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Animal Health Surveillance Quarterly is a veterinary science publication that provides a topical summary of animal health matters and reports of animal health surveillance activities undertaken in Australia during the previous 3-month period. As part of the National Animal Health Information System (NAHIS), this report contributes to Australia's annual animal health report to the World Organisation for Animal Health (OIE).

Message from the Australian Chief Veterinary Officer

Welcome to the second issue of *Animal Health Surveillance Quarterly* for 2018.

'Protecting our animals, preserving our future' is the slogan of the World Organisation for Animal Health (OIE). It neatly encapsulates the goals of the intergovernmental organisation, which is responsible for improving animal health worldwide, and its 182 Member Countries.

In May 2018, I was enormously privileged to be appointed President of the OIE during the 86th OIE General Session.[1]

Australia has a proud tradition of active participation in the OIE, and strongly contributing to the global animal health community in many fields. During the 86th General Session, Australia's Dr Ingo Ernst was re-elected as the President of the Aquatic Animal Health Standards Commission and Dr Rupert Woods was appointed to the OIE Working Group on Wildlife.

The OIE also recognised the significant services and outstanding contributions of Dr Graeme Garner AM through its highest honour, the Gold Medal. Dr Garner had an illustrious career with the Australian Government, and is an internationally respected veterinary epidemiologist with particular expertise in modelling infectious diseases.

As the 28th President of the OIE since the organisation's inception in 1924, I look forward to opportunities to further strengthen connections and collaborations within the global community, and champion animal health and veterinary services. I have identified three key objectives to guide my presidency and support the continued success of the OIE. These relate to increasing Member Country participation and engagement; improving the transparency and integrity of OIE processes; and strengthening the veterinary voice in global discussions.

Animal health has wide-ranging implications for us all. This includes economic, food security and public health implications. So too are there many ways we can all contribute. I encourage you to engage as part of your local and our global community, and also celebrate the contributions of our colleagues as we work together to 'protect our animals and preserve our future'.

1 oie.int/about-us/key-texts/final-reports-of-the-general-session

Exercises Dragonglass and Obsidian — testing our FMD vaccine supply chain

Brendan Pollard and **Kathy Gibson**, Animal Health Australia; and **Mark Cozens**, Queensland Department of Agriculture and Fisheries

Vaccination is included as a response option under Australia's AUSVETPLAN response strategy for foot-and-mouth disease (FMD). Animal Health Australia (AHA) has a supply agreement for the production, storage and supply of FMD vaccine for use in the event of an FMD emergency in Australia.

The aim of Exercise Dragonglass was to test the arrangements for the supply and distribution of simulated FMD vaccine and vaccination equipment from the suppliers to a designated vaccine centre (DVC) in Queensland.

Exercise Dragonglass was conducted in two parts:

1. desk-top evaluation of documentation for the ordering and importation of a hypothetical consignment of FMD vaccine
2. functional exercise to simulate the supply, importation and distribution of a test consignment of (simulated) FMD vaccine and its delivery to one Australian jurisdiction (Queensland).

The objectives of Exercise Dragonglass focused on confirming:

- international ordering and supply arrangements for FMD vaccine from the Australian FMD antigen bank
- correct documentation to facilitate customs and biosecurity clearance
- timelines for delivery of the FMD 'vaccine'
- maintenance of the FMD vaccine cold chain.

The aim of Exercise Obsidian was to test the arrangements for supply and distribution of simulated FMD vaccine and vaccination equipment from a jurisdictional DVC (Queensland) to the farm gate.

The objectives of the Exercise Obsidian focused on:

- assessing inventory control procedures
- practising distribution and reconciliation of simulated FMD vaccine in a jurisdiction
- assessing the utility of jurisdictional procedures for the receipt, storage, distribution and reconciliation of FMD vaccine.

The simulated FMD vaccine consignment was packed in the United Kingdom (UK) and transported on a passenger aircraft from London to Sydney via Singapore, using a climate-controlled premium express service. It arrived in Australia 30 hours after being packed.

Animal Health Australia has a supply agreement for the production, storage and supply of FMD vaccine for use in the event of an FMD emergency in Australia.

The consignment arrived cold-chain intact, although the internal data logger recorded a temperature slightly below the recommended range (2–8°C) for FMD vaccine for part of the journey. Technical advice was that the slight temperature excursion would not have affected the efficacy of real FMD vaccine. The packaging for the vaccine consignment was sufficient to maintain the cold chain for the duration of transport from the UK manufacture site to the destination, an approved arrangement site (premises authorised to undertake post-entry biosecurity activities and treatments) in Sydney.

The consignment was repackaged at the Sydney approved arrangement site and transported to the Queensland DVC in a temperature-controlled Cocoon container. It arrived cold chain intact, 20 hours after repackaging.

Exercise Obsidian subsequently successfully tested arrangements for supply and distribution of the simulated FMD vaccine from the DVC to two nominated sites in Queensland. One site in tropical north Queensland received consignments by road and air. The other site in southern Queensland received consignments by two different road routes.

Maintaining the cold chain in Queensland presented some challenges, particularly with long-distance transportation of the consignment under prolonged hot ambient temperatures.

Exercises Dragonglass and Obsidian demonstrated the value of collaborative partnerships between all participants in the FMD vaccine supply chain.

Both exercises were successful, including the desktop evaluation of import documentation, the importation of the test consignment and the distribution of simulated FMD vaccine at the farm level. They have also helped to highlight some minor areas for improvements in processes and procedures, which are being addressed.

Exercises Dragonglass and Obsidian provide an excellent example of the importance of periodic exercises for the testing and review of existing systems and the improvement of the integrity of Australia's emergency animal disease response arrangements.

The pre-conditioned 'Cocoon' used to transport the simulated vaccine consignment to Queensland.

Checking the temperature of the test consignment of simulated FMD vaccine on the internal USB data logger.

Approaches to building livestock producer surveillance networks

Rhyll Vallis
Australian Government Department of Agriculture and Water Resources

The Australian Government's Agricultural Competitiveness White Paper funding has helped the Department of Agriculture and Water Resources improve animal health surveillance activities (AHSQ Vol. 22 Issue 4).

This issue focuses on a series of animal health surveillance network projects that are being delivered in collaboration with government and industry partners in New South Wales, Queensland, South Australia, Tasmania and Western Australia.

In each state, veterinarians and other agricultural service providers are offering free and tailored disease identification and management advice to livestock producers. They are also trialling how best to share livestock health information within a network of producers to manage disease risk.

The projects are designed to help livestock producers better detect, understand and report changes in livestock health through a supportive livestock producer surveillance network.

Activities by region

New South Wales

Two workshops for livestock producers were held in May 2018: one in Murrumbateman (hosted by the Small Farms Network) and one in Camden.

Livestock producers who participated in the workshops learned from veterinarians, butchers and other invited speakers about animal disease identification and reporting. They also gained practical skills and ideas for managing farm biosecurity and minimising disease.

Participants were invited to seek disease management advice after the event and to report any changes in livestock health through the Small Farms Network.

Western Australia

An industry-led surveillance network is being developed in the South West and Great Southern regions. The network includes livestock producers, stock agents, agricultural consultants and on-plant veterinarians.

Veterinarians will deliver a series of workshops focused on biosecurity practices, disease detection, reporting and investigation in the coming months.

After the workshops, producers will be encouraged to report disease signs using an SMS reporting system. The system will

permit regular sharing of de-identified disease intelligence.

Tasmania

Tasmania is piloting a free, confidential telephone reporting service for a small number of sheep and beef producers.

The service will allow livestock producers to share information and photos of possible animal diseases. They will also receive advice from private veterinarians about whether further investigation is required.

Reported signs of disease will be kept anonymous, and analysis of reported disease will help the network to develop a picture of livestock health across Tasmania.

Having better information about livestock disease issues will improve the support veterinarians provide to producers. Veterinarians can use the information to inform clinical diagnoses, monitor changing disease risk and suggest preventative strategies.

De-identified information collected through the service will be shared with producers and other stakeholders to inform disease management practice and programs and to identify government and industry priorities.

Queensland and South Australia

Both Queensland and South Australia are in the process of developing surveillance projects, which will be reported in a later issue of AHSQ.

When the first phase of each project ends in April 2019, the livestock producer networks will have improved abilities to identify livestock pests and diseases and implement cost-effective interventions at an earlier stage.

Australian livestock tracing system used to keep lead-affected animals out of the food chain

Kate Wingett
NSW Department of Primary Industries

In 2018, there have been four incidents in New South Wales of lead-affected animals (five animals in total) being moved to saleyards without a permit. This is extremely uncommon; a breach of detention orders issued by the NSW Veterinary Service is considered serious by the NSW Department of Primary Industries, owners and the cattle industry at large. There is a system in place to detect these movements and prevent products from these animals entering domestic or export markets.

Occasionally in Australia, usually on very extensive properties, cattle may have accidental access to discarded lead batteries.

Cattle are known to ingest lead by licking the batteries and lead poisoning and clinical illness may result. Government veterinarians are engaged to investigate such cases and will apply detention orders to animals with high blood lead levels. These animals are required to remain on the farm until testing establishes that serum lead levels have dropped to a point where the stock are eligible for slaughter. It usually takes a minimum of 12 months for blood lead levels to normalise depending on the source of the lead.

The National Livestock Identification System (NLIS) forms a crucial part of the Australian food safety system. NLIS provides the ability to trace animals and product forward and back through the supply chain. In these cases, the NLIS acted as a safety net, detecting and reporting unapproved movements before lead-affected cattle could enter the food chain.

The NLIS is a permanent, lifetime traceability system designed to:

- record the property identification code (PIC) and the individual animal identification code for each head of cattle in Australia. These individual animal identification codes are stored on ear tags and read with scanners at saleyards and abattoirs (Figure 1)
- trace movements of individual animals at each transaction point in the supply chain (e.g. farm to saleyard or abattoir).

Individual animal identification codes are stored on ear tags and read with scanners at saleyards and abattoirs.

In Australia, cattle with a blood lead level greater than or equal to 0.24 µmol/L are deemed to be chemically affected and not eligible for slaughter.

A standardised process is followed after a diagnosis of lead poisoning is made in Australian livestock. In New South Wales, the government field veterinarian notifies the State Residue Coordinator of the individual animal identification numbers of lead-affected animals. The State Residue Coordinator applies a 'PB1' status to each affected animal on the NLIS database and issues movement controls, under the *Biosecurity Act 2015*. The status and the movement control remain in place until subsequent testing shows blood lead levels of less than 0.24 µmol/L.

PB1-status cattle may be allowed to move from property to property under a permit issued by an officer authorised under the relevant jurisdictional legislation. However, an animal with a

Figure 1 NLIS ear tag coded with a unique identifying number (Photo: NSW Government)

PB1-status cannot be sold for slaughter or export. The process is similar in all jurisdictions.

In the unusual case where an animal with a PB1-status is transferred from the property where the status was acquired to a purchaser, the NLIS database automatically sends an email to the relevant State Residue Coordinator (Figure 2). The State Residue Coordinator will investigate whether the movement was permitted.

In the 2018 incidents where PB1-status cattle were moved to saleyards, an officer had not issued a permit to allow the movement. Within 24 hours of automatic notification from NLIS, all the PB1-status cattle were traced and located by authorised officers. All five animals were located before slaughter.

Local authorised officers interviewed the stock owners to determine reasons why PB1-status animals were moved without a permit. In all cases, the movement of the animals by the owners were found to be accidental. In one case, the owners were aged and had forgotten the restrictions. In another, an affected animal had been mustered accidentally while its cohorts had remained on the property. Each party then collaborated with the authorised officers to develop and implement plans to manage the individual animals.

The automated NLIS device-based status alert system is extremely successful in promptly identifying movements of lead-affected animals in Australia. This allows relevant jurisdiction and industry representatives to respond rapidly and maintain the safety of the Australian food supply.

Info 122 - NLIS Upload ID [redacted] - SALEYARD Possession - Status PB1 Inbox x

NLIS Support nlis.support@mla.com.au via dpi.nsw.gov.au
to NSW

What has happened	A device with a status of PB1 has been transferred on the NLIS database The number of devices involved was 1. **Upload ID** [redacted] **Extra Info** Transfer Date = May 31 2018 12:00AM, NVD Serial = [redacted], Source PIC = [redacted], Saleyard ID = [redacted] **RFID** **NLIS ID** [redacted]
Contact details for you to ask questions or request assistance	[redacted]

Figure 2 An email sent to State Residue Coordinator when a PB1-status beast is transferred on the NLIS

Port Adelaide river POMS virus detection and response

Shane Roberts, Manager, Aquatic Animal Health Unit, and **Evan Rees**, Aquatic Animal Health Project Officer, PIRSA Fisheries and Aquaculture

The South Australian oyster-growing sector is worth AU$32 million per year and is important to regional communities across the state. The sector largely comprises Pacific oyster (*Crassostrea gigas*) culture. Pacific Oyster mortality syndrome (POMS) is a disease caused by Ostreid herpesvirus type 1 (OsHV-1) microvariant, which causes rapid and high mortalities (up to 100%) in Pacific oysters. The South Australian Government has collaborated with the Australian Government and industry since 2012 to undertake prevention, preparedness and response activities to mitigate the threat of POMS, including (but not limited to):

- development of state and national disease response plans, such as the AQUAVETPLAN — Disease Strategy Manual — Ostreid herpesvirus-1 microvariant
- practising response plans, such as Aquatic Animal Health Subprogram: Exercise Sea Fox: testing aquatic animal disease emergency response capabilities within aquaculture
- developing aquaculture biosecurity guidelines, such as Aquaculture Farm Biosecurity Plan: generic guidelines and template.

