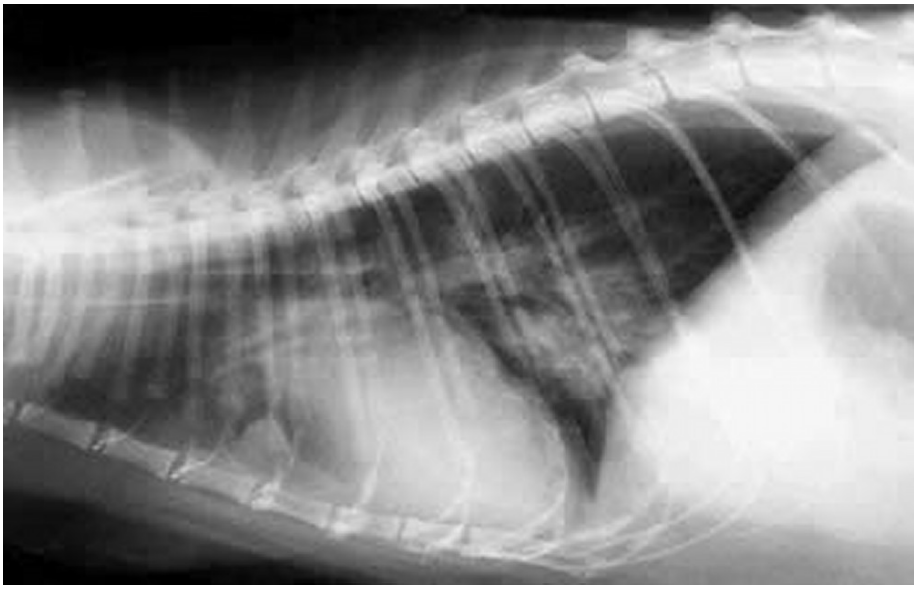

Figure 6: Feline heartworm (*Dirofilaria immitis*) disease – lateral thoracic radiograph showing enlarged caudal lobar pulmonary arteries. Photo: www.merckvetmanual.com.

Thomas Rawdon
Principal Adviser
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Thomas.Rawdon@mpi.govt.nz

Eve Pleydell
Senior Adviser Response
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Eve.Pleydell@mpi.govt.nz

Kelly Buckle
Veterinary Pathologist
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Kelly.Buckle@mpi.govt.nz

Chris Rodwell
Senior Adviser Response,
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
Chris.Rodwell@mpi.govt.nz

Stephen Cobb
Manager-Biosecurity Risk Analysis (Animals and Aquatic)
Biosecurity Science, Food Science and Risk Assessment
Ministry for Primary Industries
Stephen.Cobb@mpi.govt.nz

Quarterly report of diagnostic cases: January to March 2016

New Zealand Veterinary Pathology

Bovine

A pregnant heifer in Northland died after exhibiting marked dyspnoea for a period of 1.5 weeks. Grossly the lungs appeared nodular, and nodules were also present in the spleen and kidney. Histologically, there was multifocal necrosis in the lung, uterus, placenta and spleen, associated with an acute suppurative vasculitis and vascular thrombosis. Widely scattered fungal hyphae were visible in lesions present in the lungs and placenta. The fungal hyphae did not appear reliably septate. **Mycotic pneumonia, placentitis and splenitis** were diagnosed, most likely caused by ***Mortierella wolfii***.

A dairy herd in the Kaipara district had a history of weight loss in a few animals but no obvious clinical signs. Blood samples from four animals were submitted for routine chemistry, BVD antigen ELISA and Johne's antibody testing. Two of the animals had a marked hypoproteinemia, and others had some changes indicative of gut stasis. Three were positive on Johne's antibody ELISA. **Johne's disease** was diagnosed.

Two mature cows used for nursing calves had a history of poor weight gain. One had hindlimb paresis. Bloods were submitted for trace element testing. Blood selenium levels were markedly decreased in both animals (< 50 and 97 nmol /L; reference range 250–2000).

Two mature dairy cows from the Waikato had clinical evidence of photosensitivity. Clinical chemistry on both revealed a marked elevation in GGT, with haemolysis present in one sample, consistent with **sporodesmin toxicity**.

A group of mature dairy cows in the Western Bay of Plenty had clinical evidence of acute facial eczema. The skin of their teats was red and they had peeling, oedematous ears. They had been dosed with a rumenal zinc bolus six weeks prior and a top-up bolus had also been administered. Serum samples from seven animals were submitted. All had marked elevations in GGT (739–1464 IU/L; reference range 0–36). Serum zinc levels ranged from 12 to 23 µmol/L, but most were below 20, which is considered the minimum level to prevent facial eczema.

Published studies using elemental zinc as a supplement suggest that it does not raise serum zinc levels to the same extent as does zinc oxide. Faecal zinc levels of > 200 mg/kg fresh weight are considered a better indicator of whether zinc dosing has been sufficient (Bennison *et al.*, 2010). In these animals, faecal zinc levels ranged from 77 to 880 mg/kg (mean 391), suggesting that in most cases the levels of zinc supplementation should have been adequate to prevent facial eczema.

One of the proposed mechanisms of action of zinc supplementation in facial eczema prophylaxis is through reducing the availability of copper. Copper supplementation negates this effect. Even animals supplemented with copper before the facial eczema season may have liver copper levels high enough to reduce the efficacy of zinc supplementation (Dawson & Laven, 2007). In this case, liver copper levels in the affected mob ranged from 790 to 2 900 µmol/kg (mean 1 838) with several animals above the upper limit of the reference range of 95–2 000. In this case it is likely that ongoing copper supplementation had reduced the efficacy of the zinc bolus. It is therefore recommended that copper supplementation should be ceased during the facial eczema treatment period.

A Waikato farm ran 800 dairy cows in two herds of 400. One herd was affected by acute onset of photosensitivity. Twenty-one animals out of 24 tested had elevated GGT levels (up to 3519 IU/L; reference range 0–36), consistent with exposure to **sporodesmin**. Members of the clinically normal herd had normal GGT levels. It is assumed that there was a significant difference in sporodesmin exposure between these two herds, possibly because of different pastures or concentrate feeds.

A 200-cow dairy herd in the Waikato had 15 animals exhibiting clinical signs of **facial eczema** and some also showed ill-thrift, weight loss and evidence of anaemia. One animal died. Smear examinations were performed on four animals and two had evidence of ***Theileria* sp**. Six animals examined had markedly elevated GGT (up to 4204 IU/L; reference range 0–36), consistent with exposure to **sporodesmin**. Serum zinc levels were all less than 20 µmol/L, below the recommended therapeutic range for prevention of facial eczema.

Four Angus bulls exhibited depression and diarrhoea. Faecal egg counts were negative. All four had marked elevations in GGT (up to 2528 IU/L; reference range 0–36). Three of the four had ***Theileria* spp.** visible on blood smears**. *Theileria* infection complicated by sporodesmin toxicity** (facial eczema) was diagnosed.

Three beef animals (two cows, one calf) in Marlborough were affected by an acute onset of pulmonary distress/pneumonia. One animal died and was necropsied. Grossly, the lungs had a meaty texture with marked interstitial emphysema throughout. Histology revealed a marked interstitial pneumonia with diffuse type II pneumocyte hyperplasia. **Atypical interstitial pneumonia (fog fever)** was diagnosed. Atypical interstitial pneumonia occurs when animals graze pastures that contain high levels of tryptophan. Fermentation of tryptophan in the rumen produces 3-methyl indole, which has a direct toxic effect on type I pneumocytes, resulting in severe respiratory compromise and frequently death.

A dairy cow in the Horowhenua district had severe smelly diarrhoea, with fragments of gut mucosa visible in the faeces. The animal was recumbent and dehydrated. Culture of the faeces revealed the presence of ***Salmonella* Typhimurium**.

A two-year-old heifer in the Hauraki district had extensive nodular lesions all over the side of her face. Biopsies were submitted for histopathology, which revealed a marked papillomatous epidermal hyperplasia with extensive cytopathic effect and koilocytosis, typical of **papillomaviral infection**.

Ovine

A mob of about 44 three-year-old rams in the Hauraki district had four deaths in a week. One of the rams was necropsied. It had pale mucous membranes and liquid faeces in the distal colon. A faecal egg count revealed 3840 strongyle eggs/gram and 150 *Nematodirus* eggs/gram. Histology showed acute periacinar hepatic necrosis secondary to hypoxaemia/anaemia. **Acute severe haemonchosis** was diagnosed.

A mob of 1200 mature ewes in Gisborne were moved to a new paddock, and four days later two animals had died, with three others appearing "wobbly". One ewe had neurologic signs, with nystagmus, tremors and stiff legs. This animal was sacrificed for necropsy and TSE surveillance. Examination of the brain revealed a marked subacute and necrotising encephalitis with mild meningitis, consistent with **listeriosis**.

Equine

An 11-year-old horse in Nelson had a history of chronic recurrent uveitis, which appeared to respond to prednisolone. Equine recurrent uveitis (periodic opthalmia, moon blindness) can be caused by leptospirosis. Microagglutination testing in this horse for ***Leptospira* Pomona** revealed a very high titre (> 1:1600) in initial testing, and 1:3200 two weeks later. PCR on the urine for leptospires was negative. There were no significant abnormalities on the clinical chemistry. **Equine recurrent uveitis secondary to leptospirosis** was diagnosed.

A yearling Thoroughbred in the Waikato had clinical signs suggestive of atypical myopathy. Aspartate aminotransferase levels were markedly increased (> 8800 IU/L; reference range 283–550). Creatine kinase levels were also markedly increased (> 25 000 IU/L; reference range 231–583). The horse's paddock contained numerous sycamore trees, which in New Zealand have been shown to contain significant amounts of hypoglycin A, the toxin associated with **equine atypical myopathy** (McKenzie *et al.*, 2016).

Caprine

A large dairy goat herd (> 1000 animals) experienced a marked year-on-year decrease in production, accompanied by some feed refusal. Extensive trace element testing for selenium and copper was undertaken. Several animals were necropsied, and in at least two there was a granulomatous enteritis with acid-fast organisms, consistent with **Johne's disease** caused by ***Mycobacterium avium* ssp. *paratubercuolosis***. Serology testing of 25 animals chosen at random from the herd indicated that four were positive on Johne's antibody ELISA. In two other animals necropsied there was evidence of a moderately extensive **coccidial infection in the small intestine**, accompanied by a moderate lymphoplasmacytic enteritis. Limitations of funding prevented further testing, but it appears that Johne's disease and coccidiosis may both be contributing to the issues on this property.

Avian

A two-year-old quail (*Coturnix* sp.) was presented to a veterinarian in the Auckland region with dyspnoea and scant faeces. The bird died during evaluation, despite oxygen therapy. Necropsy revealed numerous large 4-mm-diameter white spots on the liver, and firm, yellow, nodular lungs. Histology confirmed the presence of multiple large granulomas in the liver and lungs, which contained numerous acid-fast organisms. **Systemic myobacteriosis** was diagnosed.

