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Animal Health Surveillance QUARTERLY

Newsletter of Australia's National Animal Health Information System

Message from the Australian Chief Veterinary Officer

Dr Mark Schipp
Australian Chief Veterinary Officer

Welcome to the fourth and final *Animal Health Surveillance Quarterly* for 2015.

This quarter, we participated in World Antibiotic Awareness Week on 16–22 November. Endorsed by the World Health Organization, the event acknowledged the global importance of antimicrobial resistance (AMR) as a growing public health issue. In the lead up to the week, I described the current AMR situation in the Australian animal health sector and our future plans and activities to address the issue in a video interview[1]. During the week, I spoke at the National Antimicrobial Resistance Forum where participants contributed to the development of the draft (Australian) AMR Strategy Implementation Plan for the *National Antimicrobial Resistance Strategy 2015–2019*.

Also in November, I attended the 2015 *LIVEXchange: People, Perspective and Relationships* in Darwin. The conference provided an opportunity for Australia's livestock export industry to consider global opportunities and challenges for the future. The relevance of animal welfare to the industry was highlighted in key presentations from Dr Temple Grandin, the world-renowned expert in livestock handling, and Dr Bernard Vallat, then Director General of the World Organisation for Animal Health (OIE).

As our delegate to the OIE, I submitted information to the OIE this quarter to reconfirm our status as officially free from African horse sickness, classical swine fever, contagious bovine pleuropneumonia, foot-and-mouth disease and peste des petits ruminants, and as a country with negligible risk of bovine spongiform encephalopathy. Maintaining our official status for these diseases supports Australia's international trade in animals and animal products and is a tangible example of the value of our continued surveillance for exotic animal diseases.

Animal Health Surveillance Quarterly is a veterinary science publication that provides a topical summary of animal health matters and reports animal health surveillance activities undertaken in Australia during the previous three-month period. As part of the National Animal Health Information System, this report contributes to Australia's annual animal health report to the OIE.

1 https://youtu.be/c3isMc5MZ4w

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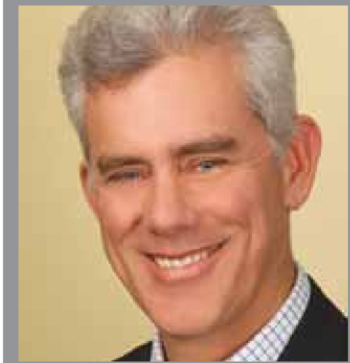
Global Foot-and-Mouth Disease Research Alliance

Kevin de Witte, Animal Health Australia



In October, I attended the Global Foot-and-Mouth Disease (FMD) Research Alliance (GFRA) 2015 scientific meeting in Hanoi, which was attended by approximately 150 people from around the world with major contingents from Africa and South East Asia. It was valuable to meet our many collaborators and world leaders in FMD research and hear the latest findings. The conference program varied from presentations or posters on FMD-endemic country responses to highly technical aspects of field epidemiology and laboratory research.

The Food and Agriculture Organization (FAO) European Commission for the Control of Foot-and-Mouth Disease (EuFMD) estimated that globally FMD costs US$5 billion per year but it is acknowledged that under-reporting from endemic countries means that this figure is inaccurate. The FAO–OIE *Global Foot and Mouth Disease Control Strategy 2012–2027* reported progress, including currently supporting 42/87 FMD-affected countries in Asia, Africa and the Middle East to reduce or eliminate virus circulation under the Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD). The limitation of vaccination, including the high cost of vaccines, is a priority research area.

The PCP-FMD builds regional surveillance and laboratory networks that can support the control of other significant transboundary animal diseases (TADs), such as:

- contagious bovine pleuropneumonia (CBPP)
- bovine brucellosis
- lumpy skin disease (Capripoxvirus)
- peste des petits ruminants (PPR)
- haemorrhagic septicaemia.

Australia is fortunate not to have any of these TADs.

The major global research directions for FMD are in epidemiology, virology (particularly sequencing), tests and vaccines. Australia has a significant investment with Animal Health Australia Members directed towards mitigating the threat of FMD, including the FMD vaccine bank and the FMD Risk Management project (FMD RMP). Through the risk management project, Animal Health Australia channels relevant industry levies through the MLA Donor Company to fund CSIRO to research virus, vaccine and test issues. The FMD RMP research effort is aligned to practical outcomes for Australia and benefits from the more technical and complicated research efforts of other countries, particularly in epidemiology, immunology and vaccine development, including thermal-stability of vaccine and diagnostic materials.

Australia recently presented two research outcomes from the FMD RMP at the OIE Reference Laboratory for Foot and Mouth Disease (FMD) in Pakchong, Thailand. In the first project, vaccine-matching studies conducted with serotype O and A strains demonstrated reasonable relationships between Thai and Australian vaccine strains. Another project in which cattle and sheep vaccinated with A Malaysia 97 and A22 Iraq 64 were challenged by A/VIT/15/2012 virus demonstrated that those species were protected against disease but not infection, with virus shedding in nasal secretions and saliva. During the study, the A/VIT/15/2012 virus caused severe disease in the unvaccinated control sheep.

Discussion at the Global Foot-and-Mouth Disease (FMD) Research Alliance (GFRA) 2015 scientific meeting in Hanoi.

A lot of effort is being placed into understanding the life cycle of FMD virus (FMDV) in endemic settings.

To quote Luis Rodriguez, Research Leader from the United States Department of Agriculture (USDA) Agricultural Research Service (ARS):

> Foot-and-mouth disease (FMD) remains one of the most studied and least understood diseases. Despite great efforts and advances on pathogenesis, vaccines and immune response, outbreak epidemiology and modeling, some of the most basic questions about disease life cycle remain unanswered.[2]

It is widely known that FMDV can infect multiple species (at least 70 wildlife and domestic species) of immunologically naive, previously infected and vaccinated animals. The virus is genetically highly variable, cannot survive outside of animals for long periods, and relies on both clinical and subclinical cases for virus survival.

As we learn more about FMDV, the gaps in knowledge are becoming more apparent but this is not to diminish the considerable progress in knowledge that has been made. FMDV is known to persist in lymphoid tissue, particularly the oropharyngeal tissue, and advances in electron microscopy can clearly demonstrate virus presence. Both probang (oesophageal–pharyngeal) sample collection and genetic sequencing of isolates will be important techniques for Australia in the event of an outbreak.

Another relevant issue for Australia and regional neighbours is the research into improved biosafety and dry submission methods for FMDV (i.e. not reliant on cold chain).

2 Rodriguez l, Garabed R, Dickmu S, Farooq U, Naeem K, Ahmed Z, Bravo-Rueda C, Pauszek S, Do Huu Dung, Ngo Thanh Long and Arzt J (2015). Understanding The Life Cycle Of FMDV In Endemic Settings. In: *Conference proceedings of Global Foot-and-Mouth Disease Research Alliance (GFRA) 2015, Hanoi, Vietnam, 20–22 October 2015.*

University Based Wildlife Disease Surveillance Pilot Program

Tiggy Grillo and Sam Gilchrist, Wildlife Health Australia; and Iain East, Australian Government Department of Agriculture and Water Resources

Wildlife Health Australia (WHA) manages Australia's general wildlife health surveillance system, which relies on the detection, submission, investigation and reporting of sick/dead captive or free-living wildlife. Key elements of the existing national wildlife health surveillance framework include a network of state and territory WHA coordinators (appointed by their chief veterinary officers), veterinarians at zoo-based wildlife hospitals and large private wildlife clinics, in addition to targeted projects and a number of focus/working groups. Through WHA's network and projects, wildlife health information is consolidated into a national database, the electronic Wildlife Health Information System (eWHIS). Nationally collated data is made available to inform decision-making and policy development, for the management of emergency disease incidents, for international reporting, and to protect Australia's trade, human health, livestock health and biodiversity. WHA's focus groups and projects improve communication and coordination, provide and receive technical advice, facilitate issue resolution and provide professional support to ensure efficient investigation and management of wildlife health.

In early 2015, WHA and the WHA Universities Focus Group examined the feasibility of more structured reporting on wildlife health and disease events investigated by Australian universities. WHA developed and circulated a survey to Australian universities, exploring how university wildlife clinics and pathology departments could enhance the national capacity for wildlife disease surveillance. The feasibility study examined caseload, event type, communication and sharing, reporting and information capture. A workshop followed, during which universities reviewed the survey findings and agreed to undertake a one-year, proof-of-concept pilot program to demonstrate the value that universities could bring to this area of Australia's biosecurity arrangements.

Coordinated by WHA, the new University Based Wildlife Disease Surveillance Pilot Program aims to boost Australia's wildlife disease surveillance capacity. Launched in December 2015, the one-year pilot program enlists the participation of seven Australian universities and is supported by funding from the Australian Government Department of Agriculture and Water Resources. The pilot program is structured on the successful Zoo Based Wildlife Disease Surveillance Program model that was established in 2010[3] (Cox-Witton et al 2014) and continues to contribute to the national wildlife disease framework.

Australian universities undertake hundreds of wildlife disease investigations each year as part of their usual operations. The priority of the pilot program is to collect wildlife disease information, generated by university veterinary clinics and pathology departments, in eWHIS. The pilot program will improve linkages between the universities and other government and non-government surveillance partners and is expected to deliver faster identification of issues and a valuable national perspective on new research opportunities. It is envisaged that a structured surveillance program for universities will likely provide opportunities to build on and enhance teaching, investigation and research collaborations across the wildlife health space.

The universities involved in the pilot program are Charles Sturt University, James Cook University, Murdoch University, the University of Adelaide, the University of Melbourne, the University of Queensland and the University of Sydney. The universities started contributing data to eWHIS on the 1 December 2015. Events reported through this new pilot program are included in the WHA quarterly report on page 4.

3 Cox-Witton K, Reiss A, Woods R, Grillo V, Baker RT, Blyde DJ, et al. (2014). Emerging Infectious Diseases in Free-Ranging Wildlife–Australian Zoo Based Wildlife Hospitals Contribute to National Surveillance. *PLoS ONE* 9(5): e95127. doi:10.1371/journal.pone.0095127

Wildlife Health Australia

Tiggy Grillo, Keren Cox-Witton and Sam Gilchrist, Wildlife Health Australia; and Iain East, Australian Government Department of Agriculture and Water Resources

Wildlife Health Australia (WHA)[4] is the peak body for wildlife health in Australia. WHA was established as the Australian Wildlife Health Network in 2002 as an Australian Government initiative to coordinate wildlife health surveillance information across Australia, to support Australia's animal health industries, human health, biodiversity, trade and tourism. WHA collates information from multiple sources into a national database — the Wildlife Health Information System (eWHIS)[5] — including submissions by WHA subscribers, state and territory WHA coordinators, researchers, and zoo and sentinel clinic veterinarians. During the quarter, 179 wildlife disease investigation events were reported into eWHIS (Table 1). This report details some of the disease and mortality events in free-living wildlife recorded in eWHIS this quarter. WHA thanks all those who submitted information for this report.

4 www.wildlifehealthaustralia.com.au

5 www.wildlifehealthaustralia.com.au/ProgramsProjects/eWHISWildlifeHealthInformationSystem.aspx

Table 2 Wild bird disease investigations reported into eWHIS, October–December 2015

Bird order	Common name for bird order[a]	Events reported[b]
Anseriformes	Magpie geese, ducks, geese and swans	8
Charadriiformes	Shorebirds	4
Columbiformes	Doves and pigeons	2
Coraciiformes	Bee-eaters and kingfishers	1
Falconiformes	Falcons	1
Gruiformes	Rails, gallinules, coots and cranes	2
Passeriformes	Passerines or perching birds	2
Pelecaniformes	Ibis, herons and pelicans	11
Podicipediformes	Grebes	1
Psittaciformes	Parrots and cockatoos	11
Sphenisciformes	Penguins	2

a Common names adapted from: del Hoyo and Collar (2014) *HBW and BirdLife International Illustrated Checklist of the Birds of the World. Volume 1 – Non-passerines*. Lynx Editions, Barcelona. (Courtesy of the Australian Government Department of the Environment).

b Disease investigations may involve single or multiple bird orders (e.g. mass mortality event).

Wild bird mortality events — Newcastle disease and avian influenza exclusion

WHA received 41 reports of wild bird mortality or morbidity investigations from around Australia in October–December 2015. A breakdown of the bird orders represented is presented in Table 2. Reports and samples from sick and dead birds are received from members of the public, private practitioners, universities, zoo wildlife clinics and wildlife sanctuaries. Avian influenza (AI) was excluded by polymerase chain reaction (PCR) testing for influenza A in nine of the events as part of Australia's general (sick and dead bird) AI surveillance program. AI exclusion testing was not warranted in the remaining 32 events, based on clinical signs, history, prevailing environmental conditions or other diagnoses. In addition, avian paramyxovirus was excluded in 6 events by PCR testing specific for Newcastle disease (ND) virus and/or pigeon paramyxovirus 1 (PPMV-1).

Avian influenza surveillance

Australia's National Avian Influenza Wild Bird (NAIWB) Surveillance Program comprises two sampling components: pathogen-specific, risk-based surveillance by sampling of apparently healthy, live and hunter-killed wild birds; and general surveillance by investigating significant unexplained morbidity and mortality events in wild birds, including captive and wild birds within zoo grounds (with a focus on exclusion testing for AI virus subtypes H5 and H7). Samples from sick or dead birds are discussed above. Sources for targeted wild bird surveillance data include state and territory government laboratories, universities and samples collected through the Northern Australia Quarantine Strategy.

During the quarter, pathogen-specific, risk-based surveillance occurred at sites in Victoria, Northern Territory and Western Australia with faecal environmental swabs collected from 751 waterbirds. Results are pending.

Chronic phalaris toxicity in Bennett's wallabies

During the six months preceding October 2015, it is estimated that up to 100 Bennett's wallabies (*Macropus rufogriseus rufogriseus*) died on a single property located just north of Hobart, Tasmania. Wallabies observed just prior to death appeared disorientated and some were also in poor body condition.

Gross necropsy findings of a single adult female wallaby were consistent with chronic weight loss. Histopathological examination revealed widespread

Table 1 Number of disease investigations reported into eWHIS, October–December 2015[a]

Bats[b]	Birds	Marsupials	Feral animals	Snakes and lizards	Freshwater turtles	Monotremes	Marine mammals	Marine turtles
106	41	15	10	1	2	1	0	3

a Disease investigations may involve a single animal or multiple animals (e.g. mass mortality event).

b The majority of bat disease investigations are single bats submitted for Australian bat lyssavirus testing.

dissemination of intracytoplasmic brown granules in neuronal bodies in the cerebrum, thalamus and brain stem and limited distribution of intracytoplasmic brown granules in renal tubular epithelium (kidney) and myocardial cells (heart). The significant histological findings throughout the brain are suggestive of chronic phalaris toxicosis (phalaris staggers). The property where affected wallabies were found had a mix of scrub and improved pasture, including phalaris (*Phalaris aquatica*).

Phalaris can be found throughout agricultural areas of Tasmania and is occasionally associated with toxicity in livestock[6]. The toxicity is attributed to the presence of certain alkaloids in the leaves and although toxicity in Australian livestock is consistently reported, Alden et al stated that the epidemiology of the disease remained unclear[7].

