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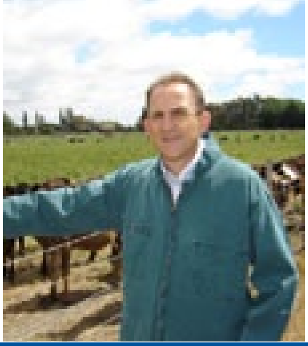

EDITORIAL

The veterinary profession in New Zealand: celebrating the past and looking to the future

In 2011 the veterinary profession is celebrating its 250th anniversary: the first veterinary school was established in Lyon, France, in 1761 by Claude Bourgelat. The New Zealand Veterinary Association (NZVA) has joined with veterinary associations all around the world to celebrate this milestone through World Veterinary Year (Vet2011), and to use the opportunity to raise the profile of the profession. A short video marking Vet2011, introduced by Dr Bernard Vallat, Director-General of the OIE, can be seen here.

NZVA held the opening ceremony for Vet2011 at a function at the residence of the French Ambassador in Wellington on 31 January. The Ambassador, Mr Francis Etienne and the Minister for Agriculture, Hon. David Carter, were our guests and both spoke at the opening ceremony. NZVA has other events and promotional activities planned during the year. Details of these can be found on the NZVA website at www.vetspace.org.nz

Vet2011 also furnishes an opportunity to reflect on where the profession is at this time, and what we need to do to ensure the profession continues to be relevant to a changing world. Veterinarians have been serving society and animal populations for 250 years. Our profession has been responsible for dramatic improvements in human and animal health through disease control, improved agricultural productivity, scientific research and technological advances. We are also animal doctors, playing an important role in society by caring for the health and wellbeing of our companion animals.

New Zealand relies heavily on exports of animals and animal products for its export revenue and standard of living. Veterinarians make a major contribution to the economy through their work in animal health and welfare programmes in our livestock and food processing industries, research and development, as well as through controlling zoonoses and protecting the biosecurity status of New Zealand.

Vet2011 will also celebrate the wider contribution veterinary professionals make in biomedical research, wildlife conservation, ecology and the protection of the environment and biodiversity. We are a diverse profession and will continue to evolve into new areas of endeavour as we face the new challenges of the 21st century. Veterinarians are also at the forefront of the "One World One Health" concept.

The world faces new challenges in the 21st century, with broad acceptance of the reality of human-induced climate change, the increasingly urgent need to protect and replenish ecosystems and a call for real sustainability in the way we use the planet's resources. The critical link between environmental health and human/animal health is becoming more widely understood and appreciated. The real challenge is to find the political will to make the important decisions and take action.

The first New Zealand veterinary practice was opened by John Webster in the Wellington area in 1843. Over the years the profession expanded and the New Zealand Veterinary Association was formed in 1923. In 2011 there are more than 2300 registered vets in the country, and more than 75 percent are members of the NZVA. This compares very favourably with the five other veterinary associations NZVA benchmarks against, i.e. in the United Kingdom, United States, Canada, South Africa and Australia. Only the American Veterinary Medical Association has a higher percentage of registered vets as members.

Until 1963, New Zealand veterinarians had to go overseas to obtain their veterinary qualifications, and most headed to Sydney or Queensland University to study. The vet school at Massey University was founded that year, so in 2013 it will be celebrating its 50th anniversary. While it remains the only vet school in New Zealand, with a responsibility to supply most of the veterinary needs of New Zealand society, Massey has always had a strong focus on production animals and supported the rural economic base of the country. This focus continues, and during 2010 NZVA and Massey conducted roadshows around the country to obtain feedback from veterinarians on the skills and attributes of Massey veterinary graduates and find out what curriculum changes are necessary to ensure the graduates of 2020 will continue to meet the needs of the New Zealand livestock industries.

New Zealand livestock production is currently going through a period of restructuring, with significant changes in land use, farm amalgamations into larger and more efficient units, corporate farming, and many new people moving into animal production, particularly dairying. The rural veterinary profession is also changing and adapting, with practice amalgamations seeing large numbers of vets working within individual practices, enabling greater specialisation and better work/lifestyle balance.

Within the Government there are about 300 veterinarians working under various portfolios, mostly to do with supporting and facilitating livestock production, processing and exports. The recent amalgamation of the Ministry of Agriculture and Forestry with the New Zealand Food Safety Authority means that now most government veterinarians work for the one organisation.

The Government has acknowledged the importance of a strong and vibrant rural veterinary workforce by initiating the Voluntary Bonding Scheme for vets working with rural livestock. Government recognises the critical role that veterinarians play in the key portfolios of food safety, biosecurity and animal welfare, and that an effective rural veterinary workforce underpins the rural economy.

The bonding scheme is entering its third year and about 45 veterinarians are currently involved. It is too early to comment on whether the scheme is helping to retain vets in rural areas, but New Zealand is not the only country providing such incentives to encourage and support vets in rural practice: South Africa and the midwestern states of the United States have initiated similar schemes.

I believe that the changes happening within the livestock industries, veterinary practice and government organisations are creating a great opportunity for much-improved coordination and efficiency and added value of veterinary input into the livestock sector. Veterinarians work at all steps along the value chain of our livestock and food processing industries. Communication and coordination of effort can be a challenge within our profession, because veterinarians are highly intelligent individuals for whom working in teams and with other skilled professionals in other disciplines does not always come naturally.

I believe that for veterinarians to expand their relevance and contribution to the agricultural economy we need to improve our strategic approach to working with other rural professionals and communicate our ability to add value to farming businesses and to industry sectors. Working in isolation and competing with other groups is not, I believe, the smart approach. We need to find synergies and ways of working together at an exciting time of change within the rural sector.

Vets are not necessarily great at communicating the value that they can add to farm productivity and profitability. No doubt farmers can be hard individuals to convince, but that is part of the challenge. James Herriot does not cut it in 2011, and vets need to be able to demonstrate their ability to improve the bottom line by adding value to farm animal health and welfare programmes. Likewise, better integration of government services will also add greater value to the industries we serve and complement the contribution that vets in private practice make to the rural economy.

NZVA has recognised the changes that are happening and the opportunity to work with a small group of key influencers within the profession. In mid-2010 NZVA invited a group of key individuals who were responsible for employing and managing large groups of veterinarians in both government and private practice, to discuss some of these issues. A follow-up meeting is planned for May 2011. We hope that these forums will help better communication and coordination within the profession.

Another example of opportunity to better coordinate veterinary effort in the livestock economy is the Primary Growth Partnership (PGP) initiatives in the dairy, meat and wool industries announced in August 2010. PGPs have the potential to bring a greater level of coordination and cooperation between stakeholders. NZVA considers that the veterinary profession is a key stakeholder in each of these PGP initiatives and we have been meeting with the relevant organisations involved to explore where veterinarians can contribute.

Nothing stands still; evolution continues and vets need to keep asking themselves, “How do I add value?”

Richard Wild
President
New Zealand Veterinary Association

ANIMALS

Exotic disease focus

BOVINE EPHEMERAL FEVER

Bovine ephemeral fever (BEF), commonly known as three-day sickness, is an economically important arbovirus disease of cattle and water buffalo. Disease can result in loss of milk production, weight loss, and affected bulls can become infertile for several months. In severe cases mortalities can occur. Animal health costs, including diagnosis, treatment and prevention, can be substantial.

The disease is caused by bovine ephemeral fever virus (BEFV), a single-stranded negative-sense RNA virus of the genus *Ephemerovirus* (Family Rhabdoviridae). BEF came to notice in the nineteenth century in southern Africa and Egypt, and the disease was also known in Asia. Epizootics of BEF usually occur in the summer and autumn in the temperate climes of Australia, South Africa, China and Japan, and disappear in the winter when the temperature drops significantly. There is an apparently strong association between the rainy season and epizootics in tropical climates, as evidenced by sporadic outbreaks that occur after heavy rainfall (US Animal Health Association, 2008). Disease in Africa, Australia and China has spread rapidly over large distances and generally in a direction away from the Equator. BEF does not occur in Europe, the Americas, Papua New Guinea, New Zealand or the Pacific Islands (Animal Health Australia, 2001).

Transmission

Transmission of BEF is widely accepted to be via the feeding activity of an arthropod vector, although the definitive vector or vectors remain unknown. BEFV has been isolated from a mixed pool of culicine and anopheline mosquitoes and from biting midges (genus *Culicoides*) in both Africa and Australia. Mosquitoes are suspected to be the most important vector. The virus is not transmitted by close contact, body secretions or aerosol droplets. Meat of infected animals poses no risk as the virus is susceptible to the low pH caused by post-mortem formation of lactic acid in muscle, and also because transmission does not occur via ingestion (Center for Food Security and Public Health, 2008).

Clinical signs

The virus is introduced when mosquitoes feed. It multiplies in the bloodstream and is carried into tissues by white blood cells. Experimentally the incubation period usually varies from three to five days, but may be as short as 29 hours or as long as 10 days. The natural incubation period is unknown but is suspected to be similar to that found experimentally (US Animal Health Association, 2008).

The classical course of the disease begins with a fever, which is often biphasic or triphasic and occasionally multiphasic. Circulating virus is detectable prior to the first febrile response, which occurs three to seven days post inoculation. During the first febrile response, which lasts about a day, affected cattle may appear only slightly depressed, but milk production in lactating cows will drop abruptly. A second febrile episode may occur immediately after the first, or may be delayed by up to 24 hours. It is during this second febrile episode that the characteristic clinical signs are observed (Animal Heath Australia, 2001). Rectal temperature during a febrile episode will vary depending on the stage in the cycle that it is assessed, but can peak at 40–42°C (US Animal Health Association, 2008).

Clinical signs of BEF vary from mild to fatal. Mortality (average 1.5 percent) is more likely in high-producing dairy or beef cattle in fat condition. Disease tends to be less severe in young cattle, and can be as mild as loss of appetite, loss of milk production, reluctance to move, and mild lameness (for link to video see page 6).

In more severe cases the clinical signs may include ruminal atony, severe depression, serous or mucoid ocular and nasal discharges, salivation, subcutaneous and submandibular oedema, tachycardia, tachypnoea, and muscle twitching or waves of shivering and recumbency (Animal Health Australia, 2001). The most severely affected cases may suffer aspiration pneumonia (caused by inhaling ingesta or oral medications owing to loss of the swallowing reflex), subcutaneous emphysema, complete paralysis and death. Dehydration as a result of inability to get to water also contributes to mortalities. Abortion can occur if a cow suffers from BEF in late pregnancy. Temporary infertility in bulls may persist for up to six months and is likely the result of the inflammatory response to the virus. Cows untreated late in lactation may have reduced production for the remainder of the lactation period (US Animal Health Association, 2008; Center for Food Security and Public Health, 2008).

Clinical signs in most cattle end abruptly on the second or third day after the disease has become apparent. Spontaneous and rapid recovery can occur at almost any time, even in cases with apparently severe paralysis. Antibody levels are usually detectable two to four days after clinical recovery (Animal Heath Australia, 2001).

During febrile episodes, virus circulates in close association with neutrophils. Inflammation in the walls of blood vessels results in fibrin-rich fluid moving into the peritoneal, pleural and pericardial cavities, and some also into the joint capsules, carrying virus and neutrophils with it (Animal Heath Australia, 2001).

A significant part of the pathology associated with BEF results from the inflammatory process instigated in response to the virus. As a result, early use of NSAIDs can result in a rapid improvement in the clinical signs in affected animals. This treatment may also prevent production loss caused by the infection (US Animal Health Association, 2008).

Post-mortem findings

There are comparatively few descriptions of the pathological changes that follow natural BEFV infection. Post-mortem findings are consistent with a generalised inflammatory process. Often a straw-coloured fluid can be found in the joint capsules, chest and abdominal cavities. Cellulitis and focal necrosis of skeletal muscles may be present. Because BEF disrupts the swallowing reflex, inhalation pneumonia can result from attempted feeding by the animal, or from an attempt by the owner to encourage feeding or administer oral medication, and this will be observed at post mortem (US Animal Health Association, 2008; NSW Department of Primary Industries 2001).

Diagnosis

A number of diagnostic techniques have been described. Often a presumptive diagnosis can be made in the field, based on previous disease history, season, environmental conditions and clinical signs. A field diagnosis can be supported with a differential leukocyte count on a fresh blood smear. A neutrophilia with many immature forms (at least 30 percent immature or banded) is not pathognomonic of BEF, but if neutrophilia is absent the field diagnosis is likely to be incorrect (US Animal Health Association, 2008; Animal Health Australia, 2001). In addition, a blood sample placed in a serum tube to clot may not contract normally during clotting, and the clot will contain white streaks. This phenomenon is also seen in severe milk fever (Animal Health Australia, 2001).

If confirmation of BEF is necessary, the collection of paired sera with a convalescent sample taken 14–21 days after the onset of disease should be tested concurrently by VNT or ELISA to demonstrate seroconversion or significantly rising antibody levels. Virus isolation may be attempted, and requires a blood sample to be taken in a lithium-heparin anticoagulant during the early stages of disease. After centrifuging, the white cell layer is inoculated into flasks containing a monolayer of mosquito cells derived from *Aedes albopictus*. Cells are incubated at 36°C for 13 days, then assessed with specific fluorescence tests for the presence for BEFV. PCR techniques are now also available for more rapid virus detection (Animal Health Australia, 2001).

Differential diagnosis

Bovine ephemeral fever can have similar clinical signs to a number of other diseases, including some exotic to New Zealand. These include early Rift Valley fever, heartwater, bluetongue, botulism, babesiosis and blackleg. Salivation may also resemble that seen in foot and mouth disease but vesicles will be absent (Center for Food Security and Public Health, 2008).

Control

Infection and recovery from BEF provides lifelong immunity. Vaccines have been developed to mitigate production loss in high-producing dairy cows, beef cattle and bulls. Vector control is difficult because the definitive vectors remain unidentified, but avoiding mosquitoes (e.g. by housing valuable animals during risk periods) and destroying mosquito habitat has a beneficial effect.

Significance to New Zealand

A potential low-competence vector, *Culex quinquefasciatus* (see Figure 1) is endemic in New Zealand (Mackereth *et al.*, 2007). Live cattle imports into New Zealand are only permissible from Australia. The Import Health Standard requires that animals be placed in pre-export quarantine for 30 days and undergo veterinary inspection before entering New Zealand. These and other measures should mitigate the risk of introducing a viraemic animal, but ongoing vigilance remains essential.

Figure 1: *Culex quinquefasciatus*, a potential low-competence vector of BEV

Where environmental conditions, clinical signs and supporting white cell counts are consistent, BEF should be considered as a differential diagnosis. Call the MAF exotic disease and pest hotline (0800 80 90 66) if you suspect BEF.

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CLINICAL AND EPIDEMIOLOGICAL INVESTIGATION TO EXCLUDE FOOT AND MOUTH DISEASE IN CATTLE

Introduction

An outbreak of foot and mouth disease (FMD) has the potential to have a significant economic effect in New Zealand through loss of markets for agricultural products. Financial losses would continue, owing to lost production capacity, even after trading partners were satisfied that the disease had been eradicated. Therefore, it is important that New Zealand has a robust biosecurity system for preventing the entry of FMD, and an efficient investigation and response system for early detection and mitigation of spread should an incursion ever occur.

The Investigation and Diagnostic Centre (IDC) Wallaceville is charged with investigating and excluding FMD and other foreign animal diseases from our livestock. The IDC regularly receives calls from animal health professionals and farmers regarding suspicious signs in livestock. Most calls relate to suspected FMD in cattle rather than other production animals. Very few notifications involve more than one affected animal.

Some endemic diseases in cattle can be clinically confused with FMD. These include bovine viral diarrhoea (BVD), mucosal disease (MD), papular stomatitis (PS), actinobacillosis caused by *Actinobacillus lignieresii* (woody tongue or WT), malignant catarrhal fever (MCF), phototoxic dermatitis (PD), footrot and traumatic injury (Holliman, 2005) (Table 1). However, some notifications received by IDC investigators do not fit into any of the classical FMD differentials listed in Table 2. In most of these cases the exact cause of the condition remains undetermined.

This paper describes the investigation methods for exclusion of FMD in cattle and outlines the clinical presentation and laboratory results from several idiopathic vesicular and erosive conditions where FMD was excluded. In addition, a pictorial library of lesions from clinical FMD is provided (Figure 5) and some of the more common endemic differentials of FMD are shown in Figures 6–11.

Methods

Incursion investigators are alerted to suspect FMD cases via the MAF exotic disease and pest hotline. Each notification is risk-assessed according to species, morbidity/mortality, location of lesions (feet, oral, and teat), lesion description and whether fever is present. In addition, other potential risk factors for introduction of FMD are assessed. These include a temporal association between disease in animals on the affected property, and movements of people and goods from overseas or introductions of livestock from other parts of New Zealand. Key people from both MAF and industry are placed on alert until FMD is excluded and the investigation is stood down.

Almost all notifications result in a field visit by a veterinarian, even if the risk is assessed as low. The investigation incorporates visits by veterinarians with specialised biosecurity training (Initial Investigating Veterinarians) and subsequently by an Incursion Investigator where FMD cannot be excluded by the Initial Investigating Veterinarian. Veterinary investigators carry out a full clinical examination on affected animals and, where indicated, on a sample of animals from the same herd not showing clinical signs. In addition, epidemiological and milk-production data from the affected farm is collected and analysed, and cattle movements on and off the farm are traced.

A key part of the clinical examination of affected animals is describing skin or mucosal lesions and assessing clinical features associated with fever and pain.

Clinical features associated with fever are:

- anorexia and/or lethargy; and
- elevated rectal temperature.

Clinical features associated with pain are:

- lameness, particularly with reference to the number of feet affected and the degree of pain;
- drooling;
- other signs of oral discomfort such as gritting teeth or lip smacking; and
- teat lesions, with reference to pain experienced at milking.

Useful terms to describe skin and mucosal lesions include macule, papule, vesicle, pustule, scab, erosion and ulcer. However, incorrect use of terms can result in confusion as to the potential aetiology. A pathological description of the lesions can sometimes convey a more accurate picture of what the lesions are likely to be (see Figures 1–11). Digital images of lesions are helpful but complement rather than replace a verbal or written description. The following terminology has been developed from the list used by the National Centre for Foreign Animal Disease in Winnipeg, Canada:

- distribution: where and how many;
- consistency: fluid-filled or hard;
- colour: hyperaemia present or absent; colour of vesicular fluid;
- shape: elevated, depressed, flat, nodular or round;
- size: dimensions of the lesions; and
- other features such as whether odour is present.

Epidemiological farm data collected from each animal include ear tag and lifetime identification of affected cattle, age and breed, and the date when clinical signs were first observed. With multiple cases, the management group (stratum) of each affected animal is determined. The point prevalence is then calculated for each group. Any differences in prevalence may provide evidence for specific factors being part of the aetiology of disease.

Further analysis of differences in prevalence of disease by stratum (age, management group, calving group) can be carried out using data from the Livestock Improvement Corporation (LIC), Hamilton. However, this is not generally useful during the early stages of FMD exclusion as it takes several days and analysis is not generally completed until after the initial visit.

Farm history is often sufficient to explain any drop in milk production, and further analysis can quantify such changes. If the farmer is a Fonterra supplier, milk-production data can be downloaded from the Fencepost website (Anonymous, 2010) and analysis completed before a field visit by veterinarians.

Milk production, measured in terms of volume (litres) and weight of milksolids (kg), is compared for two periods based on when the first case was observed. The first period consists of two days (incubation period) prior to first clinical signs being observed until the date of investigation. Production is compared to that immediately prior to this period. Data need to be corrected for any trend in production that is unrelated to disease, for example the seasonal variation in the herd's milk production. The calculated linear regression coefficient for production can be used to correct data for comparisons. It is possible to set up analyses in advance using software such as 'R' (Ihaka and Gentleman, 1996).

If FMD is suspected on clinical and epidemiological grounds, various response actions are instigated. These include collecting samples for laboratory confirmation and taking steps to prevent spread. These are not discussed further in this paper, which focuses on the key features of several investigations of suspect FMD.

Cases where FMD has been excluded

Four case studies are described where investigation was necessary to exclude FMD (Table 2). In all cases FMD was excluded, but the aetiological cause of lesions was not determined.

TABLE 1: USUAL CLINICAL AND EPIDEMIOLOGICAL FEATURES ASSOCIATED WITH INFECTION OF FMD AND FMD DIFFERENTIAL DISEASES

	MORBIDITY	COMMONLY AFFECTED AGE GROUP	CORONITIS AND/OR LAMENESS	TEAT/S AFFECTED	VESICLES PRESENT	FEVER PRESENT IN EARLY STAGES	USUAL LOCATION OF LESIONS	LESION DESCRIPTION
Food and mouth disease	High	All	Yes	Yes	Yes	Yes	Mouth, muzzle, feet	Vesicle, erosions
Papular stomatitis	High	<20 months	No	Yes	No	Yes	Mouth, muzzle, nasolabium, oesophagus, teats	Papule/erosion
Malignant catarrhal fever	Sporadic	1–2-year-olds	Possibly	No	No	Yes	Mouth, muzzle, eyes, intestine, kidneys	Erosions/ulcers, crusting around the muzzle
Bovine viral diarrhoea	1 or more	1–2-year-olds	Possibly	No	No	No	Oral cavity, nasolabium, gastrointestinal tract, feet, skin	Erosions/ulcers, crusting around the muzzle
Phototoxic dermatitis	Sporadic	All	Possibly	Yes	Possibly	Yes	Non-pigmented skin (and ventral, tip and sides of tongue)	Subcutaneous swelling/skin necrosis
Wood tongue	Sporadic	All	No	No	No	No	Oral cavity	Firm, often elevated lesions
Oral trauma	1 or more	All	No	No	No	No	Oral cavity	Lacerations

TABLE 2: SUMMARY OF KEY ASPECTS OF FOUR INVESTIGATIONS WHERE FOOT AND MOUTH DISEASE (FMD) AND ENDEMIC DIFFERENTIALS FOR FMD WERE EXCLUDED*

CASE	DATE OF INVESTIGATION	AGE OF CATTLE	FEVER PRESENT	VESICLES PRESENT	MAIN LESION	LAMENESS OR TEAT LESIONS	DROP IN MILK PRODUCTION	HERD PREVALENCE
1	15/3/2010	Mixed	No	Yes	Erosions of oral mucosa	No	No	0.3% (1/330)
2	20/9/2006	Mixed	No	No	Erosions of oral mucosa	No	No	40–60% (n=220)
3	5/12/2006	9 months	Yes	No	Erosions of oral mucosa	No	-	30% (9/30)
4	22/11/2005	Mixed	No	Yes	Erosions of oral mucosa	No	No	80% (n=397)

* Bovine viral diarrhoea (BVD) was excluded by Ag and Ab ELISA; malignant catarrhal fever (MCF) by PCR; papular stomatitis (PS) by histology and/or electron microscopy; phototoxic dermatitis (PD) by clinical signs; and woody tongue caused by *Actinobacillus liegenerisi* (WT) by clinical signs and histology.