A Sun Conure (*Aratinga solstitialis*) in a facility in the Waikato had compromised health, with evidence of metabolic disease. The animal died and was submitted for necropsy to rule out avian tuberculosis, as other birds from the same facility had a history of mycobacterial infection. There was no evidence of acid-fast organisms on special histologic staining, but multiple cross-sections of intestinal nematodes were visible on histology, accompanied by numerous bioperculate eggs. **Intestinal capillariasis** was diagnosed.

Poultry

A backyard chicken in the Christchurch area had a swollen crop and was off food for two days. The owner indicated that the bird might have ingested flakes of lead paint from renovations that were being performed on the property. Blood lead levels were greater than 0.60 mg/L; levels greater than 0.4–0.6 are consistent with clinical lead intoxication. Much lower levels are considered tolerable in chickens and eggs raised for human consumption. Recently there has been considerable concern about prevalence of high lead levels in home-raised poultry and their eggs. This case highlights the considerable public health implications of **lead intoxication** in backyard poultry flocks. (Trampel *et al.*, 2003)

A flock of 8000 12-week-old crossbred laying hens in Canterbury experienced increased mortalities. About 800 died. Four hens were necropsied by the submitter, who noted marked pericarditis and oophoritis, with mild enlargement of the spleens. There was some evidence of a low *Heterakis* worm burden but this was considered unlikely to be the cause of death. ***Pasteurella multocida*** was cultured from the ova, pericardium and liver of two of the birds. Enrichment culture for *Salmonella* was negative. **Septicaemic pasteurellosis** was diagnosed.

Feline

A two-month-old kitten from Auckland presented with diarrhoea. Faecal testing revealed no evidence of intestinal worms or protozoa, but ***Salmonella* Bovismorbificans** was isolated from the faeces.

An eight-year-old cat in the Waikato had moderate diarrhoea. Faeces were submitted for culture and parasite examination, including testing for *Giardia*, *Cryptosporidia*, faecal egg counts, *Salmonella* and *Campylobacter* culture. Culture was positive for ***Campylobacter jejuni***, the likely causative agent of the enteritis.

A seven-week-old kitten at a rescue centre in Taupo had had chronic diarrhoea since 4–5 weeks of age, despite frequent de-worming. Culture of the faeces revealed ***Campylobacter jejuni***.

Canine

A nine-month-old Doberman in the Taupo region had a history of recurrent diarrhoea. Faeces were submitted for culture and parasite examination. Culture was positive for ***Campylobacter jejuni***, likely the agent of the enteritis. Testing for *Giardia, Cryptosporidia, Salmonella* and faecal egg counts was negative.

A Cocker Spaniel in Southland had a four-day history of diarrhoea and enteritis. Culture for *Salmonella, Campylobacter* and *Yersinia* spp. was performed, as well as a faecal egg count and antigen ELISA for *Giardia* and *Cryptosporidia* spp. Concurrent ***Campylobacter jejuni*** infection and ***Giardia*** were diagnosed by culture and antigen ELISA.

A three-month-old Huntaway puppy had severe vomiting and diarrhoea, with icterus and dehydration. Clinical chemistry results demonstrated evidence of cholestatic liver disease and severe azotemia. Leptospires were not detected by PCR at first presentation, and an initial microagglutination test for *Leptospira copenhagenii* revealed a titre of 1:200. Nine days later, when the dog was re-tested, the azotemia had resolved but there was still some evidence of cholestatic liver disease**.** ***Leptospira copenhageni*** MAT titres had risen to 1:3200, confirming **leptospirosis**.

Lagomorph

A female pet rabbit from North Canterbury died suddenly. Postmortem by the submitting vet was relatively unremarkable, but there was evidence of a nutmeg liver and a mild enteritis. Histologic examination revealed a multifocal to coalescing hepatocellular necrosis with dissociation of hepatocellular cords and nuclear pyknosis. Some other organs (lung, spleen, kidney) had equivocal evidence of microvascular thrombosis. Peracute **rabbit calicivirus infection (rabbit hemorrhagic disease)** was considered the most likely cause of death, based on the histologic abnormalities.

Fish

A stingray (*Dasyatis brevicaudata*) held in a captive facility died and samples were submitted for histology. The most significant abnormalities were a marked necrotic bronchitis and hepatitis with intravascular protozoal parasites. The parasites most closely resembled ciliates of the subclass Scuticociliatida. These organisms have been reported before in elasmobranchs, as well as some teleost fishes including seahorses and weedy sea dragons. The necrosis was likely the result of **vasculitis and thrombosis** induced by the parasites.

Gribbles Veterinary Pathology

Bovine

A mob of 175 yearling Friesian bull calves were transported from Ashburton to Northland. Twenty-six subsequently died and the surviving calves were lethargic, with white mucous membranes. A complete blood count on one affected animal revealed a haemoglobin concentration of 31 g/L (reference range 90–150), haematocrit of 0.10 L/L (reference range 0.24–0.40), anisocytosis, polychromasia, high numbers of nucleated red blood cells, and 40 *Theileria* organisms per thousand red blood cells, consistent with **theileriosis**.

In the Waikato, eight abortions were recorded in a herd of 300 Friesian cross dairy cattle, with a high rate of pyometra and empty cows noted at scanning. There were no gross abnormalities in three feti submitted for necropsy, apart from effusions and oedema consistent with autolysis, and white foci suggestive of myocarditis or autolysis in the heart of one fetus. Histopathology of two showed multifocal necrotising encephalitis, myositis, myocarditis, hepatitis and splenitis consistent with a diagnosis of **Neospora-related abortion**. This was supported by a positive *Neospora* PCR result from the stomach contents of two feti, by high *Neospora* IFAT titres in two dams (>/= 1:2000) and a lack of significant bacteria cultured from stomach contents. A *Tritrichomonas* PCR test of two samples of uterine pus was negative. The high incidence of reported pyometra or endometritis in these cows might be explained by retention of fetal membranes after abortion.

Eight cows from a herd of mixed-age and mixed-condition Friesian/Jersey cross dairy cattle in the Waikato had aborted at four to five months' gestation. They had been fed mouldy silage within the previous two weeks. Two feti were grossly unremarkable apart from effusions and oedema consistent with autolysis. Despite freezing artefact, in one fetus histopathology showed a severe meningitis or encephalitis with narrow fungal hyphae and thrombosis, and also multifocal hepatic thrombosis with hepatitis, consistent with **fungal abortion**. ***Mortierella wolfii*** was considered likely to be the causative agent.

Tissues from one aborted foetus and sera from eight aborted dairy cows from a North Canterbury property were received. Typical lesions of ***Neospora caninum*** infection were seen on histopathology of the heart and brain of the fetus. Six of the aborted cows had *Neospora* IFAT titres of > 1:2000, indicating recent immune stimulation by *Neospora*.

One Friesian calf in a mob of 60 calves on a North Canterbury farm died suddenly. The calves had been vaccinated three days previously and a clostridial infection as a result of the vaccination was suspected. However, the only lesions detected were due to a **systemic adenovirus infection** in the kidney and intestines.

Two 1-year-old heifers on a Southland dairy farm were losing weight and in poor condition. A bovine viral disease (BVD) antigen ELISA test on both returned high positive results, confirming **mucosal disease.** The remaining 200 heifers in the mob were tested by BVD antigen ELISA on ear-notch samples and 46 were positive. On re-testing of the positive animals a month later using BVD PCR, 44 were still positive, confirming they were **persistently infected with BVDV**.

Four out of 150 six month-old calves were found dead on a Southland dairy farm. One appeared to be blind before being found dead. Brain tissue collected from one calf was examined by histopathology, and a diagnosis of **polioencephalomalacia** was confirmed.

A two-year-old heifer from a Manawatu dairy farm presented with many 10–40 mm cutaneous masses over the body. Some were hairless and the owner reported they had only been present for a week. A fine-needle aspirate of one mass was collected. On smear examination there were greater numbers of lymphocytes than expected for the amount of blood. Many of the lymphocytes had large, round to slightly indented nuclei, coarse chromatin patterns, and some contained multiple irregularly-shaped nucleoli (1–6 per cell). There were also low numbers of small lymphocytes with dark dense nuclear chromatin and a few eosinophils. This cytological pattern and the clinical findings are consistent with **cutaneous bovine lymphoma** (Thompson *et al.*, 1993). This is quite a rare neoplasm, affecting cattle from about one to three years of age. Signs include raised circular hairless plaques on the head, neck, sides and perineum. The cutaneous lesions may regress and recur over several months and death eventually occurs following infiltration of internal organs.

A two-year-old beef steer on a Hawke's Bay farm was seen blind and ataxic before being found dead. Two other steers out of the mob of 600 were also ataxic. Brain was removed from the dead

steer at postmortem and submitted for histopathological examination. There was oedema throughout the cerebrum and death of neurones, consistent with a diagnosis of **polioencephalomalacia.** Treatment of the two other affected steers with vitamin B1 (thiamine) was successful. In another case, four 5-month-old replacement heifer calves on a Wairarapa dairy farm died over the course of a month. Two were observed seizuring prior to death. Histological examination of the brain revealed widespread malacia of cortical laminae, with neuronal necrosis and infiltration by gitter cells, consistent with a diagnosis of **polioencephalomalacia** caused by **thiamine deficiency**.

A two-and-a-half-year-old Angus steer was not growing as well as the two others on a Wairarapa lifestyle block. On clinical examination the only abnormal finding was an elevated rectal temperature (40.1°C; normal 39). A blood sample tested positive for bovine viral diarrhoea virus by ELISA, confirming this steer was **persistently infected with BVDV**.

Veterinary attention was sought for an adult Highland cow in the Wairarapa after the rapid appearance of a pedunculated 40-mm-long protruding lesion from the ventral bulbar conjunctiva of the left eye. The mass was firm and starting to become hard and necrotic at the apex, where it was resected and portions sent for histopathological examination. Refractile debris was seen in the lesion, associated with a **pyogranulomatous and fibrosing scleritis** characteristic of an inflammatory reaction to foreign debris, most likely plant material. Neoplasia was ruled out.

A Wairarapa farmer subcutaneously injected 50 five-month-old Friesian bull calves with 2 ml of calcium copper edetate (50 mg elemental copper per ml). Over the following two days one calf was found dead and another became unwell and lethargic and subsequently died. Analysis of a blood sample from the sick calf revealed a GDH activity of 5128 IU/L (reference range 8–41), AST activity of 3383 IU/L (reference range 68–214), GGT activity of 109 IU/L (reference range 9–39) and a total bilirubin concentration of 54 µmol/L (reference range 0–15), consistent with severe hepatocellular necrosis. Postmortem of one calf revealed that the liver was swollen and rounded, with a prominent lobular pattern. Histological examination revealed this pattern to be the result of massive hepatocellular necrosis. The kidney copper concentration was elevated, at 203 µmol/kg (reference range 0–157), confirming the clinicopathological suspicion of **acute copper toxicity.** The calves were in good health prior to treatment, but no testing had been done to ascertain liver or serum copper status to see if copper supplementation was necessary.