POMS has not been detected in South Australian oyster farms.

Detection in the Port River

During late February 2018, researchers from the South Australian Research and Development Institute (SARDI), a division of Primary Industries and Regions SA (PIRSA), were undertaking a Fisheries Research and Development Corporation (FRDC) project to improve surveillance methods for the early detection of the POMS virus. Researchers reported a high mortality event of feral Pacific oysters.

On 28 February 2018, Pacific oyster samples produced positive polymerase chain reaction (PCR) assay test results for the POMS virus (OsHV-1 microvariant), confirming the presence of the virus in feral Pacific oyster populations in the Port Adelaide River. This finding agreed with observed high mortalities in this population of up to 90 to 100%.

It was unclear whether the virus was contained to Port River. The closest oyster-growing region is approximately 60 km from Port Adelaide, and the closest oyster hatchery is approximately 25 km away.

The industry was proactive and suggested a statewide oyster livestock standstill as a precautionary measure. PIRSA strongly supported this decision, given this was the first detection of POMS in South Australia. PIRSA subsequently enacted a legal notice under section 37 of the *Livestock Act 1997* to formalise a statewide oyster livestock standstill.

Temporary spatial restrictions for fishing vessels based in Port Adelaide were put in place to enable them to safely continue their fishing operations away from oyster-growing regions.

Response to disease

The first phase of the PIRSA Emergency Disease Response (28 February to 19 March 2018) involved more than 30 PIRSA staff, several Fishcare volunteers, South Australia's state laboratory, Vetlab (Gribbles Veterinary Pathology), and three other Australian

Figure 3 Port River Incident Management Team inspection, March 2018

animal health laboratories. The response effort received further assistance from personnel within and outside PIRSA, including researchers and industry representatives.

An Incident Controller was appointed and the Incident Management Team (IMT) formed. Field teams confirmed the extent of feral Pacific oysters and infection in Port Adelaide and collected samples from Port Adelaide and sites further afield, including West Lakes, Port Lincoln, Port Giles and Klein Point (Figure 3). Laboratory teams prepared and tested more than 700 oysters for the presence of the POMS virus.

To reduce the risk of disease spread, the removal of all bivalve shellfish from the Port River system was banned under the *Fisheries Management Act 2007*. High-risk vessels were traced and inspected to manage biofouling. Temporary fishing exclusion areas were implemented around the adjacent oyster-growing regions of Yorke Peninsula and Kangaroo Island under the *Fisheries Management Act 2007*.

To reduce the viral load in the Port River system, government staff were deployed to extensively destroy feral oysters using flame guns (Figure 4) and physical knockdown. Later in the response, a private company was contracted to continue the feral oyster knockdown.

Hydrodynamic modelling of viral particle dispersal and epidemiological analysis were used to inform the emergency response. Modelling showed that the live virus, which remains infective for approximately 2 days, dispersed up to approximately 5 km from Port Adelaide and that viral DNA dispersed up to approximately 30 km from the port in a south-westerly direction.

In the second phase of the response (20 March to 6 April 2018), a statewide surveillance program was implemented to determine the extent of infection in South Australia, clarify the disease status of commercial-growing regions and inform risk assessment and review of the statewide oyster livestock standstill. The 'proof of freedom' surveillance was required to facilitate ongoing trade and market access for our oyster industry given this was the first detection of POMS in South Australia.

The surveillance program included hatcheries, farmed

Figure 4 Feral oyster destruction using flame guns

oysters and known feral oyster populations in and adjacent to growing regions. In addition to Vetlab, three interstate laboratories were engaged to help process such a large number of oysters for testing in a short time frame. More than 1200 oysters were tested across all growing regions using PCR assay, and all results were negative for the POMS virus. This provided 95% confidence that the virus was less than 1% prevalent. Given the virus is expected to be greater than 10% prevalent in an infected area, PIRSA declared the South Australian oyster-growing region as free of POMS on 6 April 2018.

Subsequently, the statewide oyster livestock standstill and the temporary fishing closures were lifted. In May 2018, oyster samples collected from the Port River tested negative for the POMS virus. This indicated that the virus had entered its inactive phase, with the water temperature below 18ºC. The virus is expected to reactivate during next summer, with further POMS outbreaks in the Port River likely to occur in remaining feral Pacific oysters. PIRSA will continue to monitor the Port River.

PIRSA enacted its communication and awareness campaign in step with the two phases of the response. The first was largely, but not exclusively, directed at commercial and recreational fishing sectors, Flinders Ports (the state's largest port operator), Port River boating and yachting clubs, commercial marine operators and local councils. The second targeted the state's oyster-growing areas. The campaign included media releases, fact sheets, web page and mobile app updates, social media, signage and flyers.

Two key, and linked, elements in the success of the communications campaign were stakeholder cooperation and a clear call to action. Distributing an information package for stakeholders to share facilitated the spread of PIRSA's messaging further, across more channels, and more promptly than PIRSA could have achieved alone. The information package included an email with content for inclusion in newsletters, attached media release, flyer and signage artwork and social media assets, including translated materials for target recreational fishing communities. Feedback to PIRSA indicated that stakeholders were keen to share the 'call to action' messages with their networks.

Figure 5 Signage at Lucky Bay promoting the safety of South Australian oysters to consumers and bait and berley best practice

The phase one call to action focused on the Port River, promoting the ban on bivalve removal. The second promoted the safety of South Australian oysters to consumers and also bait and berley best practice (Figure 5). This second phase of messaging was developed with industry, as a direct response to grower concerns. Industry helped to develop the messaging, distribute flyers and erect signs across growing areas.

Ongoing disease management

PIRSA is currently drafting a plan for the ongoing management of POMS. The plan includes managing areas of high risk in Port Adelaide, monitoring POMS outbreaks and reducing risks of spread, including bivalve fishing closures, biofouling management advice for vessel owners and communication and awareness activities. PIRSA plans to engage further with vessel operators that use the Port River, to ensure biofouling management guidelines are understood. PIRSA will continue to work with South Australian Pacific oyster hatcheries to develop and implement farm biosecurity plans and emergency response protocols while continuing active (early detection) surveillance for all growing regions in spring 2018 and autumn 2019.

Wildlife Health Australia

Silvia Ban, Keren Cox-Witton and Tiggy Grillo
Wildlife Health Australia

Wildlife Health Australia (WHA)[2] 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)[3] — including submissions by WHA subscribers, state and territory WHA coordinators, researchers, and university, zoo and sentinel clinic veterinarians.

During the quarter, 144 wildlife disease investigation events were reported in eWHIS (Table 1 and Figure 6) and samples were collected from 1819 wild birds for avian influenza (AI) surveillance.

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.

Table 1 Number of disease investigations reported into eWHIS, April to June 2018[a]

Mammals				Birds[c,d]	Reptiles
Bats[b]	Marsupials	Feral mammals	Monotremes		
64	27	2	1	48	2

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.
c Additional sampling for targeted avian influenza surveillance is presented elsewhere in this report.
d Includes free-ranging birds (native or feral species) and a small number of events involving birds from zoological collections and captive breeding programs.

2 www.wildlifehealthaustralia.com.au/Home.aspx

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

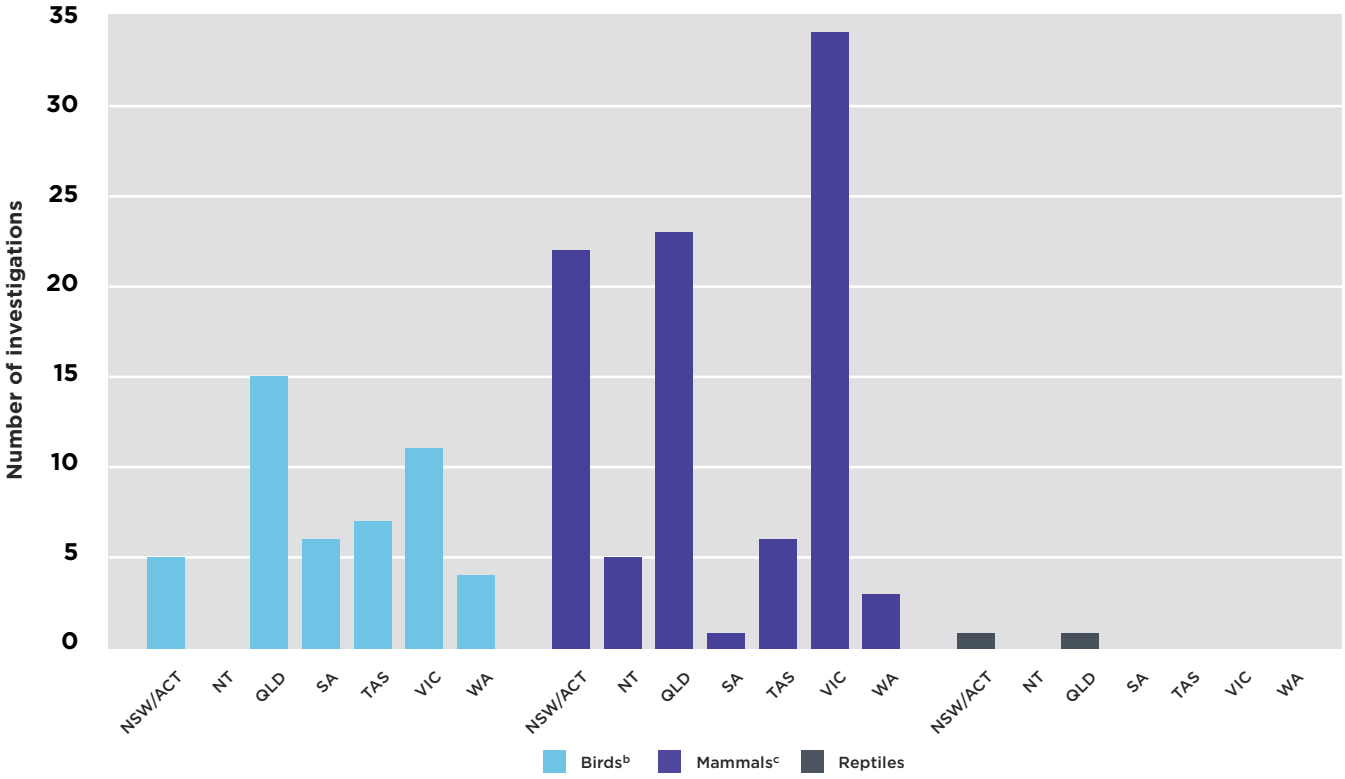


Figure 6 Number of disease investigations reported, by taxonomic class and jurisdiction, into eWHIS, April to June 2018[a]

a The chart shows the number of disease investigations or events reported into eWHIS. Each disease investigation may involve one or multiple animals.
b Birds includes free-ranging birds (native or feral species) and a small number of events involving birds from zoological collections and captive breeding programs.
c Investigations involving mammals include individual bats submitted for Australian bat lyssavirus testing.

Wild bird mortality event summary — Newcastle disease and avian influenza exclusion

WHA received 48 reports of wild bird mortality or morbidity investigations from around Australia during the quarter. Investigations may involve a single animal or multiple animals (e.g. mass mortality event). A breakdown of wild bird events by taxonomic order is given 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. AI was excluded by polymerase chain reaction (PCR) testing for influenza A in 23 of the events as part of Australia's general (sick and dead bird) AI surveillance program. Disease caused by AI was excluded in the remaining 25 events based on clinical signs, history, histopathology, prevailing environmental conditions or other diagnoses. Avian paramyxovirus was excluded in 14 events by PCR testing specifically for Newcastle disease (ND) virus or pigeon paramyxovirus type 1 (PPMV-1), or both. PPMV-1 was diagnosed in a number of wild bird mortality events this quarter, as detailed above.

Pigeon paramyxovirus type 1 detected in feral pigeons

This quarter, Wildlife Health Australia received reports of PPMV-1 detections in Victoria and, for the first time, in the Australian Capital Territory.

In the Australian Capital Territory, a feral pigeon (rock pigeon; *Columba livia*) morbidity and mortality event started in February 2018 in the suburb of Mitchell. Over a 6-week period, approximately 15 to 20 birds were found dead each day. Before death, pigeons were observed with polydipsia (drinking in excess). Three birds submitted for investigation were in poor nutritional condition. PPMV-1 was confirmed by PCR on pooled cloacal and tracheal swabs tested at NSW DPI Elizabeth Macarthur Agricultural Institute, Menangle. AI, *Chlamydia psittaci* and pigeon rotavirus were excluded via PCR assay.

In the same month at a property in the suburb of Weston in the Australian Capital Territory, approximately seven feral pigeons (*Columbiformes* sp. unidentified) presented with neurological signs, including tumbling and difficulty in righting, over a 10-day period. The birds were from a flock of 30 to 50 permanently resident feral pigeons at the property. One pigeon was vomiting and presented with watery faeces. The birds were easy to catch and subsequently died or were euthanased due to the severity of illness. Four pigeons were submitted to an ACT Government veterinarian for gross necropsy and collection of samples for histopathology and specific

Table 2 Wild bird disease investigations, by taxonomic order, reported into eWHIS, April to June 2018

Bird order	Common name for bird order[a]	Events reported[b]
Anseriformes	Magpie geese, ducks, geese and swans	3
Columbiformes	Doves and pigeons	5
Charadriiformes	Shorebirds	1
Falconiformes	Falcons	4
Passeriformes	Passerines or perching birds	12
Pelecaniformes	Ibis, herons and pelicans	2
Psittaciformes	Parrots and cockatoos	23
Sphenisciformes	Penguins	1
Strigiformes	Typical owls and barn owls	2
Suliformes	Gannets, boobies and cormorants	1

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 and Energy.)

b Disease investigations may involve a single or multiple bird orders (e.g. mass mortality event). This quarter six wild bird events involved multiple bird orders. Two events involved the bird orders Passeriformes and Columbiformes, the third event involved Falconiformes and Strigiformes, the forth involved Passeriformes and Charadriiformes, the fifth involved Passeriformes, and Pelecaniformes, and the sixth involved Passeriformes and Strigiformes.

testing at Elizabeth Macarthur Agricultural Institute.