CASE 1 (BAY OF PLENTY)

A six-year-old Friesian dairy cow presented with oral erosive lesions and several vesicles on the nasal plenum. The cow was mildly depressed, anorexic, displayed inspiratory dyspnoea and had a subnormal rectal temperature (37.5°C). Lameness and teat lesions were not apparent. None of the other 330 cattle in the herd were affected. There was a bilaterally symmetrical, firm swelling of the muzzle resulting in occlusion of the nostrils. An irregular-shaped erosive/ulcerative lesion was present on the right-hand side of the dental pad (Figure 1A). Several vesicles, generally circular in shape and 1–3cm in diameter, were present on the nasal planum (Figure 1B). Serosanguinous fluid was present in the vesicles. Cytological smears showed that the fluid consisted almost entirely of blood, with small numbers of degenerate neutrophils.

A standard screen for bovine health, including serum biochemistry (clotted blood), complete blood count and haematology (whole blood in EDTA), was carried out. A neutrophilia (7.6 x 10^9/L; reference range 0.6–4.5 x 10^9) and lymphopaenia (1.3 x 10^9/L; reference range 1.8–7.5 x 10^9) was present. There was an increase in liver enzymes: GGT was 325 IU/L (reference range 9–39) and GLDH was 112 IU/L (reference range 8–41). In addition, the cow was hypoalbuminaemic (24 g/L; reference range 27.8–45.3). The morphological diagnosis from histological sections of lesions was a necrotising dermatitis and stomatitis with epithelial separation and vascular thrombosis.

Although vesicles were present, lesions did not resemble those observed for vesicular disease. There was no sloughing of epithelium in the oral cavity or around the coronary band. The vesicles appeared to represent accumulation of fluid exudate resulting from necrosis of tissues in the epithelial and submucosal layers. Only one animal was affected and there was no effect on milk production.

The pathogenesis of lesions was not determined. We speculated that vesicular lesions could be secondary to inflammation/necrosis resulting from bacterial cellulitis, the initial point of entry of bacteria being from a penetrating wound in the dental pad. However, multifocal lesions observed histologically did not support this hypothesis. In addition, there was evidence that systemic disease was present.

The distinctive vesicles observed on the nasal planum of the affected cow were similar to those described in an outbreak of erosive stomatitis in a dairy cow herd (Case 4, below). However, in that case the prevalence of infection had been high and none of the affected animals had shown signs of systemic disease. It is possible that disease of different aetiology could produce the same type of lesions.

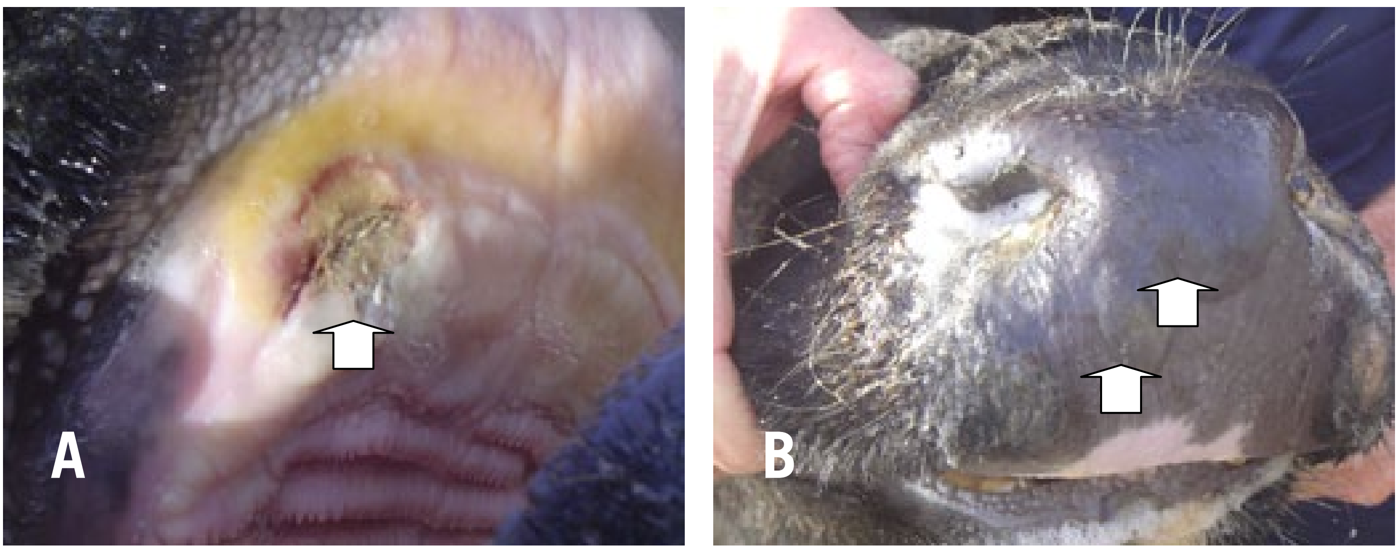

Figure 1 (Case 1): A discrete, ulcerated lesion on the lateral side of the dental pad, with yellow discoloration and odour indicating necrosis of underlying tissues (A; white arrow); and intact coalescing vesicles, incorporating about a third of the total area of the muzzle (B; black arrows).

CASE 2 (TARANAKI)

A herd of 220 dairy cows presented with a high prevalence (estimated to be 40–60 percent) of healing erosive oral lesions. The lesions were predominantly on the rostral part of the dental pad (Figure 2A). A circular, erosive lesion 2cm in diameter was present on the muzzle of one cow and on the dorsal surface of the tongue of another (Figure 2B). Lesions were not present on teats, the coronary bands or the interdigital region. Affected cows were not depressed, and rectal temperatures were normal (<40°C). There had been no drop in milk production in the days and weeks before this disease episode had occurred.

All tissues tested negative to parapox virus by electron microscopy and PCR. No viruses were isolated from specimens collected from lesions. Histological examination of tissues showed there was an acute to subacute vesicopustular stomatitis with acute to chronic vasculitis and collagen degeneration. In all tissue samples a distinctive feature was the subepithelial vasculopathy that affected the tissues from the epidermal junction to the depths of the sample. No environmental agent was identified that could explain a local caustic or toxic aetiology.

Figure 2 (Case 2): Erosive/ulcerated lesion covering the entire rostral surface of the dental pad from one affected dairy cow, with yellow and thickened sloughed epithelium (A; white arrow); and a circular erosive lesion, 2–3cm in diameter, (B; black arrow) on the rostral tip of the tongue of another affected cow.

CASE 3 (TARANAKI)

An investigation was carried out when nine five-month-old dairy calves from a mob of 30 (30 percent) presented with superficial erosions (Figure 3). The calves did not present with either fever or lameness.

Multiple irregular-shaped lesions were present on the dorsum and edges of the tongue, on the buccal mucosa and undersurface of the tongue. Lesions were up to 10cm long and 5cm wide, and some appeared to have coalesced.

Histologically the lesions were described as a subacute superficial pustular stomatitis. This lesion and the absence of demonstrable micro-organisms in the unruptured pustules suggested that the cause could be viral, toxic or allergic.

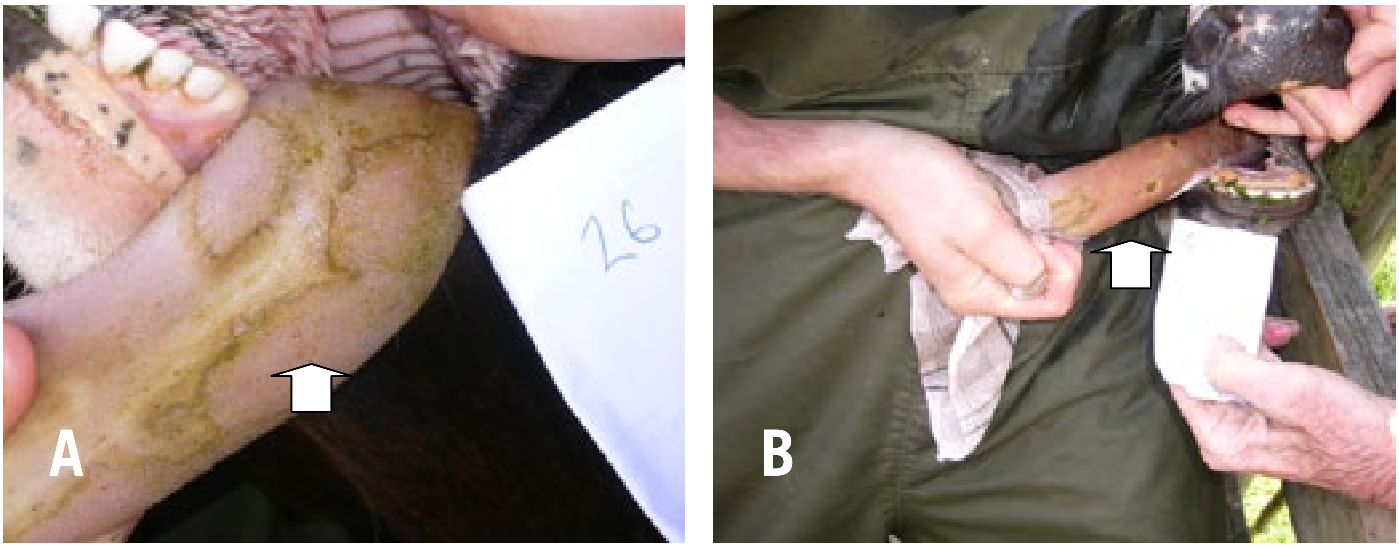

Figure 3 A & B (Case 3): Multiple irregular coalescing superficial erosive lesions (white arrows) covering about a third of the dorsal surface of the tongue of several nine-month-old calves.

CASE 4 (WAIKATO)

An investigation was carried out on a 397-cow herd that had healing oral erosive lesions (Figure 4B) in 80 percent of the herd. Intact vesicles were observed on the muzzles of two affected cows. None of the affected cows were systemically ill and there was no decrease in milk production.

Lesions were predominantly erosions. A single intact vesicle was identified on the muzzles of two cows during the investigation (Figure 4), as well as several ruptured vesicles on the muzzles of other cows. Erosions were generally circular in shape, and averaged 20mm in diameter (range 5–60mm). Twenty-one percent (7/34) of the cows had one oral lesion, 44 percent (15/34) had two, and 29 percent (10/34) had three or more lesions.

No infectious aetiological agent for any exotic infectious vesicular disease or any endemic cause of vesicular disease was detected using virus isolation, polymerase chain reaction (PCR), electron microscopy (EM) or serological tests. The investigation is described in detail by McFadden et al (2007).

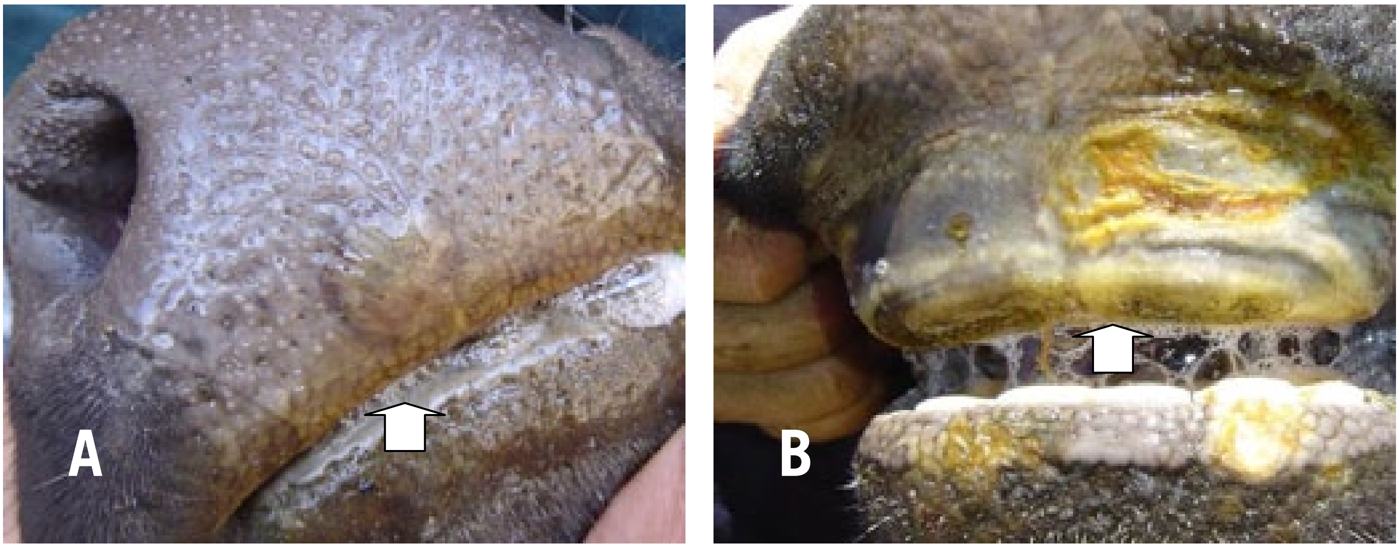

Figure 4 (Case 4): An intact, circular vesicle about 2cm in diameter (A; arrowed) on the lateral part of the muzzle, just dorsal to the lip of one affected dairy cow; and diffuse areas of erosion/ulceration (B; arrowed) on the rostral hard palate, upper and lower lip of another affected cow.

Recognition of FMD

Figures 5–11 show FMD and some of its common endemic differentials.

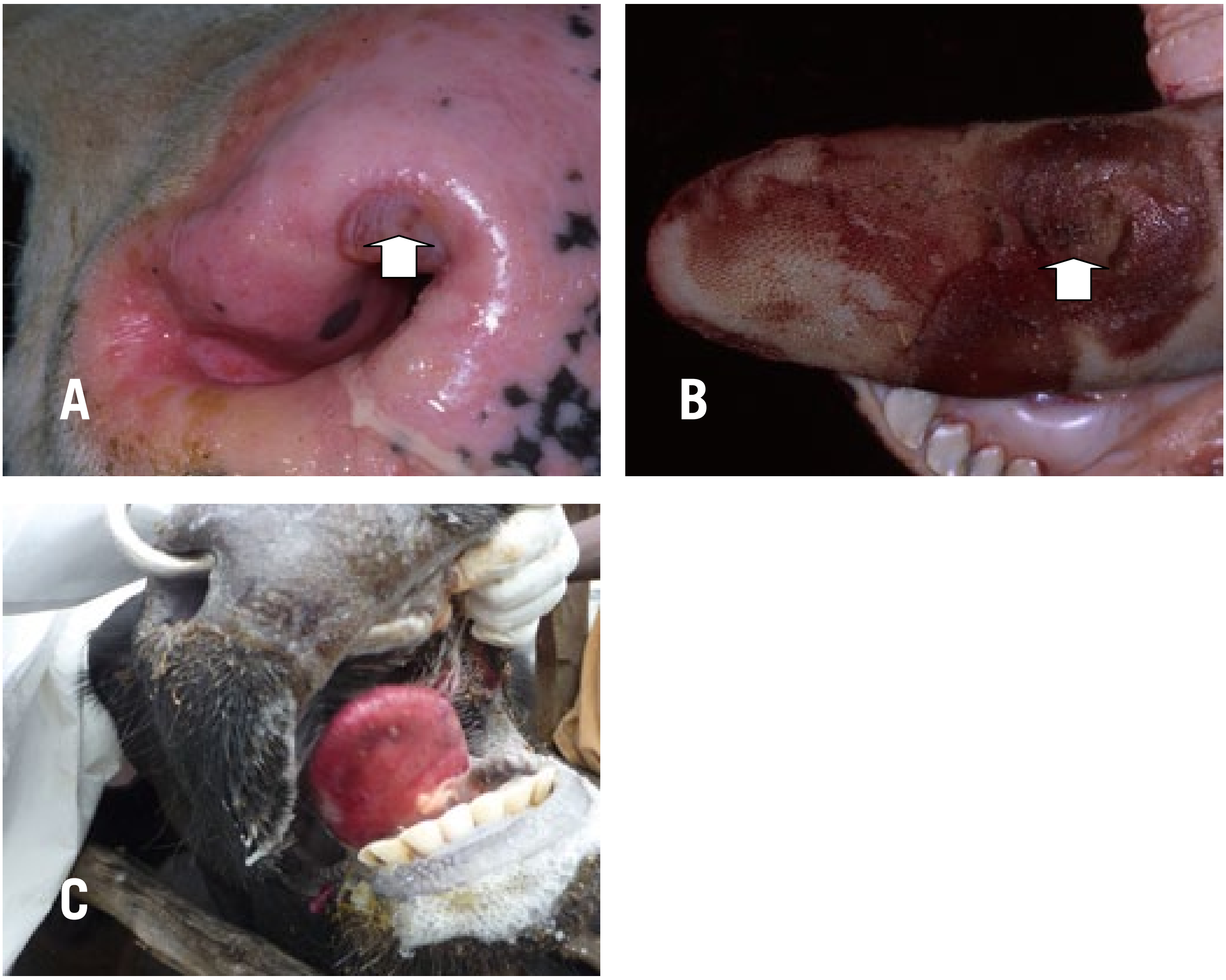

Figure 5: Foot and mouth disease lesions. A: A 2cm-diameter fluid-filled vesicle on the dorsal entrance to the nostril (arrowed). B: extensive areas of erosion covering about a third of the dorsal surface of the tongue (arrowed). (Photos courtesy of Dr Peter Fernandez, USDA, APHIS International Services, Regional Director for Europe, Middle East and Africa, Brussels, Belgium). C: Sloughing of epithelium from the rostral part of the tongue. (Photos courtesy of Mary van Andel, Investigation and Diagnostic Centre)

Figure 6: Endemic differentials for FMD: Papular stomatitis. A & B: multiple circular (about 5mm diameter) coalescing raised areas of hyperaemia, with white necrotic centres present on the nasal planum, lips and dental pad. (Photo courtesy of Donald Arthur, Selwyn Rakaia Vet Services Ltd). C: Hard palate. (Photo courtesy of Rob Fairley, Gribbles, Christchurch)

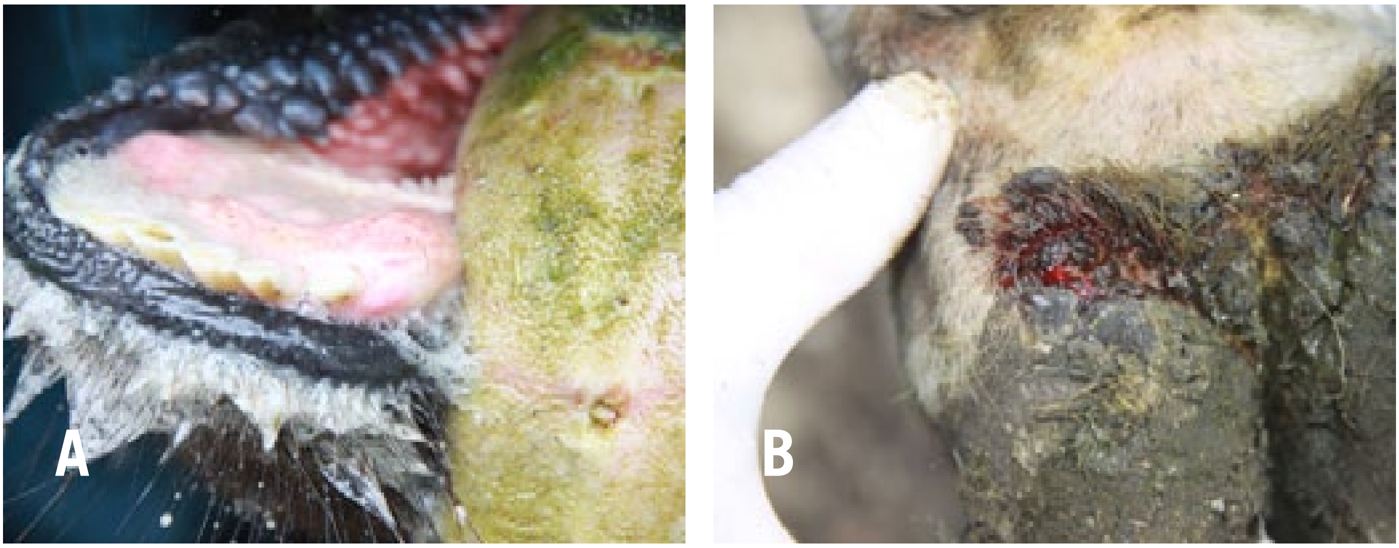

Figure 7: Endemic differentials for FMD: Bovine viral diarrhoea. A: multiple small (1–2mm diameter) erosive lesions on the dorsal surface of the tongue. B: Erosive lesions around the bulb of the heel and interdigital region. (Photos courtesy of Aaron McCullough, Aorangi Vet Services)