A mob of 163 recently-weaned dairy heifers was transported out to grazing on a central North Island farm. About one month later, 30–40 of them began to lose weight and developed diarrhoea. Some of the more severely affected heifers had bloody diarrhoea and three of them died. Faecal oocyst counts from three were light, moderate, and heavy. Faecal cultures produced light growths of ***Campylobacter*** spp. from two heifers and a moderate growth of ***Yersinia pseudotuberculosis*** from one. Histological examination of the intestinal tract revealed numerous coccidial oocysts and gametocytes in the distal small intestinal and colonic mucosa, with associated enterocyte necrosis and crypt abscesses. These investigations confirmed a diagnosis of **coccidiosis.**

Several deaths occurred among a mob of Friesian dairy heifers soon after being trucked to grazing on an East Coast farm. Post-mortem examination revealed extensive swelling and dark red discolouration of the skeletal muscle. Histology of the affected tissue confirmed widespread myonecrosis accompanied by fibrinosuppurative inflammation and scattered large bacterial rods with terminal spores. The clinicopathological findings were typical of **blackleg,** caused by ***Clostridium chauvoei***.

Ten of 250 cows on a Bay of Plenty dairy farm developed skin lesions of the feet and associated lameness. Lesions occurred predominantly on the dorsal surface of the foot, typically close to the coronary band, and occasionally on the plantar surface. Hind and forefeet were affected. The lesions ranged from mild crusting and erosion to ulceration and proud flesh. Similar lesions were reported from cows in a number of surrounding herds in the same region. Histological evaluation of biopsies from two cows revealed severe chronic necrosuppurative dermatitis and cellulitis with foreign debris and numerous mixed bacteria. Examination of Warthin-Starry silver stains did not reveal significant spirochaete populations. The cases were diagnosed as **necrotising dermatitis** but a definitive cause was not identified. It seems likely that some form of inciting insult (e.g., trauma, maceration, solar radiation, chemical irritant, mites or other arthropod bites) damaged the epidermal defence mechanisms and enabled infection by necrotising bacteria.

Ovine

Ill-thrift and death was reported in a group of hoggets from Northland, which had been drenched with abamectin and closantel five weeks before presentation. Post-mortem examination of one revealed congestion within a lung lobe. Histopathology of multiple tissues identified severe chronic suppurative bronchopneumonia and multicentric cerebral abscessation. It was suspected that these sheep had **enzootic pneumonia,** with haematogenous spread to the brain in the tested animal.

A South Canterbury farm reported 10 lamb deaths from a mob of 800 over a four-week period when they were about six months old. One lamb was presented alive to the veterinary clinic, where it was noted to have neurological signs of convulsions and nystagmus. The lamb was euthanased and post-mortem examination undertaken. Histological examination revealed lesions of protein-rich perivascular oedema in the brain, typical of **enterotoxaemia** produced by the epsilon toxin of ***Clostridium perfringens*** **type D**. The lambs were not vaccinated against clostridial infection. Another case of enterotoxaemia was diagnosed in a lamb from a North Canterbury property where eight 4-month-old Romney lambs from a mob of 1000 had died in the previous six weeks.

From a mob of 520 four-month-old recently weaned lambs on an Otago sheep farm, 12 had died over a two-week period after a short period of ill-thrift associated with respiratory distress. Necropsy of one lamb found consolidation of the cranial lung lobes and ***Pasteurella multocida*** was isolated from the lesion.

Sixty out of a mob of a thousand lamb hoggets were found dead or moribund

over a six-day period on a Southland sheep farm. They had last been drenched a month before. Post-mortem examination of several dead hoggets found that they were in very poor condition. Histological examination of the gastrointestinal tract of one animal found evidence of chronic parasite damage in the abomasum and small intestine. Faecal egg counts on this group were markedly elevated (up to 3000 eggs per gram), confirming a diagnosis of **gastrointestinal parasitism**.

Ten out of a mob of 600 hoggets were found dead over a 10-day period. A moribund hogget was killed and postmortem undertaken. No gross lesions were identified but histopathological examination of the brain revealed pathology consistent with a diagnosis of **polioencephalomalacia.**

Ten lambs from a mob of 250 died over a period of four days while grazing a good-quality plantain/clover mix on a Wairarapa sheep farm. The lambs were about five months old and in good body condition. Clostridial 5-in-1 vaccine had been administered at docking and weaning and a thorough drenching programme was in place. Post-mortem examination of two lambs showed extensive petechial haemorrhage of the epicardium, and fibrin within the pericardium. On microscopic examination there was suppurative myocarditis, pericarditis and leptomeningitis associated with bacteria and intravascular fibrin thrombi. The signalment, history and pathology were considered compatible with **histophilosis.**

An East Coast sheep farmer reported an outbreak of diarrhoea and unexpected death in previously healthy mixed-age ewes. Post-mortem examination revealed dehydration, distension of the gall bladder, and thickening and reddening of the distal small intestine, cecum and spiral colon. These changes were correlated with mucosal necrosis and fibrinosuppurative inflammation that were identified histologically. Mesenteric lymphadenitis and hepatic and pulmonary intravascular thrombi were also identified. The diagnosis of **salmonellosis** was confirmed by culture of a heavy growth of ***Salmonella* Hindmarsh** from the intestinal contents.

Blood was received from a pet mixed-breed sheep in Hawke's Bay. It was one of two clinically affected sheep from a small flock of three pet sheep fed pasture and sheep nuts. The affected ewe was clinically jaundiced, mildly anaemic (haemoglobin 63 g/L; reference range 80–140), reticulocytes were 1.2 percent (reference 0) and the urine was red. The blood was haemolysed so RBC numbers and absolute reticulocytes could not be measured. There was an inflammatory leukogram with an increased neutrophil count of 14.9 $x10^9$/L (reference range 0.4–5 $x10^9$). Heinz bodies were seen in 60 percent of RBCs (reference 0). Serum biochemistry revealed a GDH of 257 IU/L (no established reference range), elevated GGT (98 U/L; reference range 32–70) and increased bilirubin (355 µmol/L; reference range 0–8). The serum copper concentration was 54 µmol/L (reference range 11–25) confirming a diagnosis of **chronic copper toxicity**. Chronic copper toxicity in sheep can result in Heinz body formation.

Caprine

Adult milking does on a Waikato dairy farm presented with diarrhoea after a change in the feed offered to them. Most recovered after antibiotic therapy but one goat died and post-mortem examination was undertaken. Bacteria associated with necrosis and suppurative inflammation was seen on the superficial aspects of the lamina propria in the small intestine. Although culture was not undertaken, the bacterial morphology and pathology suggested ***Yersinia*** infection. In addition, uroliths were visible in the renal pelvis, suggesting that **urolithiasis** contributed to the death.

Mated Saanen does on a Taranaki dairy goat farm developed a purulent vaginal discharge after mating. Two had lost weight and had elevated rectal temperatures, along with swelling of the vulva. Swabs of the vaginal discharge from these two goats were tested by a herpesvirus PCR that detects bovine, cervine and caprine herpesvirus. This test was positive, confirming a diagnosis of **caprine herpesvirus vulvovaginitis**.

Porcine

Three litters of two- to three-day-old piglets from the Waikato had developed diarrhoea, ill-thrift and death. They had been vaccinated against parvovirus infection. Culture of a faecal sample identified ***Escherichia coli*** positive for K88 fimbriae, consistent with a diagnosis of **enterotoxigenic colibacillosis**.

An eight-year-old pet kunekune boar from a Taranaki farm developed a large subcutaneous swelling at the angle of the jaw. The mass had a necrotic centre on surgical exploration so a biopsy was taken to exclude the possibility of tuberculosis. Histologically, most of the biopsy consisted of necrosis and bacteria. However, cords and islands of pleomorphic epithelial cells, some of which had angular keratinised cytoplasm, were observed peripherally, leading to a diagnosis of **squamous cell carcinoma** with secondary necrosis and bacterial infection.

Canine

A four-year-old crossbreed dog from the Auckland region presented with chronic weight loss and recent diarrhoea. A 10-cm-diameter intra-abdominal mass was palpated. Cytology smears from this mass contained many neutrophils, epithelioid macrophages, plasma cells, lymphocytes and eosinophils associated with fungal hyphae. Surgical removal of the mass was performed; at surgery it was intimately associated with, but not infiltrating, a ureter. Histopathology of the mass, ureter and associated kidney confirmed a pyogranulomatous steatitis with intralesional fungi (**mycetoma**), with an unremarkable kidney and ureter. Culture and identification of the organisms subsequently revealed they were ***Scopulariopsis*** and ***Microascus***, saprophytic fungi occasionally known to be pathogenic in humans. The source of the infection was not identified, but haematogenous spread or introduction by a migrating foreign body were considered the most likely scenarios.

An adult Mastiff cross dog from Auckland had dysuria and malodorous urine, followed by acutely swollen and painful testes and epididymides. Histopathology of a testis showed suppurative to pyogranulomatous inflammation within the epididymis, with many free spermatozoa and short bacilli. ***Escherichia coli*** was isolated from a fresh sample of testis, consistent with **coliform epididymitis** and ruling out brucellosis.

An eight-year-old male Collie dog from a Southland sheep-and-beef farm was presented to a veterinarian after being off food and less energetic than usual over the previous three days. The dog was severely jaundiced on clinical examination. Haematology revealed

only mild inflammatory changes but a biochemistry panel revealed severe liver enzyme elevations including bilirubin 384 µmol/L (reference range 0–3), alkaline phosphate 942 IU/L (reference range 0–87), and alanine aminotransferase 234 IU/L (reference range 0–88). This panel also revealed severe azotaemia (urea 55 mmol/L; reference range 2.5–9, and creatinine 620 µmol/L; reference range 48–109), suggestive of renal damage.

A leptospirosis PCR on a urine sample was weakly positive and a microscopic agglutination test for a range of *Leptospira* serovars including ***Leptospira pomona*** had a titre of 1:25 600. After two weeks of antibiotic treatment the dog was much improved and the liver enzymes and kidney analytes were normal. The source of this infection was not determined and the dog had never left the property. This is the first time **leptospirosis** has been diagnosed in dogs in Southland.

Fine-needle aspirates were obtained from a two-year-old English Cocker Spaniel bitch in Taranaki that had been lame for three weeks. The dog initially had pyoderma, and grass seeds stuck between the toes; then it developed a lump over the metapharyngeal area. Radiographs showed no significant findings. An aspirate collected and examined by cytology showed the lesion was inflammatory, with moderate numbers of degenerate neutrophils. In addition, there were low numbers of protozoal-type organisms (morphologically suggestive of ***Neospora caninum***, ***Toxoplasma gondii*** (Hoffman *et al*., 2012) or ***Hammondia*** **spp.)** A pyogranulomatous dermatitis caused by *Neospora caninum* infection has been previously described in dogs (Boyd *et al.*, 2005, LaPerle *et al.*, 2001).