Chronic phalaris toxicity has previously been reported in eastern grey kangaroos (*M. giganteus*) in Victoria[8,9] and red kangaroos (*M. rufus*) and wallabies grazing phalaris-dominant swards in captivity (Munday, pers comm, 2009)[10]. Affected macropods display a variety of neurological signs, including ataxia, muscle tremors, a wide-based stance and sporadic collapse. Often, these clinical signs are exacerbated when the animals are approached.

There are many challenges when investigating the epidemiology of suspected plant poisonings in free-ranging wildlife. In contrast to the domestic livestock setting, precise spatial and temporal details of the interaction between wildlife and potentially toxic plants are not often available to sample. In addition, many free-ranging animals have developed mechanisms to cope with plant toxins, such as avoidance, dilution, degradation or detoxification[11]. If defense mechanisms fail or there is ecological disturbance, such as loss of preferred or suitable forage, weed overgrowth or some underlying health issue, ingestion of toxic plants may be detrimental leading to wildlife morbidity or mortality[12,13]. Other documented plant poisonings in Australian wildlife include hepatotoxicity and secondary photosensitisation in red kangaroos following ingestion of lantana (*Lantana camara*)[14], suspected pyrrolizidine alkaloid hepatotoxicosis in southern hairy-nosed wombats (*Lasiorhinus latifrons*) associated with consumption of potato weed (*Heliotropium europaeum*)[15] and crystal-associated hepatopathy consistent with intoxication by steroidal saponins in eastern grey kangaroos (AHSQ Vol. 19 Issue 2).

Australian bat lyssavirus

Reports to WHA for the October–December quarter included 123 bats tested for Australian bat lyssavirus (ABLV) from New South Wales, Northern Territory, Queensland, Victoria and Western Australia.

Bat submissions were made for a variety of reasons:

- 38 cases involved contact or suspected contact with the potential for ABLV transmission to humans; of these
  - 8 were also associated with trauma
  - 10 displayed neurological signs and 2 displayed other clinical signs
  - 3 also involved contact with a pet dog or cat
  - the remainder had no further history reported
- 46 cases involved contact with a pet dog (34 bats) or cat (12 bats)
- 10 bats displayed neurological signs
- 9 bats presented with other clinical signs
- 6 cases were associated with trauma (e.g. barbed wire or netting entanglement)
- 6 bats were found dead
- 8 bats had no further history reported at this time.

During the quarter, 13 flying foxes were confirmed positive for ABLV by PCR testing for pteropid ABLV ribonucleic acid (RNA); of these, eight grey-headed flying foxes (*Pteropus poliocephalus*) were from various locations in New South Wales and two little red flying foxes (*P. scapulatus*), two black flying foxes (*P. alecto*) and one spectacled flying fox (*P. conspicillatus*) were from south-east, central and far north Queensland.

The ABLV-positive flying foxes presented with a variety of neurological and other clinical signs, including aggression, abnormal behaviour, agitation, paresis, vocalising, biting, twitching, drooling, inability to fly, respiratory distress, aspiration, unresponsiveness and emaciation. In those flying foxes where histology was conducted, changes included nonsuppurative meningitis and/or meningoencephalitis (mild to severe) with occasional Negri-like bodies in neurons. In one case, no histological abnormalities were detected in the brain. Potentially dangerous human contact was reported in seven of these cases and an experienced public health official provided appropriate counselling and information.

Among the ABLV-positive flying foxes were three 3–4-week-old juvenile grey-headed flying foxes rescued from amongst numerous dead juvenile flying foxes at a New South Wales Central Coast flying fox roost in November. A large number of people, including many who were not vaccinated, had contact with the infected bats; all were provided with appropriate follow-up by an experienced public health official. This event was a useful reminder that all bats, including very young juveniles, can be infected with ABLV. Central Coast Local Health District circulated a media release about the event[16], warning the community not to handle bats and to call on the expertise of a vaccinated wildlife carer if an injured or trapped bat is found. NSW Department of Primary Industries circulated a Chief Veterinary Officer Bulletin to wildlife carers[17].

More information on ABLV testing of bats in Australia is available in *ABLV Bat Stats*[18].

6 Lane P, Morris D, Bridle K and Eyles A (2015). *Common grasses of Tasmania*. Cradle Coast NRM, NRM North, NRM South and the University of Tasmania.

7 Alden R, Hackney B, Weston LA and Quinn JC. (2014). Phalaris Toxicoses in Australian Livestock Production Systems: Prevalence, Aetiology and Toxicology. *Journal of Toxins* 1(1): 7.

8 AHSQ Vol. 6 Issue 4

9 Bacci B, Whiteley PL, Barrow M, Phillips PH, Dalziel J and El-Hage CM (2014). Chronic phalaris toxicity in eastern grey kangaroos (Macropus giganteus). *Australian Veterinary Journal* 92(12): 504–508.

10 Munday (pers comm) cited by Ladds P. (2009). In: *Pathology of Australian Native Wildlife*. CSIRO Publishing.

11 Fowler ME (1983). Plant poisoning in free-living wild animals: a review. *Journal of Wildlife Disease* 19(1): 34–43.

12 Fowler (1983)

13 Woolford L, Fletcher MT and Boardman WSJ. Suspected pyrrolizidine alkaloid hepatotoxicosis in wild southern hairy-nosed wombats (Lasiorhinus latifrons) (2014). *Journal of Agricultural and Food Chemistry* 62(30): 7413–7418.

14 Woolford et al (2014)

15 Johnson JH and Jensen JM (1998). Hepatotoxicity and secondary photosensitization in a red kangaroo (Megaleia rufus) due to ingestion of Lantana camara. *Journal of Zoo and Wildlife Medicine* 29(2): 203–207.

16 www.cclhd.health.nsw.gov.au/News/media/20151201%20Health%20alert%20-%20Australian%20Bat%20Lyssavirus.pdf

17 www.vpb.nsw.gov.au/sites/default/files/images/NEWS_20151218_DPI_CVO Bulletin bat lyssavirus infection in juvenile bats.pdf

18 www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.aspx

Aquatic animal health

Brett Herbert, Aquatic Pest and Health Policy Section, Australian Government Department of Agriculture and Water Resources

Investigating bonamiasis in native oysters in southern Australia

Farming of native flat oysters (*Ostrea angasi*) is expanding around Australia to diversify income streams for oyster farmers, reduce potential losses from diseases affecting other oyster species and re-seed old but depleted oyster beds. Strong domestic and international markets exist for native flat oysters, and shellfish industries in Victoria and South Australia are investigating re-establishing native oyster production to meet this demand. But this rapidly expanding industry faces a unique biosecurity issue that could threaten production.

Bonamia ostreae and *Bonamia exitiosa* are significant parasitic pathogens of oysters that cause high mortality rates and substantial economic losses to the oyster industry globally. The World Organisation for Animal Health (OIE) lists both pathogens as notifiable mollusc diseases.

In the early 1990s, a *Bonamia* sp. infection decimated experimental aquaculture of the native flat oyster and adjacent wild beds in Victoria. More recent surveys found *Bonamia* spp. in native flat oysters in Tasmania, Western Australia, New South Wales and South Australia. *Bonamia* sp. is present in Pacific oysters (*Crassostrea gigas*) in South Australia. Monitoring of apparently healthy native flat oysters since 2013 at Victorian aquaculture sites shows that *Bonamia* spp. are present at farm sites in Port Phillip Bay and Westernport Bay. After emergence of clinical disease in 2015, the CSIRO Australian Animal Health Laboratory completed in-depth testing using multiple techniques, which confirmed detection of *B. exitiosa* in some of the native flat oysters farmed at the sites. As a result, Australia notified the OIE of infection with *B. exitiosa* in January 2016.

Surveillance of *B. exitiosa* in southern Australia is vital to inform risk to aquaculture and restocking projects. While native flat oysters in most Victorian and South Australian farms are healthy, it is clear that infection with *Bonamia* spp. poses a substantial risk to production, especially given that the conditions that trigger clinical disease are unknown and no management techniques have been identified to minimise losses.

To address some of these issues, a project funded by the Fisheries Research and Development Corporation has commenced to identify the distribution and taxonomy of *Bonamia* spp. in Australia (particularly in southern Australia) and develop and test techniques to enable effective, accurate and sensitive identification of *Bonamia* spp. This information will assist in managing risks associated with emergence of clinical bonamiasis in Australia and minimise potential effects on aquaculture production.

Research updates will be available through the Fisheries Research and Development Corporation's *Health highlights: Aquatic Animal Health Subprogram newsletter*[19].

19 http://frdc.com.au/research/aquatic_animal_health/Pages/default.aspx

State and territory reports

Under the Australian constitution, state and territory governments are responsible for animal health services within their respective borders (jurisdictions). The governments develop and administer legislation governing the surveillance, control, investigation and reporting of disease and chemical residues and contaminants, as well as legislation relating to animal welfare. The governments deliver their services through government-appointed or government-accredited animal health personnel (district veterinarians, regional veterinary officers and local biosecurity officers). They also provide extension services to industry and the community.

The 'State and territory reports' summarise disease investigations undertaken within jurisdictions and describe a selection of interesting cases. Test results from suspect exotic or emergency disease investigations are reported in Table 17 of 'Quarterly statistics'.

Unless otherwise stated, disease events involving wildlife are reported by Wildlife Health Australia.

New South Wales

Rory Arthur, Animal Biosecurity and Welfare Branch, Department of Primary Industries

During the quarter in New South Wales, 701 livestock disease investigations[20] were conducted to rule out emergency diseases and investigate suspect notifiable diseases. The number of investigations by category of livestock is shown in Figure 1.

Field investigations were conducted by veterinary officers of the NSW Department of Primary Industry and Local Lands Services (550) and private veterinary practitioners, who in 151 cases submitted samples to the state diagnostic veterinary laboratory for subsidised testing to exclude or confirm notifiable diseases.

During the quarter, the state veterinary diagnostic laboratory (Elizabeth Macarthur Agricultural Institute) processed approximately 700 livestock sample submissions to rule out emergency diseases and investigate suspect notifiable diseases. Sample submissions were also received requiring testing for export, accreditation programs and targeted surveillance.

The Department of Industry in New South Wales is obliged under the *Stock Diseases Act 1923* and the *Animal Diseases and Animal Pests (Emergency Outbreaks) Act 1991* to detect and manage notifiable disease outbreaks. The risks to government of failure to detect these diseases are managed by an active, district-based disease and pest surveillance program. Part of the program requires government veterinary officers to investigate potential notifiable disease outbreaks and unusual diseases that may be new, emerging or difficult to diagnose. Another part involves the reporting and exclusion of suspected notifiable diseases by private veterinarians whose laboratory tests under these circumstances are funded by government.

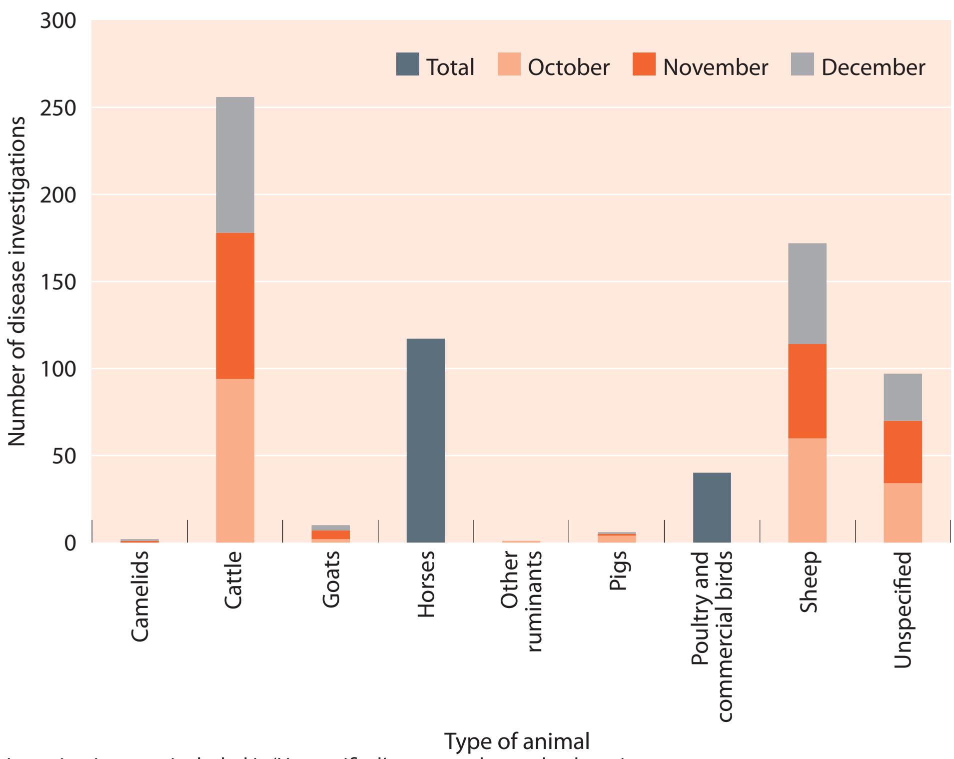
The following case reports are a selection of field investigations, chosen to reflect the range of livestock disease incidents during the quarter.

Anthrax in the Central West

Two anthrax incidents occurred during the quarter. In November, there were deaths on two nearby properties in the Forbes district of the Central West region. Nine mixed yearlings from a herd of 220 died on one property and 19 from a herd of 142 died on the other. The immunochromatographic test (ICT) for anthrax was used with positive results in each case and laboratory confirmation followed. Both properties are in the known anthrax endemic area and each has multiple neighbouring properties where anthrax has been diagnosed in the past 10 years. The National Livestock Identification System (NLIS) database was used to trace a number of animals that had recently moved off the properties. All animals were accounted for and either returned to the property of origin, detained for 21 days or destroyed.

20 Field investigation with laboratory diagnostic testing.

Figure 1 Number of field disease investigations in New South Wales, October–December 2015



Investigations not included in 'Unspecified' category due to database issues.

Both properties were managed according to NSW Department of Primary Industries anthrax policy. The properties were quarantined for 42 days, contaminated areas were disinfected and all carcases were burnt to ash. All at-risk cattle and other livestock were vaccinated.

There were 22 mortality investigations where anthrax was excluded as the cause of death in livestock. Nine of these investigations involved the use of the ICT for anthrax with negative results. Alternate diagnoses included ketosis, clostridial infection, *Cheilanthes sieberi* poisoning and bovine ephemeral fever for nine cattle investigations, prolapsed rectum and haemonchosis for nine sheep investigations, and erysipelas for three pig investigations. No alternate diagnosis was made in one horse investigation.

Update on 3D syndrome cattle deaths

A sporadic syndrome with the key signs of drooling and diarrhoea leading to death ('3D syndrome') has been under investigation on extensively grazed properties in the Western region by NSW Department of Primary Industries, Local Land Services and private veterinarians. Cases were first investigated in 2006, then again in 2009 and 2013. All emergency and exotic diseases have been excluded.

In the previous high-risk period (October 2014 to February 2015), there were no requests by landholders to investigate cattle deaths in which 3D syndrome was suspected.