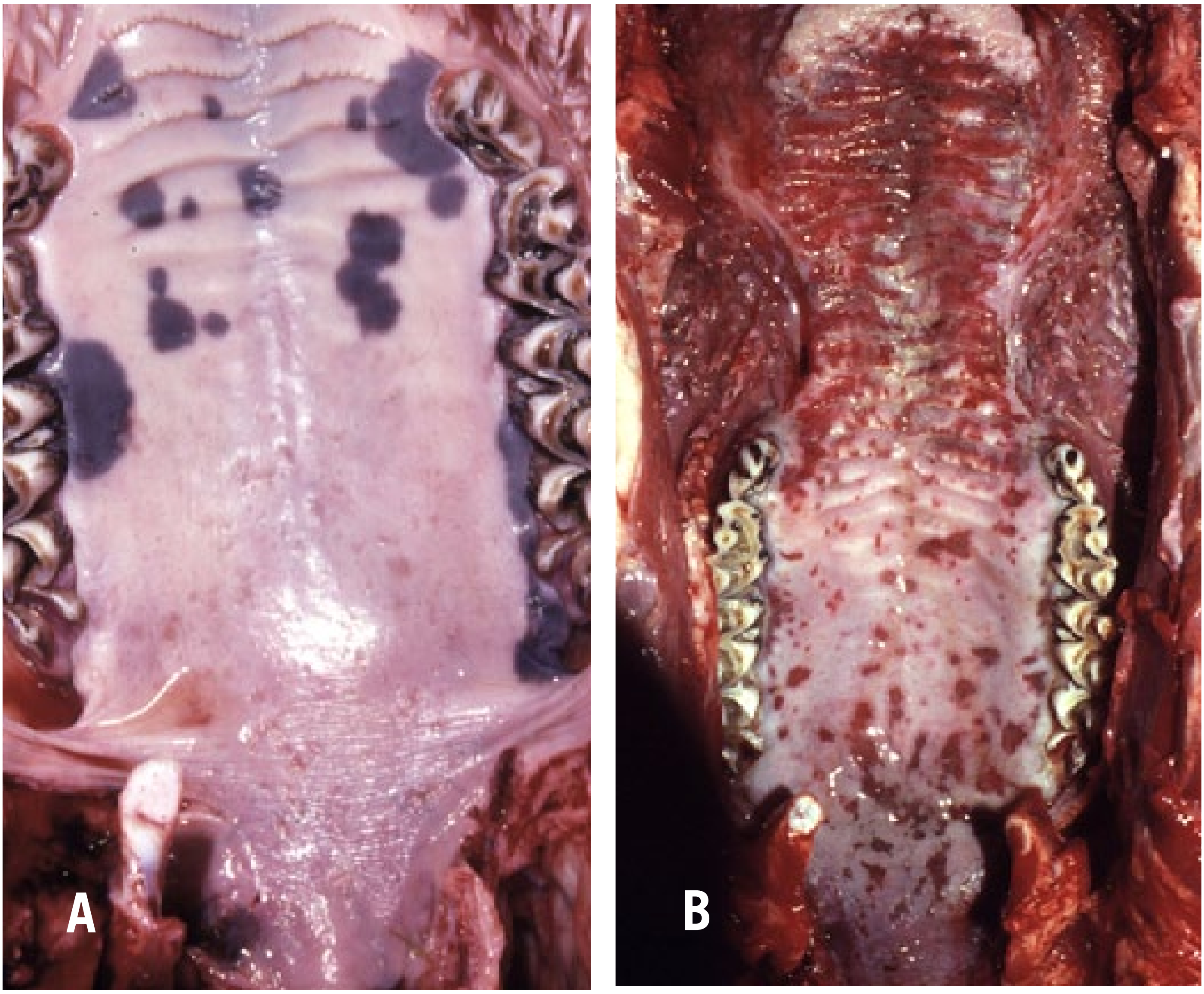

Figure 8: Endemic differentials for FMD. A: Bovine viral diarrhoea – multiple small (1–2mm diameter) healing erosive lesions on the hard palate. B: Mucosal disease – areas of hyperaemia on the hard palate varying from small to large and extensive multiple coalescing irregular areas. (Photos courtesy of Keith Thompson, Massey University)

Figure 9: Endemic differentials for malignant catarrhal fever. Extensive areas of erosion and ulceration on the nasal planum (A) and hard palate (B), with underlying areas of haemorrhage, overlaid with necrotic epithelium. (Photos courtesy of Keith Thompson, Massey University). Corneal opacity and mucopurulent discharge from eyes and nostrils (C). Photos courtesy of Aaron McCullough, Aorangi Vet Services)

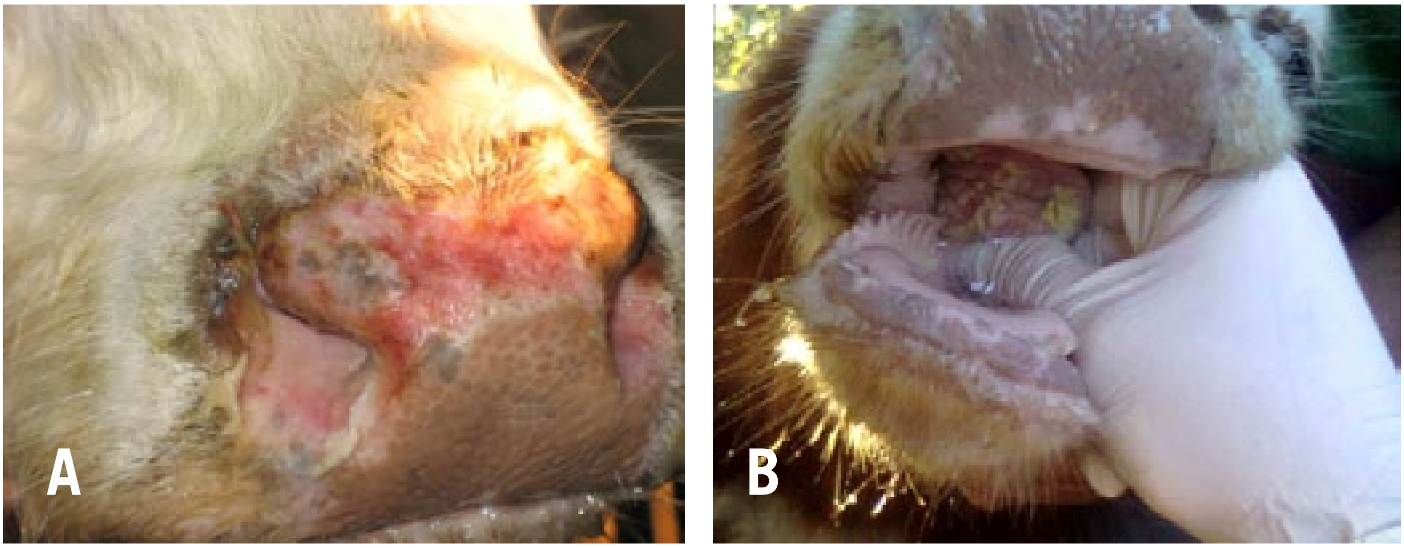

Figure 10: Endemic differentials for photosensitivity. Extensive areas of erosion on the dorsal nasal region (A) and the ventral surface of the tongue (B).

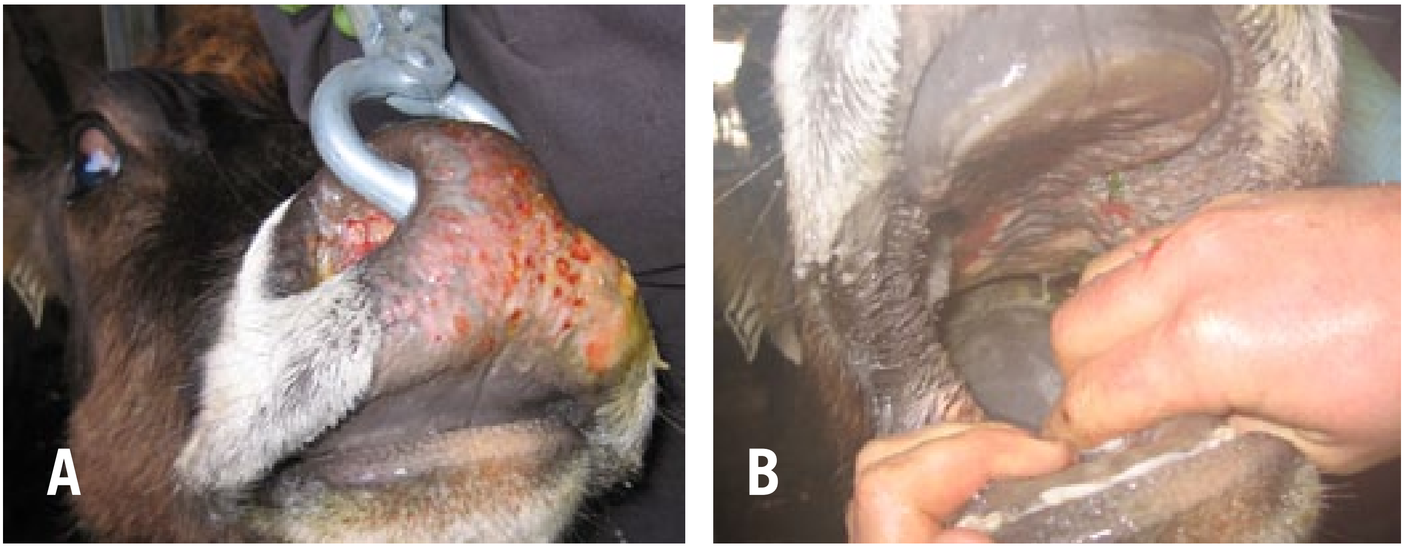

Figure 11: Endemic differentials for actinobacillosis ("woody tongue"). Granulomatous in appearance with extensive areas of irregular coalescing raised areas of hyperaemia, with patchy erosions on the nasal planum (A) and erosive lesions on the hard palate (B). Photos provided by Lester Laughton, AsureQualityNZ

Conclusion

This paper has summarised the epidemiological approach used by investigators at the IDC to exclude FMD from cases where suspicious signs are reported. The key findings from several investigations have been described where aetiology was not determined. None of the cases presented with signs expected from endemic FMD differentials (PS, PD, BVD, MD, MCF, woody tongue, traumatic injury). Thus lesion recognition forms only part of the investigation process and it is necessary to carry out a full investigation that incorporates results from clinical, laboratory and herd epidemiology to exclude FMD from these cases.

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CHEMICAL RESIDUES SURVEILLANCE PROGRAMME 2008–2009

This article reports the results of testing for specified residue and chemical contaminants under the Animal Products Act regulations. The programme operates and reports on a 1 July–30 June year.

TABLE 1: NUMBER OF SAMPLES TESTED FOR THE SPECIFIED COMPOUND OR GROUP. FIGURES IN BRACKETS ARE THE NUMBER OF SAMPLES TESTING ABOVE THE ANIMAL PRODUCTS ACT MAXIMUM PERMISSIBLE LEVEL (MPL)

COMPOUND OR CLASS	LIVE ANIMALS	FARMED RUMINANTS †	HORSES	FERAL DEER	PIGS	POULTRY 9	OSTRICH	HONEY §§	SALMON
Stilbenes	42	227	54			20			8
Thyrostats	42	225	54						
Synthetic steroids	42	226	54						8
Resorcyclic acids	42	227	54						
Hormone growth promotants		248							
Beta-agonists	42	302	55				9		
Chloramphenicol	42	315	55					4	8
Nitrofurans		312	50		27	22	12	5	8
Dimetridazole		308	50		50		14		
Antibiotics††		307	51		51	56	18	30	
Carbadox		189	26		99				
Sulphonamides§		5221*(2)							8
Anticoccidials					25	20	8		
Virginiamycin			57						
Anthelminthics	954	75	75				13		22
Pesticides‡		863(1)			25	46	23	33	
Non-steroidal anti-inflammatory compounds							9		
Paradichlorobenzene								35 (1)	
1080 (sodium monofluoroacetate)				40					
Malachite green (including leuco form)									10
Lead				24					
Tutin								36	
Amitraz								36	

Notes:

† Farmed cattle, sheep, goats and deer.

‡ Includes chlorinated hydrocarbons, herbicides, organophosphates, synthetic pyrethroids, fungicides and carbamates. More pesticides than usual were tested as a response to finding two endosulfan residues in samples of exported beef.

§ Tested only on bobby calves at the processor and only positive samples are sent to the central laboratory. The prescribed testing rate is 1 in 600 bobby calves.

9 Includes chickens, ducks and turkeys.

§§ Only sampled from processors who also export honey.

†† Antibiotics include penicillins, cephalosporins, tetracyclines, aminoglycosides, macrolides, quinolones, bacitracin and diaminopyrimidines.

* Bobby calves are tested preslaughter for sulphonamides and the testing (SOS – sulphonamide on site programme) is carried out at the processor and not at the central laboratory as is the case for all other tests. Bobby calves returning positive results do not enter the food chain.

Monitoring meat, birds, farmed salmon and honey

Not all of the samples for the testing were independent. Some samples were analysed for more than one unrelated compound or activity class. The different live animal tests for stilbenes, thyrostats, synthetic steroids, resorcyclic acids, beta-agonists and chloramphenicol were all performed on the one sample from any given live animal. The programme outline is set out in Table 1 and the results of testing are as follows.

One bovine sample had temephos above the maximum permissible level (MPL) and one honey sample of had paradichlorobenzene (PDB) at the MPL of 0.01 mg/kg. The temephos non-compliance was determined to have occurred because the supplier submitted the animal in error before the label witholding period had elapsed. The supplier was entered onto the surveillance list and the next submission of stock was checked for temephos residues.

The PDB residue was likely the result of residual PDB in recycled beeswax that had not been completely decontaminated from earlier years when PDB use was permitted.

Two bobby calves returning positive sulphonamide test results at the processor were confirmed by the central laboratory. The suppliers were entered onto the surveillance list and tested at a high sampling rate until a clear line was shown.

Non-compliant results are investigated to determine, if possible, the cause.

SCOPE OF TESTING

Testing of samples is increasingly done using multi-residue methods. This involves testing a sample for many compounds of one class and often more than one class. These include:

Stilbenes:	3 compounds
Synthetic steriods salmon: others:	 8 compounds 25 compounds
Thyrostats:	5 compounds
Hormone growth promotants:	4 compounds
Nitrofurans:	4 compounds
Antibacterials:	25 compounds
Coccidiostats: poultry pigs	 8 compounds 6 compounds
Beta-blockers	1 compound
Non steroidal anti-inflammatories	4 compounds
Anthelminthics (2 separate tests): acrocylic endectocides test: other anthelminthics test:	 5 compounds 14 compounds
Sulphonamides:	7 compounds
Pesticides in honey: in fat:	 61 compounds 238 compounds

Dairy monitoring

This section reports the results of testing for specified residue and chemical contaminants under the Animal Products Act National Chemical Contaminants Programme (NCCP). The sampling and testing programme is set out in Table 2. The programme operates and reports on a 1 July–30 June year. No detection above the action limit was reported for any sample.

TABLE 2: NUMBER OF DAIRY SAMPLES TESTED FOR THE SPECIFIED COMPOUND OR GROUP. FIGURES IN BRACKETS ARE THE NUMBER OF SAMPLES TESTING ABOVE THE ANIMAL PRODUCTS ACT ACTION LEVELS.

COMPOUND OR CLASS	MILK	COLOSTRUM
Chloramphenicol	32	28
Nitrofurans	328	57
Antibiotics§	328	58
Dexamethasone	169	28
Sulphonamides	328	58
Levamisole	328	58
Benzimidazoles	327	28
Macrocyclic lactones	119	28
Pesticides‡	327	57 (1)
NSAIDS	169	28
Dapsone	327	58
Aflatoxins	167	0
Elements†	208	0
Melamine	317	57

Notes:

§ Antibiotics include penicillins, cephalosporins, tetracyclines, aminoglycosides, macrolides, quinolones, bacitracin and diaminopyrimidine. Only 119 milk samples were tested for ampicillin, amoxycillin, benzylpenicillin, cloxacillin, cephalonium and cephapirin. Only 57 colostrum samples were tested for ampicillin, amoxycillin, benzylpenicillin, cloxacillin, cephalonium and cephapirin. Only one sample recorded a detection above the action limit: for DDE (a persistent metabolite of DDT and now deregistered pesticide) in colostrum fat.

‡ Pesticides include chlorinated hydrocarbons, herbicides, organophosphates, synthetic pyrethroids, fungicides and carbamate.

† Arsenic, boron, cadmium, lead, mercury and selenium.

The full report is available on the NZFSA website at www.nzfsa.govt.nz/dairy/subject/residues/nccp-results-2008-2009.pdf

http://www.foodsafety.govt.nz/elibrary/industry/Dairy_National_Chemical-.pdf

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QUARTERLY REVIEW OF DIAGNOSTIC CASES: OCTOBER TO DECEMBER

Gribbles Veterinary Pathology

CATTLE

A one-year-old Jersey cross heifer in the Rangitikei district showed non-specific signs of weight loss. Serum biochemistry showed no significant changes and azotaemia was not present. Blood glucose was normal. On two occasions the urine had a 4+ and 3+ urine glucose reading with dilute urine of SG 1.012 and 1.008. This indicates a **paradoxical glucosuria** or **Fanconi syndrome**. Persistently dilute urine without azotaemia indicates renal insufficiency and has previously been reported in a Simmental bull. There is a tubular defect involving the resorption of glucose and other compounds from the urine. It has mostly been reported in dogs and humans, where it may be inherited or acquired. Post-mortem examination showed one kidney was much larger than the other and histopathology revealed pyelonephritis.

A 10-week-old Friesian calf from the Wairarapa was found dull, wandering aimlessly and bellowing. Serum lead was measured at 0.5 mg/L (> 0.3 is consistent with **lead toxicity**). The veterinarian found a chewed-up truck battery on the property. Another calf had died two days before.

A herd of four-month-old calves in Taranaki that had been vaccinated two weeks previously included four that were stiff and lethargic. One calf was seen to fall over, convulse, and was dead within 30 seconds. The animal was in good condition and well hydrated. The calves were due to be shifted and had been under challenging conditions in this paddock for the previous 24 hours. There was access to foxglove (*Digitalis* sp.), three plants of which were well eaten. Histology revealed subpleural and epicardial haemorrhages, which were interpreted as agonal changes. This supported the diagnosis of **digitalis (foxglove) toxicity**. Histologic changes have not been recorded with digitalis poisoning, although grossly the heart may be distended.

During this quarter 27 cases of bovine **salmonellosis** were diagnosed in the Waikato, Rotorua, Hauraki Plains, Bay of Plenty and Taranaki regions. They included 20 cases of ***S.* Typhimurium**, three of ***S. ruiru*** and one each of ***S. infantis, S. seftenberg, S. emek, S.* Brandenberg** and ***S. mbandaka***. Two strains were isolated from one property. In 19 cases adult cattle were affected; the rest were calves or age was not stated. In many of the adult cattle cases, multiple animals were affected with acute-onset diarrhoea and there were marked production drops and occasional deaths. One herd had a 30 percent drop in milk production four days after a change to feeding palm kernel (PKE). Another herd of 400 had a 40 percent drop in milk production, which started one day after a change to feeding PKE, and 120 cows were affected. In two cases *S. typhimurium* was isolated from the PKE being fed to the animals.

A 700-cow dairy herd in South Canterbury was put into an area of new pasture in early December. When checked 30 cows were down, three were dead, and another three died despite treatment. The affected cows had clinical signs like milk-fever cases. Blood was taken from four affected cows, all of which were significantly low in serum calcium, with one profoundly low at 0.25mmol/L (reference range 2–2.6). The remaining animals were slow to respond to calcium treatment but eventually got up (including the one with the lowest calcium level). The cows were removed from the paddock and no further cases occurred. It was thought that ingestion of some calcium-binding chemical like oxalate was the most likely reason for these cows having such low serum calcium. A walk through the paddock revealed a substantial infestation of fathen (*Chenopodium album*) in the sward. Fathen-derived, oxalate-induced **hypocalcaemia** was thought to be the cause of the problem. The farm had several other paddocks of new grass but the farmer was able to spray the fathen out before grazing them. No further cases have occurred from grazing the sprayed paddocks.

On a Canterbury farm, six animals died in a group of 120 yearling cattle and one mildly affected animal recovered. The seven animals were all affected at the same time and they had a tremor and were hypersalivating. They eventually became recumbent. Organophosphate poisoning was strongly suspected. The paddock the animals were in was clean, with little grass, and an initial examination did not reveal anything. However, subsequent closer examination revealed that the animals had broken into a roped-off area next to an old barn that contained a bag of phorate, with 2–3kg of loose phorate also present in a tyre near the bag. Serum from two animals had low levels of cholinesterase, supporting a diagnosis of **organophosphate poisoning**.

Three calves had died from a mob of 35 Jersey/Friesian cross heifers on a Wairarapa farm. Prior to death, the affected calves were pyrexic and developed dysentery.

Six other calves were also affected. Histopathology of the intestine revealed severe ulcerative enteritis and diffuse infiltration of the lamina propria by large numbers of coccidia, confirming a diagnosis of **coccidiosis**.

One-week-old bull calves on a calf-rearing unit in the Wairarapa developed diarrhoea and dysentery. Culture of one faecal sample isolated both ***Salmonella*** **Typhimurium** and ***S.*** **Hindmarsh**. On another Wairarapa property, all five calves being reared had diarrhoea and four were pyrexic. Culture of faeces from two calves grew ***S.*** **Hindmarsh,** confirming a diagnosis of **salmonellosis**.

On a 1050-cow dairy farm in the Rangitikei, there had been an ongoing diarrhoea problem in milking cows for three weeks. The latest three cows to be affected had elevated rectal temperatures and profuse diarrhoea. ***Salmonella*** **Typhimurium** was isolated from faecal samples from all three cows, confirming a diagnosis of **salmonellosis**.

Arcanobacter pyogenes was cultured from the milk of multiple cows on three properties in the Wairarapa and one in Hawke's Bay. The usual history was a single cow affected, often non-responsive to antibiotic treatment. *A. pyogenes* **mastitis** can be a severe pyogenic problem and is difficult to treat effectively.

Multiple 3cm masses had developed on the legs of two adult Friesian cows on a Manawatu dairy farm. Eventually the masses would soften, point and discharge pus. Culture of the purulent material isolated ***Arcanobacter pyogenes*** as a cause of the **dermatitis**.

Over a two-week period, 15 abortions were recorded from a mob of 150 mixed-breed beef cows in the Rangitikei. Aborted calves were usually found dead in the paddocks and were autolysed, suggesting intrauterine death some time previously. No abortifacient bacteria or fungi were cultured from foetal stomach contents. Serum samples collected from eight aborted cows were tested by leptospire microscopic agglutination test (MAT). All had titres to ***L. pomona***, five of 1:1600 or greater, two of 1:800 and one of 1:400. The cows had not been vaccinated against leptospirosis. Such high titres after recent abortions in the absence of any other abortifacent agents are highly suggestive of **leptospiral abortion**.

A one-year-old Devon bull died overnight on a Manawatu farm. When the lung was examined histologically, lymphocytes could be seen infiltrating through blood vessel walls. This had led to vascular thrombosis and haemorrhage in the surrounding tissue. This pattern of histopathology is pathognomonic of **malignant catarrhal fever** caused by **ovine herpes virus 2**.

Five cows in a beef herd developed a vulvovaginitis once the bull was introduced for mating. Samples of the discharge from two cows were tested for *Trictrichomonas foetus* and **bovine herpes virus** by polymerase chain reaction (PCR). Herpes virus was identified, confirming a diagnosis of **infectious pustular vulvovaginitis**.

A veterinary investigation was carried out after an outbreak of dysentery in 25 out of a mob of 250 four-month-old Friesian bull calves on a Wairarapa farm. The affected calves were pyrexic, without other symptoms. Microbiological culture of faecal samples from two calves isolated heavy growths of ***Yersinia pseudotuberculosis,*** confirming a diagnosis of **yersiniosis**.

Seven full-term calves were born dead on a large Southland beef stud. The breeder noticed that all the dead calves appeared to have swollen abdomens. Necropsy of one dead calf showed that the abdomen was distended by an effusion with a total protein of 23g/L, consistent with a modified transudate. The pleural cavity did not have any fluid and the bladder was intact. The heart appeared grossly normal and histopathological examination of sections of the liver, lung, heart, spleen and kidney were unremarkable. The cause of this problem was not determined, but given the numbers of calves affected it may have been a **lethal gene**.