An 18-month-old male neutered Kelpie from the greater Auckland region developed a firm subcutaneous swelling above the right eye. Over several months the swelling spread to involve the side of the head and the hard palate, with loss of the right upper molars and multifocal ulceration. There was no response to empirical antibiotic therapy so a biopsy was taken. Microscopic evaluation of affected tissues showed numerous round to oval, 5–8-µm yeast bodies with thick, clear capsules and rare narrow-based budding. Moderate numbers of macrophages and fewer lymphocytes, plasma cells and neutrophils were interspersed with the yeast bodies. These histological findings were compatible with **cryptococcosis.** This is uncommonly diagnosed in dogs, the yeast being inhaled or inoculated from environmental sources such as soil and bird droppings. Molecular techniques are required to differentiate *Cryptococcus neoformans* from *C. gatti* infections.

A 10-year-old Labrador in the Wairarapa was noticed to be straining to urinate owing to an obstructed bladder, the result of a thickened urethra. Smears obtained from the urethra and sent for cytological examination revealed numerous round cells with marked anisocytosis and anisokaryocytosis. The nuclei were mostly round, containing coarse chromatin, and there were 1–6 irregularly shaped and sized nucleoli in some cells. Many of the cells had a moderate amount of pale basophilic cytoplasm, with some cells appearing more basophilic than others. An occasional neoplastic cell contained a large pink transitional cell inclusion body in the cytoplasm. Occasional binucleated and multinucleated cells were also present. These findings were consistent with a **transitional cell carcinoma.**

Feline

Two litters of kittens and adult Birman cats from the Waikato had diarrhoea, despite treatment with fenbendazole and toltrazuril after a previous diagnosis of coccidiosis. Faecal culture was negative for *Salmonella* and *Campylobacter* spp., and parasitic eggs or oocysts were not found, but faecal antigen ELISA tests were positive for ***Cryptosporidium***, suggesting a diagnosis of **cryptosporidiosis.**

A British Blue kitten from Auckland had watery, mucoid and occasionally bloody diarrhoea along with intermittent vomiting and mild anorexia. The kitten had been previously treated with praziquantel and pyrantel embonate. Faecal culture was negative for *Salmonella* and *Campylobacter* spp., and parasitic eggs or oocysts were not found, but a positive faecal antigen ELISA test for ***Giardia*** was consistent with a diagnosis of **giardiasis.**

A four-year-old Burmese cat from Northland presented for veterinary examination because of coughing, along with excessive lip-licking and gagging. No abnormalities were identified on pharyngeal examination, but generalised peripheral lymphadenopathy was present. In-house laboratory testing was negative for feline immunodeficincy virus. There was mild hyperglycaemia as the glucose was elevated to 9.36 mmol/L (reference range 4.11–8.83) and haematological abnormalities included marked anaemia (RBC 1.8 x 10^{12}/L; reference range 4.8–9 x 10^{12}), haemoglobin 31 g/L (reference range 80–140), haematocrit 0.11 (reference range 0.24–0.45). There was increased MCV (59 fL; reference range 39–56), neutropenia (0.2 x 10^{9}/L, reference range 2.5–12.5 x 10^{9}) and monocytosis (5 x 10^{9}/L, reference range 0–0.9 x 10^{9}), with subjective thrombocytopenia. The monocytic cells had moderate to abundant blue, sometimes vacuolated cytoplasm and highly pleomorphic nuclei with nucleoli, suggestive of leukaemia. The same cells were seen in a smear from one of the enlarged lymph nodes, and a FeLV antigen test was positive, indicating a diagnosis of **feline leukaemia**.

A four-month-old Ragdoll kitten from Northland was examined because of excess salivation, vomiting, diarrhoea and fever over two days, followed by death. At post-mortem examination the gastrointestinal tract contained grey, malodourous fluid and there was segmental reddening of the small intestine. Culture of a faecal sample isolated ***Salmonella*** **Infantis** and ***Campylobacter jejuni***. Significant findings on histopathology of multiple tissues included severe mucosal epithelial loss in the small intestinal villi and crypts, with a few surviving dysplastic epithelial cells and adherent bacterial colonies. Lymphoid depletion was also noted in gastrointestinal lymphoid tissue, spleen and lymph nodes. The diagnosis was **feline parvoviral enteritis**, with the bacteria cultured possibly representing opportunistic pathogens.

Equine

A two-month-old sport horse foal from Northland had respiratory compromise and signs of pneumonia for more than 10 days. An ultrasound examination of the respiratory tract suggested aspiration pneumonia. A transtracheal wash showed marked suppurative inflammation with karyolytic neutrophils and some intracellular or extracellular cocci. Culture of the tracheal wash yielded

Streptococcus equi* ssp. *zooepidemicus, a common cause of **opportunistic foal pneumonia**.

A subcutaneous mass was excised from the scrotum of a 21-year-old gelding from Auckland. Histopathology showed coalescing pyogranulomatous inflammatory foci centred on bacterial colonies, consistent with ***Staphylococci* spp.**, and eosinophilic Splendore-Hoeppli material (asteroid bodies) surrounding the colonies, leading to a diagnosis of **botryomycosis**.

Lagomorph

Deaths of up to 30 rabbits a day for three days were reported on a commercial rabbitry housing 220 rabbits in the Auckland region. Post-mortem examination of two 3-month-old rabbits showed yellow nasal discharges and dark red, mottled lungs in both, with red mottling on the thymus and caecum in one. Histopathology of multiple organs identified marked hepatic necrosis, coccidial life-stages in bile ducts, splenic fibrin, pulmonary oedema with alveolar fibrin, and congestion or haemorrhage in other organs. These signs were all consistent with **rabbit calicivirus (rabbit haemorrhagic disease)** and **hepatic coccidiosis**. Rabbits dying from calicivirus infection may show few if any gross changes because they typically die acutely. The virus causes apoptosis of hepatocytes, macrophages and endothelial cells, leading to marked liver necrosis and disseminated intravascular coagulation. Gross changes might include a bloodstained nasal discharge, pulmonary oedema and haemorrhage, hepatomegaly, splenomegaly, perirenal haemorrhage and serosal ecchymoses.

Avian

A juvenile weaned African Grey parrot from Auckland was anorexic, became unwell and then died despite supportive care. At post-mortem examination there were yellow-brown areas within the liver, fibrin on the surface of the liver and in the pericardial sac, and areas of air-sac opacity and pulmonary congestion. A smear of pericardial exudate contained many bacilli, consistent with death due to **bacterial septicaemia**, which was probably due to an agent such as *Pasteurella*, *Salmonella*, *Pseudomonas* or *Escherichia coli*.

A central Canterbury veterinarian sent in a biopsy from a lesion on the head of a canary. The owner had two canaries with large proliferative lesions around the beak and eyes. Histological examination revealed a hyperplastic epidermis with massive numbers of **poxvirus** inclusions, confirming a diagnosis of **canary poxvirus infection**.

Laying hens on an Otago free-range poultry farm began dying at the rate of 4–10 per day after a new batch of experimental feed was provided. These birds were close to the end of their laying period and were part of a flock of 400 in a large paddock. Six birds were postmortemed. They were in good condition and all had normal ingesta in the crops and gizzards, suggesting that the deaths were relatively sudden. All were laying but the developing ovules were large and flaccid and the oviducts were empty. The lungs were normal in five of the birds but in one they were slightly larger, very congested and haemorrhagic. Cultures of lung from this bird and bone marrow and liver from two other birds revealed a moderate and mostly pure growth of ***Pasteurella multocida.*** The origin of this bacterial infection was not identified but in the month before the outbreak began, the birds' paddock was partially flooded and this may have attracted infected feral birds. Other birds elsewhere on this farm were unaffected.

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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 January to March 2016.

Exotic vesicular diseases ruled out

An experienced bovine practitioner called the MPI exotic pest and disease hotline to report and provide photographs of an outbreak of stomatitis involving seven of 14 rising-three-year-old maiden heifers at a Waikato dairy run-off. In discussion with the farm owner, the practitioner had determined that the outbreak had begun three weeks earlier. Heifers presented with drooling saliva and exhibited lesions including ulcers and erosions on the hard palate (**Figure 1**) and gum, and raised circumscribed lesions on the tongue (**Figure 2**). Individual heifers had proliferative lesions on the lips and muzzle, and soft-tissue swelling in the head. As heifers were diagnosed they were moved home to the milking platform.

The photographs were reviewed by the Incursion Investigation Team, who agreed with the practitioner's diagnosis of actinobacillosis (an endemic differential for vesicular disease). However, given that there were multiple cases (actinobacillosis is usually sporadic) and the unusual presentation of some of the lesions, and owing to the high risk that exotic vesicular-type diseases pose to New Zealand's primary industries, the AsureQuality Initial Investigating Veterinarian (IIV) system was activated and an IIV was dispatched. The IIV examined the heifers, observed the dairy herd and reviewed health records and milk production performance with the owner and manager. The IIV reported his findings to the Incursion Investigator. These supported the farm veterinarian's original diagnosis and the investigation was stood down. Subsequently, MPI facilitated histopathological examination of biopsies from two of the affected heifers and the diagnosis of actinobacillosis was confirmed.

A veterinarian notified MPI of two backyard kunekune pigs presenting with blisters or vesicles, fever and lethargy; one also had a sore foot. The vesicles were located on the ventral abdomen and were said to be filled with clear fluid and some purulent material. The pigs had been unwell for a few days from mild pneumonia, which had responded to antibiotics. The owner knew about the regulations regarding feeding swill to pigs and said that they did not receive meat scraps. There was no history of travel by the owners, and there had been no overseas visitors or introduction of new animals. Under direction from the Incursion Investigator, the veterinarian examined the mouths, muzzles, feet and muco-cutaneous junctions of both pigs and reported that no lesions were evident. Photographs of the blister-type lesions were sent to the Incursion Investigator to assess. The lesions were not consistent in appearance or location with vesicular diseases that affect pigs, i.e., foot-and-mouth disease, swine vesicular disease or vesicular exanthema of swine. The investigation was closed.

Figure 1: Ulcerations on hard palate. Photo: Arnica van der Wiele.

Figure 2: Raised circumscribed lesions on the tongue. Note also proliferative lesions on the gingiva and lip. Photo: Arnica van der Wiele.

Anthrax ruled out

An MPI Verification Services veterinarian called the MPI exotic pest and disease hotline regarding a bull that had an enlarged spleen but no other abnormal findings at post-mortem examination. The bull had passed ante-mortem examination. Photographs of abdominal and thoracic viscera were sent to the Incursion Investigation team for review. Anthrax (an exotic differential for splenomegaly) was excluded on clinical and post-mortem grounds. Unfortunately a sample taken for histopathology was inappropriately fixed and therefore unable to be used. PCR testing of fresh spleen at the MPI Animal Health Laboratory (Wallaceville) was positive for *Theileria orientalis* type Ikeda. This could have been responsible for a haemolytic event, with subsequent extramedullary haematopoiesis explaining the splenomegaly. The investigation was closed because no biosecurity risk was identified.