In November 2015, a landholder on a property in the Western region where 3D syndrome had previously been diagnosed reported deaths in calves. The affected herd had 231 cows with calves at foot in a 3200 ha paddock. As the cows were continuously joined, the calves were of mixed ages. The owner reported that calves younger than 14 weeks old had been found dead; on closer inspection, other calves were noted to have diarrhoea and drooling. The attending veterinarian noted nasal discharge. Two recently deceased calves (estimated 7–10 weeks old) were necropsied and two affected live calves were sampled; they subsequently died.

Significant findings in the necropsied calves included a severe necrotising tracheitis (inflammation of the trachea with tissue death); observation of torovirus-like particles under an electron microscope in the faeces of calf 1, and a severe, multifocal, acute fibrinous pneumonia in calf 2, from which *Escherichia coli* was isolated.

Rotavirus was detected in the faeces of one of the affected live calves; the remaining calves tested were negative. *Campylobacter* sp. was detected on selective culture of faeces from the two sick calves. The faeces or intestinal contents were negative for *E. coli* K99, *Cryptosporidium* sp., helminths and coccidia; *Yersinia* sp. and *Salmonella* sp. by selective culture; and coronavirus by real-time polymerase chain reaction (PCR) testing. Nasal swabs were negative for infectious bovine rhinotracheitis by real-time PCR testing and bovine respiratory syncytial virus by PCR testing; and tissue or blood samples tested negative for bovine viral diarrhoea virus antigen capture enzyme-linked immunosorbent assay (ELISA). Although the tracheitis and pneumonia had contributed to the deaths of the two necropsied calves, the cause of the diarrhoea was not determined. The calves are not considered to have met the case definition for 3D syndrome (i.e. minimal gastrointestinal tract pathology and younger than 3 months old).

Investigations are ongoing to improve knowledge about cattle health in western New South Wales and to determine the cause of 3D syndrome. NSW Department of Primary Industries and Local Land Services ran a mortality survey of farms in districts where 3D syndrome investigations have occurred. In addition, departmental veterinarians ran a follow-up detailed survey of farms reporting deaths in cattle. In spring 2015, a vegetation survey of some affected farms was completed.

Oesophageal pathology was a feature of 3D syndrome reported in 2013. In an attempt to investigate possible initiating events, the oesophagus of each heifer consigned directly to slaughter from an affected property was examined; abnormalities were detected in 15 of 26 cattle (58%) examined. The most common lesion (found in 12 heifers) was a lengthways tear of the oesophagus, ranging from 1 to 10 cm long. Histopathology revealed oesophagitis (inflammation of the oesophagus) in 11 heifers (42%), where eosinophils were the main type of inflammatory cells.

The cause of 3D syndrome remains undetermined. The current hypothesis is that pathology in the alimentary canal is caused by initiating events, which are likely to include physical abrasion by plant materials, resulting in the typical end-stage pathology. Bacteria — particularly pathogenic species — that normally live in the alimentary canal contribute to death because they change the integrity of the gastrointestinal lining. It is likely that this disease process happens at a low level in various pastoral districts of New South Wales and possibly other states. On occasions, the initiating events are more widespread or common, resulting in more affected animals and properties.

Leishmaniasis in a dog

In late October 2015, a stud male Staffordshire bull terrier was diagnosed with leishmaniasis at a small-animal referral clinic in Western Sydney. The dog was imported from Spain into Australia 3.5 years ago with a negative indirect fluorescent antibody test (IFAT). The dog had presented with chronic wasting, regional hair loss, intermittent lameness, dead sperm and enlarged lymph nodes. It was also blind and had been diagnosed with dry eye in September 2014 at another referral clinic. Initially, cancer was suspected but the specialist clinician had considered infection with *Leishmania* spp. and *Ehrlichia* spp. in the differential diagnosis. Assessment of skin biopsies by a private pathology laboratory revealed macrophages containing basophilic inclusions that looked like amastigotes (protists in the leishmanial stage without visible external flagella or cilia). The laboratory notified NSW Department of Primary Industries, which then oversaw the case. A subsequent IFAT of the dog's serum showed a titre of greater than 1:640, confirming the diagnosis of *Leishmania infantum*. The clients chose to have the dog euthanased. Stored semen samples were delivered to the CSIRO Australian Animal Health Laboratory for PCR testing.

A trace-back investigation was arranged by the Greater Sydney Local Land Services district veterinarian and the NSW Department of Primary Industries. The district veterinarian interviewed the breeder and found that the affected dog had been kept isolated from most of the dogs on the property and a monthly flea control program had been strictly followed. The affected dog had been living on the property for the past 1.5 months of its illness and before that had been kept in south-western Sydney. While in Australia, the dog's semen had been collected and used to inseminate a bitch in May 2013.

A small study using a risk-based sampling plan was designed to assess the risk of *Leishmania* transmission. Although the risk of vector transmission of *Leishmania* is low in Australia, unknown vector transmission pathways were investigated by assessing and testing dogs that may have lived close to the affected dog. The risk of venereal transmission was assessed by testing the semen samples and any bitches the dog may have serviced. The vertical pathway of transmission was assessed by testing any puppies that may have been produced from such matings.

Three in-contact dogs were identified for assessment: two lived in the breeder's house and another belonged to a relative of the breeder. The affected dog's semen had been used only once (May 2013); five puppies had been produced. Four of these were traced in the Sydney region. Three different veterinary clinics were contacted to provide medical records, and advice was provided on the disease and its public health risks. At the affected dog's primary clinic, the district veterinarian examined eight at-risk dogs (a bitch, her puppies and in-contact dogs) and sampled 5 mL of clotted blood for IFAT and 5 mL of whole blood and conjunctival swabs for PCR testing at the CSIRO Australian Animal Health Laboratory.

The semen samples from in-contact dogs were negative (by IFAT and PCR testing) for *Leishmania* spp. All samples from the dogs assessed were also negative (by IFAT and PCR testing). Clinical examinations of the eight dogs were unremarkable. The bitch appeared to have chronic dermatitis but she had a long history of allergy that had been diagnosed before she was inseminated. Two of her offspring examined had multifocal areas of hair loss and dermatitis. The in-contact dog that had been living with the affected dog during its last 6 months had a moderate-to-high flea burden.

The owners of all the dogs were told that the results were negative but that regular veterinary check-ups were essential to monitor for the development of clinical signs. Each private veterinarian received a detailed report of the study, as well as a monitoring plan and clinical sign-scoring sheet. The fact that the semen samples were negative tied in well with the negative results from the puppies but monitoring is still required on the unlikely chance that parasite shedding could occur intermittently. The owners of the in-contact dogs were given similar instructions. The in-contact dog that had the moderate-to-high flea burden will be closely monitored by her private veterinarian.

Avian influenza and Newcastle disease excluded in poultry

A poultry producer reported a loss in egg production, along with respiratory signs and sporadic deaths, in mixed-age, free-range laying hens. Five per cent of the flock of 2000 had died over a 7-month period.

All age groups were affected. Several affected birds were examined by the district veterinarian and found to be failing to thrive and depressed. They were displaying open-mouthed breathing and audible gurgling. Some had an eye discharge. Many of the affected birds had diarrhoea and their cloacas were matted with faeces. The hens had been vaccinated against Newcastle disease. Five hens were necropsied and each had inflammation of the serosal surfaces of the reproductive tract and intestine, accompanied by varying amounts of congealed yolk in the coelom (main body cavity). All but one had small-to-moderate amounts of blood in the trachea and oral cavity. Laboratory samples were negative for Newcastle disease, avian influenza and *Chlamydia psittaci* but pooled samples were positive for infectious laryngotracheitis (ILT).

The owner culled all the sick birds and restocked with hens vaccinated against ILT.

Northern Territory

Susanne Fitzpatrick, Department of Primary Industry and Fisheries

During the quarter in the Northern Territory, 128 livestock disease investigations[21] were conducted to rule out emergency diseases and investigate suspect notifiable diseases. The number of investigations by category of livestock is shown in Figure 2.

Field investigations were conducted by government veterinary or biosecurity officers (106) and private veterinary practitioners, who in 22 cases submitted samples to the state veterinary diagnostic laboratory for subsidised testing to exclude or confirm notifiable diseases.

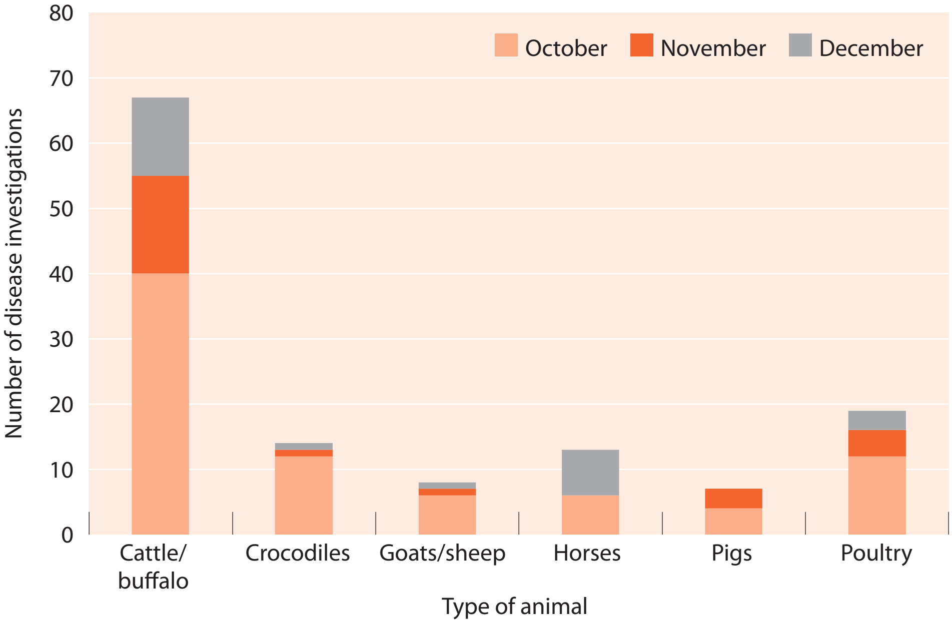
During the quarter, the state veterinary diagnostic laboratory (Berrimah Veterinary Laboratories) processed 196 livestock sample submissions[22] to rule out emergency diseases and investigate suspect notifiable diseases. Sample submissions were also received requiring testing for export, accreditation programs and targeted surveillance.

The Department of Primary Industry and Fisheries in the Northern Territory provides a free disease investigation service to livestock owners for diagnosis of notifiable emergency, exotic and endemic disease, including zoonotic diseases. Subsidies are available to private veterinarians for significant disease investigations in livestock. Berrimah Veterinary Laboratories provide free diagnostic testing for exclusion of notifiable disease for all disease investigations.

21 Field investigation with laboratory diagnostic testing.

22 Some investigations involved multiple submissions.

Figure 2 Number of field disease investigations in the Northern Territory, October–December 2015



The following case reports are a selection of field investigations, chosen to reflect the range of livestock disease incidents during the quarter.

Urea toxicity in calves

Ammonia toxicity was diagnosed as the cause of death in four 1–3-week-old Brahman calves during November 2015 on a small property outside Darwin. A similar syndrome was reported to have killed seven calves on the same property in a similar presentation in November the previous year. Affected calves showed clinical signs of hypersensitivity, incoordination and muscle tremors progressing to recumbency and death within a few hours of onset. Necropsy consistently revealed the abomasum to contain muddy water, dirt and burnt vegetation, with rapidly affected animals also containing milk clots. Histology revealed microvascular rarefraction of the brain parenchyma and cerebral oedema, with various areas of grey matter (particularly the cerebral cortex) containing activated microglia and Alzheimer type II cells, suggestive of ammonia toxicity. Ammonia levels in blood plasma and/or aqueous humour were markedly elevated. Due to the suspicion of urea toxicity in the previous year, urea supplements were not provided to cattle in the paddock in which the cows were calving.

The build-up to the wet season was particularly long, with extended dry and hot weather until the first significant rains in early and mid-November, just prior to the first deaths. There were several areas in the paddock where ground surface holes were evident, particularly around old lick supplement sites. The cows and other cattle had been observed digging in these areas over the previous seasons, and the holes were seen to fill with rainwater during the first rains of the wet season, just prior to the clinical signs in calves being observed. Inspection of the water troughs indicated that they might have been too high for the calves to drink from. A diagnosis of urea toxicity was made based on elevated ammonia levels in blood and/or aqueous humour and access to these old urea supplement areas. Soil samples collected

Left: Site of old urea supplement lick blocks before rain. Right: Site of old urea supplement lick blocks after rain. Photos: Department of Primary Industry and Fisheries.

from the two ground surface holes revealed markedly elevated urea in one site (1.4 g urea/kg) and elevated ammonia (13–1140 mg NH_3/kg) and nitrate (61–119 mg NO_3/kg) levels in both sites. Control soil samples collected from the same paddocks were < 0.3 g urea/kg, < 5 mg NH_3/kg and < 30 mg NO_3/kg, confirming a diagnosis of ammonia toxicity.

Mortalities ceased after the herd was moved to a different property. The combination of water troughs being too high for calves to access, holes dug by the cows around old urea supplement sites, and dry hot weather preceding the first rains of the season were significant factors that contributed to up to 80% calf mortality in this case.

Bovine ephemeral fever in cattle

Four cattle out of a herd of six heifers and steers on a small hobby farm outside Darwin died in late November 2015. The owner reported that three 12–24-month-old crossbred Brahmans, which had been sourced from different properties as calves, had become ill at different periods over the preceding 3 weeks. Affected animals showed a sudden loss of body condition progressing to recumbency and death within 3 days. One sick heifer found in sternal recumbency could stand with a hunched back and guarded abdomen when approached. The heifer was cudding and intermittently grazing on shrubs in the paddock but appeared weak and offered little resistance to capture and restraint. The mucous membranes appeared normal to slightly tacky, rectal temperature was normal and the faeces were hard. Three days later, the condition of the heifer deteriorated and she died after a period of lateral recumbency and paddling with small amounts of serous nasal discharge.

Haematological testing of blood samples collected at the first visit demonstrated a profound neutrophilia without a left-shift and a quantitative real time (qRT) PCR test on the same blood sample was negative for bovine ephemeral fever (BEF) virus at that time. In addition, faecal analysis revealed a high burden of *Haemonchus* sp. worm eggs but histology of a range of fixed necropsy tissues was generally unremarkable. A qRT-PCR test performed on fresh splenic tissue sample collected a day after the initial blood sample collection was strongly positive to BEF virus.

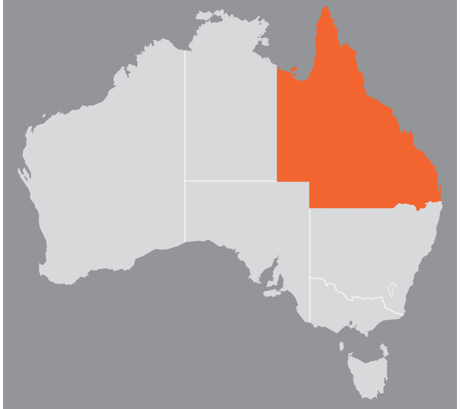
The negative qRT-PCR test result on the initial blood sample indicates that the animal was no longer viraemic with BEF virus by the time of the initial sampling. Together with the marked neutrophilia that was detected in the absence of an apparent bacterial infection and the positive qRT-PCR result on splenic tissue, the diagnosis was consistent with a recent infection with BEF virus. It is unclear whether the other three animals from the same cohort had been infected with BEF virus because samples were not collected. There had been no history of deworming or other treatments of the cattle. The weather in November had been intermittently wet and very humid and a number of properties around the region had reported increased insect activity and suspected BEF cases. BEF is a common disease reported in the Top End during the wet season, usually causing mild and short-lived illness. The combination of severe haemonchosis, young cattle that may not have been exposed to BEF virus in previous seasons and high insect vector activity may have contributed to the severity and high mortality of this case.