On gross assessment, all birds had prominent keels (were underweight) but full crops. Histopathological lesions were consistent with PPMV-1 and included necrotising pancreatitis (*n* = 4), tubulointerstitial nephritis (*n* = 3) and encephalitis (*n* = 1). Pooled tracheal swabs and cloacal swabs (*n* = 4 birds) tested positive for PPMV-1 via PCR assay. AI and pigeon rotavirus were excluded via PCR assay.

In the following months, PPMV-1 was confirmed in two domestic pigeon lofts in the Australian Capital Territory.

A number of sick pigeons from the first loft were presented to a local veterinarian in April following the death of eight pigeons from a free-fly aviary (domestic pigeons and a small number of feral pigeons are free to fly in and out of the aviary). The pigeons had not been vaccinated by the owners.

Samples from one dead pigeon, necropsied by the ACT Government veterinarian and submitted to Elizabeth Macarthur Agricultural Institute for investigation, had histopathogical lesions in the kidneys and pancreas consistent with PPMV-1. This was confirmed by positive PCR results. Cloacal samples from two additional sick birds tested positive for PPMV-1 via PCR assay at Elizabeth Macarthur Agricultural Institute.

PPMV-1 was confirmed via PCR assay in a second unvaccinated loft in the Australian Capital Territory, after an investigation of a mortality and morbidity event involving nine birds. In June, seven feral pigeons (*C. livia*) died at a property in the centre of Canberra. Despite the event being noted as unusual, samples were not submitted for testing due to autolysis.

One feral pigeon (*C. livia*) was found weak and unable to fly in Fitzroy North, Melbourne, Victoria in May. The incident was reported to an Agriculture Victoria veterinary officer and the bird submitted to Agribio Veterinary Diagnostic Services, Bundoora for testing.

The cloacal swab was positive for PPMV-1 via PCR assay, and microscopic renal lesions were also consistent with the disease.

Also in May, another feral pigeon (*C. livia*) found weak was submitted to Agribio for testing as part of a multi-species mortality event in Werribee involving house sparrows (*Passer domesticus*). PPMV-1 was detected in cloacal swabs by PCR assay. Three house sparrows submitted to Agribio as part of the investigation tested negative for avian paramyxoviruses via PCR assay. This event was consistent with a common environmental factor and suspected to be due to organophosphate poisoning.

PPMV-1 was first detected in domestic loft pigeons in Shepparton, Victoria, in August 2011.[4] The first confirmed case in a free-ranging bird was reported in October 2011 in a feral pigeon in Melbourne, Victoria.[5] Since then, PPMV-1 in free-ranging feral pigeons has been detected in the Greater Sydney region, New South Wales and Victoria, primarily around Melbourne. In several cases, the likely source of infection was domestic pigeons.[6,7] This is the first detection of PPMV-1 in pigeons in the Australian Capital Territory (Figure 7).

4 AHSQ, Vol. 16, Issue 3.

5 AHSQ, Vol. 16, Issue 4.

6 AHSQ, Vol. 17, Issue 1.

7 AHSQ, Vol. 17, Issue 4.

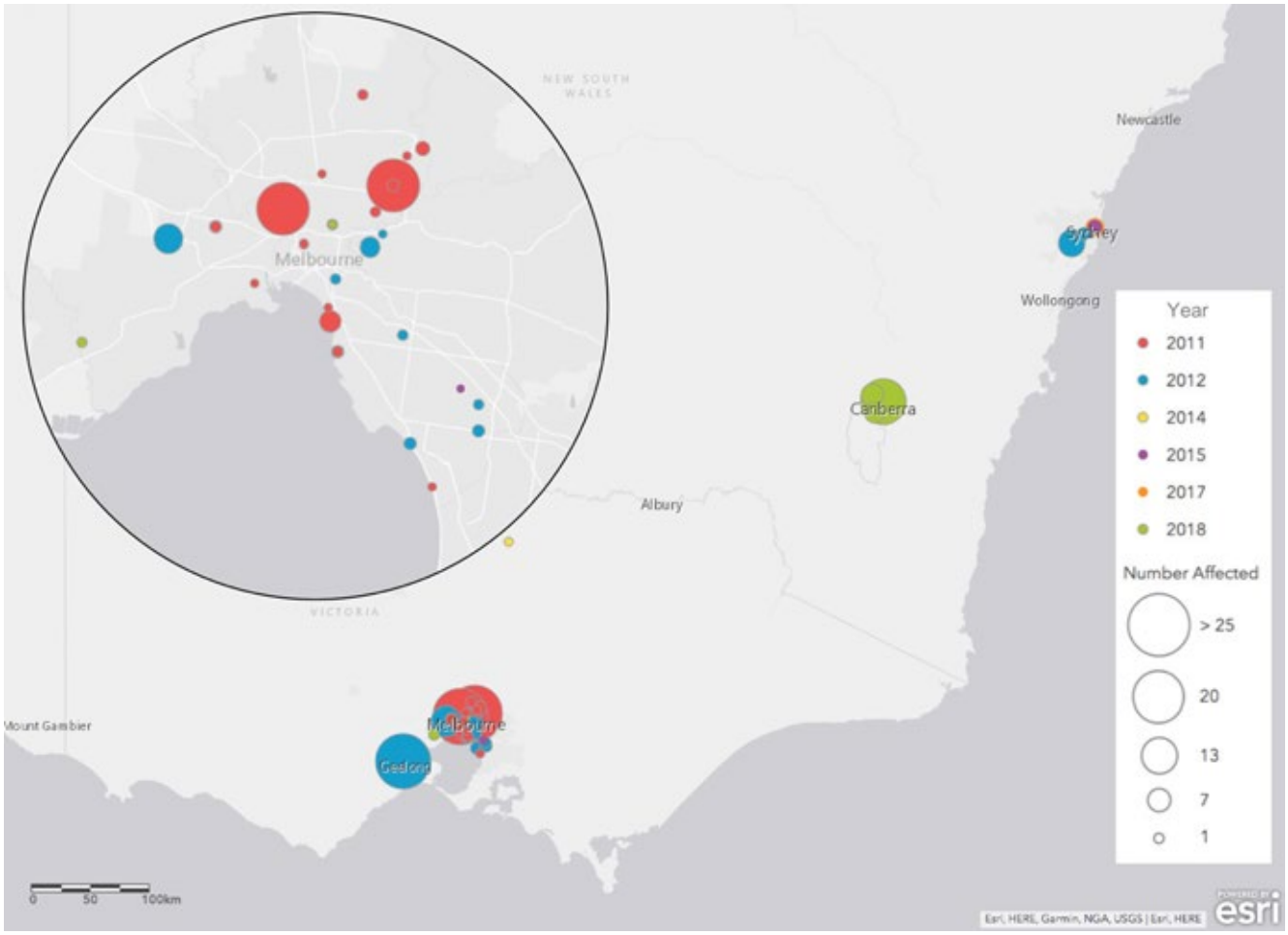


Figure 7 Feral pigeon mortality events in which birds were tested positive for pigeon paramyxovirus type 1 (PPMV-1), by year and number of birds affected in each suburb, reported to eWHIS

NSW: 2012, 2015, 2017; Victoria: 2011, 2012, 2014, 2015, 2017, 2018; ACT: 2018

A total of 40 PPMV-1 positive events have been reported into the eWHIS database between 2011 and 2018 (Figure 7), involving from one to more than 600 birds per event.

With the exception of one collared sparrowhawk (*Accipiter cirrocephalus*) and one spotted turtle dove (*Streptopelia chinensis*), both detections in January 2012 in Melbourne (AHSQ Vol. 17 Issue 1), all events reported into eWHIS have involved feral pigeons. The collared sparrowhawk is the only native bird that has tested positive for PPMV-1. The spotted turtle dove is an introduced feral species. Of note, the affected collared sparrowhawk was a juvenile bird and may have been predisposed to infection with PPMV-1 due to concurrent fungal infection. Necropsy findings in the collared sparrowhawk included mycotic pneumonia and mycotic hepatitis. In addition to histological lesions, there were molecular evidence (PCR) and positive immunohistochemistry (IHC) diagnostic for infection with PPMV-1. PPVM-1 infected feral pigeons had previously been confirmed in the immediate area and it is likely that infection in the sparrowhawk may be the result of high virus challenge associated with recent predation on diseased pigeons, based on reports from other countries in which pigeon paramyxovirus is endemic.[8]

The ability of the PPMV-1 strain present in Australia to cause disease in native pigeons and doves remains unknown.[9] Australia has 22 native species of pigeons and doves;[10] to date, none have tested positive for PPMV-1. While PPMV-1 has caused disease in poultry in Europe and South Africa, a study using the Australian variant suggests this virus has limited disease potential in poultry.[11] The PPMV-1 detection in domestic and feral pigeons and other avian taxa emphasises the importance of continued surveillance and biosecurity measures in Australia.

8 Forbes NA & Simpson GN (1997). A review of viruses affecting raptors. *Veterinary Record* 141: 123126.

9 WHA (2016). *Avian paramyxoviruses and Australian wild birds*. Fact sheet, November 2016, Wildlife Health Australia. www.wildlifehealthaustralia.com.au/FactSheets.aspx

10 AHSQ, Vol. 16, Issue 3.

11 Shan S, Middleton D, Williams D, Wang J, Gard G, Bruce K, Bingham J, Daglas S, Frazer L, Walker S & McCullough S (2013). Pathogenicity study in chickens of an avian paramyxovirus type 1 isolated from domestic pigeons in Victoria, 2011. Oral presentation. In: *Australian Association on Veterinary Laboratory Diagnosticians*, 28–29 November 2013, Geelong, Victoria. https://publications.csiro.au/rpr/pub?pid=csiro:EP142328

Avian influenza surveillance

Australia's National Avian Influenza Wild Bird (NAIWB) and 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 were discussed earlier. Sources for targeted wild bird surveillance data include state and territory government laboratories, universities and samples collected through the Northern Australia Quarantine Strategy (NAQS).

During the quarter, pathogen-specific, risk-based surveillance occurred at sites in New South Wales, the Northern Territory, Queensland, Victoria, Tasmania and Western Australia. Cloacal and faecal environmental swabs were collected from 1819 waterbirds, with 1819 tested for AI. No highly pathogenic AI viruses were identified. However, this quarter targeted surveillance activities continued to find evidence of a wide range of subtypes of low pathogenic AI (LPAI) viruses, including low pathogenic H5.[12, 13, 14] Molecular analysis of AI viruses detected through the targeted surveillance activities contribute to understanding of AI viruses dynamics in Australia, help maintain currency of diagnostic tests, and serve as a point of comparison when novel AI virus strains of importance emerge overseas.

Salmonella spp. infection in wild pelicans and ravens

Salmonellosis was diagnosed in two separate incidents in wild birds this quarter, one in Victoria and one in South Australia. Salmonellosis outbreaks are not uncommon in wild birds and are often associated with areas where birds congregate, such as bird feeders and watering areas.[15]

In April, a group of four Australian pelicans (*Pelecanus conspicillatus*) with abnormal wing conformation were observed around a pier at Swan Bay on the Bellarine Peninsula in Victoria. Three of the pelicans were caught and examined at Melbourne Zoo. Pelican 1 was thin, had chronic cloacal prolapse and abnormal carriage of the right wing. Radiographs showed increased soft tissue opacity and sclerotic bone in the left shoulder joint. Blood analysis showed moderate anaemia, hypoproteinemia and leucocytosis. Pelican 2 was in good body condition with luxation of the right elbow. Pelican 3 was severely emaciated.

The three birds were euthanased due to poor prognosis. On necropsy, all three had hepatomegaly with suspected miliary abscesses.

12 Grillo T et al (2015). Avian influenza in Australia: a summary of 5 years of wild bird surveillance. *Australian Veterinary Journal*. 93 (11): 387–393

13 Haynes L et al (2009). Australian surveillance for avian influenza viruses in wild birds (July 2005 to June 2007). *Australian Veterinary Journal*. 87 (7): 266-272

14 www.wildlifehealthaustralia.com.au/ProgramsProjects/WildBirdSurveillance.aspx

15 Velarde R et al (2012). Septicemic salmonellosis caused by *Salmonella* Hessarek in wintering and migrating song thrushes (*Turdus philomelos*) in Spain. *Journal of Wildlife Diseases* 48(1): 113–121.

Pelican 1 had a large abscess in the left shoulder that had destroyed the normal architecture of the joint. Histopathological changes in Pelican 1 included multifocal granulomatous hepatitis and splenitis with intralesional bacteria. Swabs from the shoulder abscess and liver cultured *Salmonella* spp. group B. This bird showed severe chronic lymphoplasmacytic and granulocytic enteritis with intramucosal trematodes and possible protozoa.

Pelican 2 showed acute and chronic multifocal hepatitis with degenerating parasites present in some lesions.