Leptospirosis exotic strains excluded

A technician with the MPI Animal Health Laboratory contacted the Incursion Investigation Team to report that three of eight bulls tested positive for leptospirosis during routine semen export testing. Positive tests included MAT for *Leptospira interrogans* serovars Canicola and Grippotyphosa for one bull, and Canicola only for two bulls. The three bulls were re-bled and bloods sent to a subcontracting laboratory for further testing against a panel of *Leptospira* serovars. Results were negative for all serovars, at MAT 2:100 or lower. Bulls for semen export receive frequent vaccinations for many agents, including common New Zealand *Leptospira* serovars. Periodically these bulls show seroconversion to exotic serovars, probably because of cross-reaction. There have been four similar notifications during the past few years and investigations into these cases have all been negative for leptospirosis, so the investigation was closed.

Cysticercus bovis excluded

An MPI Verification Services veterinarian called the exotic pest and disease hotline to report finding two unusual lesions in a bovine heart at slaughter. The veterinarian provided photographs to the duty Incursion Investigation Veterinarian. A 3-cm-diameter white thick-walled cyst was found in the external myocardium. This cyst was larger and of a different colour to what would be expected with *Cysticercus bovis*, a notifiable differential for cyst-like lesions in bovine muscule (Malmo *et al.*, 2010). Subsequently, on incising the lesion for histopathology, it was found to be a thick-walled abscess. A cyst on a heart valve was determined to be a serous cyst. These have been found in up to 11 percent of cattle at slaughter and may represent ectasias of blood vessels and lymphatics (Maxie & Robinson, 2007). Notifiable disease was ruled out and the investigation closed.

Porcine reproductive and respiratory syndrome ruled out

A veterinary pathologist called the MPI exotic pest and disease hotline to report possible vasculitis in an Auckland Islands sow. The sow died after a two-day history of illness followed by abortion of dead piglets. At postmortem the sow was grossly pale, with one freshly dead fetus in the uterus. The uterine wall was grossly expanded by haemorrhage, which created a mass-like effect. Histopathology of the uterus showed neutrophils within vessel walls, indicating possible vasculitis. Unfortunately no other tissues were collected by the veterinarian. Vasculitis in pigs can be caused by a number of endemic and exotic diseases including the exotic agents porcine reproductive and respiratory syndrome virus, classical swine fever virus and African swine fever virus.

The sow was located in a specific-pathogen-free laboratory. The veterinarians and the facility manager were contacted and the biosecurity of the facility was interrogated. The laboratory is a shower-in, shower-out facility and all feed is treated. There had been no outbreak of illness in the other sows. Exotic disease was ruled out on epidemiological grounds and a negligible risk profile in light of the equivocal histological lesions and gross lesions, which were atypical for exotic disease. Communication with the manager and veterinarians included a request for notification if any further disease occurred in sows at the facility. This case is an example of the high sensitivity of the MPI surveillance system and the willingness of veterinary pathologists to report any unusual disease. As there was no biosecurity risk associated with this notification, the investigation was closed.

Peri-weaning failure-to-thrive syndrome investigated

A possible emergence of peri-weaning failure-to-thrive syndrome in pigs (PFTS) on three farms was investigated after being referred to MPI by a veterinarian via the exotic pest and disease hotline. PFTS is a new disease recognised in North America, the cause or causes of which have not been elucidated. The syndrome appears to cause damage to the intestinal lining, and also induces inflammation of the nerve ganglia in the pylorus of the stomach, which delays gastric emptying time – hence piglets don't eat, lose condition and hence often are euthanased. Infectious agents may be involved, especially haemagglutinating encephalomyelitis virus (HEV), a coronavirus that is present in New Zealand.

In the affected farms there was a similarity in age, behaviour and clinical appearance to PFTS, but characteristic histopathological changes were not seen. Other similar findings on all three farms were intestinal villous atrophy and bacterial pneumonia. The syndrome has not been reported outside of the US and Canada, and diagnosis depends on ruling out all infectious, management, nutritional and environmental factors that can cause post-weaning wasting in piglets. Several possible infectious causes were most likely involved with these pigs, in particular Glasser's disease, rotavirus infection and *Mycoplasma suis*. A histopathological opinion was sought from an expert in the US, who did not believe the changes were consistent with PFTS.

Cysticercus cellulosae excluded

An MPI Verification Services veterinarian called the MPI exotic pest and disease hotline to report finding a white nodule in the myocardium of one of a line of 60 pigs at a slaughterhouse. No other significant lesions were found on post-mortem inspection. Notifiable differentials for muscle cysts or nodules on pigs are *Cysticercus cellulosae* and *Trichinella spiralis*, both parasites that can be passed on to humans by ingestion. The solitary lesion and, in the case of *Trichinella spiralis*, its location, tended to rule out these parasites. Nevertheless the lesion was submitted to a Gribbles veterinary laboratory for histopathological examination, which identified a pyogranulomatous myocarditis. The nodule had a well demarcated inflammatory focus composed of patternless sheets of sometimes vacuolated epithelioid macrophages, multi-nucleated macrophages, neutrophils, eosinophils, lymphocytes and plasma cells within a fibrous matrix. There was no evidence of *C. cellulosae* or *T. spiralis*. Bacterial (including mycobacterial) and fungal etiologies for pyogranulomatous myocarditis were ruled out using Gram, Ziehl-Neelsen and periodic acid-Schiff stains. The lesion was most likely attributable to aberrant migration of a nematode larva. Exotic disease was ruled out and the investigation closed.

EHV-1 myeloencephalitis excluded

An equine veterinarian called the MPI exotic pest and disease hotline to report a yearling Thoroughbred horse with apparently sudden ataxia and urinary incontinence. Apart from a slight reduction in tail tone there were no other clinical abnormalities, with normal mentation and normal temperature. None of the other 200 equines on the property exhibited signs of disease. While equine herpesvirus-1 (EHV-1) is not an exotic disease, there has only been one recorded outbreak of its neurological manifestation (equine herpesvirus myeloencephalopathy – EHM) in New Zealand. EHM is a highly transmissible disease requiring prompt biosecurity measures to control spread. The farm manager, in consultation with the primary veterinarian, voluntarily instituted biosecurity measures on the property. Nasal swabs and blood samples were taken from the horse and submitted for diagnostic testing at the MPI AHL (Wallaceville). PCR tests on nasal swabs and EDTA blood were negative for EHV-1. However, nasal swabs and blood may be virus-negative by the time they are submitted from clinical cases, making ante-mortem diagnosis of EHM difficult. A single serum sample tested negative to EHV-1 antibodies. No further cases developed on the farm in the ensuing three weeks, during which the horse's condition remained the same. The horse was euthanased and a necropsy conducted at the Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North. Gross and histopathological findings were consistent with Wobbler syndrome. EHV-1 infection was ruled out and the investigation was stood down.

EIA ruled out

A veterinary pathologist called the MPI exotic pest and disease hotline to report a possible case of exotic disease in an 18-month-old Thoroughbred filly with a history of unexplained weight loss. A haematological examination identified moderate anaemia (0.27; reference range 0.32–0.55). There were no haemoparasites seen on a blood smear. Ten other horses on the property remained healthy. The horse had been recently brought on to the property and its travel and contact history were unclear. Samples were submitted to the MPI Animal Health Laboratory to rule out exotic disease differentials for weight loss associated with anaemia. Equine infectious anaemia was ruled out by an AGID test. The negative blood smear examination for haemoparasites was supported by negative PCR tests for *Anaplasma phagocytophilum*, *Theileria equi* and *Babesia caballi*. Exotic disease was ruled out and the investigation was closed.

A veterinary pathologist contacted MPI via the exotic pest and disease hotline to report a pony near Kumeu that had anaemia with generalised oedema and systemic illness. The 15-year-old pony had a moderate anaemia (PCV 0.25; low normal cutoff 0.32), hyperfibrinogenaemia, neutrophilic leucocytosis and elevated serum amyloid A. The pony had no history of travel. Bloods were submitted to MPI's Animal Health Laboratory for exclusion of equine infectious anaemia and equine viral arteritis viruses. Both viruses were excluded as causes of the illness. Causes of systemic inflammation and anaemia in horses are many, and the cause in this case remains unknown. Exotic disease was ruled out and the investigation was closed.

Canine exotic fungi excluded

A veterinary pathologist called the MPI exotic pest and disease hotline to report possible exotic fungal disease in a dog. The four-year-old mixed-breed dog had been imported from Thailand 12 months previously. It had been presented to a primary veterinarian with a history of recent weight loss and diarrhoea. Haematology and biochemistry were unremarkable. Fine-needle aspirates were taken from a palpable abdominal mass and cytological examination identified pyogranulomatous inflammation with fungal hyphae. The mass was excised and submitted for histopathology and culture. Histopathology revealed the mass to be composed of adipose tissue and fibrous tissue expanded by coalescing inflammatory foci consisting of neutrophils and macrophages that surrounded clumps of fungal material. The originating tissue of the mass (e.g., a lymph node) could not be determined owing to the degree of inflammation and fibrosis. There was no evidence of an infection pathway such as grass awn. Features of the fungal material identified in PAS-stained sections included bulbous yeast-like or conidial areas and small, parallel-walled hyphae. Fresh sections of the excised mass were submitted to the MPI AHL (Wallaceville) for fungal culture and identification. The mass yielded a pure growth of fungal species resembling *Scopulariopsis* and *Microascus*. DNA was then extracted from the growth for molecular identification. Sequencing showed highest similarity to *M. cinereus, M. cirrosus* and *S. gracilis* (all 99 percent). Fungal species of the genera *Microascus* and *Scopulariopsis* are commonly isolated from soil, decaying plant material and indoor environments. A few species are also recognised as opportunistic pathogens. They have worldwide distribution. Despite the unusual presentation of this fungal infection, an exotic fungal disease was ruled out and the investigation closed.

Canine leishmaniasis ruled out

A five-year-old male neutered Labrador cross dog had a low positive serological test (IFAT = 1:100) for *Leishmania* spp. during routine pre-export testing to meet Australian import health standards. The dog had been originally imported from California. There was no history suggestive of a disease such as leishmaniasis. Blood was collected from the dog and re-tested about two weeks later, with the IFAT returning a negative titre at both the MPI AHL (Wallaceville) and North Carolina State University Vector-borne Diagnostic Laboratory, Raleigh (< 1:50 and < 1:16 respectively). Blood was also negative on PCR for *Leishmania* spp. The initial low positive titre was considered to be a false positive because of the negative IFAT re-test, negative PCR, and the absence of disease signs consistent with leishmaniasis.