In October 80 percent of a mob of 156 yearling Angus cross heifers on a Southland beef farm developed a severe diarrhoea about a month after being drenched with a long-acting abamectin compound and shifted to lush pasture. Two died and 20 were severely affected. There was no response to antibiotic treatment. Necropsy of a recently dead animal revealed watery rumen contents and a large abomasum. An abomasal worm count identified very high numbers of both ***Ostertagia*** **sp.** (115 000) and ***Trichostrongylus axei*** (125 000). Most of these nematodes were immature, suggesting the infection was recent.

At least 15 mature cows on a Southland dairy farm developed severe weight loss and diarrhoea over a two-month period after calving. This condition was unresponsive to conservative treatment. Most of the affected cows were dried off. **Johne's disease** was confirmed by ELISA serology. This outbreak was unusual in that a large number of clinical cases developed over a short period.

Five 3-month-old dairy calves on a Southland dairy farm paddock died over a week. These calves were part of a large mob of 80 fed on grass supplemented with a pelletised calf meal containing an added coccidiostat. They had all been given a clostridial vaccination and a worm drench at weaning a month before. Two died soon after they had been noticed to be sick, and the three others were depressed and anorexic with obvious weight loss for a few days. Most also had bloodstained diarrhoea. Necropsy of one dead calf showed only haemorrhages through the intestinal mucosa, and watery contents. Histopathological examination of a range of tissues revealed ischaemic necrosis of crypt epithelium of the intestinal mucosa, with a large number of amphophilic adenoviral intranuclear inclusions in many of the endothelial cells lining the mucosal blood vessels. Similar intranuclear inclusions were seen in the endothelial cell nuclei of the blood vessels of the kidney and abomasal mucosa. Sporadic, fatal, usually single cases of **enteric adenovirus** in young cattle have previously been seen in this area, but the numbers of calves affected in this outbreak was unusual.

A mob of a hundred 15-month-old dairy heifers in good condition after overwintering on a Southland beef farm were yarded and the first 14 through the race were given an injection of 6ml of barium selenate (containing 50mg/ml of elemental selenium) and a pour-on drench containing moxidectin. Within five minutes, three of the 14 treated cattle became ataxic and were frothing at the nose. Two became recumbent and one of these died within minutes. The surviving recumbent animal was sweating and panting, with a high heart rate. It was treated with corticosteroids and antihistamine and took about an hour to recover, get on its feet and slowly walk back to the paddock. The affected animal that was still standing recovered without treatment. Necropsy of the dead cow showed a marked oedema of the larynx and white froth in the airways of the lung. The rapid onset of this condition and the necropsy findings were consistent with an **acute anaphylaxis**. The rest of the animals were returned to the paddock without being administered moxidectin or selenium. Other similar-sized mobs of the same age group had been given the same treatments earlier the same week without any ill effects. The only difference identified between these two groups was that a month earlier, animals in the affected mob had each been given a single injection of an inactivated bovine viral diarrhoea vaccine. There may have been a suspending compound or preservative in both the vaccine and the barium selenate (or in the anhelminthic pour-on) that could have caused the vaccine to sensitise the animals to the subsequent treatments.

A herd of 950 milking cows on an Otago farm were provided with a large number of lick blocks containing 20 percent molasses/sugar supplemented with minerals, vitamins and monensin. These blocks proved very popular and were gone within two to three days. Over this period many of the cows developed severe diarrhoea and the herd showed a production loss of around 2000 litres of milk. Production increased by 1000 litres and the diarrhoea stopped about another three days later. No cows died. This may have been a case of **sublethal monensin toxicity**.

SHEEP

A group of five-month-old lambs in the Tararua district were treated with selenised 5-in-1 clostridia vaccine plus a high-mineral drench. An unspecified number died and three liver samples were sent for analysis. The selenium concentrations were 84 500, 204 000 and 173 000 nmol/kg (reference range 450–10 000 nmol/kg), indicating **acute selenium toxicity**.

For several years, a North Canterbury farm has had a few lambs each year with scabby, highly proliferative lesions around the coronet of the hooves on all four feet. This year there were two such animals among a total of 2000 Corriedale lambs. Endemic contagious ecthyma has not been recorded on this farm and the lambs are not vaccinated against it. However, these lambs had lesions typical of a parapox infection. It is likely that this infection is due to **contagious ecthyma virus,** although infection with another parapox virus cannot be excluded.

On a small lifestyle block rearing orphan lambs in the Rangitikei district, there were two dead lambs and others showing evidence of black diarrhoea and weight loss. Histopathology of an affected lamb revealed severe erosive enteritis associated with large numbers of coccidia deep in the lamina propria. Less severe infections were present in the small intestine. These features confirmed a diagnosis of **coccidiosis**.

A mob of ewes with 400 lambs at foot were mustered for docking in Taranaki. The lambs had rubber rings placed on their tails, were earmarked and given a subcutaneous injection of long-acting Vitamin B12. They were also drenched with anthelmintic/mineral preparation containing sodium selenate and copper in addition to abamectin and praziquantel. Each lamb was given 3ml of this mixture – sufficient for a 15kg lamb, though the average liveweight was only 5kg. Eight lambs died overnight or the following day, and eight others were lethargic. Post mortem of the dead lambs revealed they had recently fed and were in good condition, but had froth in the trachea. No lesions were apparent on histopathology. Liver selenium concentrations were 11 300 nmol/kg (adequate > 450) and liver copper concentrations 420 mmol/kg (adequate > 300). Multiple procedures and **excessive selenium supplementation** most likely contributed to the lamb deaths.

On a large Southland sheep farm at least 17 one-month-old lambs were found dead 24–36 hours after tailing. During tailing they had been given Vitamin B12 and selenium by injection, plus a worm drench containing selenium. Affected lambs were found frothing at the mouth before dying. Necropsy of several dead lambs found 48 hours after tailing showed oedematous lungs that failed to collapse. Selenium concentrations in the livers of two animals were 20 300 and 31 300 nmol/kg (toxic level > 30 000 nmol/kg). Shortly after dosing these concentrations would have been much higher, as sheep excrete 50 percent of a selenium dose within 24 hours. Both selenium supplementation methods combined to produce **selenium toxicity** in these lambs, but it should be noted that injected selenium is about four times as toxic as selenium given orally.

Five hundred ewes and their lambs on a Southland sheep farm were shifted onto a paddock of relatively lush newly sown ryegrass. Next day 15 ewes and lambs were found dead. The farmer opened the gate and the rest of the animals were allowed to drift into a raceway, where 40 ewes became recumbent. These ewes were treated with a metabolic solution and most eventually recovered. Bloods taken from two recumbent ewes showed a hypocalcaemia (1.18 and 1.39 mmol/L; normal range 2–3). Sections of fixed liver and kidney from two or three ewes necropsied did not show any significant histological lesions. This paddock also contained a pool of stagnant water and there was a large amount of **fathen (*Chenopodium album*)** growing in areas where grass seed had failed to strike. This was likely an outbreak of **milk fever** induced by the ingestion of fathen**.**

DEER

One deer in a mob of 120 yearling wapiti cross stags on a Southland deer was found dead. This mob had last been drenched two months previously. A week later the mob was yarded to draft off 11 poorer animals. During this procedure one deer developed dyspnoea and promptly dropped dead. Another deer was seen with froth at the nose and breathing hard. Necropsy of the first animal showed both lungs were extensively consolidated and the intestine was very congested, with bloody contents. Histology was unremarkable except the lungs showed an extensive chronic interstitial pneumonia with a few eosinophils scattered throughout. No adult or larval lungworms were identified in these sections. The intestinal mucosa showed large areas of haemorrhage, which was likely a terminal change. Liver selenium, copper and Vitamin B12 concentrations were adequate. A faecal egg count showed 500 strongyle eggs/g, and larvae, possibly lungworm, were present in the same float, suggesting that relatively large numbers might have been present. It is possible that the lung changes were an unusual reaction to migrating **lungworm** larvae.

GOATS

A small mob of 10 pregnant Boer does on a rough block in Central Otago kidded normally but all the newborn kids appeared weak and unable to rise. Most of the kids also showed arthrogryposis and all died within three days despite supportive treatment. One three-day-old kid necropsied had a large thyroid weighing eight grams (normal weight 2–3) and a thick band of pale tissue through the myocardium surrounding the lumen of the left ventricle. Fresh liver from this kid had a very low selenium concentration (160 nmol/kg; normal > 500). Histopathological examination of a range of tissues showed a severe myopathy of both heart and skeletal muscle consistent with **white muscle disease**. No iodine or selenium supplementation had ever been given to the goats on this farm, and a similar problem had been seen in previous years.

PIGS

Large white weaner pigs on a Whanganui farm had lost their appetite and were losing weight. After developing yellow diarrhoea, one weaner died and was post-mortemed. Numerous ulcers were present in the caecum covered by an eschar of necrotic debris over regions of fibrosis and neovascularisation. ***Salmonella***

Typhimurium was cultured from intestinal contents, confirming a diagnosis of **salmonellosis**.

A small 15-sow Otago piggery experienced an unusually high death rate in 3–4-week-old unweaned piglets. This involved all litters. Clinically the affected piglets presented with acute severe watery diarrhoea before death. Necropsy of one recently dead piglet showed only a congested intestine. Histopathological examination of tissues showed a severe neutrophilic enteritis, a patchy lymphoid depletion of the spleen and a severe depletion of lymphocytes in all lymph nodes. The lymphocytes in the submucosal lymphoid follicles of the ileum were also depleted and replaced by large numbers of macrophages. Typical basophilic circoviral intracytoplasmic inclusions were seen in these macrophages. There were no lesions in sections of brain, lung, liver, kidney, heart or colon. No bacteria were isolated from the liver. This case of **postweaning multisystemic wasting syndrome (PWWS)** caused by **porcine circovirus type 2 (PCV2)** was unusual in that the clinical signs were relatively acute and the affected pigs were younger than usual. Commonly PMWS occurs post-weaning in five-to-12-week-old pigs and the affected animals usually fail to thrive. This outbreak could have been so acute in such a young age group because of co-infection with another infectious agent (perhaps *E. coli*) and a lack of colostral antibody protection.

CANINE AND FELINE

A one-year-old Labrador dog on a Southland farm suddenly became anorexic and was vomiting. An intestinal obstruction was suspected but radiographs of the abdomen and oral contrast media were unremarkable. Haematology test results were within normal ranges except for a marked hypercalcaemia (4.11 mmol/L; normal range 2–3), a moderate azotaemia (urea 25 mmol/L; normal range 2.5–9) and high creatinine (364 umol/L; normal range 48–109). **Cholecalciferol toxicity** was confirmed by an extremely high Vitamin D concentration in the same serum sample (> 2200 nmol/L; > 200 is toxic in humans). Initial treatment with fluids followed by conservative treatment with corticosteroids and gut protectants over the next six weeks eventually produced a recovery, although the specific gravity of this dog's urine remained low. Shortly after the diagnosis cholecalciferol bait for possums was found attached to a tree in an orchard on a neighbouring farm that the dog often visited. A packet, which would have been accessible to a dog, had been torn open.

NON-POULTRY AVIAN

A wild Malay dove was found dead in the grounds of a zoological park in Auckland. There were no significant findings at post mortem. Histopathology of the liver and kidney showed cytoplasmic basophilic smudged Giemsa-positive material (presumptive aggregates of elementary bodies of ***Chlamydophila*** spp.), consistent with **chlamydiosis**. MAF was notified. Previous cases have been reported in outbreaks in the Auckland area in previous years.

POULTRY

Increased mortality was observed in two flocks of poultry in the Waikato. Post mortem revealed spotty livers. Histologically there was moderate generalised fatty change and portal areas were frequently infiltrated with moderate numbers of mononuclear cells and heterophils. Scattered, irregular-shaped foci of necrosis and acute inflammation were present in both liver and spleen. The acute **necrotising multifocal hepatitis and splenitis** suggested an avian adenovirus infection, but intranuclear inclusions could not be detected.

Lameness and leg weakness at a broiler chicken unit in Taranaki led to an investigation. Histopathological examination of the femoral head of affected birds revealed multifocal necrosis and heterophil infiltrates. Visible bacterial colonies were centred in the necrotic debris. Microbiology cultured ***Staphylococcus aureus***, confirming a diagnosis of bacterial induced **necrosis of the femoral head**.

HORSES

Two cases of **ryegrass staggers** in horses were recorded during this period. A 12-year-old gelding from the Whanganui region showed signs of recurrent trembling and hindquarter ataxia and had a lolitrem concentration of 0.9 ng/ml. A 12-year old Standardbred from Hawke's Bay showed signs of hindquarter ataxia and had a lolitrem concentration of 0.8 ng/ml. Both of these levels are high enough to be associated with clinical signs of ryegrass staggers.

Streptococcus equi ssp. ***equi***, consistent with **strangles**, was cultured from swabs of purulent nasal or laryngeal discharge from six adult Thoroughbred horses from South Auckland with upper respiratory disease. ***Rhodococcus equi*** was cultured from a large pectoral abscess in a 40-day-old male Thoroughbred foal from south Auckland.

On a Waikato stud two foal mortalities were followed by two cases of abortion. The first foal died eight days after birth and was three weeks premature. The second mortality occurred in a two-day-old foal after it had developed respiratory distress. Subsequent to these mortalities two mares aborted. The carcass of the first foal had advanced post-mortem decomposition. The lungs were collapsed and consolidated throughout. Histology showed the lungs to be moderately autolysed with generalised congestion and alveoli containing proteinaceous material and large macrophages. Only a very few neutrophils were present. In some areas there was a layer of eosinophilic material lining the alveolar wall (hyaline membranes). The bronchiolar epithelium had sloughed in many bronchioles but there were few necrotic bronchiolar epithelial cells and none of these had intranuclear inclusions. These findings were consistent with **neonatal respiratory distress syndrome.** The second foal developed acute respiratory signs and died at two days old. Necropsy revealed marked generalised consolidation of both lungs. Histologically there was severe generalised pneumonia with alveoli containing fibrin, amniotic squames and large macrophages. Many alveoli were lined with a layer of homogeneous eosinophilic material. There was necrosis of some of the epithelium of terminal bronchioles. The adrenal cortex was congested and had multiple small foci of necrosis. Infrequent necrotic cells contained intranuclear inclusions. A re-cut section of lung had a terminal bronchiole with a few intranuclear inclusions in degenerate epithelial cells. This was consistent with an **equine herpes virus infection**. Histologically the two aborted foals had typical lesions of equine herpes virus infection. A second Waikato stud had one abortion and histologic findings consistent with an equine herpes virus infection.

ZOO ANIMALS

A 46-year-old chimpanzee died overnight after recovering from anesthesia for diagnostic tests. At necropsy the heart appeared enlarged and there were small areas of thickened endocardium on both the right and left ventricles. The liver margins were slightly rounded and there was a prominent meshwork of fibrous tissue evident on the surface. There were extensive adhesions throughout the abdominal cavity. The right ovary was about 9 x 5 x 3cm (a slightly flattened ovoid shape), firm and fibrous. The cut surface had multiple pale yellow nodules up to about 3cm in diameter. The uterus was rounded, firm and fibrous, about 12cm in diameter. There was chronic arthritis in the hip joints. Histology of the lung revealed frequent macrophages containing yellowish-brown granular pigment ("heart-failure cells") in alveoli. The kidneys had chronic glomerulonephritis that was most marked in the right kidney. The uterine mass was a **leiomyoma**. The heart had **chronic fibrosing cardiomyopathy**. This disease is a common finding in primates, especially in great apes in which sudden cardiac death is common (Lowenstein, 2003).

A nine-year-old female lemur in a Taranaki zoo died after a period of illness. Post-mortem examination revealed a jaundiced carcass and swollen liver, with haemorrhage in the duodenum. Myocarditis, myositis, hepatitis and encephalitis were seen on histopathology. Occasional zooites within lesions in the brain confirmed **toxoplasmosis** as the aetiology. A ***Toxoplasma gondii*** IgM antibody titre was also positive. Another lemur in the collection had died previously of the same cause.

New Zealand Veterinary Pathology

CATTLE

A mob of one-month-old calves in the Waikato developed diarrhoea. Faecal samples from three were submitted to the diagnostic laboratory, where testing demonstrated that all were infected with **rotavirus**. In addition, two were infected with ***Salmonella* Typhimurium** and one with ***S.* Senftenberg**.

Up to 30 percent of the cows in a dairy herd in the Waikato developed scabby skin lesions on the udder, typical of **dermatophilosis**. The farmer reported that applying topical sprays irritated the cows. ***Dermatophilus congolensis*** was cultured from a scab. The pathogenesis of dermatophilosis is that the bacteria colonise constantly wet skin when it becomes macerated. Early spring was unusually wet this year, with many consecutive rainy days.

Sometimes calves are infected by more than two agents of diarrhoea. A mob of four-week-old calves in the Waikato developed diarrhoea and five died in a 12-hour period. Faecal samples were submitted from four calves. **Rotavirus** and ***Cryptosporidium* sp.** were detected in two specimens, and ***Salmonella* Emek** was isolated from three calves.

Three faecal samples were submitted from a herd of 700 adult dairy cows in the Waikato. The cows had developed diarrhoea after grazing paddocks that had been recently fertilised with chicken faeces. ***Salmonella* Typhimurium** was cultured from all three specimens.

This spring there were more cases than usual of **salmonellosis** in adult dairy cattle. In an apparently typical case, cows in the Waikato presented with bloody diarrhoea, fever, lethargy and anorexia. ***Salmonella* Typhimurium** was isolated from faecal samples. Interestingly, the cows had been vaccinated against salmonellosis.

A mob of calves in the Bay of Plenty had previously been diagnosed with salmonellosis. Deaths continued despite vaccination. Faecal samples were submitted from five calves. Faecal egg counts demonstrated high numbers of ***strongyle*** eggs and the presence of ***Nematodirus* sp**. ***Yersinia pseudotuberculosis*** was also cultured from four of the five samples.

In the Bay of Plenty an adult cow presented with blindness. She did not respond to a person standing in front of her, but a palpebral reflex was present. A car battery in the paddock had sustained damage consistent with being chewed by a cattle beast. The cow's blood lead level was > 0.6 mg/L (bovine serum lead levels above 0.5mg/L are considered significant), confirming the clinical diagnosis of **lead toxicosis**.

Three-year-old mixed-breed cows in the Waikato experienced spontaneous fractures of the humerus. To determine whether the animals were copper-deficient, serum-ferroxidase activity of a number of animals was measured and found to be 7–9 IU/L (reference range 15–35). This supports a diagnosis of clinical **copper deficiency**. Because copper is stored in the liver, chronically inadequate copper absorption is necessary before a deficiency can develop. Copper deficiency leads to improper connective-tissue formation and predisposes animals to spontaneous fractures.

There were a few cases of **milk fever** occurring outside the immediate peri-parturient period. In a typical case in Taranaki two cows went down in the milking shed. They had classic signs of milk fever including muscle weakness, bloating, a rapid heart rate and weak pulse. Analysis of pre-treatment blood samples demonstrated **hypocalcaemia** and **hypophosphataemia**. The cows responded rapidly to administration of calcium borogluconate solution. Similar cases complicated by ketosis responded poorly to treatment.

Five cows in a Bay of Plenty dairy herd developed acute-onset blindness with marked hyphaema, subcutaneous bruising, anorexia and decreased milk production. Blood samples from two of the affected cows were submitted for analysis. A complete blood count demonstrated marked **thrombocytopenia** and mild **anaemia**. Thrombocytopaenia occurs sporadically in adult cattle and is presumed to be immune-mediated. In this case, three of the affected animals recovered after about one week. Two died from misadventure caused by their having become blind.

In Canterbury, six two-month-old calves presented with nervous signs suggestive of lead poisoning. They were bellowing, drooling, rolling their eyes, grinding their teeth and were lethargic. Two calves died and a post-mortem examination found paint flakes in the rumen. Blood from the remaining affected calves was analysed and elevated blood lead concentrations confirmed a diagnosis of **lead poisoning**. Lead-based paint has not been sold in New Zealand for more than 20 years, but occasionally calves are still kept in facilities made of old building materials painted with lead-based paint.

In the Manawatu a group 10-to-14-day-old dairy calves developed severe diarrhoea and one died. Two people in the calf-rearer's household also developed severe diarrhoea. Analysis of a faecal sample demonstrated **rotavirus** and a heavy ***Cryptosporidium* sp**. infection. Cryptosporidiosis is commonly transmitted from calves to in-contact people, particularly children.

A two-year-old Friesian-cross heifer in the Manawatu presented with bilateral corneal oedema, ulcers and blindness. Later, crusted erosive lesions developed around the coronary bands and mucocutaneous junctions. A post-mortem examination was performed and tissues were submitted for histopathology. In the brain there was the lymphocytic vasculitis characteristic of **malignant catarrhal fever** caused by **ovine herpesvirus 2**.

SHEEP

Four-to-six-week-old lambs on a Waikato property developed severe diarrhoea. Faecal samples from three lambs contained numerous **coccidial oocysts**. Under the semi-intensive to extensive sheep-rearing systems practised in New Zealand clinical **coccidiosis** in suckling lambs is unusual. The coccidians that infect sheep are typically ***Eimeria* sp**.

A mob of lambs in the Manawatu displayed chronic ill-thrift despite apparently good management. Serum samples were submitted from nine animals and five had low serum B12 levels. Low B12 is the result of dietary **cobalt deficiency** and the ill-thrift is caused by being unable to completely metabolise carbohydrate.

Four lambs in a mob of 400 in Hawke's Bay became lethargic and died within 24 hours. Another affected lamb was euthanased. The post-mortem examination findings were marked jaundice and haemoglobinuria. ***Leptospira* sp.** nucleic acid was detected in the urine by PCR, supporting a diagnosis of **leptospirosis**. The submitting veterinarian noted that the property had been extremely wet as a result of prolonged rain.

DEER

In the Manawatu six of 600 one-year-old hinds developed ill-thrift. Blood samples from three affected animals were submitted for laboratory analysis. All were serologically positive for **Johne's disease** and two had **low serum copper** levels. From time to time, Johne's disease occurs in young deer in an outbreak form.

CAMELIDS

A ten-year-old female alpaca in the Tasman district presented with ill-thrift and cachexia. It was euthanased and a post-mortem examination was performed. The abdomen contained about two litres of transudate fluid. The liver contained a large mass with a thick, fibrous capsule and a necrotic centre. The remaining hepatic parenchyma was replaced and distorted by abundant fibrous tissue. There were extensive fibrous adhesions between the organs in the cranial abdomen. In the lung there were multiple focal fibrous masses ranging from one to 12mm in diameter with a necrotic centre. The spleen had multiple white masses that were 2mm in diameter. Histopathology revealed that the liver and lung masses comprised neoplastic epithelium surrounded by desmoplastic fibrous tissue, consistent with a diagnosis of **metastatic biliary carcinoma**. The splenic masses were caseogranulomas, suggestive of **caseous lymphadenitis**.