Ketosis in cattle

Plant toxicity was initially suspected as the cause of cattle deaths on a pastoral property north of Alice Springs. Necropsy on an 8-year-old Brahman-cross cow revealed the animal was in reasonable body condition and approximately 7 months pregnant with a grossly pale and friable liver. Ketosis was confirmed by testing of a serum sample that revealed an increase in serum beta hydroxybutyrate (3.40 mmol/L), which is significantly above the normal range (0.05 mmol/L).

In the absence of a significant rainfall event, the nutritional value of the pasture in Central Australia declines considerably and it was suspected that a number of animals may no longer be able to source sufficient feed to maintain the growth of their foetus, leading to a syndrome comparable with twin lamb disease in sheep. This condition may be more common than many extensive pastoralists suspect, primarily because losses tend to be sporadic and not as obvious as a plant poisoning event or a disease outbreak. The diagnosis of ketosis is an indication of the need to provide supplementation to animals in late pregnancy during periods when the nutritional value of pasture has declined.

Queensland



Greg Williamson, Biosecurity Queensland, Department of Agriculture and Fisheries

During the quarter, Queensland's Biosecurity Science Laboratory received 1053 terrestrial animal submissions from within the state. Approximately 78% of these were for disease investigations. The remainder came from surveillance programs (8%), regulatory activities (4%) and health checks (10%) for export, movements and accreditation programs.

Biosecurity Queensland provides subsidised laboratory services to the submitter whenever an emergency, exotic, emerging, significant endemic or significant zoonotic disease is a potential diagnosis. During the quarter, Biosecurity Queensland received 863 accessions from clinically ill animals for disease investigation. Each accession may involve samples relating to one or multiple animals.

Cattle accessions (326) accounted for 38% of total disease investigation accessions, reflecting the size and economic significance of Queensland's cattle industry. Other species submitted were horses (276), wildlife (44 bats, 1 possum, 4 wild birds), honey bees (43), pigs (38), aquatic animals (35), sheep (31), goats (31), commercial birds (16), camelids (9), and 9 others (7 dogs, 1 donkey, 1 cat).

Enzootic ataxia in kids is caused by copper deficiency. Photo: Department of Agriculture and Fisheries

Neurological signs secondary to copper deficiency in goat kids

On a Boer goat farm in the South Burnett region, two red Boer goat kids developed sudden but progressive hindlimb paralysis. The kids were born in early October and each was the only survivor of twin kiddings. The deceased twins from each set were weak, appeared to be paralysed in the hindlimbs at or soon after birth, and were unable to rise to feed so they were euthanased with no investigation. The two surviving kids appeared normal at birth but developed hindlimb weakness and ataxia at approximately 8 weeks of age, progressing to paralysis.

Externally, the kids displayed no gross structural abnormalities. They were bright and alert and each could support its head, neck and shoulders but they could not stand unaided and were unable to bear weight unsupported. One appeared unable to straighten its forelimbs when lifted off the ground. Both responded to tactile stimulation of the hindlimbs and vital signs were within the normal range.

Necropsy examination of the two euthanased kids was unremarkable. Histologically, there was patchy depletion of the granule cell layer and Purkinje cell loss in the cerebellum and patchy Wallerian degeneration in the white matter tracts. One kid had severe cardiac myocyte necrosis and fibrosis. In both kids, copper levels were markedly reduced in the liver (0.8 mg/kg and 2.9 mg/kg, normal 25.0–150.0 mg/kg) and serum (6.50 µmol/L and 9.17 µmol/L, normal 11.00–19.00 µmol/L).

The clinical appearance and laboratory findings support the diagnosis of copper deficiency. Enzootic ataxia (or 'swayback' due to the development of an erratic swaying gait) develops more commonly in kids after 4–6 weeks of age although it can be seen in newborns. Copper deficiency of kids in utero or after birth produces permanent myelin degeneration in the spinal cord, which leads to progressive incoordination and paralysis. A private veterinarian is advising the producer on management to maintain adequate levels of copper.

Brucella suis infection in a pig-hunting dog

In October 2015, *Brucella suis* was diagnosed in one of two dogs used for pig hunting in the Goondiwindi region.

The 2-year-old, 38 kg mixed breed male dog presented in July 2015 with diarrhoea, dehydration and decreased appetite. The tail and body of the epididymis of the left testicle was slightly swollen. Raw feral pig meat was a regular part of the dog's diet.

The dog responded well to initial treatment with intravenous fluids, nonsteroidal anti-inflammatory drugs and antibiotics (amoxicillin-clavulanic acid, metronidazole and enrofloxacin), followed by a 2-week course of ceftiofur, metronidazole and enrofloxacin. The dog remained well until October 2015 when it presented with a very enlarged left testicle and no other clinical signs.

A provisional diagnosis of *B. suis* infection was made and a bilateral orchiectomy with scrotal ablation was performed while wearing personal protective equipment. The spermatic cord was surrounded by purulent fluid and the left testicle was abscessed.

Severe chronic pyogranulomatous periorchitis and peri-epididymitis were evident histologically. Seroconversion to *Brucella* spp. was detected as positive reactions in both the complement fixation test (titre 1:512) and the Rose Bengal plate test. Biotyping of bacterial culture by the CSIRO Australian Animal Health Laboratory identified the isolate as *B. suis* biovar 1.

The dog was discharged with a 4-week course of enroflaxacin, metronidazole and amoxicillin-clavulanic acid. Recovery was uneventful and the dog remains clinically well. There have been no clinical signs suggestive of infection in the companion dog. In dogs, *B. suis* infection is usually associated with orchitis, non-healing abscesses or discospondylitis.

The owners of the affected dog were advised not to feed feral pig meat to their dogs and made aware of the human health implications.

Infection with *B. suis* is a notifiable disease in animals and humans under Queensland legislation. *B. suis* is enzootic in the Queensland feral pig population and sporadic spillover infection occurs in people and dogs that hunt feral pigs.

Introduction of Johne's disease in sheep to Central Queensland

Johne's disease (JD) was diagnosed in three of 25 Poll Dorset rams that had been introduced from interstate to a sheep and cattle property in the Blackall–Tambo region.

The 25 Poll Dorset rams were purchased from a SheepMAP certified flock in November 2014 and introduced to a flock of approximately 10 000 sheep. The condition of one 2-year-old ram deteriorated after joining in early 2015. When examined in late September 2015, the ram was in poor body condition, reluctant to move, lethargic and ataxic, carrying its head low to the ground, and appeared blind. The ram was euthanased for necropsy and laboratory examination. There were purulent and granulomatous lesions throughout the lungs and thorax, the heart appeared soft and flabby and areas of the atrium appeared pale, the kidneys were enlarged and soft, and numerous mesenteric lymph nodes were enlarged. A presumptive diagnosis of septicaemic pneumonia was made and samples taken to confirm the presumptive diagnosis and exclude JD.

Histological lesions confirmed the gross diagnosis of severe chronic diffuse suppurative bronchopneumonia. Fresh thoracic samples for bacterial isolation had not been collected. A definitive diagnosis of concurrent JD was made on the basis of histological lesions consistent with JD, including the presence of acid-fast bacilli in the ileum and lymph nodes, positive results from faecal high-throughput-Johnes (HT-J) PCR and ELISA testing and culture, and strain typing that confirmed S strain of *Mycobacterium avium* subsp. *paratuberculosis* in gut tissues and faeces.

Another two of the 25 recently introduced rams developed signs of weight loss and scouring. These rams were euthanased for necropsy examination, which revealed enlarged ileocaecal and mesenteric lymph nodes and thickening of the ileocaecal valve. A diagnosis of JD in these two rams was made on the basis of history, gross lesions, pathognomonic histologic lesions and positive results from faecal HT-J PCR and ELISA tests. Culture from these rams is still pending.

HT-J PCR and ELISA results of samples taken from all other rams (36), including the remaining cohort of recently introduced rams (22), suggest infection in other sheep. Results from faecal culture and follow-up sampling from additional necropsies are pending.

Seven potentially contaminated paddocks on the property have been placed under quarantine. The impact of JD infection on the property is being managed by flock vaccination and regular testing of retained ewes.

Queensland has a low prevalence for JD in sheep, which is demonstrated by an absence of detection through abattoir monitoring of Queensland sheep sent for slaughter in Queensland or interstate. In this case, JD in sheep was detected as an incidental finding of an ill-thrift investigation in sheep sourced from a MAP accredited property interstate. The source-state was notified of these findings.

South Australia

Celia Dickason, Department of Primary Industries and Regions, South Australia

During the quarter, the Department of Primary Industries and Regions conducted 174 livestock disease investigations[23] to rule out emergency diseases and investigate suspect notifiable diseases. The number of field investigations by category of livestock is shown in Figure 3.

More than 18 000 farming properties are registered in South Australia, dominated by cattle (nearly 12 000) and sheep (approximately 13 000). Many properties carry both species. There are about 1 000 poultry properties and 1 000 pig properties, many of which are located in a semi-arid environment.

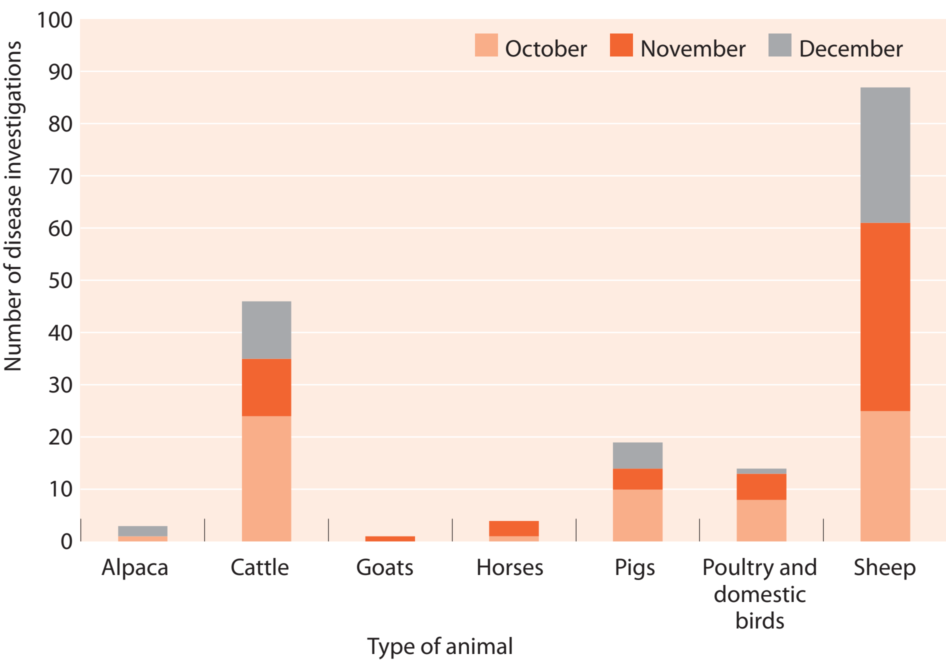
Field investigations were conducted by government veterinary or biosecurity officers (61) and private veterinary practitioners, who in 113 cases submitted samples to the state veterinary diagnostic laboratory for subsidised testing to exclude or confirm notifiable diseases.

During the quarter, the state veterinary diagnostic laboratory (Gribbles VetLab) processed 199 sample submissions to rule out emergency diseases and investigate suspect notifiable diseases and other sample submissions required as testing for export, accreditation programs and targeted surveillance.

Biosecurity SA, a division of the Department of Primary Industries and Regions, maintains close communication with rural private veterinary practitioners, who make a valuable contribution to surveillance by investigating potential incidents of notifiable diseases and significant disease events. Biosecurity SA has an Enhanced Disease Surveillance Program to promote disease incident investigations in South Australian livestock. In partnership with the National Significant Disease Investigation Program, the program funds laboratory submissions for suspect infectious diseases in livestock and subsidises contracted private veterinary practitioners for costs incurred in investigating unusual disease events. Biosecurity SA offers training and refresher courses in emergency animal disease detection and necropsy technique to practitioners, and provides ongoing technical support when required.

23 Field investigation with laboratory diagnostic testing.

Figure 3 Number of field disease investigations in South Australia, October–December 2015



The following case reports are a selection of field investigations chosen to reflect the range of livestock disease incidents during the quarter.

Foetal bovine viral diarrhoea virus infection confirmed in abortion investigation

During November 2015, a producer on the Fleurieu Peninsula reported three early-gestation abortions in his cows over a one-month period. The herd experienced a low fertility rate that season, with metritis diagnosed in 10% of animals investigated several months previously.

A 10–16-week-old foetus was submitted for further investigation. No significant histopathological lesions were seen but PCR testing of the heart blood and pericardial fluid was positive for bovine viral diarrhoea virus (BVDV) ribonucleic acid (RNA). Culture of the lung and PCR testing on the kidney were both negative for *Leptospira* spp. and *Brucella abortus*.

Although compatible lesions were lacking in the foetus to definitively attribute this abortion to BVDV type 1 (BVDV-1) infection, the positive BVDV status of the foetus, together with the history of other recent abortions in the herd, made the diagnosis of BVDV infection more likely[24].

It was advised to ascertain the BVDV infection status of the herd using further BVDV antigen testing at the herd-level, especially to determine if there were any persistently infected animals present.

Meningoencephalitis in dairy calves

In mid-October 2015, a Fleurieu Peninsula dairy producer reported the death of five calves aged between 2 and 8 weeks. Affected animals were part of a group of 17 calves, and illness and deaths had occurred over a one-week period.

Pasty diarrhoea appeared to be the initial sign of illness followed by progressive ataxia and recumbency, with blindness and death occurring within 24 hours. Attempts to treat affected calves with electrolytes, antibiotics (trimethoprim/sulfamethoxazole) and a nonsteroidal anti-inflammatory were unrewarding.

Necropsy examination was largely unremarkable but histopathology revealed a moderate-to-severe widespread meningoencephalitis with multifocal

24 Only BVDV type 1 (BVDV-1) is present in Australia. The severe BVDV-2 form in Europe and North America has not been found in Australia.

vasculitis. A causative agent could not be isolated but a bacterial aetiology is suspected based on the histopathological lesions. Faecal analysis was positive for *Cryptosporidium* spp., the likely cause of the initial diarrhoea seen in necropsied calves, but negative for *Salmonella* spp., rotavirus, coronavirus and *Escherichia coli* K99.

Improved colostrum and calf rearing management practices were advised and implemented. No further deaths have been reported.

Oxalate poisoning in pastoral sheep

A producer in the northern pastoral region reported the sudden death of 40 sheep overnight, with several more animals observed staggering around. Part of a 7500 flock, the sheep had been shorn and moved to a temporary post-shearing paddock that had previously been overgrazed. The main vegetation in the paddock was black bluebush (*Maireana pyramidata*).