Brucella canis excluded

A veterinary pathologist called the MPI exotic pest and disease hotline to report a dog with swollen, painful testicles. An Incursion Investigator interviewed the primary veterinarian. The dog had not been imported or intentionally used for breeding, but could have had unsupervised contact with imported dogs. To test for *Brucella canis*, an exotic differential for canine orchitis, a serum sample was submitted to the MPI AHL. This was negative to the *Brucella* card test. Subsequently, histopathological

examination identified a suppurative to pyogranulomatous epididymitis with haemorrhage, granulation tissue, fibrosis and intralesional bacteria. *Escherichia coli* was cultured. *E. coli* and other Gram-negative organisms cause most sporadic cases of canine epididymitis. Granulomatous or pyogranulomatous inflammation is a common complication of epididymitis, caused by the release of spermatozoa into the adjacent tissue. Exotic disease was ruled out and the investigation closed.

A veterinary pathologist called the MPI exotic pest and disease hotline to report acute suppurative epididymitis and periorchitis in a submission from a six-year-old Bulldog. The exotic *Brucella canis* is a differential for this pathological presentation where the main clinical feature is infertility. From the referring veterinarian an Incursion Investigator learned that the dog had been imported but had recently sired a litter of pups. Nevertheless a serum sample was submitted to the MPI Animal Health Laboratory to rule out *B. canis*. The *Brucella* card test delivered a negative result. Exotic disease was ruled out and the investigation stood down.

A veterinary pathologist called the MPI exotic pest and disease hotline to report a finding of necrosuppurative epididymitis and periorchitis in a submission from a dog. *Brucella canis* is an exotic differential for such lesions, where it is associated with infertility. In discussion with the primary veterinarian, the Incursion Investigator determined that the dog was not imported, it had not been in contact with imported dogs, and its one and only mating had been successful. *B. canis* was ruled out and the investigation closed.

Mycoplasma sinusitis in ducklings investigated

A veterinarian notified MPI via the exotic pest and disease hotline of an unusual sinusitis in wild ducklings from several locations in Auckland. The birds had distended, pus-filled sinuses and there was histological evidence of chronic-active inflammation, lymphoid nodules and epithelial hyperplasia. Swabs from affected birds tested negative by PCR for *Ornithobacterium rhinotracheale* (which at the time was considered absent in New Zealand) and *Avibacterium paragallinarum* (infectious coryza), which had been found in NZ chickens. Six of the 12 swabs submitted for testing were positive for *Mycoplasma* spp. by PCR and two of the strongest positives were sequenced, with the highest similarity being to *M. anatis*. This pathogen has been found in farmed ducks in New Zealand and is presumed to be in wild populations as it occurs elsewhere in the world. The affected ducklings had a poor response to antibiotic treatment and were euthanased, and the reporting of new cases diminished substantially. Culture of the *Mycoplasma* organisms was not possible from the submitted samples but Friis broth to support the viability of *Mycoplasma* spp. for culture was sent to the veterinarian in case the outbreak continued.

Aspergillosis in a kereru confirmed

A veterinarian called the MPI exotic pest and disease hotline to report an ill kereru or wood pigeon (*Hemiphaga novaeseelandiae*) kept at a local wildlife sanctuary. The male kereru had begun losing weight about four weeks earlier and over the previous few days had progressively weakened, developing torticollis and regurgitation with loose faeces and tachypnoea, and subsequently died. The kereru had been housed in an aviary together with other birds for about four years, with no apparent illness during this period, and the other birds in the aviary remained healthy. A postmortem was carried out and a range of tissues collected for histological analysis. Gross pathology showed that the lungs and air sac tissues were thickened, with a nodular appearance in places. Histological findings included cardiac vascular thrombosis with intralesional fungi, and severe necrotising and granulomatous fungal pneumonia. Fungal morphology was consistent with *Aspergillus* spp. These findings supported aspergillosis as the cause of the mortality and the investigation was stood down.

Deformed wing virus excluded

Dying bumble bees and bumble bees with deformed wings were reported to MPI by a member of the public from Whangarei. The caller had a nest on her property and over a couple of days she had found about 50 dead bees. Many had severely shrivelled wings (**Figure 3**) upon emergence from the nest. Several causes of deformed wings have been identified in honey bees, but not much is known about this presentation in bumble bees; in fact this appeared to be the first such report in New Zealand. Deformed wing virus (DWV) is endemic in honey bees but has not been detected in bumble bees in New Zealand, though it has caused disease in bumble bees overseas. A PCR test for DWV was negative, as were tests for the exotic Israeli acute paralysis virus and acute bee paralysis virus. Also negative were PCR tests for Kashmir bee virus (which has been found in bumble bees in New Zealand, though not in association with disease) and *Nosema* spp. *N. bombi* is adapted to bumble bees but *N. ceranae* can also infect them. However, these tests have not been validated for bumble bees and a lack of positive controls means they are inconclusive. External mites can cause wing deformity, but no pathogenic species were found on examination. Numerous deutonymphs of the external mite *Kuzinia laevis* were found on the bees. These mites are established in New Zealand and are commensals that cause no harm, feeding only on the pollen of their host. From discussions with the caller about the relative isolation of the property, and their herbicide and pesticide use, it did not appear that a toxic agent could be implicated. The cause of disease was not found, but exotic agents were excluded.

Figure 3: Bumble bees with deformed wings. Photo: Kylee Walker

A member of the public called the MPI exotic pest and disease hotline to report dying bumble bees with stunted wings emerging from a nest in Dunedin, and the presence of undersized bees. This was the second such notification to MPI within a month, the first report having come from Whangarei. Bees were

examined by an Incursion Investigator, who confirmed that the presentation was the same as in the first case. The caller suggested a possible toxic cause, as the footpath close to the nest on her property had recently been sprayed for weeds by the local council. The Incursion Investigator discussed this with the Dunedin City Council, who advised that only salt water had been sprayed. PCR tests for deformed wing virus, Israeli acute paralysis virus, acute bee paralysis virus, Kashmir bee virus and *Nosema* spp. were all negative. However, these tests are inconclusive as they have not been validated for bumble bees. Examination of the bees by an entomologist did not find any parasites of concern. No cause of the disease was found, but exotic agents were excluded.

European foulbrood ruled out

An Apiary Advisory Officer reported that larvae in diseased hives near Port Taranaki had signs consistent with European foulbrood (EFB). Samples of affected larvae were collected and sent to the MPI Animal Health Laboratory (Wallaceville) for testing. *Melissococcus plutonius*, the causative agent of EFB, was excluded by PCR testing.

A beekeeper notified MPI via the exotic pest and disease hotline of a single hive (of 12 on the property) with brood discolouration consistent with a potential aetiology of European foulbrood (EFB). About a quarter of the uncapped brood were no longer the typical white-to-cream colour, but had a yellow discolouration and chalky appearance. Brood samples from one affected and three unaffected hives were submitted to the MPI AHL (Wallaceville) for exclusion of exotic disease. Molecular testing for the exotic EFB and the endemic American foulbrood gave negative results. Detailed hive inspection identified a large burden of *Varroa destructor* mites in the affected hive, with smaller numbers in the unaffected hives. Brood changes were considered the result of parasitic mite syndrome, where viral infections such as sacbrood are exacerbated by poor *Varroa* control. Exotic disease was excluded and the investigation was closed.

A hobbyist beekeeper called the MPI exotic pest and disease hotline to report reduced and diseased brood in one of his four hives. The notification was referred to an AsureQuality Apiculture Technical Advisor, who discussed the presenting signs and management of the colony with the beekeeper. Brood presentation was consistent with parasitic mite syndrome, reflecting a heavy load of the endemic varroa mite (*Varroa destructor*) rather than the exotic differential (infection with European foulbrood, *Melissococcus plutonius*). The beekeeper had neglected to treat this nucleus hive for varroa mite in the spring. Exotic disease was ruled out and the investigation closed.

Small hive beetle excluded

A hobbyist beekeeper contacted MPI via the exotic pest and disease hotline after finding three small dark brownish-black beetles about 4 mm long on the bottom-board of her single suburban hive during the previous six weeks. She had discarded the beetles. Under the direction of an AsureQuality Apiculture Technical Advisor, an apiary inspector visited the property to carry out a hive examination to exclude the presence of small hive beetle (SHB), *Aethina tumida*. The inspector found the hive to be very strong, with large numbers of bees, healthy brood and good honey stores. A detailed hive inspection found no beetles and there was no brood damage indicative of SHB larval infestation. The beetles seen are likely to have been *Saprinus detritus* (pill beetle), which are not infrequently found among the detritus on the bottom-board of New Zealand hives. Exotic disease was excluded and the investigation was stood down.

Honey bee mortalities investigated

A retailer notified MPI via the exotic disease and pest hotline that a customer had found a couple of dead bees among cashew nuts imported from Vietnam. The nuts had been packaged in a vacuum-sealed bag before export and the customer had opened the bag about one week previously. To help determine the source of contamination the bees were sent to MPI's Plant Health & Environment Laboratory, where they were identified as the European honey bee, *Apis mellifera*, commonly found in managed colonies in New Zealand and Vietnam. As the packaging had been open for a week in New Zealand, it was concluded that the contamination probably occurred here. For this reason (and because the bees were dead) there was no biosecurity risk and the investigation was closed.

Exotic bees excluded

A member of the public contacted MPI to report what she described as unusually small, fast-flying bees in her garden – a description that could be consistent with the exotic bee *Apis cerana* (Asian or eastern honey bee). The notifier was unable to provide good photographs of the bees. An Incursion Investigator contacted an AsureQuality Apiculture Technical Adviser, who visited the property and identified the insects as the common wasp, *Vespula vulgaris*. An exotic bee incursion was ruled out and the investigation closed.

A member of the public sent an MPI Incursion Investigator a digital photograph that he had taken several months previously of what he considered to be an unusual wasp (*Vespula* sp.). Owing to the high quality of the picture an entomologist at the MPI Plant Health and Environment Laboratory was able to identify the insect as a wool carder bee, *Anthidium manicatum*, a species established in New Zealand. An exotic wasp incursion was ruled out and the investigation closed.

Brown dog tick excluded

A veterinarian notified MPI of a suspect brown dog tick (*Rhipicephalus sanguineus*) found by a client near her dog. The tick was identified as bed bug (*Cimex lectularius*) by an MPI entomologist.

A veterinarian called the MPI exotic pest and disease hotline to report finding four suspected exotic brown dog ticks (*Rhipicephalus sanguineus*) on a dog at Karamea. There was no history of importation. The ticks were couriered to the MPI Plant Health and Environment Laboratory, where they were identified as *Haemaphysalis longicornis*, also known as the cattle tick, an established parasite in New Zealand. Exotic ticks were ruled out and the investigation was stood down. However, theileriosis in cattle is transmitted by these ticks, and this find has been logged as a data point confirming the occurrence of cattle ticks on the West Coast.

A paraglider called the MPI exotic pest and disease hotline to report finding

a suspected brown dog tick on his parachute after a trip to Karioitahi Beach, near Waiuku, Franklin District. The caller used the MPI freepost service to mail the tick to the MPI Plant Health and Environment Laboratory (Tamaki), where it was identified as an endemic cattle tick (*Haemaphysalis longicornis*). The investigation was closed.