HORSES

A uterine swab was submitted from an 11-year-old mare in Southland. A moderate pure growth of ***Serratia marcescens*** was obtained. *Serratia* spp. are occasional opportunistic pathogens.

Hepatic encephalopathy is rare in horses in New Zealand. Nevertheless a 20-year-old male pleasure horse in the Waikato developed undulating nervous signs suggestive of hepatic encephalopathy, and diarrhoea. Serum biochemistry was consistent with **severe liver disease**, with serum GGT of 1 518 IU/L (normal range 7–45); GLDH 324 U/L (normal 1–8 U/L); bilirubin 114 µmol/L (normal 10–42 µmol/L); albumin 21 g/L (normal 32–40) and urea 14.8 mmol/L (normal 3.0–9.2). As a result of the diarrhoea there were electrolyte abnormalities (hyponatraemia, hypochloraemia and hyperkalaemia). The clinical signs progressively worsened and the horse was euthanased. Necropsy revealed the liver was swollen and the cut surface had a "nutmeg" appearance. Histologically there was chronic severe diffuse hepatic fibrosis and replacement of hepatic parenchyma. Decreased functional hepatic mass is consistent with a diagnosis of **hepatic encephalopathy**. Progressive hepatic fibrosis in horses is most often attributed to ingestion of hepatotoxic plants such as ragwort (*Senecio jacobaea*), ngaio (*Myoporum laetum*) or rangiora (*Brachyglottis repanda*) (Parton *et al.*, 2006).

Over a one-week period three foals on a Waikato property developed mild colic, yellow, watery diarrhoea and mild dehydration, and became recumbent. Clinical biochemistry demonstrated low sodium and chloride ion concentrations typical of diarrhoea, and the serum amyloid-A concentration was high, consistent with inflammation. Analysis of a faecal sample ruled out rotavirus and *Cryptosporidium* infection, but ***Campylobacter jejuni*** was isolated. The farm staff reported experiencing gut upsets at the same time, and it would have been interesting to investigate whether these had been zoonotic or anthroponotic infections.

A ten-year-old Thoroughbred mare in Wanganui progressively lost weight over several months despite the owner's attempts to improve its condition. Laboratory investigation demonstrated that the mare had **low blood selenium** levels, and **cyathostome larvae** were detected in the faeces. Cyathostomes and other small strongyles that infect the large bowel can cause remarkable weight loss in horses.

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QUARTERLY REPORT OF INVESTIGATIONS OF SUSPECTED EXOTIC DISEASES

Exotic disease investigations are managed and reported by MAF's Investigation and Diagnostic Centre (IDC) Wallaceville. The following is a summary of investigations of suspected exotic disease during the period from October to December 2010.

Vesicular disease ruled out

A Waikato veterinarian called the MAF pest and disease hotline after examining a Hereford bull with suspected photosensitivity. Crusting of the skin and mucous membranes around the nose and eyes was evident and the tongue was hyperaemic, with loss of epithelium and papillae along the rostral margins. The remainder of the tongue, hard palate and sublingual and premaxillary gingiva appeared normal. An AsureQuality Initial Investigating Veterinarian (IIV) visited the farm under the direction of an Incursion Investigator. The remaining livestock on the farm (about 300 dairy cattle and three beef bulls) were inspected and a subset yarded for clinical examination including measurement of rectal temperatures. No abnormalities were found. Exotic vesicular disease was excluded on clinical and epidemiological grounds and a presumptive diagnosis of photosensitivity was made. Blood was collected and submitted to IDC Wallaceville for subsequent assessment of endemic differential diagnoses. A molecular assay for malignant catarrhal fever virus gave negative results, while biochemistry indicated hepato-biliary damage consistent with a diagnosis of secondary photosensitivity ("spring eczema"). The investigation was stood down.

A New Zealand Food Safety Authority (NZFSA) veterinarian called the MAF pest and disease hotline after examining a processed and cleaned omasum from a steer presented for slaughter that day. Numerous small (0.5–1.5cm) unruptured vesicles were identified affecting the leaves of the omasum, while the remainder of the forestomachs, abomasum and intestines was normal. Eighteen prime steers had been slaughtered that day, with no abnormalities identified at ante-mortem inspection. Under the direction of an Incursion Investigator all the abomasums and tongues, with associated gingival tissue, were inspected. Similar vesicles were identified in a further two abomasums. No abnormalities were identified in any of the tongue tissues. Exotic vesicular disease was excluded on clinical and epidemiological grounds and a presumptive aetiology of trauma associated with tripe processing and cleaning was identified. Histology carried out on the omasal tissues identified artefactual splitting of the muscle layer of the laminae, with the development of a cavity. Findings supported a diagnosis of post-mortal processing artefact. The investigation was stood down.

A veterinarian contacted MAF after noticing mouth and foot lesions along with drooling in one heifer, and drooling in one other animal on the same property. The property was grazing 700 dairy heifers. Animals from five different sources were present on the property. The last movements onto the property had occurred three months previously.

An IIV dispatched to the property noted that one animal was pyrexic with bilateral corneal oedema and poor body condition. This animal was salivating, but had no mouth or hoof lesions and was noted by the farmer to have been clinically ill for one day only. The second animal had lesions in the mouth as well as on the feet, was pyrexic, and had reportedly been losing weight for two weeks. Twenty-six in-contact animals were found to be clinically normal. Serum was collected from these animals. Visual examination of the rest of the animals on the farm showed no further drooling or lame animals.

Real-time PCR testing performed on the animal with corneal oedema was positive for malignant catarrhal fever. The animal with mouth and hoof lesions tested positive by ELISA for bovine viral diarrhoea (BVD) antigen, but negative for antibody, suggesting that mucosal disease had caused the lesions in this case. All other in-contact animals tested negative by ELISA for BVD antigen and positive for BVD antibody, indicating exposure and seroconversion. The investigation was stood down based on clinical and epidemiological findings in the field and the diagnosis of endemic disease.

A veterinary practitioner called the MAF exotic pest and disease hotline to report that a Miniature stallion recently released from quarantine following importation from the USA was salivating and had oral ulceration. The condition had been present since five days into the 14-day post-arrival quarantine period, and the quarantine station's attending veterinarian had considered sharp teeth the most likely explanation. These were treated in the quarantine facility by dental floating and mouth rinses. Gastroprotectants, anti-inflammatories and antibiotics were also given. The horse had remained afebrile throughout its illness and had tested negative to vesicular stomatitis virus by cELISA prior to export from the USA. Rabies was excluded on clinical grounds. A vesicular stomatitis virus VNT was negative for both New Jersey and Indiana serotypes. On endoscopic examination, as well as numerous small healing ulcers on the hard and soft palates, two granulomatous lesions were noted bilaterally in the upper mandible, adjacent to the rear teeth. Following this detection, treatment with sodium iodide was instituted and the horse made a rapid and uneventful recovery from the hypersalivation. A definitive cause of the lesions could not be determined, but it seems most likely that they resulted from trauma (for example, from sharp teeth) or exposure to a toxic or caustic agent, with subsequent entry of a bacterium such as *Actinobacillus lignieresii*.

BSE ruled out

A pathologist from New Zealand Veterinary Pathology called the MAF exotic pest and disease hotline to report histological lesions consistent with a possible aetiology of transmissible spongiform encephalopathy in two Friesian-cross cows. The cows were four and five years old, and came from a dairy herd in which a number of animals were exhibiting nervous signs. The two individuals had died rapidly after showing a variety of signs including ataxia, depression, seizures, blindness and frothing at the mouth. Histological assessment was confined to the locations within the central nervous system specified by the TSE surveillance programme. Histology identified moderate laminar vacuolation and oedema. An apicomplexan parasite was also identified in one of the animals. Samples were submitted to IDC Wallaceville for histological assessment by MAF's reference pathologist and for Bio-Rad ELISA testing. Testing of brain tissue samples from both cows gave negative results, and histopathology was consistent with acute laminar cortical necrosis (polioencephalomalacia), with no evidence of a spongiform encephalopathy. The apicomplexan parasite was considered inconsequential. Findings were consistent with sulphur toxicity, given that the cattle had been grazing paddocks recently fertilised with superphosphate. Exotic disease was excluded and the investigation was stood down.

Haemorrhagic septicaemia excluded

A Gribbles pathologist reported to IDC Wallaceville a disease outbreak in calves where sudden death and respiratory dyspnoea were key features. Over the course of the outbreak about 10 percent (90/900) of calves were affected. Specimens of heart, spleen, kidney and lung tissue and peritoneal fluid were submitted from one chronically affected calf that had been previously treated with enrofloxacin (Baytril®). Histology revealed a fibropurulent pleuritis/epicarditis/peritonitis. In lung tissue there was evidence of an area of chronic pneumonia and bronchiectasis. *Pasturella multocida* was not isolated by culture or detected by PCR, but the outbreak was not unlike other outbreaks reported in calves in New Zealand where a non-haemorrhagic septicaemia capsular type B strain of *P. multocida* has been isolated from affected calves.

Mycoplasma bovis excluded

A Gribbles veterinary pathologist called the MAF exotic pest and disease hotline to report histopathology findings suggestive of *Mycoplasma bovis* infection. The sampled animal was a dairy heifer from a farm chronically affected with respiratory disease. The histopathological finding of concern was severe chronic bacterial bronchiolitis. Samples for bacteriology, *Mycoplasma* culture and PCR testing for mycoplasma were submitted to the IDC Animal Health Laboratory (AHL).

Bacterial culture identified a *Ureaplasma* sp. Sequence analysis identified the isolate as most consistent with *U. diversum*. This finding is consistent with the clinical signs and case history noted by the referring veterinarian. In New Zealand, this organism is known to be associated with bovine respiratory disease and pneumonia in calves. Several secondary and opportunistic bacterial pathogens common in chronic bovine respiratory cases were cultured (e.g. *Hafnia alvei* and *Aeromonas* spp.). The exotic pathogen *M. bovis* was not detected by PCR testing and the investigation was stood down.

A Gribbles pathologist reported to IDC Wallaceville that *Mycoplasma bovis* could be a differential diagnosis for an outbreak of bovine mastitis on an organic dairy farm. Manuka honey had been infused into the udders of cows at dry-off as a form of dry-cow mastitis prevention. It was the first time this treatment had been used on the farm; it is not standard practice in New Zealand. A variety of bacterial species had been isolated from milk collected from cows with mastitis, including *Staphylococcus aureus*, *S. uberus*, and a further *S.* species that was coagulase-negative. On cytology the pathologist observed a large number of eosinophils. While a hypersensitivity reaction to the infusion of manuka honey is the most likely cause, eosinophilic mastitis has been reported to arise from the toxins produced from *M. bovis*. Milk samples collected from 11 cows with mastitis all tested negative for *Mycoplasma* species by PCR at the IDC and the investigation was stood down.

Enzootic bovine leucosis excluded

An official veterinarian overseeing a meat plant called MAF when he identified a tumour-like mass affecting the uterus and pelvic lymph nodes of an aged dairy cow. No other animals from a mob of 35 presented for slaughter that day were affected. Samples were collected and submitted for histopathology by MAF's reference pathologist to exclude enzootic bovine leucosis (EBL), a viral infection that causes neoplasia in cattle and is the subject of a control scheme administered by the dairy industry. The mass was identified as a uterine carcinoma that had metastasised to the draining lymph nodes, and the investigation was stood down.

Chronic wasting disease ruled out

A pathologist reported small vacuoles in the hypoglossal and vagal nuclei of the obex in the brain of a deer with chronic ill-thrift. The animal had been submitted for testing as part of the TSE surveillance scheme. MAF's reference pathologist determined that the changes were only mild and non-specific. There were no intraneuronal vacuoles and no vacuolation of the solitary nucleus and/or trigeminal tract. The brain stem tested negative using the BioRad TeSeE ELISA (ruminants).

Lameness outbreak in lambs investigated

A veterinarian contacted MAF after 40 percent of a flock of 600 12–15-week-old female lambs on a sheep-milking farm experienced an acute-onset lameness. There had been an incident three weeks prior to the outbreak where six lambs had similar signs. All the affected animals were bright and responsive, seeking water and shade, but were unable to rise. No fever or mouth lesions were noted in any of the animals. Some had foot scald between the cleats, but no lesions were present at the level of the coronary band. The veterinarian had visited the farm the day before calling the pest and disease hotline, at which time there were 30 lambs with clinical signs. This constituted about 40 percent of the lambs in the flock. None of the adult animals on the farm were affected and there was no decrease in milk yield. No new animals had been brought onto the farm within the six weeks preceding the outbreak. Lambs were being fed concentrate and pasture. This feeding programme had been in effect for the past month at the time of the incident.

Radiographs of a sacrificed lamb were taken to exclude pathological fractures. Liver samples were analysed for copper and selenium, and one animal was found to be low in copper although two others were not. Histopathology did not show any abnormalities in any tissues. PCR testing for mycoplasma was negative, and complete blood counts and biochemistry were normal, with the exception of GGT, which was markedly elevated.

Concentrate feeding was stopped and all lambs recovered within three to five days. No growth loss was noted.

Analysis of both the prior batch of feed and the batch being fed at the time of the outbreak revealed no abnormalities. It was concluded that laminitis was the most likely aetiology for the clinical signs displayed, and the investigation was stood down.

Equine herpesvirus myeloencephalopathy case inconclusive

An equine veterinary practitioner called the MAF exotic pest and disease hotline to report suspected equine herpesvirus myeloencephalopathy associated with equine herpesvirus type 1 (EHV-1) infection on a Thoroughbred stud property. A horse imported from Australia two weeks previously showed ataxia and hind-limb paresis, dysuria, radial-nerve paralysis and encephalitic clinical signs, and died 36 hours after the onset of disease. Head trauma was initially suspected and the horse was buried without necropsy.

A second horse imported at the same time exhibited similar clinical signs two days later, and this prompted the veterinarian to contact MAF. This horse later aborted (possibly as a consequence of corticosteroid treatment for the neurological disease), and a third horse, from another consignment, had aborted within 48 hours of arrival. Three further animals aborted over the following two weeks, but none displayed neurological signs.

Blood had been collected from the first animal prior to its death, and this was retrieved from a commercial veterinary laboratory. Serum from the second affected horse, horses that aborted, and fresh and fixed tissues, stomach contents and heart blood from aborted foetuses were collected and submitted to the AHL for testing. Paired sera were collected from 34 horses with varying degrees of exposure ranging from very high to low. Single sera were also collected from horses, whole blood from 30, and nasal swabs from 24 higher-exposure-risk animals. The property maintained good biosecurity and revaccinated horses for EHV (particularly any whose prior status was unclear), and maintained voluntary movement restrictions during the outbreak.

Hendra virus was excluded on clinical and epidemiological grounds. Sera were tested for antibodies against West Nile virus by VNT, EHV-1 and 4 by ELISA, and EHV by VNT. EDTA blood was tested for EHV-1 and WNV by PCR. The nasal swabs were tested for presence of virus by PCR for EHV-1. Foetal tissues and stomach contents were also tested by PCR for WNV and EHV-1. All WNV tests were negative. Nasal swabs from adult horses were also negative for EHV-1 by PCR, indicating that active shedding of virus was unlikely to be occurring at the time of onset of clinical signs, and that infection had possibly occurred some time earlier.

The serological picture was confused by vaccination. Eighteen horses were negative for EHV-1 in the ELISA at the time of acute sampling, and 18 were positive. Of the horses testing EHV-1-negative in the acute-phase sample, seven showed an increase in EHV VNT titre, but only two had a significant (fourfold) increase. Both these horses had been revaccinated in the week before the first blood sample was taken, and it is likely that the rising titre was associated with vaccination. All horses that aborted, and all animals with neurological signs, were ELISA-positive for EHV-1. Change in VNT titre could not be assessed for three animals, including both neurological cases, as the first neurological case died before a convalescent sample could be collected, and one animal that aborted died of haemorrhage following uterine artery rupture at the time of the abortion. The surviving neurological case had insufficient serum remaining for an acute-phase EHV VNT after other testing had been conducted, although the convalescent titre was higher than that of any other animal tested.

Of the five aborted foetuses, four had histopathology suggestive of EHV involvement, and three were PCR-positive for EHV-1, including the foetus of the surviving neurological case. Virus isolation was successful from three aborted foetuses, including one from a neurological case. EHV-1 was confirmed by DNA sequencing of part of the thymidine kinase gene.

To determine whether there was a genetic basis for the observed neuropathogenic EHV-1 effects, the ORF30 gene of the EHV-1 was sequenced from one of the isolates obtained from the brain of an aborted foetus. Analysis of the ORF gene sequences looked to identify a specific single-nucleotide polymorphism (SNP), which was examined in the isolate and was found to be consistent with the non-neuropathogenic strains of EHV-1 viruses. Sequences of the ORF30 gene from New Zealand EHV-1 isolates obtained about 30 years ago were sequenced together with the new isolate, and had the same pattern as the EHV-1 isolate obtained from the horses under investigation.

EHV-1 is known to be present in New Zealand, where it causes sporadic or epidemic abortion in horses, although equine herpesvirus myeloencephalopathy (the neurological illness caused by EHV-1) has not been reported. Stress can lead to a recrudescence of equine herpesvirus and cause clinical signs in animals infected some time previously, including vaccinated animals. The initial cases in this outbreak, and their close contacts, had recently been imported, so it is possible that a recrudescence of infection acquired elsewhere was involved. Vaccination is frequently employed in an attempt to reduce the impact of the infection in New Zealand and overseas, although disease may still occur in vaccinated animals. Some scientists associate EHV-1 myeloencephalopathy with a particular SNP at the ORF30 gene, although the significance of the sequence type is disputed.

The viruses obtained in this outbreak were sequenced and found not to be of the sequence type associated overseas with EHV-1 myeloencephalopathy. However, as none of those was obtained from the neural tissue of an animal showing neurological signs, it cannot be definitively stated that the neurological disease observed was caused by EHV-1, whether or not the virus was of a sequence type believed to be associated with myeloencephalopathy. Exotic causes of neurological disease were excluded in this investigation, but myeloencephalopathy associated with EHV-1 may be an emerging disease in New Zealand, and MAF would be interested to hear of any possible cases that arise in future.

Equine viral arteritis ruled out

A healthy three-year-old Thoroughbred gelding returned positive titres (1:4, 1:8) for EVA in VNT carried out during pre-export testing. Based on information provided by the farm owner, AsureQuality veterinarians, and the farm veterinarian, there was no clinical evidence to suspect EVA infection in the horse population at the property. A repeat serum sample was collected from the gelding, and from nine currently in-contact animals, to rule out any subclinical EVA infection. All of the in-contact animals returned a negative titre (< 1:2), while the gelding continued to return a positive titre (1:8), in the EVA VNT. The investigation concluded that there was no clinical or epidemiological evidence to support a diagnosis of EVA infection. Non-specific cross-reactivity is a known occurrence with the EVA VNT, and is consistent with the variability in titres identified for the gelding. Exotic disease was excluded and the investigation stood down.

Equine viral arteritis and equine infectious anaemia ruled out

A pathologist reported marked anaemia and neutropenia in a 22-year-old Thoroughbred gelding. The horse had been on the same property for the last 15 years, along with one other retired Thoroughbred. The private practitioner attending the animal suspected neoplastic disease because of the high calcium levels and decreased haematocrit noted in March of the same year. Since that time the animal had lost condition. VNT for equine viral arteritis (EVA) and a Coggins test for equine infectious anaemia (EIA) were both negative.

A Gribbles pathologist called the MAF exotic pest and disease hotline to report anaemia and lymphopaenia in an equine. The blood sample tested was from a very old (about 35 years) female Miniature horse. The horse had been mildly off food for two to three weeks and on the night of 27 October 2010 was completely anorexic. The primary veterinarian attended the horse and found nothing remarkable on clinical examination. There was also no epidemiological evidence or history to indicate that an infectious disease had been the cause of the previous clinical signs. In order to rule out current infection with EIA, the blood from Gribbles was requested for a Coggins test at the IDC AHL. The horse was given an injection of the NSAID drug flunixin and responded quickly. The Coggins test was negative for EIA and the investigation was stood down.

A veterinary practitioner reported a four-year-old gelding with a history of skin oedema and mild respiratory dyspnoea. The skin oedema was multifocal and distributed over the chest, flank and neck areas. No fever was present. The horse had not travelled overseas or had contact with recently imported horses. EIA and EVA were excluded using the gel-diffusion test and VNT respectively, on paired serum samples collected two weeks apart. The gelding recovered rapidly after receiving antibiotic and steroid treatment administered by the attending veterinarian.

Porcine reproductive and respiratory syndrome ruled out

A veterinary pathologist reported pigs from a small pig holder with a history of poor reproductive performance (small litter sizes of three to eight) and acute death of piglets, after identifying histological changes consistent with potential exotic diseases. Exotic animal diseases that could present in this way include porcine reproductive and respiratory syndrome (PRRS), Aujeszky's disease and classical swine fever (CSF).

There were two piglet mortality events on the affected farm that raised concern. The most recent, which prompted the report to MAF, involved the acute death of one of three piglets from a litter. The dead piglet underwent a post-mortem examination and tissues were collected for histological examination. The main findings were an interstitial pneumonia with fibrinopurulent pleuropneumonia and thrombosis, and a granulomatous splenitis and fibrinous serositis. A previous event, about two months earlier, involved the acute death of five piglets about three weeks old, from a litter of eight. A post-mortem examination was carried out on one of the three remaining weaner piglets that died some time later, and histological examination identified interstitial pneumonia and dilated cardiomyopathy.

An Incursion Investigator visited the property. The remaining pigs (two sows, a boar, and two piglets) were in good health with clean housing and adequate shelter. All adult pigs had been purchased from a market and originated from different properties. Serum was collected from the three adult pigs. Testing at IDC Wallaceville determined that the samples were serologically negative for CSF, PRRS and Aujeszky's disease. In addition, tissues (liver, kidney, tonsil, lymph node and spleen) were negative by PCR to these same diseases as well as porcine circovirus type 2 virus. The only bacterium isolated from culture of tissues (heart, lymph nodes, liver, lung, spleen, kidney, tonsil) was *Escherichia coli*, and tissues were negative by both culture and PCR for *Mycoplasma* spp. Exotic causes of piglet death and poor reproductive performance were excluded.