Affected animals were of mixed age, sex and body condition. Signs of lethargy or depression and dehydration were noted but there was no pyrexia. Blood biochemistry showed azotaemia and hypocalcaemia and urine was isosthenuric, all of which suggested oxalate toxicity. The most remarkable finding on necropsy was significantly enlarged kidneys and bladder. Histopathology of the kidneys revealed moderately severe renal tubular degeneration and nephrosis associated with intralesional oxalate crystals.

Black bluebush has previously been associated with oxalate nephrosis and is considered a toxic plant to ruminants. The plant is known to exist in overgrazed areas and is eaten by hungry livestock.

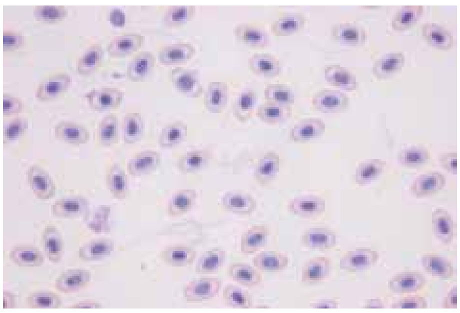
The producer was advised to immediately provide good quality hay to the remaining sheep and to move them to a more appropriate paddock as soon as possible. No further losses were reported.

Polioencephalomalacia in Merino wethers

A south-east sheep producer reported five sudden overnight mortalities out of a group of 500 Merino wethers. One affected animal was found in lateral recumbency with paddling and seizures but was otherwise in good body condition. The rest of the flock appeared normal. Necropsy revealed inflamed meninges with little other gross change visible. Brain histopathology showed lesions consistent with polioencehalomalacia (PEM), including a multifocal laminar pattern of oedema and necrosis in the deep grey matter of the sulci and gyri in the cerebral cortex. Transmissible spongiform encephalopathy (TSE) was ruled out on histology, according to the Australian and New Zealand standard diagnostic procedures for TSEs.

The most common cause of PEM is vitamin B_1 (thiamine) deficiency, which can be due to a decrease in thiamine synthesis by rumen microorganisms. This is usually associated with a change in diet (more common) or increased thiamine destruction by thiaminase found in bracken fern (less common) or thiamine antimetabolites (also less common). PEM can be caused by high levels of dietary sulfur that will cleave thiamine, due to the application of superphosphate fertilisers, high levels of sulfur in water, or ingestion of some *Brassica* genus plants.

In this case, a superphosphate fertiliser was spread onto the paddock that the wethers were grazing, so it is possible that this caused the PEM.



Top: Ticks visible on skin of live fowl. Bottom: Spirochaetes causing tick fever in poultry. Photos: Primary Industries and Regions SA.

Effective treatment of thiamine deficiency needs to occur as soon as possible after signs are observed. Recommended treatment includes an initial dose of thiamine at 10 mg/kg administered intravenously, followed by intramuscular administration every 12 hours for a total of four treatments. A response should be evident within 2–6 hours.

In this case, the producer moved the Merinos to a different paddock and experienced no further losses.

Avian spirochetosis in backyard poultry

A small backyard poultry owner in the Murraylands reported illness and death in two 16-week-old layer pullets. These birds had been introduced 2 weeks previously to the small flock of 15 other layer chickens.

The birds had been observed to be weak and ataxic prior to death, and necropsy revealed anaemia. Helical-coiled bacteria observed in blood smears confirmed a clinical suspicion of avian spirochetosis (tick fever) caused by *Borrelia anserina*. Histopathology revealed typical reactive changes in the liver and spleen commonly associated with this infection. Real-time and reverse-transcriptase PCR testing was negative for both avian influenza and Newcastle disease.

B. anserina is usually transmitted in the bite of an infected fowl tick (*Argas persicus*) but it can be spread between birds by ingestion of infective discharges from infected birds. The more virulent strains of *B. anserina* infection generally cause an acute septicaemia characterised by high mortality with variable morbidity. Most of the domesticated fowl species are susceptible to spirochetosis.

Whilst ticks on poultry are relatively easily seen on live birds, they are notoriously difficult to eradicate once established on a property, particularly in older structures containing wood and on earth floors. Ticks are extremely hardy and can survive several years without a host. Where sheds are poorly constructed or birds are not confined to pens, eradication can be difficult. Parasite numbers can be reduced and controlled by spraying an appropriately registered insecticide at 5-day intervals until thorough inspection fails to detect them. A minimum of three spray applications is required but this treatment will rarely eradicate ticks from housing.

In flocks where the disease is established, good flock immunity appears to develop.

Tasmania

Sue Martin, Biosecurity Tasmania, Department of Primary Industries, Parks, Water and Environment

During the quarter in Tasmania, 266 livestock disease investigations were conducted to rule out emergency diseases and investigate suspect notifiable diseases. The number of investigations[25] by category of livestock is shown in Figure 4.

Field investigations were conducted by government veterinary or biosecurity officers (18) and private veterinary practitioners, who in 248 cases submitted samples to the state diagnostic veterinary laboratory for subsidised testing to exclude or confirm notifiable diseases.

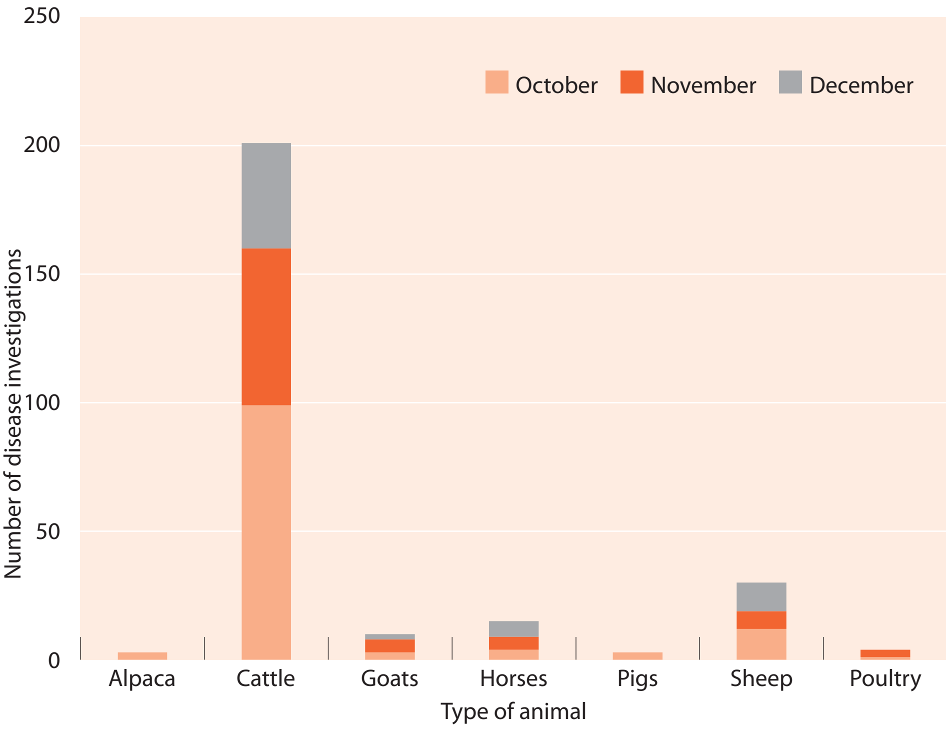
25 Field investigation with laboratory diagnostic testing.

During the quarter, the state veterinary diagnostic laboratory (Animal Health Laboratory) processed 267 livestock sample submissions to rule out emergency diseases and investigate suspect notifiable diseases. Sample submissions were also received requiring testing for export, accreditation programs and targeted surveillance.

In Tasmania, most livestock disease investigations are undertaken by private veterinary practitioners in collaboration with veterinary officers from the department. Private veterinary practitioners are eligible for a subsidy from the National Significant Disease Investigation Program[26] for disease investigations when presenting clinical signs are consistent with an exotic, emergency or emerging disease. Diagnostic samples are required to be submitted to the Animal Health Laboratory.

The following case reports are a selection of field investigations, chosen to reflect the range of livestock disease incidents during the quarter.

Figure 4 Number of field disease investigations in Tasmania, October–December 2015



Glässer's disease in young pigs

Glässer's disease (infectious polyarthritis or porcine polyserositis caused by *Haemophilus parasuis*) was diagnosed as the cause of death of 10 young grower pigs from a group of 50. The affected pigs were purchased as weaners from multiple sources and grown out together under free-range conditions. Clinically affected pigs were noted to be lethargic, variably lame and had mild neurological signs and occasional diarrhoea. Field necropsy samples and a fresh dead pig were submitted to the state veterinary diagnostic laboratory.

Gross findings were consistent with Glässer's disease. The pigs were found to have fibrinous polyserositis involving the peritoneum, pleura, pericardium, some joints and the meninges. There was also mild bronchopneumonia. *H. parasuis* was isolated on culture.

The disease usually occurs as sporadic outbreaks in weanling to 4-month-old pigs and is usually associated with a stressor, such as being weaned, moved to a

26 http://dpipwe.tas.gov.au/biosecurity/animal-biosecurity/animal-health/information-for-veterinary-practitioners

different pen or transported. When introduced into a previously non-infected herd, the disease may spread through a herd until herd immunity develops or the infection is eliminated.

There are several pathogenic serovars of *H. parasuis*. The isolate in this case was referred to a reference lab for strain serotyping using both the gel diffusion and indirect haemagglutination (IHA) methods. A number of serotypes of *H. parasuis* can be involved in disease outbreaks with serotypes 2, 5 and non typables such as this being the most common. Often various serotypes can be involved on a single farm.

Remaining pigs in the group were treated with antibiotics. Losses from this group continued for several weeks but then tapered off. The owner is aiming to move towards a closed herd management system to reduce the risk of further disease outbreaks.

Lead poisoning in beef cattle

Lead poisoning was confirmed as the cause of death in seven mixed age beef cattle from a group of 90 over a two-week period. All affected animals had shown brief neurological signs prior to death and had died in one particular paddock or shortly after moving out of it. Blood lead levels from a clinically affected animal were 3.8 μmol/L (normal < 0.2 μmol/L) and necropsy tissue samples returned lead levels of 873.0 μmol/kg wet weight in the kidney (normal < 2.0 μmol/kg).

Potential sources of lead toxicity on the farm were investigated. The paddock in which livestock died was found to contain numerous degraded batteries with clear indications that cattle had been chewing on the materials. The owner was instructed to dispose of batteries and battery waste, and to fence off waste areas so livestock could not gain access to batteries or other waste residues that may contain lead contaminants or the ground on which they had been lying. All livestock were removed from at-risk sites. All exposed animals were identified and the owner was issued with a direction preventing the removal or slaughter of exposed cattle and any progeny born to them during the detention period until further testing could confirm blood lead levels had returned to normal.

Fowl cholera in barn layer chickens

Fowl cholera was diagnosed as the cause of low-level mortalities in 2000 barn layers. Mortalities of 3–5 birds per day were found in a single pen in a multiage shed over a two-week period but there was no significant drop in egg production. Affected birds were lethargic and hot, with some yellow diarrhoea, and rapidly progressed to death.

Two live and two dead birds were submitted to the state veterinary diagnostic laboratory for necropsy. Necropsy findings included splenomegaly and hepatomegaly with a variable fibrinous exudate in the peritoneal and pericardial cavities and on the liver surface. Some livers had scattered pale miliary foci throughout the parenchyma. Histologically, there was a fibrinonecrotic hepatitis and splenitis and fibrinous pericarditis and peritonitis. *Pasteurella multocida*, the causative agent of fowl cholera, was isolated from all birds.

TaqMan real-time PCR testing was undertaken to exclude avian influenza and Newcastle disease viruses. All samples tested negative for the presence of avian influenza type A RNA and Newcastle disease class 1 and class 11 using primers targeting the F-gene, M-gene and L-gene.

Fowl cholera vaccines are available but efficacy is variable. Farm hygiene and biosecurity measures are important in the control of fowl cholera and the owner has been advised how to minimise the risk of further mortalities.

Victoria

Karen Moore, Biosecurity, Department of Economic Development, Jobs, Transport and Resources

During the quarter in Victoria, 468 livestock disease investigations[27] were conducted to rule out emergency diseases and investigate suspect notifiable diseases. The number of investigations by category of livestock is shown in Figure 5.

Field investigations were conducted by government veterinary or biosecurity officers (142) and private veterinary practitioners, who in 326 cases submitted samples to the state veterinary diagnostic laboratory for subsidised testing to exclude or confirm notifiable diseases.

During the quarter, the state veterinary diagnostic laboratory (AgriBio, the Centre for AgriBioscience) processed 304 livestock sample submissions to rule out emergency diseases and investigate suspect notifiable diseases. Sample submissions were also received requiring testing for export, accreditation programs and targeted surveillance.

Across all species, nonspecific clinical patterns were most commonly reported, followed by signs associated with the gastrointestinal tract, the central nervous system and the respiratory tract. The diseases most commonly diagnosed by species were gastrointestinal diseases in cattle, diseases of the central nervous system in sheep and respiratory disease in poultry and horses. Cases of clinical disease where no definitive disease agent was identified were reviewed in the context of the surrounding circumstances and exotic or emergency diseases were excluded where appropriate.

The following case reports are a selection of field investigations, chosen to reflect the range of livestock disease incidents during the quarter.

27 Field investigation with laboratory diagnostic testing.

White muscle disease in beef calves

In October 2015, a beef producer from a property at Tatong, in north-east Victoria, had 15 calves die, aged 7–9 weeks. The affected animals were from three of four groups of 139 Angus heifers with calves on the property; the calves of adult cows were unaffected. The producer had lost several calves the previous year but the deaths had ceased after administration of a booster clostridial vaccine.

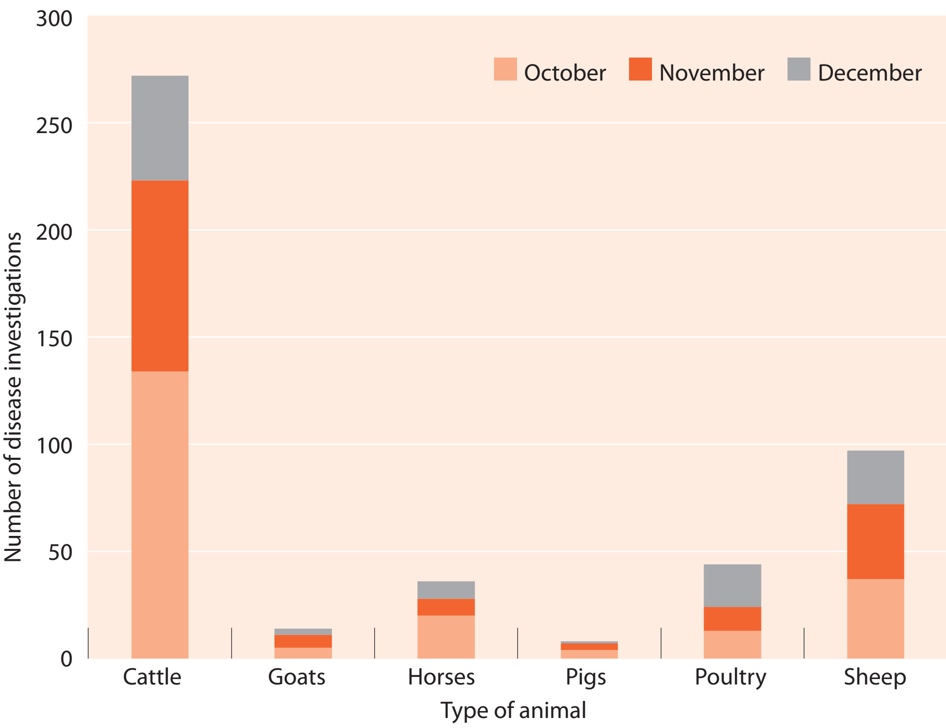
Clinically, the affected calves, which were the older, better grown progeny, were depressed with laboured breathing, pyrexia and rapid heart rates (200 beats/min). They usually died within 48 hours of the first signs being observed but most were found dead with no overt signs of disease.