Pelican 3 had acute multifocal hepatic necrosis and mild hepatitis with intralesional bacteria in one instance, which was considered consistent with *Salmonella* infection.

In suburban Adelaide in April, a member of the public reported one sick and three dead Australian ravens (*Corvus coronoides*) in their backyard. The ravens had reportedly been fed raw chicken necks by a neighbour. The sick bird was lethargic, had slightly droopy wings and coughed when trying to eat. It was euthanased due to poor prognosis.

AI and avian paramyxovirus were excluded by PCR testing of cloacal and tracheal swabs in the euthanased bird and one of the birds found dead. Histology revealed similar lesions in the two birds, including granulomatous pneumonia, duodenitis, myositis, myocarditis and ventriculitis, with clusters of gram-negative coccobacilli within the lesions. *Salmonella* sp. cultured from pooled lung, liver and kidney samples was identified as *Salmonella enterica* subsp. *enterica* serotype Hessarek. This serotype was identified in 2011 in an Australian raven that presented with nystagmus and head tremor. *S*. Hessarek has been identified in an Australian magpie (*Cracticus tibicen*) in Victoria. Outside Australia, this serotype has been described in outbreaks in song thrushes (*Turdus philomelos*) in Spain and starlings (*Sturnus vulgaris*) in Israel.[11,16] It is reported to have caused egg-associated salmonellosis outbreaks in humans in Australia.[17]

Australian bat lyssavirus

Reports to WHA for the quarter included 66 bats tested for Australian bat lyssavirus (ABLV) from the Australian Capital Territory, New South Wales, Northern Territory, Queensland, South Australia, Victoria and Western Australia.

Bat submissions were made for a variety of reasons:

- 30 cases involved contact with a pet dog (24) or cat (5) or both (1)
- 17 cases involved contact with the potential for ABLV transmission to humans; of these
  - five were also associated with trauma (e.g. netting or barbed wire fence entanglement, fracture)
  - two displayed neurological signs (e.g. behavioural changes, paralysis)
  - two involved contact with a pet cat
  - one displayed other (non-neurological) signs
  - the remainder had no further history reported
- 11 cases were associated with trauma (e.g. netting or barbed wire fence entanglement, fracture)
- three bats displayed other (non-neurological) signs (sudden death)
- two bats displayed neurological signs (e.g. aggression, paralysis)
- two bats were found dead
- one bat had no further history reported at this time.

During the quarter, three flying-foxes were confirmed positive for ABLV by fluorescent antibody test or PCR assay for pteropid ABLV ribonucleic acid (RNA), or both. Details of the cases are as follows:

• A juvenile male black flying-fox (*P. alecto*) from south-east Queensland was found hanging low in a public street. In care, it was behaving aggressively (attacking suspended fruit) and died overnight. There were no significant gross findings on necropsy. Some gliosis and Negri-like bodies were detected histologically in the brain.

• A female grey-headed flying-fox (*P. poliocephalus*) from Victoria, which was found on the ground, was submitted for ABLV testing due to potentially infectious human contact.

• A black flying-fox from south-east Queensland was reported to be aggressive, and potentially infectious human contact had occurred when a person tried to rescue the bat.

In the two cases where there was potentially infectious human contact, clinical advice was provided by an experienced public health official.

More information on ABLV testing of bats in Australia is available in ABLV Bat Stats.[18] ABLV is a nationally notifiable disease in Australia. Cases of suspect ABLV infection or exposure should be reported to the Emergency Animal Disease Watch Hotline on 1800 675 888.

16 Singer N et al (1977). Isolation of *Salmonella* Hessarek from starlings (*Sturnus vulgaris*). *Avian Diseases* 21, 117-119

17 Moffatt CR et al (2016). *Salmonella* Typhimurium and outbreaks of egg-associated disease in Australia, 2001 to 2011. *Foodborne Pathogens and Disease*, 13(7), 379-385

18 www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.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 investigation undertaken within jurisdictions and describe a selection of interesting cases. Test results from national notifiable animal disease investigations are reported in Table 16 of ‘Quarterly statistics’.

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

New South Wales

Rory Arthur
NSW Department of Primary Industries

During the quarter in New South Wales, 756 livestock disease investigations[19] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[20] The number of investigations by species of livestock is shown in Figure 8. Field investigations were conducted by government veterinary or biosecurity officers (436) and private veterinary practitioners (320). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

During the quarter the State Veterinary Diagnostic Laboratory, Elizabeth Macarthur Agricultural Institute, Menangle, processed 525 livestock sample submissions[21] to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications and for accreditation programs and targeted surveillance.

The Department of Industry in New South Wales is obliged under the *Biosecurity Act 2015* and the *Animal Diseases and Animal Pests (Emergency Outbreaks) Act 1991* to detect and manage notifiable disease outbreaks. The risk of failure to detect these diseases is managed by an active, district-based disease and pest surveillance program delivered by government and private veterinarians. 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. They also conduct targeted surveillance projects, inspections of stock at saleyards and monitoring of compliance programs. Private veterinarians submit samples for notifiable disease testing to the State Veterinary Diagnostic Laboratory when notifiable diseases are suspected. The outcome is district-based early detection of notifiable diseases and valid reports on the animal pest and disease statuses of all districts in New South Wales. These reports are aggregated at regional and state level, for subsequent official reporting to Animal Health Australia and, through the Australian Government, to the World Organisation for Animal Health (OIE). The surveillance program is supported by the government veterinary diagnostic laboratory and by research staff located there who design and improve diagnostic tests and, working with field veterinarians, investigate the epidemiology of diseases that have significant biosecurity impacts.

The following case reports are a selection of field investigations, chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

One case of anthrax — 56 exclusions

There was one anthrax incident during the quarter, on a property in the Central West region in early May. Ultimately, 20 crossbred lambs in a flock of 600 died. The affected lambs had not been vaccinated.

The property had 1600 lambs in three separate feedlots, but only one feedlot was affected. The feedlot area had been used for over 10 years without incident, although anthrax had occurred in a different part of the property in 2007.

The affected sheep had been introduced to the feedlot 2 months before the first deaths. No movements of lambs from the feedlot had occurred in the previous 20 days.

The owner contacted the government district veterinarian, who immediately investigated the case. At the time, one sick lamb

19 Field investigation with laboratory diagnostic testing.

20 Emergency diseases are a subset of notifiable disease defined as diseases listed in the Emergency Animal Disease Response Agreement www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

21 Some investigations involved multiple submissions.

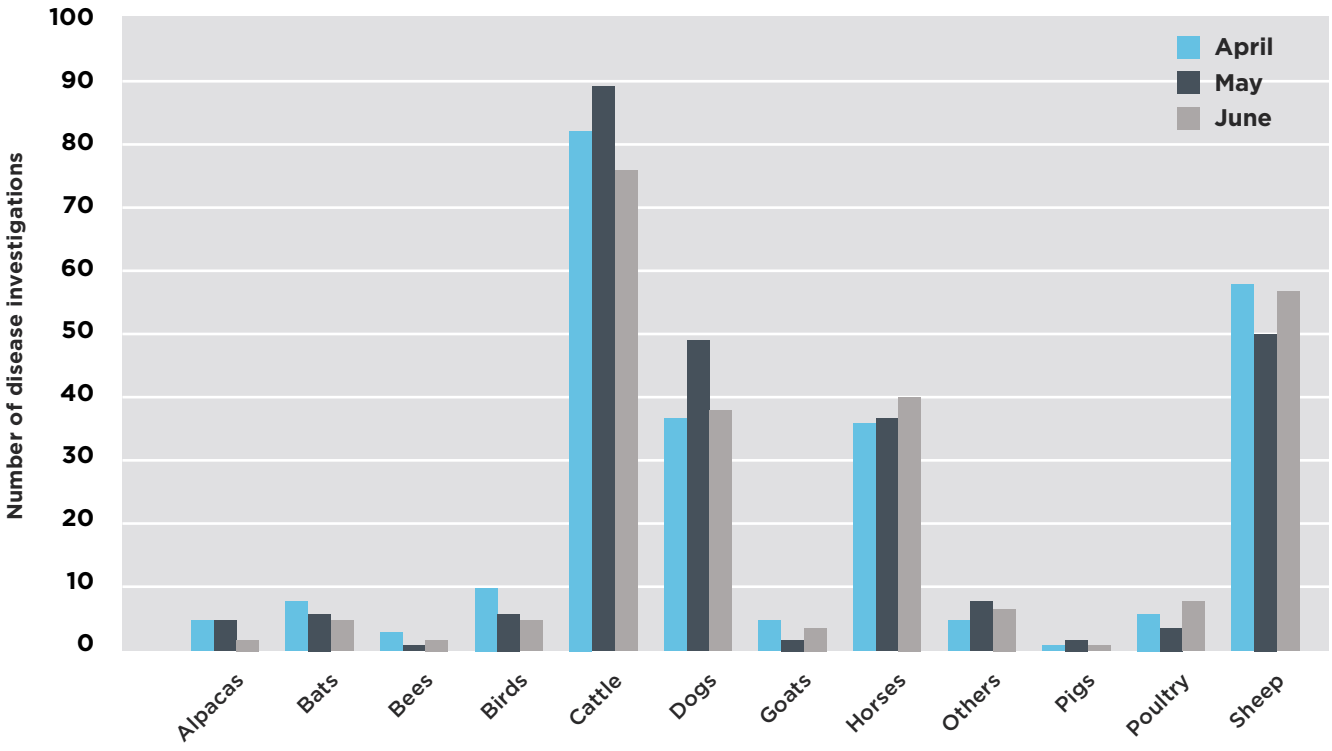


Figure 8 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in New South Wales, April to June 2018

and three carcasses were available for examination. The carcasses had unclotted blood oozing from the nasal cavities. The veterinarian performed an anthrax immunochromatographic test (ICT), which was positive. The result was later confirmed by the State Diagnostic Veterinary Laboratory with polychrome methylene blue stain examination of a peripheral blood smear from the ear of a dead lamb.

The incident was managed in accordance with the NSW DPI Anthrax policy. The carcasses were burned and decontamination protocols followed. The property was placed under quarantine and all at-risk stock (1600 lambs) were vaccinated. A biosecurity direction was given requiring vaccination of stock on the property for at least 3 years. Deaths stopped within 1 week.

During the quarter there were 56 investigations in which anthrax was excluded as the cause of death. Of these:

- 36 involved cattle; alternative diagnoses included abomasitis, bloat, hepatitis, clostridial infection, water deprivation, lactic acidosis, *Babesia bovis* infection and nitrate/nitrite toxicity (*Sorgum* spp.)
- 18 involved sheep; alternative diagnoses included mastitis
- one involved pigs; alternative diagnosis was *Salmonella* spp. infection
- one involved a horse; no alternative diagnosis was identified.

The anthrax ICT was used in 40 of these 56 exclusions, all with negative results. In the other 16 investigations, anthrax was excluded by laboratory testing or on clinical grounds.

Exclusion of exotic diseases in weaner pigs

In June, a government veterinarian investigated deaths in weaner pigs on a small piggery in the Central Tablelands. The piggery had 33 breeding sows. Three boars had been introduced in the previous 12 months. The pens held approximately 300 piglets, weaners and growers in total.

A private veterinarian first investigated the incident. Approximately 50 of the weaners had died in the past 6 months after intermittent bouts of loss of appetite, diarrhoea, lethargy and wasting. The sows were up to date with their vaccinations, and all animals were being fed age-appropriate commercial feed.

The veterinarian conducted a necropsy on one of the dead weaners. It had fluid in the body cavities, enlargement of the mesenteric lymph nodes and enteritis. Histopathological examination at the State Veterinary Diagnostic Laboratory showed marked necrotising enteritis, lymphadenitis and vasculitis. Tests for African swine fever, classical swine fever, *Salmonella*, *Haemophilus parasuis* and porcine circovirus type 2 (PCV-2) were all negative. As no diagnosis was confirmed from initial sampling, the private veterinarian contacted the district veterinarian for assistance with further investigation.

The district veterinarian examined a weaner pen in which nine of 12 weaners had recently died, including one during the previous night (Pig 1). Two live pigs were

examined: one was in poor body condition (Pig 2), and the other was weak (Pig 3).

Both Pig 2 and Pig 3 had normal vital signs and no evidence of neurological impairment, although Pig 3 was quiet and reluctant to stand, and its skin appeared inflamed. Diarrhoea in the pen contained undigested feed but no blood.

At necropsy, all pigs had thickening of the small and large intestines. Pig 3 had diphtheritic membranes in the small and large intestines. There was a severe, diffuse, proliferative and fibrinonecrotising enteritis, with histopathology suggestive of *Lawsonia* spp. infection.

Polymerase chain reaction (PCR) testing of Pig 1 and Pig 2 was positive for *Lawsonia intracellularis* and *Brachyspira pilosicoli*. Selective *Salmonella* culture was negative. PCR testing was negative for *Brachyspira hyodysenteriae*, porcine delta coronavirus, porcine epidemic diarrhoea virus, transmissible gastroenteritis virus, porcine respiratory coronaviruses, bovine viral diarrhoea virus, classical swine fever and African swine fever. The blood was low positive for PCV-2 on reverse transcription PCR assay, at a level inconsistent with porcine circovirus associated disease (PCVAD), instead suggesting subclinical infection.

L. intracellularis is one of the main gut pathogens of pigs. Infection causes a proliferative enteropathy usually referred to as porcine intestinal adenomatosis, which can be complicated by the involvement of other bacteria.

Proliferative enteropathy causes a range of clinical signs, including chronic mild diarrhoea and poor growth performance. Although in this case, necrotising enteritis was considered the cause of the weaner deaths.