Human cutaneous anthrax investigated

Staff at a human medical laboratory notified MAF that enquiries had been made about diagnostic testing for a suspect case of human cutaneous anthrax in Taranaki. Contact was made with the Public Health Unit to obtain history of the case and offer assistance with testing. The affected person had developed a suspicious skin lesion following an incident where his hand was head-butted into the side of a calf-feeder by a calf. The spouse of the affected person was interviewed. No overseas travel was reported; all livestock on the property were reported to be in good health and no suspicious sudden deaths had occurred in recent times. However, there had been a cluster of acute calf deaths about a month earlier. These had been attributed to rotavirus or pneumonia. The property had been affected by heavy rains in recent months and soil was now dried and cracking; and apart from resowing of pasture in the preceding 12 months, no earthworks had been undertaken. Samples were submitted from the lesion to the MAF AHL for culture. The specimen was found to be negative for *Bacillus anthracis* by PCR and culture, and the investigation was stood down. Livestock anthrax cases last occurred in the Taranaki region in the early twentieth century. A cutaneous mycobacterial infection is presumed to have been the cause of the lesion.

Canine death in transitional facility investigated

An Official Veterinarian overseeing a dog and cat transitional facility informed IDC of a seven-year-old terrier bitch with a suspected abdominal mass. The dog was otherwise healthy and was four weeks into the mandatory three-month quarantine period for dogs entering New Zealand from South Africa. The owner consented to euthanasia of the dog after it failed to respond to medical treatment, and a post-mortem examination was carried out. The findings were unremarkable apart from an encapsulated multilocular mass (most likely neoplastic) attached to the trigone of the bladder. The brain was collected and submitted to IDC Wallaceville for rabies testing, as required by the import health standard for dogs from South Africa. Rabies immunohistochemistry tests conducted at the Australian Animal Health Laboratory, Geelong, were negative and the investigation was closed.

Brucella canis excluded

A veterinary practitioner called the MAF exotic pest and disease hotline to report a possible case of *Brucella canis* in a 10-year-old Huntaway farm dog with a history of dysuria and constipation. The dog had been born in New Zealand and never travelled overseas, although the farm had an ovine brucellosis problem (caused by *B. ovis*, which is widespread in New Zealand). On clinical examination it was found to have one shrunken testis and a swelling in the epididymis. The dog was castrated and the epididymal lesion was found to be purulent. Serum submitted for the *B. canis* card agglutination test was negative but a culture from the lesion yielded *Escherichia coli*. Histopathology of the testes and epididymis showed acute suppurative epididymitis and orchitis of the left testis, and atrophy of the right testis with interstitial cell tumours (the latter likely an incidental finding). The reaction seen was consistent with a diagnosis of *E. coli* infection. *E. coli* is a common cause of prostatitis and epididymitis/orchitis in dogs, which are often due to ascending infection.

A veterinarian contacted MAF after receiving histopathology results from a laboratory regarding tissues from a three-year-old male boxer dog with refractory testicular swelling. The veterinarian initially believed the swelling was due to trauma, as the dog had recently been hit by a car, but after the swelling failed to resolve both testes were surgically removed and histopathology revealed chronic suppurative epididymitis. The dog had been born in New Zealand and never travelled overseas, nor had it been mated with bitches that had originated or travelled outside New Zealand. A blood sample was collected and submitted to IDC Wallaceville. Serum tested negative in the *B. canis* card agglutination test, so *B. canis* was ruled out and the investigation stood down.

A private veterinary practitioner called the MAF exotic pest and disease hotline to report an eight-month-old Huntaway dog with orchitis and epididymitis. The dog had been born in New Zealand, was unmated and was the only dog on a farm. It had initially presented with lethargy and mild pyrexia, and was discovered to have one swollen testis. The dog's condition had deteriorated the following day, so it was castrated. At surgery, the unaffected testis was small but grossly normal, and the other showed evidence of epididymitis and orchitis. Serum biochemistry conducted the day after surgery showed evidence of hypercalcaemia, and the dog was euthanased after its condition continued to deteriorate despite antibiotic therapy. Serum was submitted to the AHL and tested negative for the *B. canis* card agglutination test. Histopathology of the testes and epididymal tissue showed evidence of a malignant tumour affecting the tunica vaginalis bilaterally. A diagnosis of bilateral testicular mesothelioma was made, possibly secondary to haematogenous spread from an abdominal tumour as tumour cells were present in veins. Testicular tumours are uncommon in young dogs. There was no evidence of an infectious cause of disease.

Paragonimus in a dog confirmed

A veterinary parasitologist called the MAF exotic pest and disease hotline to report the presence of *Paragonimus* eggs in a smear of respiratory tract mucus from an eight-year-old Rottweiller dog submitted by a private practitioner. *Paragonimus* is a trematode parasite found in the Americas, Africa and Asia. The dog, along with another from the same household, had been released from quarantine two months previously. The dogs originated from a coastal area of South Africa. Soft, frequent coughing had prompted the owner to seek veterinary advice, and chest radiographs were taken under general anaesthetic. On extubation traces of mucus and blood were visible on the ET tube, and a smear of this material was submitted for cytology. Microscopy of the sample showed unusual parasite ova, which were identified by a specialist Gribbles veterinary parasitologist as belonging to the genus *Paragonimus*.

Paragonimus spp. have a life cycle involving freshwater molluscs and freshwater crustaceans. Ingestion of the crustacean results in infection of the maintenance host. Flukes encyst in the lung tissue and lay eggs. The resulting irritation causes coughing, and then eggs are swallowed by the host and shed with faeces. Humans can act as the maintenance host if they eat poorly cooked or raw infested freshwater shellfish. Discussion with the owner revealed that the dogs had often eaten freshwater crabs while in South Africa.

Treatment of both animals was initiated, with praziquantel at 25 mg/kg three times daily for three days. Faecal egg analysis and complete blood counts were performed on both dogs on the day therapy started, and again a month later. Faecal re-testing was performed every fortnight. Initially one dog had *P.* eggs in the faeces, and a significantly elevated eosinophil count. Fourteen days after starting treatment, no more ova were detected in the faeces, and no further eggs were found in subsequent tests. One month after therapy, eosinophil counts for both animals were within the normal range. For the first month after therapy the owner collected and bagged all faecal material produced by the dogs and this was incinerated. Both dogs have now left New Zealand.

Leishmania ruled out

A Gribbles haematologist contacted MAF to report an imported dog with a mild, poorly regenerative anaemia and neutropaenia, and a history of gradual weight loss and dry, thickened and crusting skin. The dog had been imported from Ohio, USA, about two years earlier. Signs were consistent with a potential aetiology of leishmaniasis, a disease exotic to New Zealand. The dog was re-bled and samples were submitted to IDC Wallaceville, where they were tested for serological and antigenic evidence of *Leishmania* spp., with negative results. Further laboratory testing and a positive response to thyroxine supplementation indicated that the dog was hypothyroid. Exotic disease was excluded and the investigation stood down.

Rhipicephalus sanguineus confirmed

A six-year-old female Labrador recently arrived from Tonga on board a yacht was found to be carrying a live tick while undergoing biosecurity checks during post-arrival quarantine. The dog underwent insecticidal dipping and was held in quarantine while repeat blood testing was undertaken. The NZFSA veterinarian overseeing the quarantine facility re-examined the dog many times but no further ticks were found. The tick was identified by MAF's reference expert as a nearly fully engorged female brown dog tick, *Rhipicephalus sanguineus*. The dog was re-bled before release from quarantine and tested for serological and antigenic evidence of *Ehrlichia* and *Babesia* spp, with negative results. The kennel and associated bedding, shipping crate and contents were appropriately treated or disposed of. The dog owner was visited and interviewed by an Incursion Investigator, and the yacht inspected. There was no evidence of an established tick population. The dog was released from quarantine and will undergo bi-monthly tick treatment with Frontline® spray application over the next three months. *R. sanguineus* is known to have caused temporary infestations in North Island houses on three occasions, and is the most commonly intercepted exotic tick. It could become established in New Zealand, especially in northern parts of the North Island, or in heated houses in other parts of the country. No further action is required in relation to this detection.

Infectious bursal disease ruled out

The MAF AHL reported that infectious bursal disease virus (IBD) could not be excluded in two serum samples submitted for testing. The samples had been collected as part of routine surveillance in the poultry industry IBD control-and-eradication scheme, and had been referred to MAF for routine follow-up VNT testing because results exceeded the cut-off ELISA level in commercial poultry laboratory tests. Owing to cell toxicity, IBD could not be excluded in the two sera. The samples had been collected from broiler chickens at slaughter, and the entire house had been slaughtered by the time of notification. The farm concerned had not noted any increase in morbidity or mortality, and the house itself was newly constructed. Further blood samples were collected from the farm for screening ELISA, bursal samples were taken for histopathology, and the farm's morbidity and mortality records were reviewed. Further serum samples from the shed, and bursal histopathology from nine birds culled or found dead on the farm, were negative for IBD. The toxic reaction was likely due to serum lipaemia, which is uncommon in broiler chickens.

The MAF AHL reported that infectious bursal disease (IBD) virus could not be excluded in seven of ten serum samples submitted for testing. The samples had been collected from 52-week housed layer chickens as part of routine surveillance in the poultry industry IBD control-and-eradication scheme, and had been referred to MAF for routine follow-up VNT testing because results exceeded the cut-off ELISA level in commercial poultry laboratory tests. Two other sheds from the property sampled at the same time had tested negative in the ELISA. The VNT titres were low and could have been due to non-specific cross-reactions or cell toxicity. The farm concerned had not noted any increase in morbidity or mortality. Ten sera collected from the same shed a fortnight later were ELISA-negative; and of a further 100 sera collected six weeks after the first, 98 were also negative by ELISA. The two positive sera were referred for VNT, which showed low titres indicating a likely non-specific reaction rather than active infection. This, combined with the broader epidemiologic picture, excluded IBD infection on this property. The IBD ELISA has only 85 percent specificity under New Zealand conditions and the VNT is also imperfectly specific. Previous investigations have shown a low prevalence of VNT positives in IBD-negative New Zealand poultry flocks, and this is likely due to non-specific cross-reactions.

The MAF AHL reported that infectious bursal disease (IBD) virus could not be excluded in six of ten serum samples submitted for testing. The samples had been collected from 22-week free-range layer chickens as part of routine surveillance in the poultry industry IBD control-and-eradication scheme, and had been referred to MAF for routine follow-up VNT testing because results exceeded the cut-off ELISA level in commercial poultry laboratory tests. Two other sheds from the property sampled at the same time had tested negative in the ELISA, and chickens from the suspect shed had also previously tested negative in the ELISA four weeks previously when tested at a pullet rearer's property. The VNT titres were low and could have been due to non-specific cross-reactions or cell toxicity. The farm concerned had not noted any increase in morbidity or mortality. Ten sera collected from the same sheds a fortnight later were ELISA-negative; and of a further 28 sera collected from each of the three sheds six weeks after the first, 82 were also negative by ELISA. Two sera were positive and were referred for VNT, which showed low titres indicating a likely non-specific reaction rather than active infection. This, combined with the broader epidemiologic picture, excluded IBD infection on this property. The IBD ELISA has only 85 percent specificity under New Zealand conditions and the VNT is also imperfectly specific. Previous investigations have shown a low prevalence of VNT positives in IBD-negative New Zealand poultry flocks (particularly in young layers

14–30 weeks old), and this is likely due to non-specific cross-reactions.

Small hive beetle ruled out

A beekeeper called the MAF exotic pest and disease hotline to report an unusual grub found burrowing in the middle of a brood frame. He was concerned that it could be a larval form of the small hive beetle (*Aethena tumida*), an exotic pest of beehives. The larva was described as about 25mm long, creamy in colour with darker colouring at one end, and was found under a lighter-coloured capping in a frame of brood. Four cells had been burrowed through and there was some evidence the larva had been chewing the comb in the immediate vicinity. Problems or similar larvae had not been detected in other frames, hives or apiaries. The insect was submitted to the Plant Health and Environment Laboratory in Christchurch for identification, and found to be *Galleria mellonella*, the greater wax moth. This species is established in New Zealand and is a parasite of beehives.

An AsureQuality Apiary Officer contacted MAF after a member of the public reported fermenting honey frames, hive weakness and the presence of small beetles in a hive located in Fendalton, a suburb of Christchurch. The exotic differential of concern in this case was the small hive beetle, *Aethina tumida.* Adult bees were submitted for examination for exotic mites, and samples of the beetles were submitted to IDC Tamaki for identification. No tracheal or external mites were found. The beetles were identified as being in the family Nitidulidae, but were not *A. tumida*.

Brood samples were collected for bacteriology. Bacterial culture was negative for *Paenobacillus larvae* (American foulbrood, AFB), *Melissococcus pluton* (European foulbrood, EFB) and *P. alvei* (a saprophytic bacterium). Virus testing at IDC Wallaceville was negative by PCR for Israeli acute paralysis virus, deformed wing virus and Kashmir bee virus. However, molecular testing was positive for sacbrood virus, which is endemic in New Zealand. The Apiary Officer had described clinical signs consistent with sacbrood virus. Testing by PCR for *Nosema apis* and *N. ceranae* was positive. Since this was the first report of *N. ceranae* in the South Island, testing was performed with both the SYBR Green and TaqMan real-time PCR tests, and sequencing was performed for *N. ceranae*. Blast analysis of the amplicon sequence of the bee sample showed that it had a 99 percent homology with published *N. ceranae* gene sequences. This, in conjunction with the PCR results, demonstrated unequivocally the presence of *N. ceranae* in this South island bee sample. The investigation was stood down after exotic disease was excluded, as *N. ceranae* has been endemic in New Zealand since it was discovered in 2010 in the Coromandel area.

European foulbrood ruled out

An AsureQuality Apiary Officer called the MAF exotic pest and disease hotline after a commercial beekeeper reported a single hive with brood signs consistent with European foulbrood (EFB, *Melissococcus pluton* infection). The findings included dead and discoloured larvae and patchy brood. Eleven other hives at the affected apiary had healthy brood. The beekeeper had about 400 hives spread across 31 apiary sites. PCR testing and culture were both negative for EFB. Culture for the endemic bacteria *Bacillus larvae* (the causative agent of American foulbrood) and *Paenobacillus alvei* were also negative. The other endemic differentials for these clinical signs are half-moon syndrome and parasitic mite syndrome. The biosecurity investigation was stood down once the exotic differential had been ruled out.

A beekeeper contacted MAF after identifying changes to drone brood consistent with foulbrood in three of four hives in one apiary. Affected larvae were twisted and discoloured in a small number of drone brood cells. Brood samples from two hives were submitted to IDC Wallaceville for molecular analysis. Assays for *Paenibacillus larvae* (American foulbrood) and *Melissococcus plutonius* (European foulbrood) returned negative results. Further testing for sacbrood virus (endemic) returned a positive result in one of the two hives, and this was confirmed by sequencing. No evidence of exotic disease was found and the investigation was stood down.

Cape bees ruled out

An AsureQuality Apiary Officer contacted MAF after a beekeeper reported bees behaving like Cape bees (*Apis mellifera capensis*). A small number (<10) of bees in one of the beekeeper's eight hives appeared to be being fed by worker bees and attempting to lay eggs. Such behaviour would potentially be exhibited by Cape bees in a hive of European bees, owing to the former's higher pheromone levels. The bees and a collection of other bees from the affected hive were collected and submitted to IDC Tamaki. Taxonomic identification, including wing-length measurements and dissection to assess the number of ovarian follicles and size of spermatheca, were consistent with European honeybees (*Apis mellifera mellifera*). There was no evidence of exotic bee species and the investigation was stood down.

Bee mortalities investigated

A beekeeper in Whakatane had observed that bee mortality occurred at the same time every year when hives were placed in pastoral lands where a lot of maize was being grown. He suspected that imidacloprid poisoning was the cause of death. A test for imidacloprid was carried out on dead bees at AsureQuality, Lower Hutt, but it was not found to be within the limits of detection (0.01 mg/kg). In addition, the bees tested negative by PCR for Israeli acute paralysis virus and positive for *Nosema* spp., but sequencing was negative for *N. ceranae*. Bees were PCR-positive for the endemic Kashmir bee virus and deformed wing virus. Since the acute mortality event, colonies have been healthy with no further mortality events reported.

An Apiculture Officer from AsureQuality was contacted by a commercial apiary near Havelock North because of decreased breeding-stock production during spring. The officer called the MAF exotic pest and disease hotline to report that samples of adult bees had been collected and were available for testing if required. Another officer was sent to inspect several hives, report on the findings and collect further samples. The hives visited displayed no obvious signs of infectious disease on the day of the inspection, either in larvae or in adults. Further samples of adults were collected and tested for Israeli acute paralysis virus (IAPV), *Nosema apis* and *N. ceranae*. Five of the eight hives inspected were sampled (two of the remaining hives had been sampled previously) and four were positive for *N. apis*. None of the hives were positive for IAPV or *N. ceranae*. Having excluded exotic infectious disease and identified *N. apis*, the investigation was closed.

Colony collapse investigated

A member of the public called the MAF exotic pest and disease hotline to report the collapse of three hives in one apiary in the Little River area on Banks Peninsula. The three hives were reported to have been active and apparently normal until two weeks before the report. A cold snap had preceded the report, and when examined afterwards two hives were devoid of honey and one appeared to have been robbed. Very few dead bees were found, but adult bee numbers were very low. Brood, dead larvae and pollen were present in the hives. Clinical signs in the hive were not suggestive of European foulbrood as there were no sunken cappings, there was no smell, and the dead larvae were of all ages. The caller was concerned about the possibility that varroa might have caused the adult bee die-off. An Apiculture Officer carried out a field examination and concluded that one hive had died from starvation and the other two had probably succumbed to parasitic mite syndrome subsequent to varroa infestation. The beekeeper had not used any varroa preventative measures. Samples of live bees and larvae were submitted for testing at IDC-AHL Wallaceville to exclude exotic disease. Molecular testing was performed for the endemic fungal diseases *Nosema apis* and *N. ceranae*. One of the three hives tested positive for *N. apis* but all three were negative for *N. ceranae*. Clinical examination excluded American foulbrood (*Paenobacillus larvae*). Molecular testing was negative for the exotic viral disease Israeli acute paralysis virus. The exotic disease investigation was stood down. The colony deaths were attributed to parasitic mite syndrome, given the clinical signs and the results of diagnostic testing.

Bumblebee mortality investigated

A member of the public contacted MAF via the exotic pest and disease hotline after noticing 30–40 dead bumblebees under a lime (*Citrus*) tree in their garden. The sizes of the affected bees ranged from small to large. There was a history of spraying with insecticide 10–14 days previously. The caller was able to collect fresh samples and to submit them on ice to the IDC. Testing was performed to rule out exotic and infectious disease. The bees were examined for tracheal and external mites. No exotic mites or insects were found in the sample but there were large numbers of hypopi (immature stages) of phoretic mites (*Kunzia laevis*). These mites use adult bumblebees as a means of dispersal and are not parasitic. PCR testing was negative for Israeli acute paralysis virus, *Nosema ceranae*, *N. apis*, deformed wing virus and Kashmir bee virus. Lime trees have been reported to have narcotic or toxic effects on bumblebees, and in the absence of any disease identification this is thought to be the most likely cause of the mortality event.

A member of the public reported to the IDC Wallaceville that about 70 dead bumblebees had been found under a tree in a suburban garden. The tree was identified as *Grevia robusta,* a species known to contain cyanogenic glycosides in its flowers, and native to Australia where bumblebees are uncommon. No previous reports of this species being toxic to bumblebees could be found. Samples were submitted and testing was performed to rule out exotic and infectious disease. The bees were examined for tracheal and external mites. No exotic mites were found in the sample. PCR tests were negative for Israeli acute paralysis virus, *Nosema ceranae*, *N. apis*, deformed wing virus and Kashmir bee virus. Exotic disease was excluded, but no clear reason for the mortality event was found.

Southern saltmash mosquito excluded

On 28 October 2010 a Waimakariri District Council employee called the MAF exotic pest and disease hotline to report a call from a woman in the Kairaki Beach area regarding an unusually large number of biting insects over the previous two weeks. Upon speaking with the woman, the insects could not be clearly identified over the phone, and nor could the exotic southern saltmarsh mosquito be ruled out, especially since the area concerned was near an estuary. Therefore a sample collection kit was sent out to the woman, and a Mosquito Control Services (NZ) field technician visited the area to collect further samples as part of his routine surveillance work. An identification of *Aedes antipodeus* was made at Tamaki IDC. This mosquito is native to New Zealand and is known as the New Zealand winter mosquito. It breeds mainly in freshwater and tends to prefer larger water bodies rather than containers or puddles. There has been significant damage to field drains as a result of the September 2010 earthquake, and hence there may have been more habitat to enable larger numbers of this mosquito to breed.

A member of the public called the MAF exotic pest and disease hotline to report the sudden appearance three days previously of aggressive day-biting mosquitos with stripes, in St Martins and Lyttelton, Christchurch. The caller reported having seen similar mosquitoes the previous year and was concerned that they might be southern saltmarsh mosquitoes (SSM), *Aedes camptorhynchus*, which has been eradicated from New Zealand. National Saltmarsh Mosquito Surveillance Programme activity recently undertaken in the area found several established and endemic species, but no SSM. Specimens were submitted to the MAF Plant Health and Environment Laboratory at Tamaki for identification, but they were non-biting native chironomid midges and unlikely to have been the species causing the problem. The biting insect is most likely to have been *Ochlerotatus notoscriptus* (the striped mosquito), based on the description provided and recent surveillance programme findings in the area. This species is known to be established in New Zealand.

The IDC was contacted by a Department of Conservation staff member who was concerned that mosquitoes found in an estuary near Blenheim could be southern saltmarsh mosquito (SSM, *Ochlerotatus camptorhyncus*). The locality was close to where the last adult SSM had been found in October 2006, and where the last larvae were found in June 2008. New Zealand was declared free from SSM on 1 July 2010. Specimens of larvae and adult mosquitoes provided by the informant were identified at the IDC as *Opifex fuscus,* a New Zealand endemic mosquito commonly called the rock pool mosquito, which breeds in brackish and saline water. This mosquito has no known vector status, though it can host Whataroa virus under laboratory conditions. It regularly bites humans and is also suspected to bite seabirds and other coastal animals. It occurs around both the North and South Islands.

A member of the public contacted MAF to report a day-biting mosquito with striped body parts, seen around his home on the Coromandel Peninsula. Samples were collected and submitted to IDC Tamaki for taxonomic identification. They were identified as *Aedes (Ochlerotatus) antipodeus*, a native species. No further action was required with respect to this detection.

Exotic tick confirmed

A NZFSA Verification Agency Supervising Veterinarian called the MAF exotic pest and disease hotline to report that a dog just arrived from Australia had a tick embedded in the skin of its axilla. The tick could not be submitted for identification as it had been severely damaged during removal. The Australian exporter of the dog was contacted by the importer and after inspecting other dogs on the property reported finding several "scrub or paralysis" ticks. The dog was taken to a quarantine facility and treated for ticks. The travel crate was treated with insecticide and bedding was burned. No further ticks were found. The importer had not imported any personal effects with the dog and had not herself been to Australia to collect it. The dog was held in quarantine for three days of inspections. A subsequent retest for *Babesia gibsoni*, a tick-borne blood parasite of dogs found in Australia, returned negative results.