A West Coast hunter called the MPI exotic pest and disease hotline to report finding ticks on his two pig dogs. Five days previously he had been hunting at a location east of Little Wanganui. The notifier supplied digital photographs of the ticks to the Incursion Investigator and these were identified as the endemic cattle tick (*Haemaphysalis longicornis*). The sample included one female, 11 nymphs and six larvae, indicating a well-established population and a location very favourable to *H. longicornis*. This report confirmed that its range can include the Karamea area of the Buller District, an association that was previously not clear. An exotic tick incursion was ruled out and the investigation closed.

A member of the public called the MPI exotic pest and disease hotline to report finding ticks on her two dogs. The notifier had recently moved onto a lifestyle block. She had also had a recent visitor from Australia and following an internet search she was concerned that her visitor might have inadvertently carried brown dog ticks in her belongings. The notifier submitted photographs of the ticks and these were determined to be most likely endemic cattle ticks, *Haemaphysalis longicornis*. The Incursion Investigator had the ticks submitted to the MPI Plant Health and Environment Laboratory (Tamaki), where they were confirmed as *H. longicornis*. An exotic tick incursion was ruled out and the investigation closed.

An Auckland veterinarian called the MPI exotic pest and disease hotline to report finding two ticks on a dog. The dog's contact and travel history suggested that these were most likely the cattle tick, *Haemaphysalis longicornis,* rather than the exotic *Rhipicephalus sanguineus* (brown dog tick). However, visual examination alone cannot definitively distinguish these species. Furthermore, if it was assumed that all ticks seen within the known *H. longicornis* range were *H. longicornis,* then an incursion of *R. sanguineus* could be missed. The ticks were submitted to the MPI Plant Health and Environment Laboratory (Tamaki) for identification. *H. longicornis* was confirmed and the investigation closed.

A Wairarapa veterinarian called the MPI exotic pest and disease hotline to report two ticks found on a farm dog. The veterinarian thought the ticks did not look like the endemic cattle tick (*Haemaphysalis longicornis),* which is frequently seen on farmed deer. She was also aware of the *Rhipicephalus sanguineus* (brown dog tick) incursions that MPI had responded to in 2015. The ticks were submitted and identified as nymph and adult female (both unfed) *H. longicornis* (the endemic cattle tick). An exotic tick incursion was ruled out and the investigation closed.

A member of the public from Northland called the MPI exotic pest and disease hotline to report finding four ticks on her cat and in her house. The notifier had spent three previous summers at the semi-rural property without encountering ticks and believed that the cat was picking up the ticks indoors. This would be somewhat unusual if the ticks were the endemic cattle tick. The ticks were submitted to MPI to rule out *R. sanguineus* (brown dog tick), an exotic differential, and were identified as adult female *Haemaphysalis longicornis* (the endemic cattle tick). An exotic tick incursion was ruled out and the investigation closed. Subsequently the owner confirmed that the cat was picking up the ticks outdoors.

A member of the public called the MPI exotic pest and disease hotline to report finding a tick on his cat at his Northland lifestyle property. He had lived there for 20 years and had never previously seen a tick on his pets. The notifier submitted digital photographs of the tick to an Incursion Investigator. These were examined by an entomologist at the MPI Plant Health and Environment Laboratory (Tamaki) (PHEL) and were of sufficiently high quality to enable identification of a fully engorged female cattle tick, *Haemaphysalis longicornis*. The known range of this tick includes Northland. The specimen was subsequently submitted to PHEL, where the identification was confirmed. An exotic tick incursion was ruled out and the investigation closed.

References

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Maxie MG, Robinson WF (2007). Cardiovascular System. In: Maxie MG (Ed.) Jubb, Kennedy, and Palmer's Pathology of Domestic Animals, 5th ed. Elsevier Saunders, New York, p. 26.

Paul Bingham
Team Manager
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
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 January to March 2016.

Oyster herpesvirus confirmed in the South Island

An oyster farmer contacted MPI via the exotic pest and disease hotline to report about 3 percent mortality occurring in Pacific oysters (*Crassostrea gigas*) 30–50 mm long on a marine farm. While this was within acceptable mortality limits for the farm, it was considered unusual as the oysters had not been graded or otherwise stressed recently. Live and dead oyster samples were submitted to MPI's Animal Health Laboratory to test for oyster herpesvirus (OsHV) and other exotic diseases if necessary. Samples tested positive to OsHV by PCR, and sequencing of a representative sample confirmed the OsHV-1 uvar strain. OsHV-1 uvar was also confirmed from wild oysters submitted from Pelorus Sound.

The virus has been linked with high oyster mortality rates in farmed Pacific oysters in the North Island, Australia and several European countries. OsHV-1 uvar was first detected in New Zealand during a large mortality event in juvenile farmed Pacific oysters in the North Island in the summer of 2010, and is believed to be well established in the marine environment, but has not been previously found in the South Island. The emergence of the disease in the South Island may be the result of environment factors such as unusually high water temperatures. Results were communicated back to the farmer and Aquaculture New Zealand to inform the wider industry and the investigation stood down.

Mediterranean fanworm confirmed

During a summer vessel hull inspection, a number of suspect Mediterranean fanworm (*Sabella spallanzanii*) were found on the hull of a vessel in Endeavor Inlet, Queen Charlotte Sound. This species has not previously been detected in this area, although it is known to be established in other parts of New Zealand. The identification was confirmed by the Marine Invasives Taxonomic Service. The discovery was passed on to the Marlborough District Council, which has regional marine biosecurity jurisdiction, and the investigation was closed.

Confirmed range extensions

A notifier photographed what he believed to be the non-native orange-striped green anemone, *Diadumene lineata*, from two new locations: Matapouri and Wainui Bay. He submitted the photographs to the Marine Invasives Taxonomic Service, where this species was confirmed. Both these records are range extensions. Local government agencies were contacted and the investigation was closed.

A diver notified MPI via the exotic pest and disease hotline of a suspected non-indigenous goby in a lagoon at the high-ecological-value area of Tawharanui, in Northland. Photographs were submitted, which were sufficient for the Marine Invasives Taxonomic Service to confirm identification as *Arenigobius bifrenatus*, the Australian bridled goby. This is a burrowing coastal and estuarine goby native to temperate regions of Australia. The first record of this species in New Zealand was in the Whangateau Harbour in 1998. It is thought to have arrived by accidental transport in shipping ballast water. This notification represents a range extension from previous records, which include Whangarei and Waitemata harbours. This record was from within a marine reserve administered by the Department of Conservation so this organisation was notified and the investigation closed.

Furunculosis in salmon excluded

A veterinarian called the MPI exotic pest and disease hotline to report that the 2014 year-class of salmon in a freshwater salmon farm were showing ulcerated lesions similar to those presented by the disease furunculosis. This disease is caused by *Aeromonas salmonicida*, an exotic bacterium. The mortality rate and rate of infection were low (< 1 percent) and no unusual water temperatures or flow regimes were recorded. Feed had been frequently changed. Not all pens were affected and no lesions were observed at neighbouring farms 150 m downstream. Samples were collected and submitted to the MPI Animal Health Laboratory, where testing excluded the exotic pathogens *Aeromonas salmonicida* and *Yersinia ruckeri*. There were some environmental aeromonads present. The main finding was a filamentous branching bacterium of the genus *Nocardia* that could not be speciated completely but was similar to *N. jejuensis, N. alba* or *N. ninae*. The disease showed an unusual presentation and it is likely to be a new strain of *Nocardia*, possibly specific to NZ and therefore previously unrecorded. *Nocardia* spp. can cause systemic bacterial infection in fish but spread slowly and are very slow-growing. *Nocardia* is not an organism of biosecurity concern and the investigation was closed.

Diseased tuatua investigated

A person concerned about the tuatuas (*Paphies subtriangulata*) he had been collecting on Puheke Beach in Northland called the MPI pest and disease hotline. He had found the bivalves were black inside and had growths around the siphon. Samples were submitted to the Animal Health Laboratory (Wallaceville) for examination but molecular testing showed no evidence of a pathogen.

Histology ruled out the presence of parasites and showed evidence of some inflammation and the presence of some bacterial colonies. However, bacteriological tests to identify the species were not performed because the samples were too autolysed. The shellfish were considered likely to have been immunocompromised by environmental conditions causing a secondary bacterial infection that led to death. The investigation was closed.

"Diseased" scallops investigated

A member of the public called the MPI exotic pest and disease hotline to report scallops (*Pecten novaezelandiae*) with strange spots on them. The notifier sent some photographs that showed perfectly circular spots. A hoax was suspected, but since the report came from an area where sick scallops were reported last year, an investigation was undertaken and samples were requested. However, the notifier failed to come up with any samples, and MPI field staff were unable to collect any scallops exhibiting the signs described. After several months of unsuccessfully trying to obtain samples the investigation was closed.

Mollusc mortality events investigated

A member of the public called the MPI exotic pest and disease hotline to report a dying population of mussels (*Perna canaliculus*) near the mouth of the Buller River, Westport. Specimens were submitted to the MPI Animal Health Laboratory for testing for exotic disease. Unfortunately they were in poor condition, so that not all diagnostics could be performed. However, histopathology showed that cysts of the parasite *Nematopsis* sp. were present. These are often found in mussels and in this case were not thought to be the cause of the mortality observed. The mussels also showed severe degradation of the digestive gland in a manner consistent with an extended period of shell closure caused by environmental insult. It was thought that a prolonged influx of fresh water from the river was most likely to have been the cause of these mortalities. There was no biosecurity risk, so the investigation was closed.

A member of the public informed MPI via the exotic pest and disease hotline that a Facebook page stated that there were thousands of dead paua (*Haliotis iris*) at Kaka Point, north of the Catlins and close to the Clutha River mouth. Subsequently MPI received other notifications of this event. Samples were collected by a fisheries officer and sent to the Animal Health Laboratory for testing. The samples were decomposing by the time they arrived, so a complete suite of tests could not be run, but the main biosecurity risk, abalone viral ganglioneuritis, was ruled out by molecular testing. The investigation was closed at this point as no bacteriology or histology could be performed. There have been reports of this type of mortality event at this location in the past, because of fresh water flooding.

A marine farmer noticed unusual mortalities in Pacific oysters (*Crassostrea gigas*) and notified MPI via the exotic pest and disease hotline. Mortality had been greater than normal over a period of a few weeks. Rough estimates of mortality in the smaller sizes were up to 40 percent and, in the bigger size classes, up to 20 percent. There was no obvious spatial pattern to the distribution of mortalities. Less than 2 percent mortality would normally be expected in mature oysters. Samples were submitted to the MPI Animal Health Laboratory (Wallaceville) to investigate the cause. PCR tests ruled out any exotic pathogens. Ostreid herpesvirus-1 microvariant was found, which has been associated with heavy mortalities of Pacific oysters in Europe and North America as well as New Zealand. Since this is a known endemic oyster disease the investigation was closed.