Necropsy of two affected calves revealed dark red consolidated lungs and enlarged rounded, dark, friable livers with copious bleeding when cut. The left ventricles of the hearts were grossly enlarged with pale streaks; when dissected, white plaques and striations were observed on the cut surfaces.

Despite the cattle having a good vaccination history, clostridial infection was again suspected as the cause of these deaths.

The beef producer annually applied superphosphate at rates higher than typically used for the district (200 kg/ha) but this year, inadvertently applied 250 kg/ha in May. The heifers were on the 'best' clover-dominant pastures that grew after the winter rains. In contrast, the adult cows were on the 'poorer' grass-dominant pastures.

Figure 5 Number of field disease investigations in Victoria, October–December 2015



Some investigations involved multiple species.

Histopathology revealed a severe cardiomyopathy typical of white muscle disease. Glutathione peroxidase concentrations were either very low or below the level of detection, confirming the selenium deficiency. Deaths stopped immediately after the provision of selenium supplements to the heifer cows and their progeny.

The district is not noted for selenium deficiency and few livestock producers routinely supplement their livestock. It appears that this producer may have induced a deficiency by the high application rate of superphosphate, compounded by vigorous post-drought pasture growth. The producer was advised to continue with routine selenium supplementation annually.

Blackleg in an organic beef herd

An organic beef herd near Wangaratta, in northeast Victoria, had four deaths out of 40 calves, aged 3–4 months, all with body condition score 4–5. Several calves had been seen with diarrhoea and were treated with electrolytes but subsequently died with rapid autolysis of the carcase.

Clinical examination of a sick calf revealed pyrexia (40.5°C), lethargy, anorexia and ventral oedema of the brisket with palpable subcutaneous emphysema. Following euthanasia, necropsy revealed ample subcutaneous and internal fat deposits, with petechial haemorrhages on the gut serosal surfaces and myocardium. Peritoneal and pericardial fluids were increased and blood tinged. The musculature below the neck and onto the brisket was dark and haemorrhagic with emphysematous crackling.

Severe necrotising and suppurative myositis and myocarditis were seen histopathologically with lesions characteristic of blackleg. The skeletal muscle of the ventral neck and myocardial myofibres and muscle bundles were expanded by oedema, fibrin and an infiltration of neutrophils. Occasional large bacilli consistent with *Clostridium* spp. were present.

The herd had not been vaccinated in recent years and the producer did not use antibiotics. The producer was advised to vaccinate the herd.

Kikuyu grass toxicity on a sheep property in northern Victoria

In the two days following September shearing on a property at Rochester, in central Victoria, 25 out of 650 mature Merino ewes were found dead with a further 20 ewes recumbent and unable to stand. Affected ewes were depressed, had evidence of nonhaemorrhagic diarrhoea, and did not respond to subcutaneous calcium administration. Following shearing, the ewes were moved onto wheat crop stubble with no concentrate feed supplementation. Necropsy findings were nonspecific.

A range of samples were submitted to AgriBio to determine the cause of the peracute deaths. Histological examination revealed an acute necrotising rumenitis with pulmonary changes suggestive of cardiac failure as the cause of death. Specific histological changes of the reticulum pointed to a possible aetiology of toxicity due to kikuyu grass (*Pennisetum clandestinum*) or mother-of-millions (*Bryophyllum delagoense*).

The property was examined for evidence of possible plant toxins. It was discovered that kikuyu grass was the predominant species present in the shearing yards where the ewes were held for some time prior to shearing. Of the ewes showing clinical signs, those less severely affected were generally seen to make a full recovery, while those who were more severely impacted did not survive. The producer was advised to check holding yards prior to future routine management practices for aberrant weeds.

Neurological signs in young Saanen goats vaccinated with ovine Johne's disease vaccine

Ataxia, trembling and paralysis were observed in eleven 8–10-week-old Saanen goats on a property in central Victoria in October 2015. All female kids in the herd of 1000 had been vaccinated against ovine Johne's disease. Clinical signs developed 3–4 days later. While initially mild, with ataxia and trembling, they gradually progressed over the following days and weeks to recumbency and flaccid paralysis in all four limbs. The affected kids were treated with injectable broad spectrum antibiotics and vitamin B. There was no response to treatment and all affected goats were euthanased.

Three of the affected goats, all showing flaccid paralysis of all four limbs, were submitted to AgriBio for examination. At necropsy, a grey–pink mass was present in the spinal musculature at the vaccine injection site in one of the three kids. On opening the atlanto–occipital joint, it was clearly evident that all three kids had chronic inflammation in the joint and surrounding the spinal cord. Histological examination confirmed pyogranulomatous inflammation of synovial and epidural tissue and, in two animals, acid-fast bacilli were found inside clear globules within areas of inflammation. The cervical spinal cord had lesions typical of pressure myelopathy from adjacent space-occupying inflammatory tissue.

The changes noted clinically, on gross examination, and histopathologically were consistent with a typical reaction to a vaccine administered inappropriately into the proximal cervical spine. A review of the technique for vaccination ensuring sharp clean equipment used on well-restrained animals, delivered by experienced workers is essential to reducing or eliminating these losses in the future.

Left: Grey–pink mass in the spinal musculature. Right: Chronic inflammation in the joint and surrounding the spinal cord. Photos: Department of Economic Development, Jobs, Transport and Resources.

Verminous arteritis in a thoroughbred mare

Verminous arteritis, due to strongylosis, was diagnosed as the cause of severe depression and dehydration in a 3-year-old thoroughbred mare, and suspected as a cause of death in two other horses on a property near Darlington in south-western Victoria in October 2015.

Seven adult thoroughbred horses and two donkeys were running in an 8 ha paddock with an abundance of semi-cured pasture. The pasture was predominantly mixed grasses, including phalaris (*Phalaris aquatica*) and some clover. The only water source was a runoff dam. The drenching history of the horses was unclear.

Two horses died on consecutive days following a brief illness with depression and diarrhoea. The first horse to die was observed to have blood in its faeces just prior to death. The next day, three of the five surviving horses were observed to have diarrhoea, one of which, a 3-year-old mare, was observed to be severely depressed with foul smelling faeces. Neither of the donkeys appeared ill.

The severely depressed mare was euthanased with a captive bolt and a necropsy conducted. Gross examination revealed a swollen liver with a cloudy white discolouration of the capsule and multifocal fibrin tags on the diaphragmatic surface. Fibrin tags were observed on the serosal surface of the caecum, and the mucosa of the caecum and small intestine was segmentally reddened with corrugations.

Histopathology revealed nematode larvae resembling *Strongylus vulgaris* in the lumina of the arteries in the liver along with thrombi and suppurative infiltrates. Nematode larvae were observed in the mucosa of the large intestine. Culture of the caecal contents was negative for *Salmonella* spp. A faecal egg count was not performed.

Following the diagnosis of verminous arteritis, all surviving horses were drenched with a product containing moxidectin and praziquantel. The two horses with diarrhoea responded to this treatment and fully recovered.

Western Australia

Jamie Finkelstein, Department of Agriculture and Food Western Australia

During the quarter in Western Australia, 196 livestock disease investigations[28] were conducted to rule out emergency diseases and investigate suspect notifiable diseases. The number of investigations by category of livestock is shown in Figure 6.

Field investigations were conducted by government veterinary or biosecurity officers (29) and private veterinary practitioners (167). All diagnostic testing was conducted at the state veterinary diagnostic laboratory to exclude or confirm notifiable diseases.

During the quarter, the state veterinary diagnostic laboratory processed 585 livestock sample submissions[29] to rule out emergency diseases, investigate suspect notifiable diseases and provide proof of freedom certifications for export, accreditation programs and targeted surveillance.

The Department of Agriculture and Food Western Australia (DAFWA), in partnership with private veterinarians and industry, works to protect Australia's reputation as a producer of safe, wholesome livestock and livestock products.

Key aims of livestock disease surveillance are early detection of reportable diseases and demonstrating Australia's absence of, and capacity to detect, reportable diseases to support domestic and export market access for Australia's livestock and livestock products.

Given that reportable diseases may present similarly to diseases endemic in Australia, a key objective is prompt investigation of cases presenting with clinical signs consistent with a reportable disease. This has the dual purpose of assisting the affected producer to manage the disease event, by definitively diagnosing the endemic disease cause, as well as supporting the wider livestock sector by demonstrating freedom from reportable diseases, which is vital to maintaining Australia's favourable animal health status and market access.

The following case reports are a selection of field investigations, chosen to reflect the range of livestock disease incidents during the quarter.

Contagious bovine pleuropneumonia excluded in cattle with respiratory signs

In December 2015, a private veterinarian investigated a report from a Northern Agricultural region producer of respiratory signs and deaths in 9-month-old mixed breed cattle.

The history included 5 dead and another 10 affected from a herd of 200. Clinical examination of an affected animal revealed respiratory distress, pytalism, pyrexia and pneumonia. The animal was euthanased and necropsy examination revealed fibrinous pleuropneumonia and pericarditis. The private veterinarian submitted a comprehensive sample set to DAFWA with a provisional diagnosis of bovine respiratory disease or pasteurellosis.

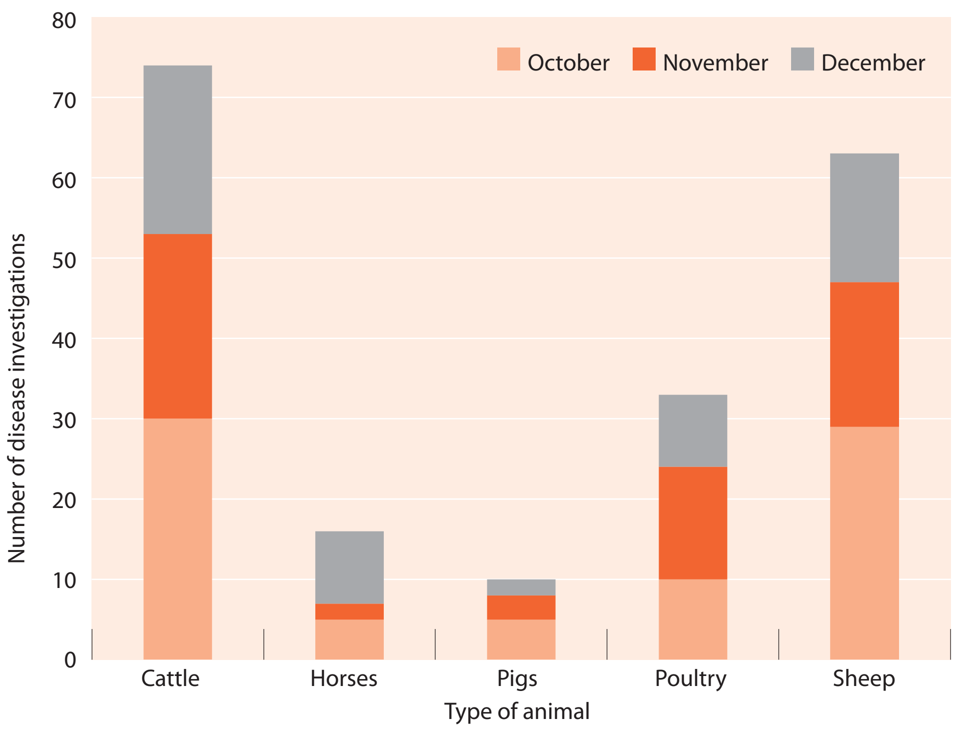
Histopathological examination of the lung revealed large foci of parenchyma heavily infiltrated by neutrophils and fibrinous exudate with multifocal necrosis. Several large bronchioles were infiltrated with significant neutrophilic debris and the interlobular septa and the pleura were expanded by oedema and neutrophilic exudate. The epicardium was expanded by a marked fibrinous exudate and intense neutrophilic infiltration.

The histopathological examination confirmed a clinical diagnosis of severe acute pneumonia. Bacterial culture isolated *Pasteurella multocida*, a commonly recognised agent of bovine respiratory disease.

PCR testing for viral agents, including bovine respiratory syncytial virus, parainfluenza virus 3, BVDV, bovine herpesvirus 1 and bovine respiratory coronavirus, were all negative. PCR and culture were both negative for mycoplasma, resulting in an exclusion of contagious bovine pleuropneumonia.

DAFWA advised the producer on management of bovine respiratory disease and a recurrence has not been reported. Excluding reportable diseases and reaching a definitive endemic disease diagnosis assisted the affected producer to manage the disease event, and supports the wider livestock sector by demonstrating freedom from reportable diseases.

Figure 6 Number of disease investigations in Western Australia, October–December 2015



28 Field investigation with laboratory diagnostic testing.

29 Some investigations involved multiple submissions.

Pigeon paramyxovirus 1 in pigeons: Newcastle disease exclusion

In November 2015, a private veterinarian investigated pigeons showing neurological signs in a loft in the Perth metropolitan area. Affected birds showed signs of lethargy, diarrhoea and significant neurological signs, with a mortality rate of approximately 25% amongst the affected flock of 120.

The private veterinarian submitted samples (pigeons) to DAFWA where necropsy examination revealed fibrinonecrotic serositis, air sacculitis and interstitial nephritis. Histopathological findings consistent with pigeon paramyxovirus 1 (PPMV-1) were observed in the kidneys.

The CSIRO Australian Animal Health Laboratory confirmed the diagnosis of Western Australia's first case of PPMV-1 by PCR testing and that the strain had 99% nucleotide and 99% amino acid similarity over the fusion protein cleavage region to previous PPMV-1 strains circulating in Victoria.

With this being the state's first detected case of PPMV-1, DAFWA implemented movement controls and monitoring of the affected loft to reduce the likelihood of introducing PPMV-1 into other pigeon lofts. DAFWA re-issued the wider pigeon industry with advice on good biosecurity practices, including vaccination, as a means to protect their lofts against PPMV-1.

Investigating significant disease events is vital to supporting Australia's favourable animal health status and ongoing market access. By investigating and confirming this virus as PPMV-1, Newcastle disease virus was excluded. Newcastle disease would have a significant impact on the commercial poultry sector in Western Australia, which is valued at about $300 million annually.

Surveillance for equine notifiable diseases

With several of Australia's national notifiable diseases affecting horses, the DAFWA Animal Health Surveillance and Diagnostics project supports the investigation of cases where horses are showing indicative clinical signs. During the quarter, this included testing for several notifiable diseases, including but not limited to Hendra virus, equine herpesvirus 1 and contagious equine metritis.