Some pigs may carry *L. intracellularis* and shed the organism into the environment without showing signs of clinical disease. The organism is widespread in the pig population and is difficult to eradicate. Clinical signs of the disease may only

appear after a stressful period (weaning, co-mingling, cold temperatures, concurrent diseases).

Mastitis in sheep — contagious agalactia excluded

A farmer near Berrigan in southern New South Wales contacted the district veterinarian to investigate an unusually high number of ewe mortalities that had occurred in his flock during lambing. The flock consisted of 1200 Merino ewes in three groups. The ewes had rapid weight loss and lethargy and died within days: about 50 ewes had died since the beginning of lambing in April.

Clinical examination of an affected ewe revealed fever, mild respiratory noise and unilateral mastitis. A milk sample was taken from the affected gland. Two dead ewes were examined, and both had lesions consistent with unilateral mastitis. One of the dead ewes had gross lung pathology, including pleural adhesions, milk and lung samples were collected. Samples from the other dead ewe were not fresh enough to use.

Samples were submitted to the State Veterinary Diagnostic Laboratory for culture. *Mannheimia haemolytica* was isolated from the milk of the live ewe, and *Aerococcus viridans* was isolated from the milk of the dead ewe. The lung culture was negative. All samples were negative for *Mycoplasma agalactiae* on PCR assay.

The clinically affected ewe responded to treatment with oxytetracycline issued by a private veterinarian. Nine more ewes were identified and treated in the following weeks, eight recovered.

The owner had not detected mastitis before on his property and was not aware of any similar disease or mortality incidents in his immediate area. A significant portion of his property was affected by fire in the month before lambing started. Though no sheep were affected by the fire, it may have increased the risk of mastitis through reduced ground cover and increased environmental contamination. *M. haemolytica* is commonly reported in sheep mastitis.

Tick fever confirmed on the Mid North Coast

After a call to the Emergency Disease Watch Hotline, the district veterinarian visited a dairy cattle property south-west of Port Macquarie to investigate the death of three cows. A further six cows appeared unwell from a group of 120. The cattle had been grazing kikuyu-dominant pasture.

The cattle had been put into yards 11 days earlier. The bulls were removed from the herd, and the best 20 weaner heifers were selected as replacements and split into a separate paddock. The remaining calves were sold at a local saleyard. At the time of the initial visit, only the dry cow herd were affected, the bulls and replacement heifer herd appeared well.

A necropsy of two dead cows showed that their livers were grossly enlarged and mottled on the cut surface. There were numerous haemorrhages throughout each carcass. One animal had red urine. A small number of adult bush ticks (*Haemophysalis* sp.) were identified on the skin, but no cattle ticks (*Rhicicephalus [Boophilus] microplus*) were found.

Two sick cows were examined. They had increased respiratory rates; one had an elevated rectal temperature (40°C), and there were pinpoint haemorrhages in the vulval mucosa of both cows examined. Differential diagnoses included bracken toxicity, cycad toxicity and tick fever.

Another cow died overnight and necropsy findings included an enlarged spleen, which was soft and bulging on the cut surface, blood-tinged pericardial fluid and red urine. The State Veterinary Diagnostic Laboratory confirmed the presence of *Babesia*-like organisms in blood smears, and blood samples tested PCR positive for *Babesia bovis*. The herd was treated with imidocarb. Losses continued in the days after the initial examination and subsequent treatment. Eventually, 50 cows died.

Within 5 days of the initial diagnosis, the owner of a nearby property contacted the district veterinarian, having lost one cow and found another sick, with red urine noted in both. The sick cow subsequently died, and a necropsy was conducted. Gross findings were consistent with those of tick fever, and *B. bovis* infection was confirmed by PCR assay at the laboratory. In response, this second herd was also treated with imidocarb.

Given the intense interest in the local community, an information evening was organised by North Coast Local Land Services where a DPI Senior Veterinary Officer and cattle tick program staff provided valuable information on cattle tick and tick fever, to about 80 local stock owners.

NSW DPI cattle tick program staff used the NLIS database to trace the movement of the calves sold through the saleyards from the initial property. Deaths had occurred in traced stock on two more properties: tick fever was confirmed on one property and was highly suspected on the other. Movement restrictions were imposed, through a Biosecurity Undertaking, on traced properties, as well as the two properties identified as having cattle tick and their adjoining neighbours.

Investigations into the source of the cattle ticks in the area were continuing at the time of publication.

Northern Territory

Susanne Fitzpatrick
Department of Primary Industry & Resources

During the quarter in the Northern Territory, 52 livestock disease investigations[22] were conducted to investigate suspect notifiable diseases or rule out emergency diseases. The number of investigations by species of livestock is shown in Figure 9. Field investigations were conducted by government veterinary or biosecurity officers (35) and private veterinary practitioners (16). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

During the quarter, the state veterinary diagnostic laboratory, Berrimah Veterinary Laboratories, Darwin processed 141 livestock sample submissions[23] to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications, for accreditation programs and targeted surveillance.

The Department of Primary Industry and Resources 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.

22 Field investigation with laboratory diagnostic testing.

23 Some investigations involved multiple submissions.

Berrimah Veterinary Laboratories provide free diagnostic testing for the exclusion of notifiable disease for all disease investigations.

The following case reports are a selection of field investigations, chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

Monensin toxicity and bovine respiratory disease in weaner cattle

Monensin toxicity was confirmed as contributing to the cause of death of 40 weaner calves on a property located in the Barkly region near the Northern Territory and Queensland border. The group of 450 weaners had been kept in a yard for early weaning due to the poor body condition of cows. Weaners ranged in weight from 80 to 100 kg and were fed supplementary hay and a custom loose mix containing monensin. The weaners had been in the yards for approximately 14 days when 15 of the calves were found dead after rain. At this stage, the manager had not observed any significant clinical signs in the group.

Necropsy samples from three of the weaners were submitted to the Berrimah Veterinary Laboratories by the pastoral manager. Histological evaluation revealed moderate-to-severe pulmonary oedema and haemorrhage in all three weaners. One animal had moderate, multifocal subacute myocardial necrosis, consistent with exposure to a cardiac toxin.

The pastoral company's veterinarian visited the property a week later (21 days after yarding) and observed morbidity in approximately 60 weaners, with a total mortality of 40 weaners. At this stage, the weaners were showing clinical signs of depression, nasal discharge and coughing with a high rectal temperature. Necropsy was performed on a further four weaners and samples submitted to Biosecurity Sciences Laboratory, Queensland. Feed samples were collected during the visits for analysis.

Histology showed evidence of severe subacute suppurative bronchopneumonia and acute multifocal suppurative rumenitis. Serology revealed bovine herpesvirus 1 (BoHV-1) exposure. A culture of lung tissue and polymerase chain reaction (PCR) testing identified *Mycoplasma* spp. but excluded both *Haemophilus* spp. and bovine viral diarrhoea virus (BVDV).[24] Respiratory signs and laboratory results supported the presence

24 The severe BVDV-2 form in Europe and North America has not been found in Australia.

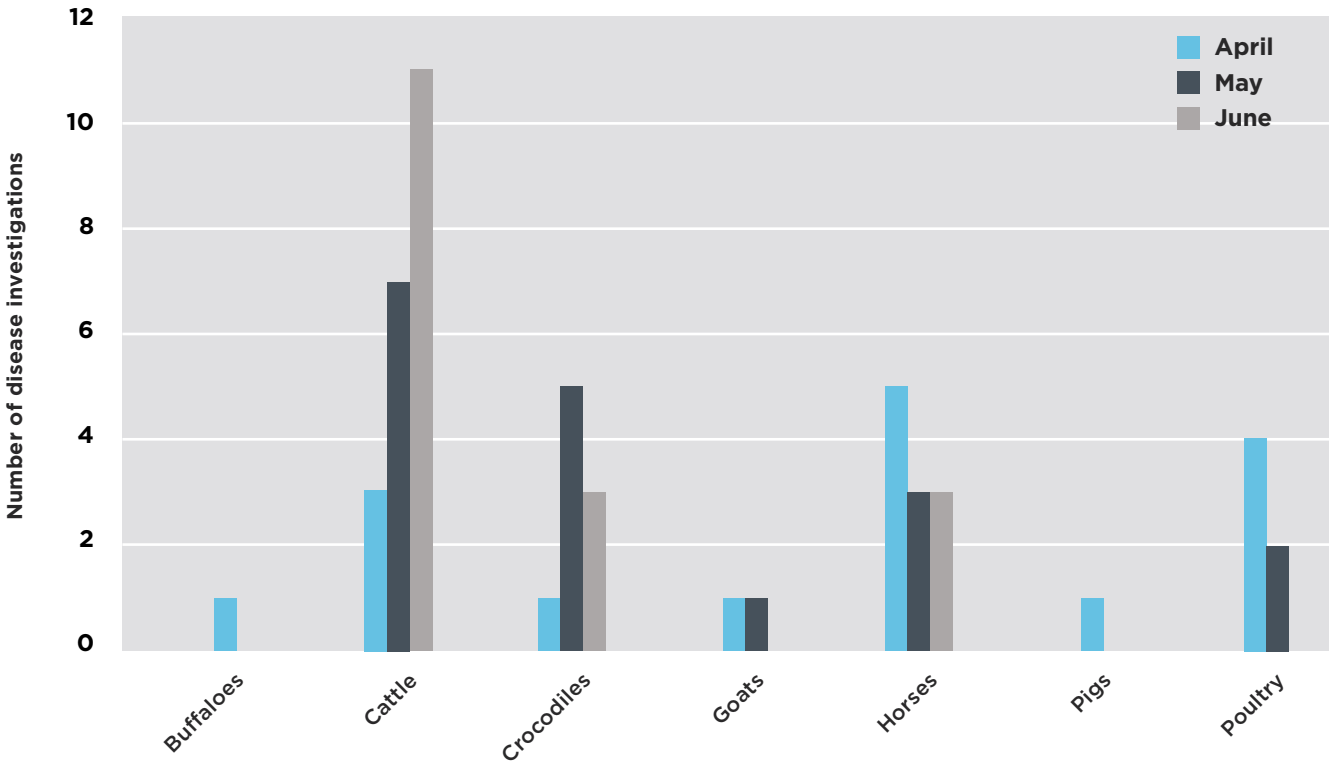


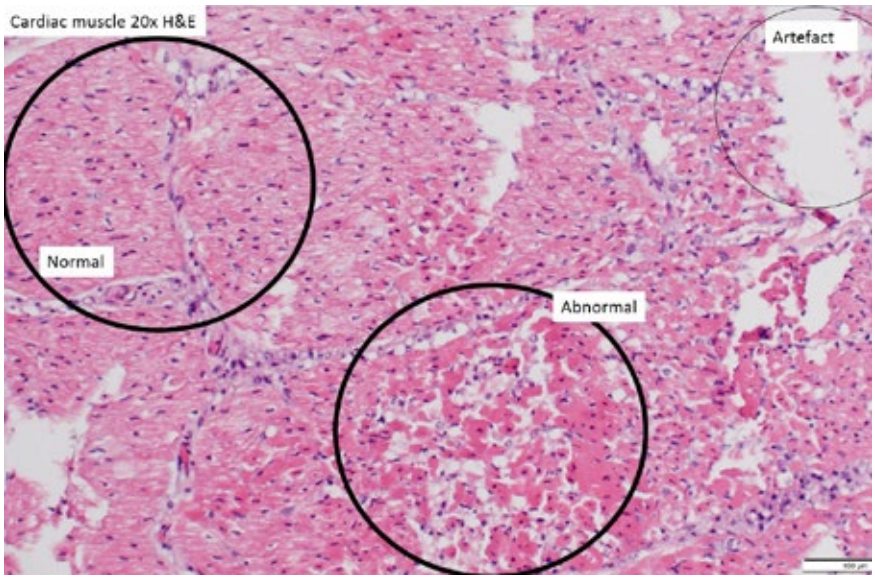
Figure 9 Number of field disease investigations to rule out emergency diseases or investigate suspect notifiable diseases, in the Northern Territory, April to June 2018

of bovine respiratory disease (BRD).

Common sources of cardiac toxins in cattle in the Northern Territory include ironwood (*Erythrophleum chlorostachys*) exposure and ionophore toxicity. Ionophore toxicity was considered to be the primary differential diagnosis in this case, with secondary BRD.

The supplementary loose mix fed to the weaners contained monensin, an ionophore used to improve feed efficiency and prevent and control coccidiosis. The manufacturer's label indicated the feed should contain approximately 50 mg/kg of monensin sodium. Laboratory testing of the sample from the initial visit revealed the level to be 220 mg/kg. Samples tested from the second visit showed levels ranging from 51 to 310 mg/kg.

Ionophores are safe and effective when administered to the appropriate species at the correct dose. However, ionophore toxicity can be encountered when naïve animals are fed the additive without being transitioned



Cardiac lesion in a weaner calf affected by ionophore toxicity

appropriately, or when the animal ingests lethal doses of the substance. The published median lethal dose (LD50) for monensin ranges from 21.9 to 80 mg/kg.[25]

Cattle can recover from acute monensin toxicosis but might later die from acute cardiac failure, especially if exercised or stressed. Deaths can occur for extended periods after exposure to toxic levels of monensin has ceased. The circumstances contributing to this disease event consisted of dry seasonal conditions requiring early weaning of calves at a lower than normal weaning weight, increased stress associated with limited immunity, variable feed quality and consumption and a rain event. The problem was regarded as multifactorial, including monensin toxicity, BRD and some degree of rumenitis.