Pilchard mortality events investigated

A member of the public reported a fish kill involving hundreds of fish in Duncan Bay, Marlborough Sounds, to the MPI office in Nelson. The person saw the dead fish while kayaking. A fisheries officer visited the site and collected a small number of fish, which were identified as pilchards (*Sardinops neopilchardus*). These were frozen and sent to the MPI Animal Health Laboratory. Having been frozen, the fish were unsuitable for histopathology, but were tested for pilchard herpesvirus, with a negative result. No further reports of fish deaths were received from the area and the investigation was stood down.

An MPI staff member reported thousands of pilchards (*Sardinops neopilchardus*) washed up with the rising tide on a 3-km stretch of Warrington Beach, near Dunedin. Samples were collected and submitted to the MPI Animal Health Laboratory, where they tested negative for pilchard herpesvirus. No further mortalities were reported from the area and the investigation was stood down.

Paul Bingham
Team Manager
Surveillance and Incursion Investigation (Animals and Marine)
Investigation and Diagnostic Centres and Response Directorate
Ministry for Primary Industries
paul.bingham@mpi.govt.nz

Plants and environment investigation report

The Ministry for Primary Industries' (MPI) Incursion Investigation (Plants & Environment) and 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 with regard to 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.

Brown marmorated stink bug intercepted

A member of the public reported a suspect bug after receiving a UV lamp from the US via mail. An Incursion Investigator immediately collected the specimen and inspected the packaging it had arrived in. No further insects were found. The insect was subsequently identified at PHEL as an unmated female brown marmorated stink bug (*Halyomorpha halys*). The individual was a lone hitch-hiker so the biosecurity risk was eliminated by its capture and destruction.

Fusarium oxysporum detected in native plants

Fusarium oxysporum f.sp. *hebes* was detected from *Hebe* plants grown at a nursery and has not been previously reported from *Hebe* spp. in NZ. In the USA, *F. oxysporum* f.sp. *hebes* causes disease in nursery stock plants, resulting in losses. It only causes disease on a limited number of species in the genus *Hebe*. Raabe (1985) noted that the disease appears to be very sporadic, being only seen a few times over a 20-year period. There are very few articles in the scientific literature describing the occurrence of this disease. Widespread decline caused by this fungus has not been reported.

Aspergillus uvarum in railway sleeper

The fungus *Aspergillus uvarum* was isolated by Scion from a railway sleeper imported in mid-2014 from Gabon, West Africa. The sleeper was of azobe (*Lophira alata*) wood and had reportedly been dipped in fungicide prior to shipment. *A. uvarum* was only described in 2008 and it may previously have been present in New Zealand but undetected owing to the scarcity of studies on *Aspergillus* species. Overseas, *A. uvarum* has been associated with black rot of grapes, and has been isolated from indoor air. Unlike many other *Aspergillus* species, *A. uvarum* is unable to produce the food-contaminating mycotoxin ochratoxin A, and is not a primary pathogen of plants. It is most commonly associated with fruit rot where temperatures are greater than 37°C, an uncommon condition in New Zealand. *A. uvarum* was assessed to be of low biosecurity concern, no further action was taken and the investigation was closed.

New to NZ thrips on bamboo

A retired entomologist reported finding a suspect new to New Zealand thrips on bamboo and identified it as *Stenchaetothrips bambusae* (Thysanoptera: Thripidae). This species is specific to bamboo, a pest plant in many regions. Samples were found in several locations around Auckland, suggesting they are likely to be widespread. Biosecurity risk is low as most bamboo species at risk are pest plants or plants of low significance.

Gypsy moth in Auckland ruled out

A suspect gypsy moth egg mass was found on the balcony of a house in Auckland. It was bright yellow and turned a darker colour as it aged. It was determined not to be an egg mass but a slime mould that is common in New Zealand and often found after rain on lawns, in mulch and on the exterior of buildings. Slime moulds feed on bacteria and fungi that live in decaying plant debris, and are considered beneficial to the environment. The investigation was closed.

Reference

Raabe R D (1985). Fusarium wilt of *Hebe* species. *Plant Disease* 69: 450–451.

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

Quarterly report of biosecurity responses

The Biosecurity Response Group was managing 42 high-priority active responses and 4 low-priority active responses (i.e. full responses were not initiated) at the end of the 1 January to 31 March 2016 reporting period. During that period five new responses were initiated and four were closed or stood down. **Figure 1** shows the number of active biosecurity responses from March 2015 to March 2016.

The Ministry for Primary Industries Biosecurity Response Group sits within the Operations Branch and is responsible for managing the biosecurity risks posed by exotic and emerging pests and diseases found in New Zealand. Responses are initiated to organisms or risk goods that may affect New Zealand's primary industries or the marine, freshwater aquatic or terrestrial environments.

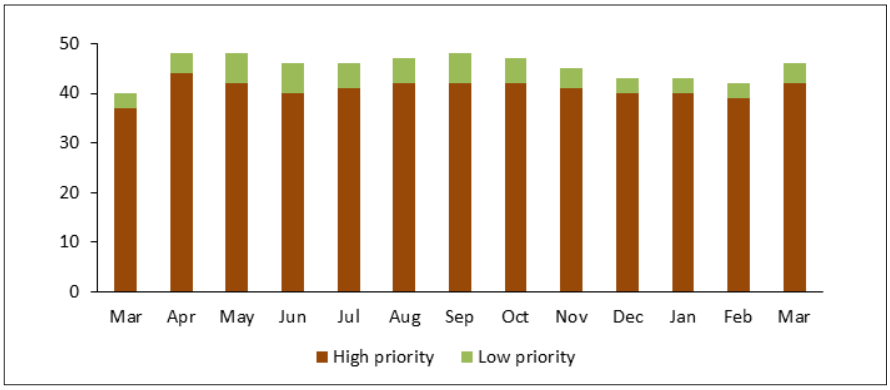

Figure 1: Active biosecurity responses from March 2015 to March 2016

The Group manages biosecurity responses affecting plant, environment, animal and marine sectors (**Figure 2**).

Christie Webber
Adviser
Plants and Environment Response
Ministry for Primary Industries
Christie.Webber@mpi.govt.nz

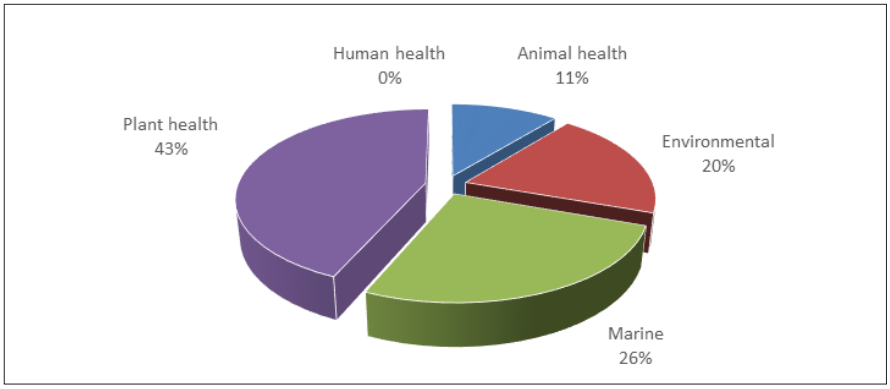

Figure 2: Sector breakdown for open responses at the end of the 1 January to 31 March 2016 reporting period.

PEST WATCH: 15 February – 10 May 2016

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

This information was collected from 16 February 2016 to 10 May 2016. The plant information is held in the MPI Plant Pest Information Network (PPIN) database. Wherever possible, common names have been included. Records in this format were previously published in the now discontinued magazine Biosecurity.

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

Validated new to New Zealand reports

Type	Organism	Host	Location	Submitted by	Comments
fungus	*Aspergillus uvarum* (no common name)	Isolated from railway sleepers	Wellington	Scion (General Surveillance)	Likely an environmental organism or contaminant.
fungus	*Colletotrichum lineola* (no common name)	*Trillium* sp. (wood liliy)	Mid Canterbury	IDC & R (General Surveillance)	Causes leaf spots. Recorded on a wide host range in temperate regions.
fungus	*Diaporthe pseudophoenicicola* (no common name)	*Setaria palmifolia* (palm grass)	Auckland	IDC & R (General Surveillance)	Isolated from leaf spots.
fungus	*Fusarium oxysporum* f. sp. *hebes* (no common name)	*Hebe* sp.	Waikato	IDC & R (General Surveillance)	This pathogen has likely been present in New Zealand for some time.
fungus	*Neofusicoccum eucalyptorum* (no common name)	*Eucalyptus* sp. (gum)	Auckland	IDC & R (General Surveillance)	Causes canker disease on *Eucalptus* spp. in Australia, Chile, South Africa and Uganda.
fungus	*Pezicula rhizophila* (no common name)	*Platanus* sp. (plane tree)	Auckland	IDC & R (General Surveillance)	Isolated from the roots of a plant exhibiting dieback.
fungus	*Phacidium grevilleae* (no common name)	*Eucalyptus* sp. (gum)	Auckland	IDC & R (General Surveillance)	Isolated from leaves.
fungus	*Septoriella hirta* (no common name)	*Triticum aestivum* (wheat)	Mid Canterbury	IDC & R (General Surveillance)	Causes root rot on cereals and grasses.
fungus	*Xenogliocladiopsis cypellocarpa* (no common name)	*Eucalyptus* sp. (gum)	Auckland	IDC & R (General Surveillance)	Isolated from leaves showing leaf spots.
insect	*Charagochilus* sp. (mirid bug)	Collected from grasses	Auckland	S E Thorpe (General Surveillance)	
insect	*Eupristina verticillata* (fig wasp)	*Ficus microcarpa* (banyan)	Auckland	IDC & R (General Surveillance)	A primary pollinator of *Ficus microcarpa*. Together with *Ficus microcarpa* now spread virtually worldwide.
insect	*Polistes dominula* (European paper wasp)	Collected in flight/visiting plant	Marlborough Sounds	IDC & R (General Surveillance)	Also recorded from Nelson and Marlborough. Likely present for a few years. Introduced to South Africa, Argentina, Chile and North America.
nematode	*Meloidogyne minor* (root-knot nematode)	*Lolium perenne* (perennial rye-grass)	Mid Canterbury	IDC & R (General Surveillance)	*Meloidogyne minor* has become a problem on golf courses and sports grounds in parts of Europe, Chile and the United States.
virus	Phlox virus M (PhlVM)	*Lavandula angustifolia* (lavender, English lavender)	Auckland	IDC & R (General Surveillance)	PhlVM has previously only been reported on phlox.
virus	Fig leaf mottle-associated virus 1 (FLMaV-1)	*Ficus carica* (fig)	Taranaki	IDC&R (High Risk Site Surveillance)	Leaf samples showed fig mosaic disease symptoms such as chlorotic mottling and blotching, vein banding, vein clearing and necrosis.

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

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

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