Risk goods investigated

A member of staff working on the dismantling of a C-130 Hercules aircraft called the MAF exotic pest and disease hotline after finding birds' nests containing dead birds in the tail section of the plane. The aircraft was being dismantled at Christchurch Airport after having been flown over from the USA. It had previously been cleared from quarantine, so this was regarded as a post-border detection even though the plane was still at the airport. A Biosecurity Inspector examined the find and oversaw the removal of all organic material by vacuuming of the cavity. The collected material was destroyed. A Museum of New Zealand Te Papa Tongarewa ornithologist identified the birds as most likely to be nestlings of the common starling *(Sturnus vulgaris)*. This European species has been introduced to many parts of the world (including New Zealand) and is widespread in the United States. Starlings are cavity-nesters, and often build nests inside buildings and other man-made structures.
The aircraft must have been parked at one site for four or more weeks for adults birds to have enough time to build a nest, incubate eggs to full term, and rear their young to this size. The plane had been in New Zealand for less than a month at the time of the report. This information supports the suspicion that the nests and birds originated outside of New Zealand. No further action was necessary as the nest and dead birds had remained confined to the airport complex, and decontamination was completed on the site.

A Biosecurity Inspector called the MAF exotic pest and disease hotline after a transitional facility (TF) manager reported that 600kg of frozen pork was missing at a recent stocktake. The pork had been imported from Canada two years previously and had been kept frozen at the TF since then. The product was not cleared to leave without first being treated.
The last stocktake had been carried out two months previously. A tracing investigation was mounted by Biosecurity Inspectors working under the direction of an Incursion Investigator, and the pork was located. The opinion of the Biosecurity Inspector was that the loss was the result of human error. The investigation also established that the pork had been treated during processing into ham, in such a way as to mitigate the biosecurity risk. The investigation was stood down and the Audit Department notified of the incident. An audit team will be investigating further to determine how the pork was allowed to leave the TF without being recorded.

A Biosecurity Officer reported to the IDC that food items including chicken wings and feet originally from China, could have been imported illegally. The importer in possession of the goods had no import documentation to demonstrate that the product had been imported legitimately. The importer claimed to have bought the product at a New Zealand market, and not by importing it directly from China. The product was voluntarily destroyed by the importer.

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MARINE

THE MARINE INVASIVES TAXONOMIC SERVICE

One of the largest biosecurity management challenges is the ability to obtain accurate and timely identifications of suspect samples. Current biosecurity trends have seen the rapid development of marine management strategies and an increased awareness of the risks posed by exotic marine organisms. Increased operational activities such as baseline port surveys, vessel hull surveys, and more recently, high-risk-site surveillance programmes, have resulted in a rapid increase in the numbers of samples being collected and requiring identification.

Previously, *ad hoc* arrangements for identifying specimens relied on the unpredictable availability of taxonomic expertise. This was inadequate, inconsistent, and lacked centralisation as identifications were largely left to the respective research providers to organise. A better identification service was required that would provide access to expert taxonomists, both within New Zealand and overseas. The service needed to provide consistent and timely identifications and reporting, and facilitate high sample throughput, accurate data management and maintain the chain of custody for evidential purposes.

Figure 1: The NIWA invertebrate collection.

MAF Biosecurity New Zealand (MAFBNZ, now MAF) and NIWA explored options for a taxonomic service specifically for marine biosecurity purposes, and the Marine Invasives Taxonomic Service (MITS) was formed. MITS is currently managed by Dr Serena Wilkens at NIWA, with technical assistance and access to a wide range of taxonomic expertise, mostly from NIWA scientists who are skilled at identifying exotic species and distinguishing them from native species.

The Marine Invasives Taxonomic Service (MITS) has been operational since November 2005, and is responsible for identifying and managing collections of all marine samples collected under biosecurity contracts with MAF. These services cover vessel biofouling, surveillance of high-risk sites, port surveys, border intercepts and passive surveillance (including samples reported by the public). MITS is funded by MAF and its services are provided by the the National Institute of Water and Atmospheric Research (NIWA) in Wellington.

MITS has formal, standardised processes from receipt of specimens through to final curation, with a dedicated biosecurity database and a museum collection. Currently the MITS collection is housed in the NIWA invertebrate collection (NIC) and is a central repository

Figure 2: The MITS collection.

for all the samples collected and identified through marine biosecurity programmes. The NIC houses a large proportion of known New Zealand offshore, sub-Antarctic and Antarctic marine species, and provides reference and research material for scientists around the world. It also includes a valuable reference collection of coastal marine species, including all of the currently documented exotic species now found in New Zealand.

To date, almost 68 500 samples have been processed through MITS, with about 1200 individual species having been identified. Just over 260 species (20 percent) are exotic organisms to New Zealand.

Two case studies below broadly outline the discovery and identification process for exotic crustacean species recently discovered in New Zealand.

CASE STUDY 1

JAPANESE MANTIS SHRIMP, *ORATOSQUILLA ORATORIA*

Figure 3: A, *Oratosquilla oratoria*, an introduced mantis shrimp, from Kaipara Harbour. B, native mantis shrimp, *Pterygosquilla schizodontia*.

O. oratoria (Squillidae) is a large edible mantis shrimp reaching almost 20cm in length. It was first captured in the Kaipara Harbour in November 2009 by commercial fishermen, and in early 2010 they contacted MAF, who arranged for specimens and photographs to be sent to MITS for identification. This species has subsequently been discovered further north, at Hokianga (Ahyong, 2010). Japanese mantis shrimps are comparatively large animals that live in shallow water, so it is unlikely that they would previously have gone unnoticed if they were also native to New Zealand. The specimens were accessioned into the MITS database and handed to a crustacean taxonomist.

O. oratoria is native to East Asia, ranging from Korea to Japan and China, where it is an important commercial species. It lives in burrows in soft sand and mud in sheltered bays and estuaries, and apparently readily colonises disturbed habitats. *O. oratoria* preys on shrimps, crabs and thin-shelled molluscs, and has dispersive pelagic larvae. It became established in Sydney Harbour, Australia, during the mid-1980s, and probably arrived in the ballast water of merchant vessels from East Asia. Its mode of introduction into New Zealand is not known, but it probably also arrived the same way, either directly from Asia or from Sydney Harbour.

Since the first specimen was sent to MITS in early 2010, other specimens have been collected by commercial fisherman from Kaipara Harbour. A voucher collection of *O. oratoria* is permanently housed in the MITS collection for reference and research.

Diagnostic characteristics used to identify the Japanese mantis shrimp include the jointed, articulated exoskeleton, specialised eyes and raptorial claws, distinctive arrangement of the spines and teeth on the tailfan, and lobes on the exoskeleton above the walking legs.

CASE STUDY 2

AUSTRALIAN GREASYBACK PRAWN, *METAPENAEUS BENNETTAE*

Figure 4: *Metapenaeus bennettae,* the introduced greasyback prawn. (Photo: www.daveharasti.com)

M. bennettae (Penaeidae) is a shallow-water eastern Australian prawn that supports an important fishery in New South Wales and southern Queensland. It was first captured in Auckland Harbour in August 2009 by a NIWA field team operating under MAFBNZ's targeted surveillance programme. The first specimen found was sent to MITS and identified.

M. bennettae grows to about 110mm long and typically lives in coastal rivers or shallow estuaries on muddy and silty substrates to a depth of about 15m (Grey *et al.*, 1983). Juveniles usually live in nearshore habitats such as mangrove mudflats and seagrass beds, whereas adults are more common in open embayments of the estuary. Both larvae and adults live inshore, so they probably first arrived in New Zealand as larvae in ballast water.

Diagnostic characteristics used to identify the Australian greasyback prawn include the spines and grooves on the head and rostrum, arrangement of spines on the legs, arrangement of the spines on the tailfan, smooth lower surface of the rostrum, and the reproductive organs.

In both these cases, rapid identification was made possible by the combination of taxonomic expertise and knowledge readily available to MITS, and formal processes to maintain the integrity of both specimen and data. It cannot be taken for granted, however, that this will always be possible for other species that show up in the future. As in other biosecurity programmes, maintaining capacity is fundamental; the ability to provide rapid and authoritative identifications depends on ongoing support for taxonomic research, enabling ongoing access to the best taxonomists.

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MARINE SURVEILLANCE IN NEW ZEALAND

New Zealand administers an exclusive economic zone of about 430 million hectares, ranging from sub-tropical waters around the Kermadec Islands to sub-Antarctic waters around Campbell Island. The net economic, environmental, social and cultural worth of all marine life in this area is incalculable, but we know that maintaining biodiversity is vital to realising it. Our current knowledge of marine ecosystems suggests about a third of all New Zealand's described native species occur in the marine environment, but much of this environment is still to be discovered in scientific terms.

New Zealand's marine biodiversity is constantly at risk from the introduction of exotic species. These can interfere with natural ecosystem processes, affecting native species assemblages by altering food-web dynamics and habitat, or exposing native species to new parasites and pathogens. Exotic marine species are mostly introduced in ballast water or from biofouling on vessel hulls associated with international trade and recreational travel.

MAF has an extensive system to try and prevent the introduction of exotic marine pests and diseases. This includes:

- developing and participating in international agreements to manage risks associated with ballast water and biofouling;
- developing and implementing import health standards to mitigate risk involved with the importation of commodities, and
- carrying out regular surveillance (particularly at high-risk sites), and a response and management network to reduce the risk of introducing harmful exotic species.

Marine surveillance for biosecurity

The core purpose driving surveillance activities is to detect new marine pests and diseases early enough so that eradication is feasible. One of the initial challenges is to understand present biodiversity across large areas of potential habitat, and to develop taxonomic knowledge to detect unknown and adventive species. Accordingly, MAF has undertaken baseline surveys to compile an inventory of native, exotic and cryptogenic species found at international shipping ports throughout New Zealand. The enormous amount of biological material collected in these surveys forms the basis of the Marine Invasives Taxonomic Service (MITS) reference database to help distinguish newly-arrived exotic species from native species. To date, the port baseline surveys have identified more than 1140 native and exotic species from ports around the country.

After initial baseline work, MAF established a long-term re-surveying programme. Together with information from the targeted surveillance programme, this provides a measure of the rate of invasion by exotic species, the success of border controls and the effectiveness of vector and pest management.

The current marine surveillance programme aims at achieving a high early detection rate for incursions of key exotic species listed on the Unwanted Organisms Register at high-risk international points of entry (see Figure 1). To achieve this we rely on risk-based profiles of key exotic species at each point of entry to determine the best allocation of sampling effort in the course of

Figure 1: High-risk international maritime points of entry to New Zealand. This figure shows targeted surveillance locations with confirmed identifications for *Sabella spallanzanii*.

surveillance activities. This helps ensure the maximum likelihood of detecting an incursion. The desired level of confidence in the reliability of the detection process is based on MAF's practical response measures and potential management required to carry out duties under the Biosecurity Act 1993.

The marine surveillance programme carries out surveys at each of these high-risk sites for the target organisms described below. None of these species are known to be present in New Zealand waters at this time. Methods used include trapping and underwater or shore searches. All sites surveyed are plotted using GPS to enable accurate site relocation in later surveys. Any suspect samples collected are sent to MITS. If a positive exotic species identification occurs through surveillance activities (via the targeted surveillance programme or the exotic disease and pest hotline) and is confirmed by MITS, MAF will investigate the incursion.

Target exotic species for marine surveillance

NORTHERN PACIFIC SEA STAR, *ASTERIAS AMURENSIS*

Figure 2: *Asterias amurensis* (Northern Pacific sea star) (photo: CSIRO)

The northern Pacific sea star is native to the coasts of China, Korea, Russia, Japan and Alaska. Its introduced range now includes Australia. This species preys on a large range of organisms, particularly shellfish, and is reported as having a significant impact on shellfish aquaculture.

EXOTIC *CAULERPA* SEAWEED

Figure 3: *Caulerpa taxifolia*

C. taxifolia is native to the Atlantic Ocean (Caribbean and tropical African coast), the Indian Ocean, northern Australia and the tropical Pacific Ocean. Introduced aquarium strains are known in at least three regions outside the native range, including the Mediterranean Sea, southern California, and parts of New South Wales and South Australia. *C. taxifolia* occurs on all types of substrate and has the potential to adversely affect native seaweed communities and reduce species diversity.

ASIAN CLAM, *POTAMOCORBULA AMURENSIS*

Figure 4: *Potamocorbula amurensis* (Asian clam) (Photo: USGS)

The Asian clam is native to China and parts of Russia and Japan. However, it has extended its range to include abundant populations in California, particularly in San Francisco Bay. The Asian clam inhabits subtidal estuarine and freshwater environments. It can form very high densities that reduce the availability of phytoplankton and zooplankton food for native species, and destabilise the substrate.

EUROPEAN GREEN OR SHORE CRAB, *CARCINUS MAENAS*

The European green crab is native to the Atlantic coasts of Europe and northern Africa. It has also become

Figure 5: *Carcinus maenas* (European green crab, otherwise known as European shore crab) (photo: CSIRO)

established on the eastern Atlantic and north Pacific coast of North America, and also in South Africa and Australia.

This crab is omnivorous and known to prey on and significantly reduce shellfish populations. It also preys upon other crabs.

CHINESE MITTEN CRAB, *ERIOCHEIR SINENSIS*

The Chinese mitten crab is native to northern Asia, extending throughout coastal rivers and estuaries of

Figure 6: *Eriocheir sinensis* (Chinese mitten crab)

mainland China. Its introduced range now includes northern Europe, North America and Hawaiʻi.

The Chinese mitten crab occupies freshwater and estuarine habitats and excavates extensive burrows along riverbanks. It feeds on vegetable matter and small invertebrates including polychaete worms and bivalves. It is also one of the immediate hosts of lung flukes, including *Paragonimus ringeri*, a species that infects humans.

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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 MAF's Investigation and Diagnostic Centre (IDC) Wallaceville. The following is a summary of investigations of suspected exotic marine diseases and pests during the period from October to December 2010.

Genetically modified zebra danio fish confirmed

In 2007, an investigation was carried out into the importation of genetically modified (GM) zebra danio fish (*Danio rerio*). These had been imported without being declared as GM, so they were unauthorised goods under the Biosecurity Act and new organisms under the Hazardous Substances and New Organisms (HSNO) Act. Several hundred fish were seized and destroyed, but it was acknowledged that some might not have been located.

In July 2010 a member of the public contacted MAF to report that he had bought some zebra danios from a private breeder in Nelson and subsequently become aware that they might be genetically modified after reading information on the internet. In September 2010 another member of the public notified MAF that she had bought some zebra danios from a garden centre in Nelson, and after speaking with a local pet store owner she suspected these were GM. The garden centre was reported to have sold fish supplied by the same private breeder who had supplied the fish reported in July. The suspect fish were voluntarily relinquished to MAF and destroyed. PCR testing for the red fluorescent protein (RFP) gene confirmed that they were genetically modified. These fish are thought to be the progeny of survivors from the original incursion that could not be traced and destroyed during the 2007 response.

Concurrently, an online auction for "red danios" came to MAF's attention. These fish were bought via the auction and destroyed, and the seller provided details of the fish breeder from whom they had been obtained. To date, however, these fish have not been linked to the Nelson breeder but appear to have been distributed by an unconnected private breeder.

GM danios in New Zealand are considered a low risk to economic, environmental and human health values, and medium risk to social and cultural values. Danios are a tropical species and are unlikely to survive here in the wild. It appears that there is little or no export of aquarium specimens from New Zealand, so trade is unlikely to be affected. As they are likely to have been incorrectly declared on importation as unmodified danios, any disease and pest risks they may have posed have already been addressed through the post-entry quarantine. The genetic modification is unlikely to increase the invasive potential of *Danio rerio* in New Zealand. Aquarium fish are very unlikely to be eaten, but if they are, the risks are likely to be the same as with eating unmodified aquarium fish.

There are significant public and stakeholder concerns regarding GM organisms, and New Zealand takes pride in its "clean, green" image. The presence of these fish may impact on that reputation unless appropriately managed. Additionally, the distribution of illegal and unlabelled GM danios in the aquarium trade could damage the reputation of the entire industry and hobby.

Information from this investigation was provided to the MAF Enforcement Group. A biosecurity response was initiated with the primary objective of supporting the Enforcement Group's activities, as well as actively discouraging such activities as breeding and distributing a new organism without authorisation.

Iridovirus confirmed in post-entry quarantine

A New Zealand Food Safety Authority (NZFSA) Verification Agency (VA) veterinarian reported the detection of iridovirus in ornamental fish *Pterophyllum scalare* (angelfish) being held in post-entry quarantine at the transitional facility in Auckland. This batch of fish was tested to meet the conditions of the import health standard for importing ornamental fish and marine invertebrates from all countries (fisornic.all), because 52 percent of them had died soon after arrival in May 2010. Exotic iridoviruses are of concern to New Zealand, because the susceptibility of our native fish species is unknown. Further, the importation of ornamental fish has been identified as a pathway for the introduction of iridoviruses (including dwarf gourami iridovirus) to Australia. The infected batch of *P. scalare* was part of a larger consignment of fish. Significant mortality was observed in four other batches of fish, of which all were destroyed. All other fish within the consignment had completed the six-week quarantine period and had since been given biosecurity clearance. The veterinarian confirmed that the water filtration system operating in consignment rooms had been regularly maintained and was adequate to destroy iridoviruses, and that equipment such as nets was kept separate between tanks; and therefore that no contact had occurred between the infected and cleared fish. The MAF Animal Imports Team advised the operator that the remaining *P. scalare* would need to be destroyed (under supervision of the VA veterinarian) and the investigation was stood down.

Exotic marine alga excluded

A species of marine alga proliferating in Northwest Bay, Pelorus Sound, was reported by a member of the public. A specimen was submitted to the Marine Invasives Taxonomic Service (MITS), where it was identified as *Cladophora* sp. The taxonomy of this species is not well understood but it is considered native to New Zealand, and is known to proliferate in spring in response to increased light and temperature, and occasionally nutrients. The informant was notified of the results and the investigation stood down.

Exotic crab excluded

A marina staff member reported two unusual crabs from the hull of a vessel that had been apparently abandoned in Tauranga Harbour and towed in by the harbourmaster. The vessel had been there for at least five years and was not known to have travelled out of the harbour during this time. Photos of the crabs sent by e-mail indicated that both were native species, *Petrolisthes elongatus* (commonly known as the New Zealand half-crab) and *Pilumnus novaezelandiae* (New Zealand bristle crab). The marina was notified of the results and the investigation stood down. Specimens were added to the NIWA reference collection.

Freshwater crayfish mortality investigated

A member of the public called the MAFBNZ exotic disease and pest hotline to report that she had found a large number of dead freshwater crayfish or koura (*Paranephrops* sp.) in a creek near her home in Thames. She had last visited the location four days previously and noted nothing unusual at that time. No other animals or plants seemed to be affected. Land upstream was reported to primarily consist of conservation estate. The caller collected specimens of the dead crayfish, which were badly decomposed and sent to the MAF Animal Health Laboratory for necropsy and histopathology. The Thames–Coromandel District Council was also contacted, and sent a parks staff member to the location, who reported that, apart from low water levels and low flow rates, nothing appeared unusual. The crayfish were moderately decomposed, but histological examination revealed no evidence of an infectious cause. The event had not progressed or recurred and so the investigation was stood down.

Marine biofouling investigated

A boatyard staff member reported a large amount of marine biofouling on a yacht that had been moored in Kerikeri Inlet. The yacht had never travelled overseas, but had a large number of tubeworms on its hull when it was brought in for cleaning and antifouling. The notifier was concerned that the tubeworms were a potential new pest to the area. Specimens were sent to MITS, where they were identified as the hydroid *Hydroides ezoensis* and the bryozoan *Watersipora subtorquata*. Both species are exotic but established in New Zealand. No further action was taken and the investigation was stood down.

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PLANTS AND ENVIRONMENT

HIGH-RISK EXOTIC MOSQUITOES OF INTEREST TO NEW ZEALAND

Exotic mosquitoes are of medical and veterinary importance to New Zealand owing to their potential to become established, act as vectors for disease and cause secondary health impacts. Here we highlight two quintessentially Australian species regarded as high risk to New Zealand. We provide background on the human and animal health importance of these insects.

As of early 2011, New Zealand remains free of any locally transmitted mosquito-borne diseases of medical and veterinary importance. However, this status is constantly challenged by the threat of accidentally imported high-risk exotic mosquitoes. The risk status of individual species is evaluated from their importance as vectors of disease and the likelihood of their successfully establishing and spreading here.

In 2007 the mosquito species of high risk (as determined by likelihood of entry and establishment and potential to vector disease here) were listed in a MAF report (Mackereth *et al*., 2007)**.** The species with their common name/s and status include:

Culex (Culex) quinquefasciatus (southern house or brown mosquito). Introduced.

Aedes (Finlaya) notoscriptus (domestic container, or striped, or ankle-biting mosquito). Introduced.

Aedes (Ochlerotatus) camptorhynchus (southern saltmarsh mosquito). Introduced but declared eradicated in 2010.

Aedes (Stegomyia) albopictus (Asian tiger mosquito). Exotic.

Aedes (Finlaya) japonicus (Japanese rock pool or Asian bush mosquito). Exotic.

Aedes (Ochlerotatus) vigilax (saltmarsh mosquito). Exotic.

Culex (Culex) annulirostris (common banded mosquito). Exotic.

This list has since been extended (McGinn, 2008) to include:

Aedes (Ochlerotatus) procax and

Coquillettidia (Coquillettidia) linealis.

Ae. camptorhynchus was detected in Napier in December 1998, and after nearly 11 years and at a cost of about $70 million, was declared eradicated from New Zealand in June 2010. However, it remains a high-risk species, especially given its demonstrated capacity to establish across much of the country's saltmarsh habitat.