25 Gonzalez M, Barkema HW & Keefe GP (2005). Monensin toxicosis in a dairy herd. *The Canadian Veterinary Journal* 46(10): 910.

Queensland

Greg Williamson
Queensland Department of Agriculture and Fisheries

During the quarter in Queensland, 854 livestock disease investigations[26] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[27] The number of investigations by species of livestock is shown in Figure 10. Field investigations were conducted by government veterinary or biosecurity officers (93) and private veterinary practitioners (761). All diagnostic testing was conducted at or in association with the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

During the quarter the state veterinary diagnostic laboratory Biosecurity Sciences Laboratory, Coopers Plains, processed (854) livestock sample submissions to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications and for accreditation programs and targeted surveillance.

The following case reports are a selection of field investigations, chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

26 Field investigation with laboratory diagnostic testing.

27 Emergency diseases are a subset of notifiable disease defined as diseases listed in the Emergency Animal Disease Response Agreement www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

Duck hepatitis virus and duck enteritis virus excluded in small flock deaths

Duck hepatitis virus, duck enteritis virus and type A influenza were excluded as the cause of 20 sudden deaths in a flock of 40 ducks in the Sunshine Coast region. The flock was kept on a hobby farm for personal consumption of eggs and duck meat.

The deaths occurred over a 3-week period. A private veterinarian wearing appropriate personal protective equipment conducted a necropsy on a female duck in good body condition that had died suddenly. Gross findings included multifocal, yellow–creamy pinpoint lesions in the liver, which was friable to touch, and a moderate amount of serosanguineous peritoneal fluid. The intestines were mostly empty except for green fluid, and the caecum horns were black. Fresh and fixed tissue samples were submitted to the Biological Sciences Laboratory, Coopers Plains.

Influenza A was excluded at Biological Sciences Laboratory using real-time polymerase chain reaction (PCR) assay. Histology of the liver revealed severe acute disseminated focal necrosis with abundant, lesion-associated small gram-negative bacilli and microthrombosis. The heart was congested and showed evidence of petechiation. The caecum was in an advanced stage of autolysis.

A culture of the liver produced moderate growth of *Pasteurella multocida* and group C *Salmonella* spp. *S.* Enteritidis, *S.* Gallinarum and *S.* Pullorum were not detected. The *P. multocida* was sensitive to all antimicrobials tested, including neomycin. The *Salmonella* spp. cultured was resistant to all antimicrobials, except neomycin. Detection of *P. multocida* was corroborated, in parallel testing, using real-time PCR assay of the fresh liver sample.

Samples of fresh liver and kidney were forwarded to CSIRO Australian Animal Health Laboratory to test for duck hepatitis virus and duck enteritis virus. Neither virus was detected using TaqMan PCR assay.

The smallholder farmer was advised of the zoonotic risk of *Pasteurella* and *Salmonella* spp., and about appropriate carcass handling and hand hygiene, by the private veterinarian. Management options were outlined to the producer, including treating the remaining flock, vaccination against *P. multocida* or culling the flock. Based on the culture and sensitivity results, the private veterinarian and the farmer elected to treat the flock with neomycin, which is an aminoglycoside antibiotic licensed for use in-feed for poultry. No further deaths have been reported since treatment commenced.

Fowl cholera is a highly contagious bacterial disease with

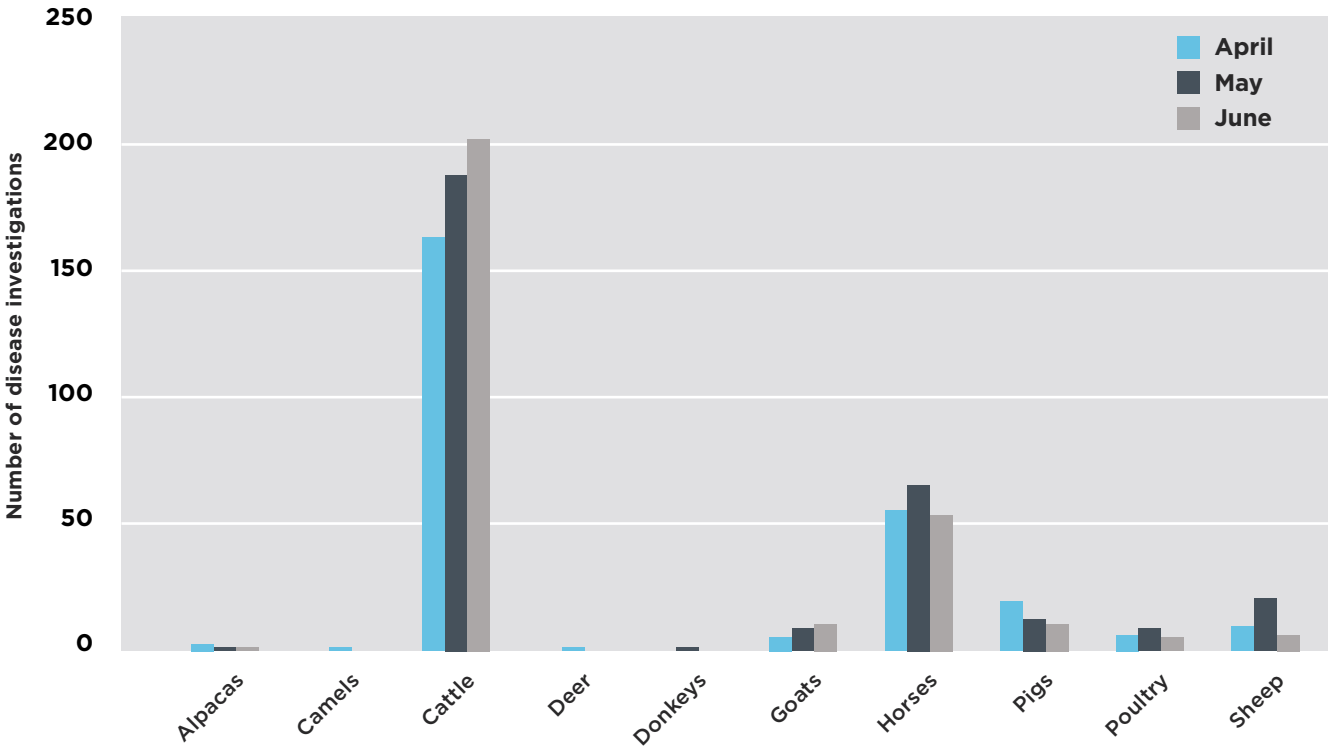


Figure 10 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Queensland, April to June 2018

worldwide distribution. It may affect many types of domesticated and wild birds, including chickens, turkeys and waterfowl. Mortality rates may reach as high as 50%, as in this case. A high percentage of a recovered flock might become carriers while appearing normal. Vaccination for fowl cholera may provide protection, but it is recommended to type the strain and choose the most effective vaccine for the serovar.

Group C *Salmonella* spp. are ubiquitous worldwide and a common cause of food poisoning in humans. Of those species endemic to Australia, *Salmonella enterica* serotype Enteritidis (group d) infection in poultry is notifiable in Queensland. Australia's layer poultry flock is free of *S.* Enteritidis, and monitoring for this serotype is conducted through the National Salmonella Enteritidis Monitoring & Accreditation Program (NSEMAP).[28] Duck hepatitis virus, duck enteritis virus and *S.* Gallinarum are exotic to Australia. *S.* Pullorum has been eradicated from Australian commercial poultry flocks and has not been detected in Australia since 1992.

Surveillance for exotic diseases is reliant on an effective client–veterinarian relationship. Communication and engagement by veterinarians with smallholder farmers help to increase the awareness about animal diseases, biosecurity and passive surveillance.

Avian chlamydiosis in an aviary collection of finches and parrots

Avian chlamydiosis killed 25 of 40 native birds in an aviary on the Sunshine Coast containing Gouldian finches and Bourke, grass and red-faced parrots.

Disease onset occurred 2 days after the introduction of 10 new female birds purchased from a local vendor. Over a 4-week period, all purchased birds, as well as 15 from the original flock of 30, exhibited clinical signs of puffed feathers, reduced activity and death within 1 to 5 days.

A dead Gouldian finch was presented to a private veterinary clinic for necropsy. The examining veterinarian wore personal protective equipment, including respiratory protection against potential zoonotic psittacosis. Fresh and fixed tissues, faeces and a cloacal swab were submitted to Biological Sciences Laboratory. Acting on a strong suspicion of chlamydiosis, the remaining at-risk birds were treated with oral doxycycline while awaiting the results.

Avian influenza and Newcastle disease were excluded using real-time PCR assay. Chlamydial infection was initially diagnosed using real-time PCR on the fresh liver sample. Histology revealed multifocal hepatocellular necrosis with mixed inflammatory cell infiltrates and dense mononuclear infiltrates in the periportal and perivascular areas. Hepatocytes and Kupfer cells contained intracytoplasmic, basophilic, granular bacteria consistent with *Chlamydia* spp. A positive chlamydial fluorescent antibody test confirmed the diagnosis.

28 www.dpi.nsw.gov.au/animals-and-livestock/poultry-and-birds/health-disease/national-salmonella-enteritidis-monitoring-and-accreditation-program

The private veterinarian advised the client of the zoonotic potential of *Chlamydia psittaci* and advised them to seek medical advice. In addition, Biosecurity Queensland advised the veterinarian about how their client could meet their general biosecurity obligation under the *Biosecurity Act 2014*, which includes that the owner must take all reasonable and practical measures to prevent or minimise the risk to human health. It was also recommended the original vendor be alerted to the detection in birds from their flock.

Chlamydiosis in animals can range from asymptomatic to fatal, depending on a number of factors, including host species and the chlamydial species involved. *Chlamydia psittaci* has a global distribution and is endemic in domesticated and wild birds of Australia, infecting a wide range of avian species, including psittacine and passerine species. Clinically, avian chlamydiosis may result in systemic and fatal disease. Older birds may asymptomatically shed the organism.

In this case, the stress of transportation and introduction to a new flock is likely to have triggered onset clinical signs in the recently purchased and companion birds. No further mortalities were reported at the property.

Epizootic infections with *C. psittaci* have been observed in mammal species, including companion animals, horses and cattle. Psittacosis in humans may range in presentation from asymptomatic to keratoconjunctivitis to severe systemic infections. In Queensland, disease due to *C. psittaci* is notifiable in humans but not in animals.

Exclusion of bovine spongiform encephalopathy and screw-worm fly in a bull with weakness and myiasis

In the Quilpie region, bovine spongiform encephalopathy (BSE) and screw-worm fly (*Chrysomya bezziana* and *Cochliomyia hominivorax*) were excluded as the cause of significant weight loss, weakness, staggering and myiasis in the nasal cavity of a bull with a foreign-body granuloma. The bull was in a paddock with 100 cows on a property that had approximately 800 cattle.

The 6-year-old Droughtmaster bull was first noticed in mid-March 2018 with a mass protruding from the nose, difficulty breathing and inability to move far. The animal was not seen with the herd again and was presumed dead for approximately a month. When found again, the bull had significant weight loss (body score 1 out of 5 compared to paddock mates with body scores of 4 of 5), was depressed and tended to isolate itself from other animals. The bull was weak and staggering, and the nasal mass appeared smaller than previously, protruding approximately 7 cm from the right nostril and attracting a large number of flies. The animal was euthanased using a captive bolt and exsanguination.

Necropsy revealed that the bull was emaciated with serous atrophy of body cavity fat. Incision of the lateral aspect of the right nares revealed that the mass extended a further 15 cm up the nasal cavity and fly larvae (maggots) were found deep in the nasal cavity. Exploration of the mass revealed two woody sticks, the longest of which was approximately 13 cm long and 4 mm in diameter. The plant was identified as turkey bush (*Eremophilia* sp.), which was present in the paddock. There were no further gross abnormalities. Blood (EDTA, heparin and plain), four maggots, fresh proximal cervical spinal cord and a range of fixed tissue, including a sample of the mass and the brain, were submitted to Biosecurity Sciences Laboratory.

Haematology and biochemistry indicated the bull had been anaemic, with leukopenia, hyperglobulinaemia, uraemia and hypocalcaemia, and had mild elevations of enzymes associated with tissue damage.
Histopathology indicated the mass contained no recognisable normal tissue and consisted of irregular dense connective tissue, granulation tissue with surface (areolar/cavity side) ulceration, haemorrhage, fibrin tags, and inflammatory cells and fibrinoid necrosis of some vessels and vascular thrombosis. These findings are consistent with a diagnosis of chronic

granulomatous foreign body reaction. The four maggots were identified as third instar larvae of *Calliphora* sp. (blow flies), excluding screw-worm fly.

Brain tissue samples showed no lesions suggestive of transmissible spongiform encephalopathy (TSE) detected at the histological brain sites specified in the Australian and New Zealand Standard Diagnostic Procedure, Transmissible Spongiform Encephalopathies.[29]

BSE and screw-worm fly are both exotic to Australia. Two nationally coordinated and funded programs, the National Transmissible Spongiform Encephalopathy Surveillance Project[30] and Screw Worm Fly Surveillance & Preparedness Program[31] provide for early detection should either occur in Australia and generate evidence to support confidence in Australia's continued freedom from these significant diseases.

Mortality due to anthrax

Anthrax was the cause of death of a 6-year-old Angus cow at an extensive beef cattle property in the Dirranbandi region of south-west Queensland.

In response to two earlier anthrax incidents on other properties in the area (AHSQ Vol. 22 Issue 1 and AHSQ Vol. 23 Issue 1), the owner had arranged to vaccinate all 600 breeders and 550 weaners on the property with the Sterne 34F2 live anthrax vaccine.