Hendra virus

Given the significant potential impact of Hendra virus infection on both horse and human health, DAFWA routinely conducts laboratory exclusions for Hendra virus where horses present with indicative clinical signs. During the quarter, DAFWA excluded Hendra virus infection in horses in seven cases from various regions of the state.

In several of these cases, not only was Hendra virus excluded, so too were other notifiable diseases that may cause similar signs in horses, such as Japanese encephalitis. This contributes to our demonstration of freedom from Japanese encephalitis, which benefits both the horse and pig industries.

Equine herpesvirus 1 (abortigenic and neurological strains)

In this quarter, DAFWA excluded abortigenic and neurological strains of equine herpesvirus 1 (EHV-1) in five cases reported from various regions of the state. Horses presented with a range of clinical signs indicative of EHV-1 infection, including nervous signs and abortion.

DAFWA provided diagnostic support in one case where EHV-1 (abortigenic strain) was confirmed. EHV-1 was diagnosed in a 9-year-old mare on a South West Agricultural region property that aborted mid-term. This was the only mare affected on the property, with EHV-1 abortigenic strain diagnosed on the basis of the clinical signs and demonstration of a rising titre. Through prompt investigation, DAFWA provided the private veterinarian with advice on management practices to reduce the impact of disease on the affected property.

Contagious equine metritis

In December 2015, a private veterinarian investigated a case in the Southern Agricultural region of several mares failing to conceive. The history and clinical examination revealed that two mares were pregnant at 14 days but aborted shortly after. Ultrasound of several mares revealed several mares with excessive uterine fluid after mating.

Whilst no definitive diagnosis was reached in this case, contagious equine metritis (CEM), caused by *Taylorella equigenitalis*, was excluded by culture. Surveillance for and exclusion of reportable diseases, such as CEM, is vital to protecting Australia's horse health status.

Australia has been free from CEM since 1980. Australia's horse breeding industries benefit from being able to trade internationally as CEM free, as many countries have introduced import conditions to prevent the introduction of CEM due its significant potential impact on horse breeding populations.

Quarterly statistics

Endemic disease monitoring

Johne's disease

In Australia, Johne's disease occurs primarily in dairy cattle and sheep, and to a lesser extent in beef cattle, goats, deer and camelids. Infection with sheep strains occurs to varying extents across the sheep-producing regions of southern Australia but has not been detected in Queensland. Cattle strains are endemic in south-eastern Australia but surveillance programs have not identified infection to be endemic in Queensland, Western Australia or the Northern Territory, and active measures are taken to stamp out any incursions. Table 3 shows the number of herds and flocks known to be infected. The reporting of sheep herds infected with Johne's disease has been replaced with the annual reporting of area prevalence estimates for ovine Johne's disease in *Animal Health Surveillance Quarterly*.

Table 3 Herds[a] known to be infected with Johne's disease, at 31 December 2015

State	Alpaca	Cattle	Deer	Goat	Total
NSW	0	112	0	0	112
NT	0	0	0	0	0
Qld	0	6	0	0	6
SA	0	51	0	2	53
Tas	0	39	0	4	43
Vic	0	915	2	13	930
WA	0	0	0	0	0
Aus	**0**	**1 123**	**2**	**19**	**1 144**

a Includes herds participating in state test and control programs.

New approaches based on risk assessment and management have been developed to control Johne's disease. Market assurance programs (MAPs) are in operation for cattle, sheep, goats and alpacas; the numbers of herds or flocks that have reached a status of Monitored Negative 1 or higher are shown in Table 4. For status definition, see the current species MAP manual[30]. Lists of cattle, goat and alpaca herds and sheep flocks assessed in the MAPs are available on the website. Herd or flock testing is undertaken by a MAP-approved veterinarian. Information about components of the National Johne's Disease Project can be obtained from state coordinators and Animal Health Australia's Johne's disease coordinator, Rob Barwell (tel. 02 6203 3947).

Table 4 Herds or flocks[a] with a Market Assurance Program status of at least Monitored Negative 1, 1 July – 31 December 2015

Quarter	Alpaca	Cattle	Goat	Sheep	Total
Jul–Sep 2015	19	364	21	381	785
Oct–Dec 2015					
NSW	10	147	11	154	322
Qld	0	0	3	1	4
SA	7	115	8	153	283
Tas	0	35	1	13	49
Vic	2	63	1	52	118
WA	0	0	0	4	4
Aus	**19**	**360**	**24**	**377**	**780**

a There are no herds or flocks in Northern Territory in the MAPs. Herds or flocks in Free or Protected zones have an equivalent status of Monitored Negative 1 or better because of the zone status.

Ovine contagious epididymitis

Contagious epididymitis, caused by *Brucella ovis*, is present in commercial flocks at a low level that varies around the country. Voluntary accreditation programs (usually in stud flocks) for ovine contagious epididymitis freedom operate in all states. Table 5 shows the number of accredited flocks at the end of the quarter.

Table 5 Ovine contagious epididymitis accredited-free flocks, 1 October 2014 – 31 December 2015

State	Oct–Dec 2014	Jan–Mar 2015	Apr–Jun 2015	Jul–Sep 2015	Oct–Dec 2015
NSW	865	865	865	858	846
Qld	81	80	77	77	79
SA	522	522	530	530	530
Tas	81	68	68	59	62
Vic	496	504	496	489	471
WA	195	195	194	194	183
Aus	**2 240**	**2 234**	**2 230**	**2 207**	**2 171**

30 www.animalhealthaustralia.com.au/maps

Laboratory testing

Serological testing

Table 6 summarises the results of serological testing for two equine viruses on samples submitted to state and territory animal health laboratories during the quarter. Positive serological test results are not an indication of the presence of clinical disease.

Table 6 Results of serological testing for two equine viruses, 1 October 2014 – 31 December 2015

	No. of tests (equine infectious anaemia)	Positive (equine infectious anaemia)	No. of tests (equine viral arteritis)	Positive (equine viral arteritis)
Oct–Dec 2014	1 242	0	664	4
Jan–Mar 2015	707	0	897	6
Apr–Jun 2015	463	0	639	4
Jul–Sep 2015	582	0	519	0
Oct–Dec 2015				
NSW	914	0	320	0
NT	1	0	0	0
Qld	25	0	0	0
SA	0	0	0	0
Tas	0	0	0	0
Vic	390	0	163	0
WA	**18**	**0**	**0**	**0**
Aus	**1 348**	**0**	**483**	**0**

Table 7 summarises the results of laboratory testing for equine herpesvirus 1 on samples submitted to state and territory animal health laboratories during the quarter.

Table 7 Results of testing for equine herpesvirus 1, at 31 December 2015

Syndrome	Negative	Positive	Total
Abortion	13	2	15
Neurological	17	0	17
Other	10	0	10
Total	**40**	**2**	**42**

Table 8 summarises the results of serological testing for three arboviruses on samples submitted to state and territory animal health laboratories during the quarter. Positive serological test results are not an indication of the presence of clinical disease. The distribution of these viruses is monitored by the National Arborvirus Monitoring Program (NAMP)[31]. Figures reported reflect tests completed at the time of reporting, therefore tests completed may increase in future reporting periods.

Table 8 Results of serological testing for three arboviruses, 1 October 2014 – 31 December 2015

Quarter	No. of tests (Akabane)	Positive (Akabane)	No. of tests (BEF)	Positive (BEF)	No. of tests (BTV)	Positive (BTV)
Oct–Dec 2014	182	5	479	31	724	42
Jan–Mar 2015	257	11	598	46	1 336	37
Apr–Jun 2014	782	31	837	41	1 650	40
Jul–Sep 2015	454	22	576	33	882	37
Oct–Dec 2015	**196**	**12**	**514**	**47**	**758**	**13**

BEF = bovine ephemeral fever virus; BTV = bluetongue virus

31 http://namp.animalhealthaustralia.com.au

Surveillance activities

Bovine brucellosis

Australia declared freedom from bovine brucellosis (caused by *Brucella abortus*) in 1989[32]. Surveillance is maintained through abortion investigations and additional testing of cattle for export or other reasons. Table 9 shows 177 bovine abortion investigations and 196 investigations for other reasons were performed during the quarter; all were negative for bovine brucellosis.

Table 9 Bovine brucellosis testing, 1 October 2014 – 31 December 2015

Quarter	No. of tests (abortion)	Positive (abortion)	No. of tests (other reasons)[a]	Positive (other reasons)
Oct–Dec 2014	35	0	980	0
Jan–Mar 2015	133	0	1 530	0
Apr–Jun 2015	114	0	1 513	0
Jul–Sep 2015	297	0	283	0
Oct–Dec 2015				
NSW	10	0	154	0
NT	0	0	0	0
Qld	52	0	0	0
SA	32	0	20	0
Tas	10	0	0	0
Vic	7	0	12	0
WA	66	0	10	0
Aus	**177**	**0**	**196**	**0**

a Some information is derived from pre-export testing of cattle destined for live export markets where the importing country requires testing. The total number of tests each quarter may therefore vary, depending on total cattle exports to particular markets.

32 www.agriculture.gov.au/SiteCollectionDocuments/animal-plant/animal-health/pet-food-safety/brucella-abortus-colour.doc

National Transmissible Spongiform Encephalopathies Surveillance Program

The National Transmissible Spongiform Encephalopathies Surveillance Program (NTSESP) is an integrated national program jointly funded by industry and government to demonstrate Australia's ongoing freedom from bovine spongiform encephalopathy (BSE) and classical scrapie, and to provide early detection of these diseases should they occur. The program, based on the World Organisation for Animal Health (OIE) *Terrestrial Animal Health Code*[33], involves testing of samples from cattle and sheep with clinical signs consistent with BSE or scrapie respectively, as well as from fallen and casualty slaughter cattle. Points are assigned to cattle samples according to the animal's age and subpopulation category (i.e. the likelihood of detecting BSE). Australia's target is to achieve a minimum of 150 000 points over a rolling 7-year period. Table 10 shows the number of animals sampled for BSE and scrapie and the points tally for cattle in the NTSESP[34] during the past 12 months. All samples tested were negative.

Table 10 Samples tested for transmissible spongiform encephalopathies (TSEs), 1 January 2015 – 31 December 2015

State	No. examined (cattle)	Points (cattle)	Positive (cattle)	No. examined (sheep)	Positive (sheep)
NSW	122	49233.8	0	215	0
NT	36	31.6	0	0	0
Qld	159	55606.7	0	19	0
SA	28	12942.5	0	51	0
Tas	25	5468.3	0	17	0
Vic	128	37429.1	0	136	0
WA	24	12425.7	0	109	0
Aus	**522**	**173137.7**	**0**	**547**	**0**

33 World Organisation for Animal Health (2014). Bovine spongiform encephalopathy, In: *Terrestrial Animal Health Code*, OIE, Paris, www.oie.int/index.php?id=169&L=0&htmfile=chapitre_bse.htm

34 www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/tse-freedom-assurance-program/

Avian influenza

Australia is currently free from highly pathogenic avian influenza. A number of low pathogenic subtypes of avian influenza have been found in wild birds. Please consult the Wildlife Health Australia report in this publication for information on avian influenza in wild birds. During the quarter, 251 birds from 100 laboratory submissions were tested for avian influenza (excluding surveillance reported in the Wildlife Health Australia and Northern Australia Quarantine Strategy reports); there were no positive results (Table 11). Tests include competitive ELISA, haemagglutination inhibition, agar gel immunodiffusion, reverse-transcriptase PCR and virus isolation.

Table 11 Results of testing for avian influenza virus in poultry, 1 October – 31 December 2015[a]

H5 positive	H7 positive	Positive for a non-H5, non-H7 strain
0	0	0

a Excludes surveillance reported in the Wildlife Health Australia and Northern Australia Quarantine Strategy reports and testing conducted for import purposes.

Newcastle disease

Australia is currently free from virulent Newcastle disease or exotic Newcastle disease, even though precursor and endemic avirulent viruses are present in Australia. Vaccination against virulent Newcastle disease using a combination of live lentogenic virus (V4) and a killed vaccine is required in commercial chicken flocks in all Australian jurisdictions. Vaccination exceptions for broilers apply in Tasmania, Western Australia, Queensland and South Australia.

During the quarter, 304 birds from 98 laboratory submissions were tested for Newcastle disease (Table 12).

Table 12 Results of testing for paramyxovirus testing in poultry, 1 October – 31 December 2015[a]

Virulent strain of ND virus	Peats Ridge strain of ND virus	Lentogenic V4 or V4-like strain of ND virus	Other paramyxovirus
0	0	0	0

ND = Newcastle disease

a Excludes testing for import purposes.

Salmonella *surveillance*

The National Enteric Pathogen Surveillance Scheme (NEPSS) is operated and maintained on behalf of the Australian Government and state and territory governments by the Microbiological Diagnostic Unit at the University of Melbourne. Data on isolates of *Salmonella* spp. and other pathogens are submitted to NEPSS from participating laboratories around Australia. Annual reports of both human and nonhuman isolates are available on request and detailed data searches are provided on request to NEPSS. Table 13 summarises *Salmonella* spp. isolations from animals reported to NEPSS.

Table 13 *Salmonella* notifications reported to the National Enteric Pathogen Surveillance Scheme (NEPSS), 1 October – 31 December 2015

Salmonella serovar	Birds[a]	Cats	Cattle	Dogs	Horses	Pigs	Sheep	Other	Total
Bovismorbificans	0	0	2	0	0	0	0	0	2
Dublin	0	0	5	0	0	0	0	0	5
Infantis	0	0	0	1	1	3	0	0	5
Typhimurium	0	3	13	8	8	0	5	1	38
Other	1	4	11	17	3	28	1	8	73
Total	**1**	**7**	**31**	**26**	**12**	**31**	**6**	**9**	**123**

a Includes both poultry and wild birds.

Northern Australian Quarantine Strategy

In recognition of the unique biosecurity risks associated with Australia's extensive and sparsely populated northern coastline, the Australian Government Department of Agriculture and Water Resources conducts an animal disease surveillance program as an integral component of its Northern Australia Quarantine Strategy (NAQS). This surveillance program aims to provide early detection of exotic and emerging pests and diseases of significance to agriculture, public health and the environment. Information is derived from the use of sentinel animals, structured surveys, vector trapping and community reporting projects. In addition, NAQS contributes surveillance data to the National Arbovirus Monitoring Program and the electronic Wildlife Health Information System (eWHIS). Table 14 summarises NAQS animal testing for specific target diseases in Australia during the past five quarters.

Table 14 Disease testing and pest surveillance under the Northern Australia Quarantine Strategy (NAQS), 1 October 2014 – 31 December 2015

	Oct–Dec 2014		Jan–Mar 2015		Apr–Jun 2015		Jul–Sep 2015		Oct–Dec 2015	
Disease or pest	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Aujeszky's disease[a]	0	0	0	0	31	0	73	0	**154**	**0**
Avian influenza	0	0	0	0	48	0	0	0	**0**	**0**
Classical swine fever	122	0	0	0	252	0	73	0	**154**	**0**
Japanese encephalitis	0	0	22	0	42	0	0	0	**0**	**0**
Surra (*Trypanosoma evansi*)	54	0	0	0	278	0	73	0	**183**	**0**

a The NAQS surveillance strategy for Aujeszky's disease has recently been reviewed and serological screening of wild pig populations commenced in the April–June 2015 quarter. Prior surveillance was based on general strategies for detecting disease events in pig populations.