Drivers for exotic mosquito surveillance

PUBLIC HEALTH

New Zealand is a signatory to the International Health Regulations 2005 (IHR 05), which set out obligations to control international movement of biological, chemical and radiological hazards to public health. Included among the biological hazards are vectors of human disease, such as mosquitoes. A recent review of vector surveillance in New Zealand (McKenzie *et al*., 2009) identifies a number of exotic arboviruses of high to medium risk: West Nile virus (WNV), yellow fever virus (YFV), Murray Valley encephalitis virus (MVEV), Ross River virus (RRV), Sindbis virus (SV), and Barmah Forest virus (BFV). Four of these viruses occur in Australia. In terms of prevalence,

TABLE 1: ANNUAL NOTIFICATIONS OF SELECTED MOSQUITO-BORNE DISEASES IN QUEENSLAND, 2000–2009 (ANON., 2010)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BFV disease	345	601	387	869	583	680	955	826	1 245	797
Dengue fever	85	42	81	725	275	117	78	120	245	1 033
Japanese encephalitis	0	0	0	1	1	0	0	0	233	0
Kunjin virus disease	0	0	0	6	5	1	1	0	0	1
Murray Valley encephalitis	0	1	0	0	0	0	1	0	0	0
Ross River fever	1481	1568	885	2514	2005	1179	2611	2137	2846	2149
Yearly total	**1911**	**2212**	**1353**	**4115**	**2869**	**2253**	**3645**	**3083**	**4325**	**3981**

RRV and BFV are the most abundant across all Australian states and territories. As an example, Table 1 shows the yearly notifications to the Queensland Department of Health of some mosquito-borne diseases.

RRV and BFV are alphaviruses maintained in a zoonotic cycle between mosquito and vertebrate (usually macropod) host. Where environmental conditions encourage mosquito abundance and longevity, human populations are more exposed to the risk of virus transmission. Infection by RRV or BFV may result in no symptoms (in the majority of cases where they are endemic, and especially with children), but 10–20 percent of infected individuals exhibit mild to severe symptoms including mild fever and rash with a polyarthritis affecting the joints of the hands, feet and knees. Joint pain may last from several weeks to many months. People of working age suffer most with RRV and BFV. In areas where there is no RRV or BFV exposure, so-called "green field" epidemics may produce very high rates of clinical disease: for example, more than 90 percent of the population of Vanuatu developed clinical RRV in 1979–80 (60 000 cases).

Disease notifications listed in Table 1 represent only the reported clinical disease burden in the community. The incidence of infection is much greater but many cases are not reported because symptoms are unapparent or mild. The true activity of RRV and BFV in Australia therefore cannot be accurately described, but clearly they are highly prevalent and there is a very real threat of their being introduced to New Zealand by travellers who are viraemic (whether symptomatic or not). Only the absence of the mosquito vector breaks the potential cycle of disease transmission in New Zealand.

VETERINARY HEALTH

McKenzie *et al.* (2009) identify bovine ephemeral fever virus (BEFV) as having a medium risk of entry to New Zealand. While the arthropod vectors of BEFV are not well known, they are likely to belong to the mosquito species and possibly also include biting midge species of the genus *Culicoides*, that feed on cattle.

RRV infection also causes clinical disease in horses. Fever, polyarthralgia in leg joints, and lethargy are the common signs. Also of concern to New Zealand is the dog heartworm *Dirofilaria immitis*, vectored by mosquitoes including *Aedes (Ochlerotatus) vigilax* and possibly *Culex annulirostris*.

Even non-infectious mosquito bites can have a variety of effects. Allergens introduced to the host animal in mosquito saliva can produce a variety of reactions, for example even moderate numbers of bites can provoke porcine allergic dermatitis syndrome (PADS) in pigs. Figure 1 shows a living pig with numerous raised lesions associated with PADS at bite sites. Fair-skinned breeds are especially sensitive. Affected pigs show signs of this reaction at slaughter (Figure 2). Affected carcasses are highly devalued, not exportable, and generally only fit for rendering.

Figure 1: PADS-affected pig after mosquito attack

Figure 2: Mosquito-marked pig carcass after slaughter

Two high-risk exotic mosquitoes

Aedes (ochlerotatus) vigilax

Figure 3: *Ae. vigilax*

Ae. vigilax (Figure 3) includes at least two subspecies whose type localities are Gosford, New South Wales and Brisbane, Queensland. Overall, the species has a wide distribution within Asia and Australasia, including the Seychelle Islands, Taiwan, Philippine Islands, Ryukyu Islands, Vietnam, Thailand, Malaysia, Indonesia, East Timor, West Irian, Papua New Guinea, Australia, Solomon Islands, Vanuatu, New Caledonia (including the Ile des Pins and Loyalty Islands), and Fiji (Lee *et al.*, 1984).

This species is essentially coastal and, like *Ae. camptorhynchus*, occupies saltmarsh in estuarine habitat flooded by spring tides, storm activity and wind-driven wave action. In Australia it also occurs inland where brackish-water habitats exist along river overflows and irrigation areas subject to salinisation. *Ae. vigilax* is found in all states or territories of Australia except Tasmania. In Victoria it occurs along the coast northeast of Gippsland, and in South Australia along the gulf regions. *Ae. vigilax* occurs in Australia at least as far south as 38°, which corresponds in New Zealand to near Gisborne. It is therefore highly likely that if *Ae. vigilax* were to penetrate New Zealand border security, it could find suitable habitat to establish itself.

Ae. vigilax is a competent vector of several important arboviruses and parasites of both medical and veterinary importance including RRV, BFV, dog heartworm and potentially also Chikungunya virus.

Culex (Culex) annulirostris

Figure 3: *Ae. vigilax*

C. annulirostris is a species complex that likely consists of several similar species and has a wide Australasian distribution (type locality: Blue Mountains, New South Wales, Australia). Within Australia it is found in every state or territory, although only once recorded in Tasmania, and is commonly found in fresh or brackish ground pools filled by rainwater runoff. These groundwater pools commonly include emergent vegetation, especially grasses. This species breeds in very high numbers in pools in pastures where animal manure increases nutrient loads, and is also found in oxidation ponds. It also sometimes colonises relatively small containers such as drinking troughs and barrels.

An extract from The Culicidae of the Australasian Region volume 7 (Lee *et al.*, 1989) reads:

"With regard to New Zealand, D.H. Graham (1339) records that on 10.vi.1929 the s.s. "Tofua" from Fiji, berthed in Auckland, was inspected and a half-barrel containing several thousand larvae and pupae of *Cx. annulirostris*, from which adults were continually emerging, was found. Two months later a barrel containing many larvae of this species was found on the waterfront, about 300 yds (275m) from the berthing-place on the waterfront. They were all destroyed, and a search in nearby water receptacles proved fruitless."

The presence of *C. annulirostris* in the southern states of Australia suggests it could probably establish in some parts of New Zealand. It can live in a wider range of habitats than the saltmarsh mosquito, and potential habitats near ports of entry would be most likely to become colonised first.

C. annulirostris is a highly competent vector of several arboviruses, including Murray Valley encephalitis virus, Kunjin virus (closely related to West Nile virus), Ross River virus and Barmah Forest virus. It is also likely to play a role in the transmission of dog heartworm.

Present surveillance

Surveillance for exotic mosquitoes is jointly managed by the Ministry of Health (MoH) and MAF. Under the IHR 05, MoH has lead-agency responsibility for responding to port detections, while post-border responses are the sole responsibility of MAF. Port surveillance consists of routine monitoring to detect exotic mosquitoes at all developmental stages. Ovitraps and light traps are maintained at ports year-round to attract and capture mosquitoes, while MAF inspects vessels and goods for the presence of mosquito larvae and adults. Detections of suspected exotic mosquitoes are responded to under a memorandum of understanding between MoH and MAF.

A major surveillance programme of all saltmarsh habitats within New Zealand was developed during the southern saltmarsh mosquito eradication programme. This programe was originally developed and administered by the MoH in 2005, but responsibility for the National Saltmarsh Surveillance Programme (NSP) was transferred to MAF Biosecurity New Zealand in June 2010. The NSP is a risk-management programme of field inspections within saltmarsh habitat, which aims at early detection of exotic saltmarsh mosquitoes (both larvae and adults). The recent review of surveillance of vectors and vector-borne disease in New Zealand (McKenzie *et al.*, 2009) has identified an additional need to include suitable receptor habitat for *C. annulirostris* in post-border inspections.

Continual improvement and development of border and post-border surveillance for exotic mosquito surveillance is essential. Early detection of the southern saltmarsh mosquito (which had apparently been present for years before it was discovered in 1998) would likely have saved the country many millions of dollars in eradication costs. Accordingly, the current investment in early detection should pay dividends in the future.

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PLANT AND ENVIRONMENT INVESTIGATION REPORT

The MAF Investigation and Diagnostic Centres (IDC) are accountable for the investigation and diagnosis of suspect exotic pests and diseases. In the plant and environment sectors IDC has investigators and scientists based in Auckland and Christchurch. IDC provides field investigation, diagnostic testing and technical expertise for new pests and diseases affecting plants and the environment. IDC also conducts surveillance and response functions, and research and development to support surveillance and incursion response activities.

Radish yellow edge virus in NZ-grown round red radish

Korea's plant quarantine authority detected radish yellow edge virus (RYEV, *Alphacryptovirus*) in imported New Zealand-grown hybrid round red radish seed. RYEV is poorly documented in the literature, largely because it is non-symptomatic in most cultivars, and even when present does not reduce crop yields. To date, New Zealand radish producers do not consider RYEV to have economic significance. However, it is listed on MAF's Unwanted Organisms Register. As no PCR test is available, the IDC Plant Health and Environment Laboratory quickly developed primers and successfully confirmed RYEV presence, both in the radish seed exported to Korea and in the seed originally imported to New Zealand to produce this seed crop. Further test results showed the presence of RYEV in radishes grown at different Canterbury sites, over different seasons, and in seed used by market gardeners throughout New Zealand. No urgent containment measures were considered appropriate. RYEV will be removed from the Unwanted Organisms Register.

Borer beetles in basketware from Philippines

Woven bamboo and cane goods from the Philippines were found to be contaminated with insect borer and mould. The goods had been removed from the point of sale by the time MAF was notified. The consignment was similar to one sent to a South Island retail distribution centre that, when inspected by a MAF Quarantine Inspector, was found to be very heavily infested with *Dinoderus minutus* (an unwanted organism), and was subsequently fumigated with methyl bromide (MeBr) at the distribution centre/transitional facilities. Both consignments had Philippine MeBr fumigation certificates. Arrangements were made to shrinkwrap the risk goods at each North Island retail store and transport them back to the Auckland distribution centre for MeBr treatment. A single basket sample sent to the IDC enabled the borer present in the North Island goods to be identified as *D. brevis*, a species related to the borer identified from the South Island consignment. It is likely both species were present in both consignments as mixed populations (not an uncommon situation). Most of the white residue on the basket was thought to be borer frass (dust-like faecal matter), although fungal material was also present. The latter was identified as *Aspergillus* and *Penicillium* species of the types commonly found on stored products in New Zealand and elsewhere, and was not considered to pose any significant biosecurity risk. Nonetheless, like the *Dinoderus* species, these fungi likely originated from the Philippines.

New badnavirus in *Bougainvillea*

A bougainvillea specimen (*Bougainvillea spectabilis* cv. Scarlett O'Hara) exhibiting small, sparse, chlorotic leaves was submitted to the IDC. The plant had exhibited similar symptoms ever since it had been planted in an Auckland residential backyard around 2001. The obtained 553bp nucleotide sequence in putative RT and RNase H region gave a 97 percent match to the "Delhi" isolate of *B. spectabilis* chlorotic vein banding virus (BsCVBV) as described by Baranwal *et al* (2010). This paper proposed that the two isolates of BsCVBV ("Delhi" and "Tirupati") recently found in India, and the previous isolates reported in Brazil and Taiwan, should be classified as distinct species of *Badnavirus*, as these isolates share <80 percent nucleotide identities. This species division is yet to be accepted by the International Committee on Taxonomy of Viruses. The Taiwanese strain of BsCVBV is present in New Zealand.

Badnaviruses are transmitted predominantly by mealybugs and some also by aphids or lacebugs. Many species can be transmitted by grafting, and a few by inoculation and in seeds or pollen.

A second undescribed *Caulimovirus* species was also detected in this plant. This virus had the closest nucleotide identity with cestrum yellow leaf curling virus (72%, 330 bps), but was considered to be a separate species. Most caulimoviruses are non-persistently or semi-persistently transmitted by aphids. While transmission methods for some caulimoviruses remain unknown, they are not known to be transmitted by seed or contact.

There have been 17 importations of bougainvilleas since 1999 but this particular infected plant is likely to have originated from an earlier import. This indicates that these viruses are likely to be widespread in New Zealand, though it is not known whether they are common, nor which virus contributes to the symptoms observed. These viruses are not unwanted or regulated organisms.

Grape vine leaves with blisters and brown spots

Two- to three-year-old grapevines pruned in 2010 were reported with blisters on the upper surface of the leaves and brown spots underneath. Wild vines growing about 30m outside the vineyard were showing similar symptoms. The IDC's Plant Health and Environment Laboratory identified erineum mites (*Colomerus vitis*) as the causative agent. This species of mite is present in New Zealand.

Ant hitchhiker on yacht

A yacht sailed to New Zealand from the South Pacific in October 2010 and berthed in Wellington. Two weeks after the yacht was cleared by MAF and Customs, the owner found an unusual ant on the yacht and suspected that there might be more. FBA Consulting inspected the yacht and found a worker carpenter ant, *Camponotus* sp., a species that is regulated in New Zealand. Since this species is nocturnal, night-time bait surveillance was used to determine the level of infestation and extent of spread before taking any action. No further live ants were found, but the owner of the yacht and the maintenance contractor were asked to contact MAF if they discovered any.

Wrongly declared Christmas decorations

During MAF border monitoring surveys, pine cones were found in Christmas decorations in a retail store in Auckland. An investigation revealed that these were imported in October 2009 and the consignment had been declared as "metal candle holders" with an incorrect tariff code. The item description and the tariff code used had not triggered MAF inspection so the pine cones passed across the border without intervention. These were now deemed unauthorised goods, because clearance had been given on the basis of misleading information. In all, 494 candle holders (with pine cones) were recalled from various stores around New Zealand. Each unit had two candle holders and there were five pine cones in each candle holder. All were subsequently destroyed at the importer's expense.

New-to-New Zealand canker pathogen on grapevines

A new-to-New Zealand grapevine pathogen (*Neofusicoccum macroclavatum*) was reported to MAF, collected from a vineyard in the Nelson region by Lincoln University researchers. *N. macroclavatum* is a known pathogen of *Eucalyptus* species in Australia, but this was the first report of pathogenicity on grapevines. The sample was collected as part of a survey of nine nurseries in September 2008, during which 322 samples were collected. No obvious introduction pathway for this new detection was identified. Lincoln University researchers used molecular technologies to identify the pathogen because traditional methods were unsuitable. Their attempts at species identification based on morphology were hampered by difficulties in eliciting spore production, combined with the similarity of spore morphology between different members of the family Botryosphaeriacae (these problems have also been reported by many other pathologists.) Since the sample came from a nursery that had been supplying plants to new vineyards for many years, it was anticipated that the species would already have become widespread in New Zealand. Lincoln University researchers completed pathogenicity tests on grapevine and *Eucalyptus* and found this isolate was pathogenic on both species. However, on grapevines it was no more pathogenic than the other Botryosphaeriaceae they had been working with, and which were already very widespread in New Zealand. In addition, previous studies by Lincoln University had found that these species were cosmopolitan on many different hosts. Production of spores from infected wood seems to be a common feature.

Considering the mode of spread (spores are dispersed by wind, irrigation water, rain, insects and human-assisted transmission/dispersal e.g. mechanically through pruning) and the fact that the infected materials had already been distributed widely, it was concluded that the pathogen was already widespread in New Zealand and the potential costs of eradication would far outweigh the benefits.

Suspect borer in screwdriver handle

A hardware store in the Waikato notified MAF of a borer-damaged screwdriver handle that came as part of a package consisting of cordless hedge trimmers and batteries. An intact auger beetle pupa (family Bostrichidae) was found inside the wooden handle and determined to be a species not known to be present in New Zealand. An Australian exporter had arranged the importation of this product into New Zealand and it had been shipped directly from China. The items had been classified as low risk because the wooden materials only constituted a small proportion of the original consignment and thus were not declared at the border. In November 2009, 152 units were imported and most had been sold by the time MAF was notified of the beetle find. The remaining stock, which were located at retail stores nationwide, were checked and no further borer infestation was found. Feedback has been provided to the Australian exporter, who has assured MAF that their product departments have been told to check all risk materials before export to New Zealand.

Live caterpillar in imported nectarine

A member of the public notified MAF of a live caterpillar found in a nectarine purchased from a supermarket in Auckland and imported from the United States. A sample was submitted to the IDC Plant Health and Environment Laboratory and identified as a species of leafroller belonging to the genus *Argyrotaenia*. This genus is not established in New Zealand, and there are seven *A.* species on the Unwanted Organisms Register. Post-border detections on fresh produce can be difficult to trace and recall, owing to rapid product turnover in the produce market and multiple consignments of the same produce being imported on a given day. In addition, members of the public may not detect the infestation until several days after purchase, meaning delays before MAF is notified. MAF manages risks at the border by implementing the requirements of the import health standard. Such detections provide useful feedback to MAF about biosecurity risks associated with product import pathways.

Subterranean termites in Auckland

Subterranean termites, *Coptotermes acinaciformis*, were found on a residential property at Pukekohe in November 2010. A rapid risk assessment was made and a response initiated. A site inspection revealed live termite activity inside the house and in imported wooden railway sleepers near the driveway. Site interviews were conducted and treatment, ongoing monitoring and tracing investigations initiated. Delimiting survey operations are planned for early to mid February 2011.

Exotic ants associated with imported goods

Ants collected by a MAF Quarantine Inspector at an Auckland yacht builder's yard were identified as queens of *Nylanderia* (=*Paratrechina*) sp., a genus that is present in New Zealand but also includes some high-risk species that are not present. Worker ant samples, not queens, are required to distinguish between the different species of *Nylanderia*. In addition to manufacturing and reconditioning yachts, the yard is also a transitional facility. The ants were found near a recently devanned sea container and a number of hatch covers received at the yard from a yacht recently arrived from the Pacific Islands. FBA Consulting was contracted to visit the site to collect worker specimens and eradicate any colonies found. Many colonies of endemic ants were found but no *Nylanderia* specimens were detected except more queens on the hatch covers. FBA Consulting baited risk sites on the yacht, including the galley, mess, food storage areas and around the deck hatches. Surveillance results suggested it was unlikely the ants had originated from the yacht. Although the source was not identified, toxic baits laid in both the yard and the yacht were considered sufficient to eliminate any undetected risk ants. Staff at the yacht builder's yard will contact MAF if further ants are found.

Pseudomonas syringae pv. *papulans* ruled out

A Plant and Food Research scientist reported a suspect *Pseudomonas syringae* pv *papulans* (Psp) (blister spot) infection on apples. The symptoms were first noticed by the orchardist in early December 2010. Samples were sent to the IDC for diagnostic testing. Apple samples exhibited small (1mm) red-purple spots, some with a lighter-coloured centre. The Plant Health and Environment Laboratory was able to rule out the presence of Psp in these samples.

Reference

Baranwal, VK, M. Ayra and J. Singh 2010. First report of two distinct badnaviruses associated with *Bougainvillea spectabilis*. Journal of General Plant Pathology 76(3): 236–39.

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Pest watch: 26 August 2010 – 1 November 2010

Biosecurity is about managing risks – protecting the New Zealand environment and economy from exotic pests and diseases. MAF Biosecurity New Zealand devotes much of its time to ensuring that new organism records come to its attention, to follow up as appropriate. The tables here list new organisms that have become established, new hosts for existing pests and extensions to distribution of existing pests. The information was collated between 26 August and 1 November 2010. The plant information is held in the Plant Pest Information Network (PPIN) database. Wherever possible, common names have been included.

PLANT KINGDOM RECORDS

Validated new to New Zealand reports

Organism	Host	Location	Submitted by	Comments
Aridelus rufotestaceus (insect: wasp, no common name)	Inanimate host (plants in garden)	Auckland	IDC (general surveillance)	
Nysius caledoniae (insect: true bug, no common name)	*Lactuca sativa* (lettuce)	Auckland	Landcare Research	
Alphacryptovirus Radish yellow edge virus (virus: RYEV)	*Raphanus sativus* (radish)	Auckland	IDC (general surveillance)	
Pieris brassicae (large white butterfly)	*Tropaeolum majus* (garden nasturtium)	Nelson	IDC (general surveillance)	

Eradicated organisms

Organism	Host	Location	Submitted by	Comments
Chrysomphalus aonidum (insect: Florida red scale)	*Gnetum pendulum* (no common name)	Auckland		Eradicated from New Zealand
Puccinia cygnorum (fungus: no common name)	*Astartea fascicularis* (no common name)	Hawke's Bay		Eradicated from New Zealand

New host reports

Organism	Host	Location	Submitted by	Comments
Uraba lugens (insect: gum leaf skeletoniser)	*Corymbia calophylla* (Marri, Port Gregory gum)	Auckland	Scion (MAF high-risk site surveillance)	
Saissetia oleae (insect: black scale, olive scale)	*Olearia traversii* (no common name)	Auckland	Scion (MAF high-risk site surveillance)	
Lecanochiton actites (insect: no common name)	*Metrosideros* sp. var. Tahiti (no common name)	Auckland	Scion (MAF high-risk site surveillance)	
Pulvinaria vitis (insect: cottony grape scale)	*Salix matsudana* (tortured willow, willow)	Bay of Plenty	Scion (personal inquiry)	
Nigrospora sacchari (fungus: no common name)	*Beilschmiedia tarairi* (taraire)	Auckland	Scion (public enquiry)	
Saissetia coffeae (insect: hemispherical scale)	*Catha edulis* (Khat)	Auckland	Scion (MAF high-risk site surveillance)	
Pseudaulacaspis eugeniae (insect: white palm scale)	*Olearia traversii* (no common name)	Auckland	Scion (MAF high-risk site surveillance)	
Puccinia coprosmae (fungus: no common name)	*Coprosma acutifolia* (no common name)	Auckland	Scion (MAF high-risk site surveillance)	
Xylotoles griseus (insect: longhorn beetle)	*Foeniculum vulgare* (fennel)	Wellington	Scion (MAF high-risk site surveillance)	
Sphaeropsis cordylines (fungus: no common name)	*Cordyline pumilio* (dwarf cabbage tree)	Wellington	Scion (MAF high-risk site surveillance)	

Extension to distribution reports

Organism	Host	Location	Submitted by	Comments
Pulvinaria vitis (insect: cottony grape scale)	*Salix matsudana* (tortured willow, willow)	Bay of Plenty	Scion (personal inquiry)	

- If you have any enquiries regarding this information please email surveillance@maf.govt.nz.

Veterinary Diagnostic Laboratories

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- CHRISTCHURCH
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- DUNEDIN
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  Postal: PO Box 371, Mosgiel
  Tel: 03 489 4600 Fax: 03 489 8576

NEW ZEALAND VETERINARY PATHOLOGY

- HAMILTON
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  Tel: 07 839 1470 Fax: 07 839 1471

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Animal Disease Emergency

To report suspected exotic diseases in animals, please phone toll free, all hours

0800 80 99 66

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