In early May, the 600 breeders were mustered in preparation for vaccination. One cow was found dead in the yards the next morning in lateral recumbency, with some blood and froth from the nostrils and blood from the anus and vulva. The attending private veterinarian suspected

anthrax, and appropriate personal protective equipment was worn to collect blood smears from the nostrils, rectum and vagina, a nasal swab and aqueous humour that were submitted to the Biosecurity Sciences Laboratory. *Bacillus anthracis* was detected in the three smears using a polychrome methylene blue stain. The detection of anthrax was confirmed by PCR assay and culture at Australian Anthrax Reference Laboratory at AgriBio Veterinary Diagnostic Services, Bundoora.

The carcass was disposed of by deep burial as dry conditions and high winds precluded safe disposal by burning. The remainder of the breeding herd appeared well and were vaccinated that day. Another 550 weaners were vaccinated soon after the incident and no further deaths have been reported. Tracing demonstrated that there was no spread of anthrax from the property. No human infection was associated with this incident.

Biosecurity Queensland officers provided the property owners with information regarding their General Biosecurity Obligation under the *Biosecurity Act 2014*, particularly their responsibility not to move any stock off the property until either 20 days after the last animal on the property had been vaccinated or 20 days after the last death of any animals on the property, whichever was the later condition. The property owners were also provided with information on managing the ongoing risk of anthrax. This included advice on vaccination and other biosecurity measures, such as minimising earthworks and disturbance of the soil.

Anthrax is a potentially fatal zoonosis and a notifiable disease in both people and animals. Anthrax is an infrequent occurrence in Queensland. While there are other common causes of occasional deaths in the region, including pimelea poisoning (colloquially known as 'St George disease'), clostridial disease and botulism, veterinarians and owners should consider anthrax as a potential diagnosis and the risk of zoonotic transmission when responding to sudden death in livestock.

29 www.animalhealthaustralia.com.au/download/9413/

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

31 www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/screw-worm-fly/

South Australia

Jane Owens
Biosecurity South Australia, Department of Primary Industries and Regions South Australia

During the quarter in South Australia, 137 livestock disease investigations[32] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[33] The number of investigations by species of livestock is shown in Figure 11. Field investigations were conducted by government veterinary or biosecurity officers (54) and private veterinary practitioners (83). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

During the quarter the state veterinary diagnostic laboratory, Gribbles Veterinary Pathology (VETLAB), Glenside, processed 137 livestock sample submissions[34] to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications and for accreditation programs and targeted surveillance.

Biosecurity SA, a division of Primary Industries and Regions South Australia (PIRSA), maintains close communication with rural private veterinary practitioners, who make a valuable contribution

32 Field investigation with laboratory diagnostic testing.

33 Emergency diseases are a subset of notifiable disease defined as diseases listed in the Emergency Animal Disease Response Agreement www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

34 Some investigations involved multiple submissions.

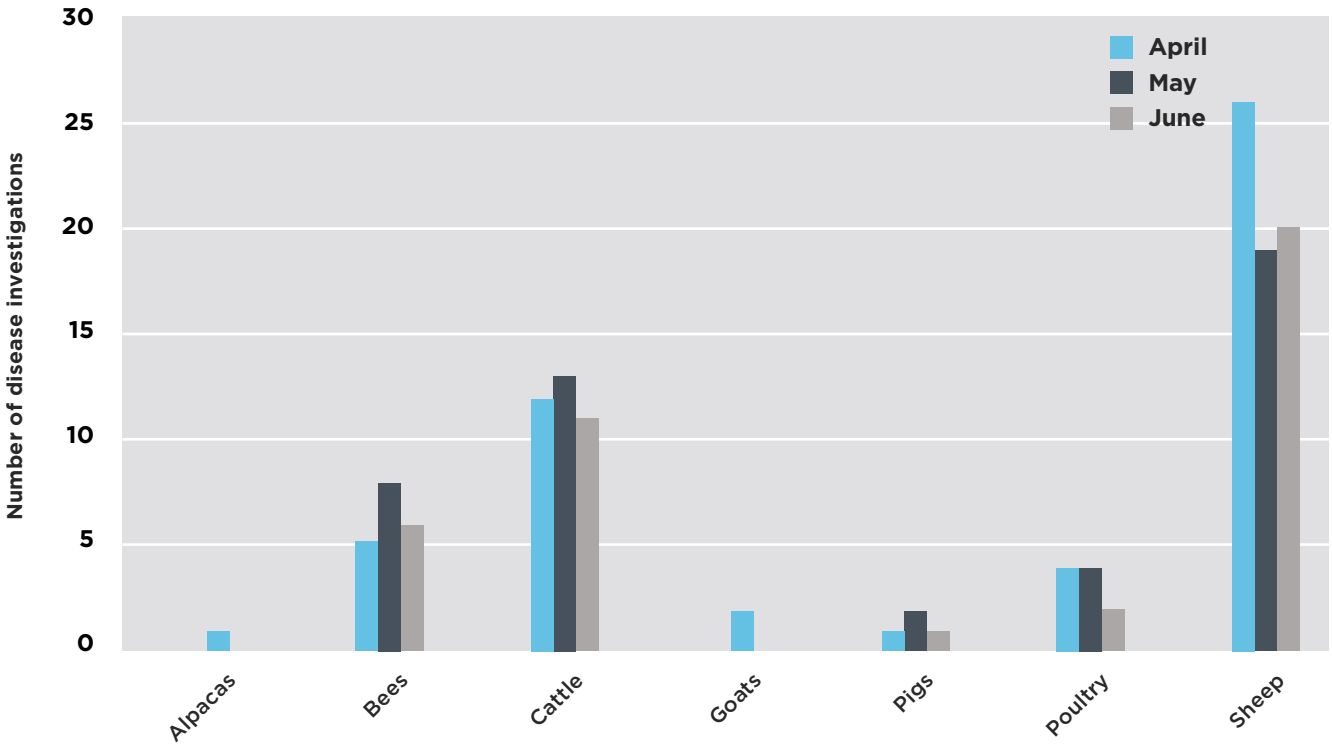


Figure 11 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in South Australia, April to June 2018

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.

The following case reports are a selection of field investigations, chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

Bloat and suspected hypomagnesaemia in lactating beef cows

In late May, a beef cattle producer in the Adelaide Hills reported finding three adult cattle dead over a period of 2 weeks. The dead cattle were found at afternoon feeding time. No other cattle were showing signs of illness. The producer was feeding out large quantities of hay each day because of insufficient pasture. No toxic plants were observed in the paddock. The cattle had been recently moved from a nearby property (belonging to the same producer). The group comprised of about 30 Red Angus cows with 1 to 4 month-old calves at foot. While grass tetany (hypomagnesaemia) and bloat were the primary differential diagnoses, the cow was examined to rule out infectious causes of sudden death.

A necropsy was performed on one cow that had died some hours before and had a 4-month-old calf. The cow was in good body condition. Some tissue autolysis had already occurred. The carcass was very bloated, with a distended gas-filled rumen containing about 50 kg of hay. Two large (200 mm and 80 mm) phytobezoars were found in the abomasum and, approximately 1 kg of sand. The intestines were empty. Considerable congestion and blood pooling around the head, neck and thoracic inlet was observed, along with a bloat line in the oesophagus. No other significant pathology was noted. Calcium and magnesium levels were normal in ocular fluid, but the results are not definitive given the post-mortem interval before collection. The necropsy findings were consistent with bloat as the cause of death in this cow.

Bloat can occur with rapid intake of a large quantity of hay and was complicated in this case by the presence of phytobezoars. Hypomagnesaemia could not be ruled out as a contributing factor nor as a causative in the previous two deaths, so the producer was advised to provide supplemental calcium and magnesium. The cattle were considered at high risk for hypomagnesaemia based on the region and the season,

with short, fast-growing pasture and lactating cattle. No further deaths have been reported.

Hypersensitivity to nematodes and chronic weight loss in sheep

In mid-June, 20 crossbred sheep from a smallholder property in the Adelaide Hills were reported as having chronic weight loss with no evidence of scouring. Weight loss had been observed over a 12-month period. The sheep had been recently drenched. Johne's disease was suspected so three sheep of varying age were presented for necropsy. The sheep were in very poor body condition score (1 out of 5), but otherwise showing no signs of illness. One sheep was pregnant. The oldest sheep (aged 6 to 7 years) was missing incisors.

A necropsy revealed all three sheep had minimal body fat. They had enlarged, granulomatous intestinal lymph nodes (Figure 12), with thickened small intestine and prominent lymphatic vessels in the mesentery. The oldest sheep had numerous small, white, well-circumscribed spots on the surface of the liver (Figure 13). Johne's disease was suspected based on gross pathology.

Ovine Johne's disease was excluded based on negative histological findings (no granulomatous lesions consistent with Johne's disease and negative Ziehl–Neelsen staining) and negative agar gel immunodiffusion test results. Results of the worm egg count were low (50 strongyle eggs per gram), with low numbers of coccidial oocysts in all sheep, and some *Trichuris* spp. eggs observed in one sheep.

All three sheep had eosinophilic granulomatous enterocolitis. Two sheep showed eosinophilic granulomas in the lungs, as well as eosinophilic infiltration and eosinophilic granulomas lesions within the mesenteric lymph nodes. The histological lesions

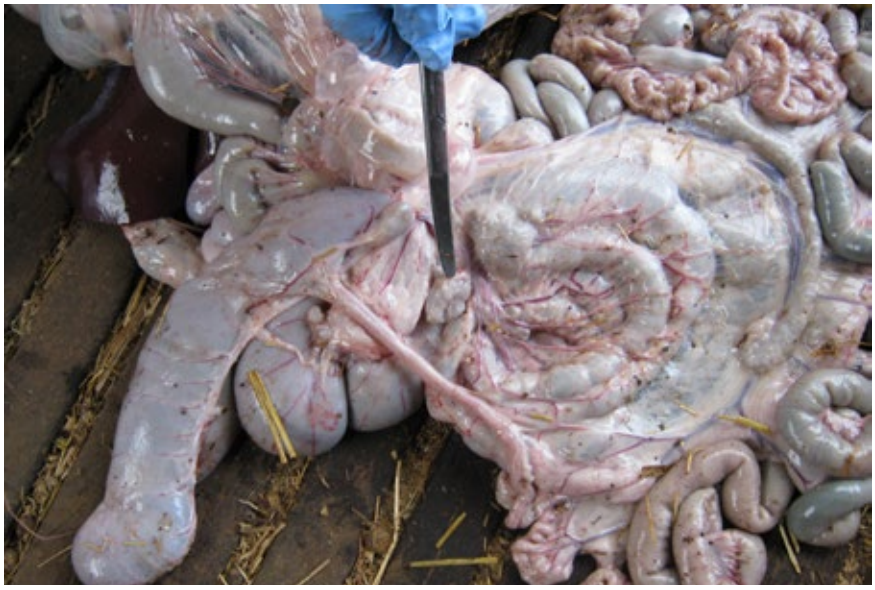


Figure 12 Intestines of sheep showing enlarged mesenteric lymph node

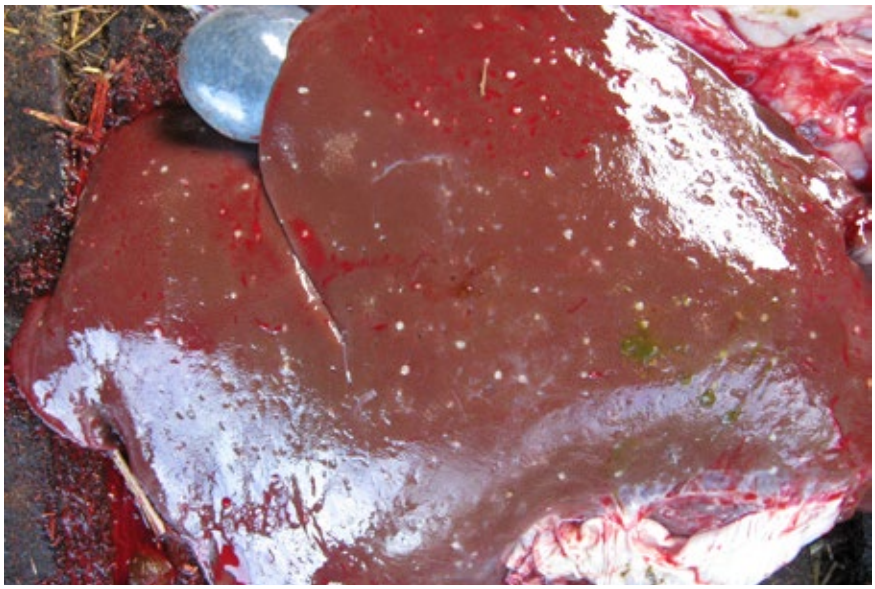


Figure 13 Multifocal lesions on the surface of the liver

were consistent with a hypersensitivity reaction to larval nematode parasite migration. This type of hypersensitivity response can cause intestinal malabsorption with ill-thrift, even with low levels

Respiratory disease complex in chickens

In early May, respiratory illness and mortalities in a certified organic chicken egg and meat farm near Karoonda were investigated. The farm had 130 meat breeder chickens, 900 meat grower heritage breed chickens (bred on the farm) and 450 layer chickens (sourced from a commercial breeder) housed in separate groups in sheds, with access to the outdoors. All chickens on the farm were unvaccinated. Respiratory illness and deaths were reported in the meat breeder and grower chickens only, with approximately 20 deaths over the preceding 10 weeks.