Screw-worm Fly Surveillance and Preparedness Program

The Old World screw-worm fly (OWS) and New World screw-worm fly (NWS), *Chrysomya bezziana* and *Cochliomyia hominivorax* respectively, are exotic to Australia and suspicion of infestation in animals is notifiable under state and territory animal health legislation[35]. The OWS is a significant production disease of livestock throughout its range and is considered a greater threat to Australian livestock industries than NWS due to the proximity of its distribution to Australia (potential entry through the Torres Strait) and traffic of livestock export vessels returning from Asia to Australian ports.

Surveillance is conducted by targeted fly trapping and livestock myiasis monitoring in addition to unplanned investigation of myiasis (reported in *Suspect exotic or emergency disease investigations* and Table 17). Fly trapping is conducted at locations suitable for local OWS establishment following a potential incursion; in areas neighbouring livestock export ports and the Northern Peninsula Area. Table 15 summarises fly trapping events over the past year. No screw-worm fly were detected. Further information on the screw-worm fly program is available on the Animal Health Australia website[36].

Table 15 Summary of fly trapping events conducted, 1 January – 31 December 2015[a]

Risk entry pathway	Conducted by	Jan–Mar 2015	Apr–Jun 2015	Jul–Sep 2015	Oct–Dec 2015
Torres Strait	NAQS	35	29	56	15
Livestock export ports	NT, Qld and WA governments	270	24	46	28

NAQS = Northern Australia Quarantine Strategy

a Excludes traps with identification results pending.

Public health

The National Notifiable Diseases Surveillance System (NNDSS) coordinates the national surveillance of more than 50 communicable diseases or disease groups. Unit records of disease notifications made to the state or territory health authority, under the provisions of the public health legislation in their jurisdiction, are supplied daily to the Office of Health Protection, Australian Government Department of Health. The data are published weekly on the NNDSS website[37] and quarterly in the journal *Communicable Diseases Intelligence* and are replicated in *Animal Health Surveillance Quarterly* (Table 16) for five important zoonoses.

Table 16 National notifications of five zoonotic infections in humans, 1 October 2014 – 31 December 2015

Quarter	Brucellosis[a]	Chlamydophilosis[b]	Leptospirosis	Listeriosis	Q fever
Oct–Dec 2014	3	12	11	19	94
Jan–Mar 2015	1	1	20	16	129
Apr–Jun 2015	5	2	17	18	127
Jul–Sep 2015	3	3	17	14	148
Oct–Dec 2015					
ACT	0	0	0	1	0
NSW	1	3	3	10	46
NT	0	0	3	0	0
Qld	1	1	9	1	40
SA	0	0	0	1	2
Tas	0	0	0	0	0
Vic	0	1	1	8	15
WA	0	1	0	1	6
Aus	**2**	**6**	**16**	**22**	**109**

a Bovine brucellosis (*Brucella abortus*) was eradicated from the Australian cattle herd in 1989 and is presently considered an exotic animal disease in Australia. Caprine and ovine brucellosis (caused by *B. melitensis*) has never been reported in Australian sheep or goats. Swine brucellosis (caused by *B. suis*) is prevalent in small areas of northern Australia and northern New South Wales where it occurs in feral pigs, with human cases predominantly seen in recreational feral pig hunters.

b Also known as 'psittacosis' or 'ornithosis'.

35 Australian Government Department of Agriculture and Water Resources National List of Notifiable Animal Diseases www.agriculture.gov.au/pests-diseases-weeds/animal/notifiable [updated November 2015; cited 8 February 2016].

36 Animal Health Australia Screw-worm Fly Surveillance and Preparedness Program www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/screw-worm-fly [updated 20 November 2015; cited 8 February 2016].

37 www9.health.gov.au/cda/source/cda-index.cfm

Suspect exotic or emergency disease investigations

During the quarter, 590 investigations of diseases were reported (Table 17) that were suspected to be either exotic or possible emergency diseases. Note that a single investigation may involve more than one animal. More details about the investigations can be found in the state and territory reports or from the relevant state or territory coordinator (see contact details on last page). Further information regarding Australia's emergency animal disease preparedness and management can be found on the Department of Agriculture and Water Resources website[38].

Table 17 Investigations of suspect emergency animal diseases listed on Australia's National List of Notifiable Animal Diseases, 1 October – 31 December 2015

Disease	Species	State	Month	Response code[a]	Finding
American foulbrood (*Paenibacillus larvae*)	Bees	Qld	Dec	2	Negative (2 unrelated investigations)
	Bees	Qld	Dec	2	Positive (7 unrelated investigations)
	Bees	Qld	Nov	2	Positive (5 unrelated investigations)
	Bees	Qld	Nov	2	Negative (8 unrelated investigations)
	Bees	Qld	Oct	2	Positive (6 unrelated investigations)
	Bees	Qld	Oct	2	Negative (10 unrelated investigations)
Anaplasmosis in tick-free areas	Cattle	NSW	Dec	2	Negative
	Cattle	NSW	Oct	2	Negative
	Cattle	WA	Oct	2	Negative (3 unrelated investigations)
Australian bat lyssavirus	Horse	NSW	Oct	2	Negative
	Horse	Qld	Dec	2	Negative (2 unrelated investigations)
	Horse	Qld	Nov	2	Negative (2 unrelated investigations)
	Horse	Qld	Oct	2	Negative (6 unrelated investigations)
Babesiosis in tick-free areas	Cattle	NSW	Dec	2	Negative
	Cattle	NSW	Oct	2	Negative (3 unrelated investigations)
	Cattle	WA	Dec	2	Negative
Bluetongue — clinical disease	Cattle	NSW	Dec	2	Negative
	Cattle	WA	Oct	2	Negative (3 unrelated investigations)
	Sheep	NSW	Nov	2	Negative (2 unrelated investigations)
	Sheep	NSW	Oct	2	Negative
	Sheep	WA	Dec	2	Negative
	Sheep	WA	Nov	2	Negative
	Sheep	WA	Oct	2	Negative
Brucellosis (*Brucella abortus, B. suis, B. canis* and *B. melitensis*)	Dog	NSW	Dec	2	Positive[b]
	Dog	NSW	Dec	2	Negative (16 unrelated investigations)
	Dog	NSW	Nov	2	Negative (8 unrelated investigations)
	Dog	NSW	Nov	2	Positive (4 unrelated investigations)
	Dog	NSW	Oct	2	Negative (17 unrelated investigations)
	Dog	NSW	Oct	2	Positive (2 unrelated investigations)
	Dog	Qld	Dec	2	Negative
	Dog	Qld	Oct	3	Positive
	Pig	NSW	Dec	2	Negative
	Pig	NSW	Oct	2	Negative (2 unrelated investigations)
	Pig	Qld	Nov	2	Negative
Classical swine fever	Pig	NT	Nov	2	Negative

38 www.agriculture.gov.au/animal-plant-health/emergency

Table 17 *Continued*

Disease	Species	State	Month	Response code[a]	Finding
Contagious bovine pleuropneumonia	Cattle	WA	Dec	2	Negative
Contagious equine metritis	Horse	WA	Dec	2	Negative (2 unrelated investigations)
East Coast fever (*Theileria parva*) and Mediterranean theileriosis (*Theileria annulata*)	Cattle	WA	Dec	2	Negative
	Cattle	WA	Nov	2	Negative (2 unrelated investigations)
	Cattle	WA	Oct	2	Negative
Enzootic bovine leucosis	Cattle	Tas	Oct	2	Negative
Equine encephalomyelitis (eastern, western and Venezuelan)	Horse	WA	Dec	2	Negative
	Horse	WA	Nov	3	Negative
Equine influenza	Horse	NSW	Dec	2	Negative
European foulbrood (*Melissococcus pluton*)	Bees	Qld	Dec	2	Negative (9 unrelated investigations)
	Bees	Qld	Nov	2	Negative (13 unrelated investigations)
	Bees	Qld	Oct	2	Negative (14 unrelated investigations)
	Bees	Qld	Oct	2	Positive (2 unrelated investigations)
Foot-and-mouth disease	Cattle	NSW	Oct	3	Negative
	Cattle	Vic	Dec	3	Negative
	Pig	NSW	Nov	3	Negative
	Sheep	NSW	Nov	3	Negative (2 unrelated investigations)
	Sheep	Vic	Nov	3	Negative
	Sheep	WA	Oct	3	Negative
Hendra virus infection	Cat	SA	Oct	3	Negative
	Cat	Vic	Dec	3	Negative (2 unrelated investigations)
	Dog	NSW	Nov	2	Negative
	Dog	NSW	Oct	2	Negative
	Dog	Vic	Dec	3	Negative
	Donkey	Qld	Oct	2	Negative
	Horse	NSW	Dec	2	Negative (33 unrelated investigations)
	Horse	NSW	Nov	2	Negative (26 unrelated investigations)
	Horse	NSW	Oct	2	Negative (36 unrelated investigations)
	Horse	NT	Oct	2	Negative
	Horse	Qld	Dec	2	Negative (78 unrelated investigations)
	Horse	Qld	Nov	2	Negative (81 unrelated investigations)
	Horse	Qld	Oct	2	Negative (105 unrelated investigations)
	Horse	SA	Nov	3	Negative (3 unrelated investigations)
	Horse	SA	Oct	3	Negative
	Horse	Tas	Oct	3	Negative
	Horse	Vic	Nov	2	Negative
	Horse	Vic	Oct	2	Negative
	Horse	Vic	Oct	3	Negative (4 unrelated investigations)
	Horse	WA	Dec	2	Negative (3 related investigations)
	Horse	WA	Dec	2	Negative
	Horse	WA	Nov	2	Negative
	Horse	WA	Oct	2	Negative (2 unrelated investigations)

Table 17 *Continued*

Disease	Species	State	Month	Response code[a]	Finding
Japanese encephalitis	Horse	WA	Dec	2	Negative (2 related investigations)
Leishmaniasis (*Leishmania* spp.)	Dog	NSW	Nov	3	Negative
	Dog	NSW	Oct	3	Negative
	Dog	NSW	Oct	3	Positive
Screw-worm fly — Old World (*Chrysomya bezziana*)	Horse	Qld	Nov	2	Negative
Surra (*Trypanosoma evansi*)	Pig	NT	Nov	2	Negative
Swine vesicular disease	Pig	NSW	Nov	3	Negative
Tuberculosis (*Mycobacterium bovis*)[c]	Cattle	Qld	Oct	2	Negative (1 granulomas examined)
	Cattle	Vic	Oct	2	Negative (2 granulomas examined)
	Pig	SA	Oct	2	Negative
Varroosis (*Varroa destructor*)	Bees	Vic	Oct	2	Negative (2 unrelated investigations)
Vesicular stomatitis	Cattle	NSW	Oct	3	Negative
	Cattle	Vic	Dec	3	Negative
	Pig	NSW	Nov	3	Negative
	Sheep	NSW	Nov	3	Negative (2 unrelated investigations)
	Sheep	Vic	Nov	3	Negative
West Nile virus infection — clinical	Horse	NSW	Nov	2	Negative
	Horse	WA	Dec	2	Negative (3 related investigations)
	Horse	WA	Nov	3	Negative

a **Key to response codes**

1 = Field investigation by government officer

2 = Investigation by state or territory government veterinary laboratory

3 = Specimens sent to the CSIRO Australian Animal Health Laboratory (or CSIRO Entomology)

4 = Specimens sent to reference laboratories overseas

5 = Regulatory action taken (biosecurity or police officers)

6 = Alert or standby

7 = Eradication

b Infection with *B. suis* occurs rarely in dogs that have had contact with feral pigs or their products.

c www.agriculture.gov.au/SiteCollectionDocuments/animal-plant/animal-health/pet-food-safety/tb-28feb12.pdf animalhealth AUSTRALIA

Animal Health Surveillance QUARTERLY

EMERGENCY ANIMAL DISEASE WATCH HOTLINE

1800 675 888

There were 1548 calls to the Emergency Animal Disease Watch Hotline during the quarter.

The Emergency Animal Disease Watch Hotline is a toll-free telephone number that connects callers to the relevant state or territory officer to report concerns about any potential disease situation.
Anyone suspecting an exotic disease outbreak should use this number to get immediate advice and assistance.

National Animal Health Information System contacts

The National Animal Health Information System (NAHIS) collects summaries of animal health information from many sources; detailed data are maintained by the source organisations. Please contact the relevant person below if further details are required. NAHIS is on the internet (nahis.animalhealthaustralia.com.au).

Name	Role	Phone	Email
Ian Langstaff	NAHIS Program Manager	02 6203 3909	ILangstaff@animalhealthaustralia.com.au
Brett Herbert	Aquatic Animal Health	02 6272 5402	Brett.Herbert@agriculture.gov.au
Corissa Miller	Australian Government NAHIS Coordinator	02 6272 3645	Corissa.Miller@agriculture.gov.au
Venessa McEniery	Australian Milk Residue Analysis Survey	03 9810 5930	VMcEniery@dairysafe.vic.gov.au
Tiggy Grillo	Wildlife Health Australia	02 9960 7444	TGrillo@wildlifehealthaustralia.org.au
Janet Strachan	National Enteric Pathogens Surveillance Scheme	03 8344 5701	JanetES@unimelb.edu.au
Mark Trungove	National Notifiable Diseases Surveillance System	02 6289 8315	Mark.Trungove@health.gov.au
Bonnie Skinner	Surveillance Information Coordinator	02 6203 3943	BSkinner@animalhealthaustralia.com.au
Rob Barwell	Johne's Disease Coordinator	02 6203 3947	RBarwell@animalhealthaustralia.com.au
Beth Cookson	Northern Australia Quarantine Strategy	07 4030 7853	Beth.Cookson@agriculture.gov.au
State and territory coordinators			
Rory Arthur	New South Wales	02 6391 3687	Rory.Arthur@dpi.nsw.gov.au
Susanne Fitzpatrick	Northern Territory	08 8999 2123	Susanne.Fitzpatrick@nt.gov.au
Greg Williamson	Queensland	07 3330 4545	Greg.Williamson@daf.qld.gov.au
Celia Dickason	South Australia	08 8207 7807	Celia.Dickason@sa.gov.au
Mary Lou Conway	Tasmania	03 6233 6330	MaryLou.Conway@dpipwe.tas.gov.au
Karen Moore	Victoria	03 5430 4525	Karen.Moore@ecodev.vic.gov.au
Jamie Finkelstein	Western Australia	08 9368 3805	Jamie.Finkelstein@agric.wa.gov.au

Animal Health Australia is a not-for-profit public company established by the Australian Government, state and territory governments, and major national livestock industry organisations to manage national animal programs on behalf of its members. Every effort is made to ensure that the information in *Animal Health Surveillance Quarterly* is accurate at the time of publication; however, it is subject to change as a result of additional or amended data being received. Further information on the outcome of cases that were pending at the time of printing may be found at www.animalhealthaustralia.com.au/ahsq. To receive an email notification of new editions, contact ahsq@animalhealthaustralia.com.au.

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