Affected chickens were observed to be open mouth breathing and lethargic, with swollen sinuses. Four affected birds were euthanased by cervical dislocation for necropsy. Cloacal and tracheal swabs were taken for avian influenza (AI), infectious bronchitis virus (IBV), infectious laryngotracheitis (ILT) and Newcastle disease (ND) virus

exclusion tests via PCR assay. All viruses were excluded except IBV. IBV was detected by RT-PCR (as distinct from subgroups 1 and 3 IBV reference strains).

Gross pathology revealed congestion of thoracic and abdominal organs and caseous necrosis of the lungs. Fresh tissues from the lung, trachea, liver, and sinuses were submitted for bacterial culture, including *Mycoplasma* spp. *Mycoplasma* infection was excluded, but a culture from pooled lung and sinus tissues revealed heavy growth of mixed bacteria and isolation of the causative gram-negative bacteria for infectious coryza, *Avibacterium paragallinarum*.

Based on culture and sensitivity testing, chlortetracycline was prescribed for the farm, conditional to the producer notifying the organic accreditation agency, followed by assistance in the implementation of a vaccine program for IBV and ND to meet their vaccination requirements under the national ND control program. It is likely secondary infection with *A. paragallinarum* arose after birds succumbed to IBV. Despite having no vaccination history, the layer chickens are likely to have received maternal antibodies for IBV from their vaccinated parents on the commercial breeder farms, as vaccination is standard practice, and hence were immune. This case highlights the importance of routine vaccination in preventing disease outbreaks on poultry farms.

Sudden death in dairy calves

In early April, sudden death was observed in a group 5-month-old dairy calves on a property on the Yorke Peninsula. Of the 40 calves being hand-raised for slaughter, four had died immediately before the investigation, and five died 2 weeks before. These were the only cattle on the property.

The owner reported nervous signs and apparent blindness in some of the calves before death. One of the four calves was recumbent but alive when the veterinarian and animal health officer arrived at the property and was observed paddling immediately before death. Bleeding from the eyes, nose and mouth was also observed (Figure 14), raising concern about the possibility of anthrax.

Personal protective equipment was worn to take a jugular blood sample. An anthrax ICT was performed with negative results. A necropsy was performed because the clinical suspicion of anthrax was very low and the ICT was negative. All dead calves were observed to have mild rectal prolapse, with significant quantities of whole barley in the rectum (Figure 15). The liver was diffusely pale and the gall bladder severely enlarged, with thickening of the bile duct, no other significant gross pathology was observed.

Histopathology showed extensive hepatic fibrosis and loss of hepatocytes, with prominent biliary proliferation, consistent with chronic hepatotoxic injury. There was spongiotic vacuolation within the brainstem and spinal cord white matter, consistent with hepatic encephalopathy secondary to liver failure. The

Figure 14 Bleeding from the eyes, nose and mouth of a calf before and after death

Figure 15 Mildly prolapsed rectum containing undigested barley

most likely differential diagnoses were chronic aflatoxicosis or exposure to pyrrolizidine alkaloid-containing plants. The calf tested was negative for type 1 bovine viral diarrhoea virus (BVDV),[35] internal parasites, *Salmonella* spp. and *Listeria* spp.

The calves were being fed whole barley, which had evidence of mould growth, and cereal vetch hay. Only a small amount of barley was remaining in the self-feeder. A sample was taken from the supply silo and screened for mycotoxins, no toxins were identified. The chronic nature of the liver changes observed indicated that the toxin was ingested some time previously, hence chronic aflatoxicosis was considered to be the cause of death. Aflatoxins are fungal toxins produced primarily by *Aspergillus flavus* and *A. parasiticus*, on carbohydrate-rich feeds that are stored in moist, hot conditions without sufficient aeration. When ingested in sufficient quantities, the toxins cause liver damage leading to death.

The producer was advised to remove all remaining barley and ensure good quality feed if continuing to raise calves for slaughter.

Deaths in dairy cattle due to acute blue-green algae toxicosis

In late May, two out of 250 dairy cattle from a property in the Clare Valley were found down in the paddock one morning and died a few hours later. The cattle had been weak, depressed and off feed the evening before. Acute algal toxicity was immediately suspected because the cattle were unintentionally given access to water containing blue–green algae.

A necropsy of both cows revealed haemorrhage on the spiral colon, with petechial haemorrhages on the diaphragm, heart and skeletal muscles. The blood was not clotting. Histopathology of the liver showed a massive hepatocellular loss and extensive necrosis, consistent with blue–green algae or cyanobacteria toxicosis. There was also vascular congestion and haemorrhages in the epicardium and the intestinal wall. The brain was submitted to Gribbles Veterinary Pathology (VETLAB) for TSE exclusion via histopathology, which was negative.

The producer was advised to prevent access to the contaminated water source immediately and monitor the remaining cattle, and was advised of the continued risk to the cattle and human health if using the water. Water from the dam was tested and found to contain excessive levels of the known toxin-producing blue–green algae, *Microcystis aeruginosa* (> 200,000,000 cells/mL, high levels ≥ 500 cells/mL). Treatment with copper sulfate (1 g/1000L) was recommended, with subsequent retesting of the water before any further stock/human access. No further deaths have been reported.

35 The severe BVDV-2 form in Europe and North America has not been found in Australia.

Tasmania

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

During the quarter in Tasmania, 274 livestock disease investigations[36] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[37] The number of investigations by species of livestock is shown in Figure 16. Field investigations were conducted by government veterinary or biosecurity officers (6) and private veterinary practitioners (268). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

During the quarter the state veterinary diagnostic laboratory, Animal Health Laboratory, Launceston, processed 595 livestock sample submissions[38] to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications and for accreditation programs and targeted surveillance.

During this quarter four investigations conducted by private veterinary practitioners were subsidised by the National Significant Disease Investigation (NSDI) Program. Private practitioners often liaise with veterinary officers from the Department of Primary Industries, Parks, Water and Environment (DPIPWE) in the event of unusual disease events. Full support for laboratory costs and additional funding under the NSDI Program is available for approved disease investigations, where presenting signs maybe consistent with nationally notifiable diseases or suspected to be a new or emerging disease. These investigations receive the highest priority.

The following case reports are a selection of field investigations, chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

Meningoencephalitis in a sheep

Non-suppurative meningoencephalitis was likely to have contributed to the death of a ewe in northern Tasmania exhibiting abnormal nervous clinical signs. Exclusion testing at CSIRO Australian Animal Health Laboratory in April 2018 confirmed that exotic causes of encephalitis in sheep, including Aujeszky's disease, flaviviruses and maedi-visna, were not involved in this case.

The 2-year-old Border Leister–Merino cross ewe, from a group of 60 sheep, was found in the paddock twitching and frothing at the mouth with a temperature of 40°C. The ewe began convulsing and died shortly after that.

36 Field investigation with laboratory diagnostic testing.

37 Emergency diseases are a subset of notifiable disease defined as diseases listed in the Emergency Animal Disease Response Agreement www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

38 Some investigations involved multiple submissions.

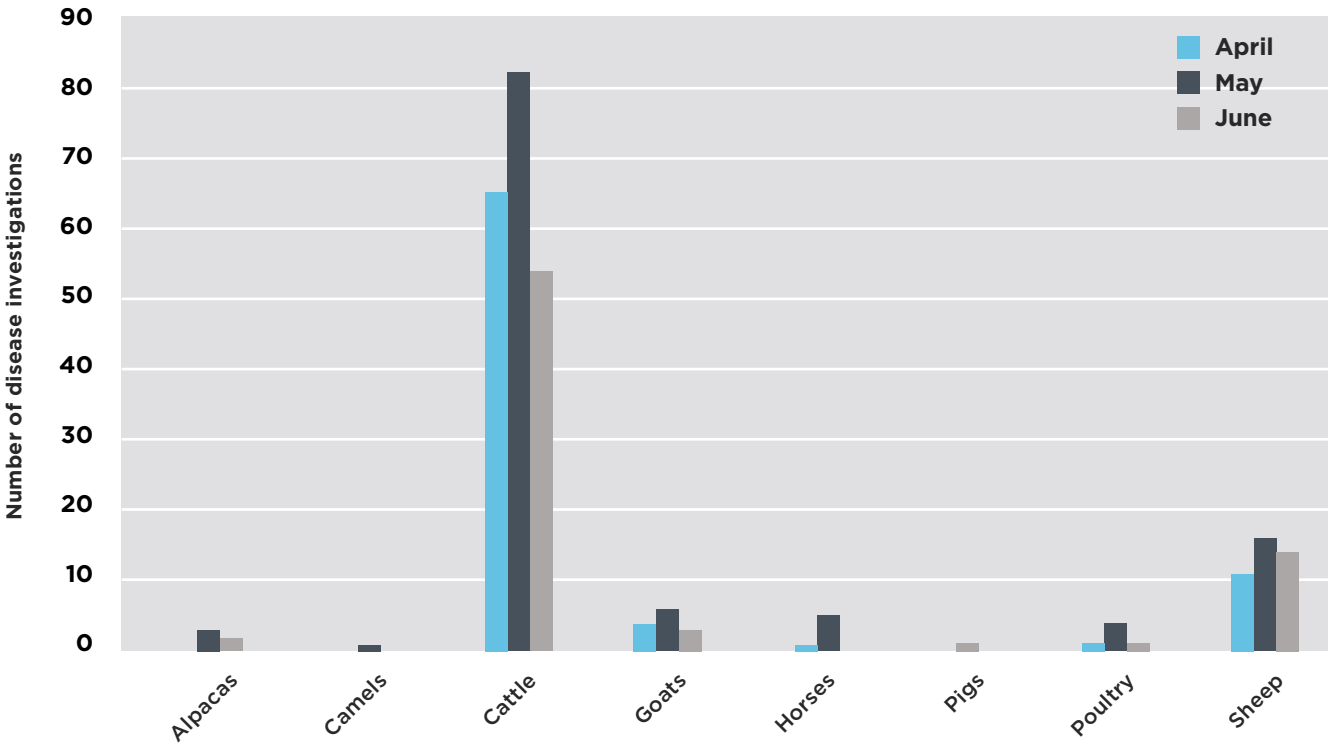


Figure 16 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Tasmania, April to June 2018

Due to the acute onset of clinical signs, initial differential diagnoses included toxicosis, snake bite, encephalitis due to *Listeria* spp. or *Histophilus* spp. infection, Aujeszky's disease, flaviviruses and maedi-visna.

Other than acute, diffuse lung congestion and pale, blotchy liver serosa, there were no other significant gross abnormalities found at necropsy. The limbs were skinned and examined for snake bite wounds, but none were found. Urinalysis was unremarkable. Clinical pathology results included changes consistent with inflammation and cholangiohepatopathy. Moderate, multifocal subacute meningoencephalitis and mild multifocal hepatitis were apparent on histopathology. Swabs taken from brain, liver and lung tissue for microbiological testing revealed no bacteria on gram stain or culture.

Bacterial cultures for endemic pathogens, such *Listeria* spp. and *Histophilus* spp., were unremarkable. Serum and brain samples were forwarded to CSIRO Australian Animal Health Laboratory for exclusion testing of exotic diseases that can cause encephalitis in sheep. Maedi-visna and caprine arthritis encephalitis ELISA test for the detection of antibodies and flavivirus competitive ELISA test for the detection of antibodies were both negative. Aujeszky's disease virus TaqMan assay, maedi-visna virus PCR assay, general PCR assay and flavivirus generic RT-PCR were all negative.

The specific cause of the nonsuppurative meningoencephalitis, which contributed to morbidity for this ewe, could not be identified. There were no further sheep affected in this flock of 60 sheep with which this ewe had been grazing before the onset of her clinical signs.

Avian tuberculosis in chickens

Avian mycobacteriosis was diagnosed in a flock of mixed-breed chickens in southern Tasmania in April 2018. From a group of 150 chickens, approximately 12 were showing respiratory signs, including weakness, wheezing and coughing.

The owner of the birds was a fancy fowl breeder. In addition to the flock of fancy breed chickens, the owner kept a flock of pheasants in a separate enclosure. None of the pheasants exhibited abnormal clinical signs.

Necropsy of one affected chicken revealed multiple fine (1 to 2 mm) pale, white gritty foci scattered through the liver and lungs. Acid-fast bacilli were evident on Ziehl–Neelsen stained samples from these tissues. Histopathology showed multiple granulomas with intralesional acid-fast bacilli, effacing both pulmonary and hepatic parenchyma. These findings were consistent with classic avian tuberculosis due to *Mycobacterium avium*.

Results of Taqman real-time PCR testing for detection of Avian influenza Type A and Newcastle disease (targeting L, M and F genes) at the Animal Health Laboratory, Launceston, were negative.

Mycobacterium can infect a wide range of birds. Most commonly,

mycobacterial infections occur in conjunction with relatively dense populations, such as captive birds, particularly those confined to aviaries for hobby, research and conservation purposes or in backyard chickens. Over the past 5 years in Tasmania, seven cases of avian tuberculosis have been diagnosed from nine suspects — all in captive birds. Mycobacteriosis in free-ranging wild birds is believed to be uncommon, but infection between domestic birds raised out of doors and wild birds has been reported. Some mammals, including humans, may also be susceptible to infection.

M. avium is shed in the faeces of infected birds. Once in the environment, the organism can survive for a long period. Ingestion or inhalation of the organism, particularly via contaminated feed or drinking water, are the most likely routes of infection. Infections typically progress slowly, and many birds present with chronic wasting disease and respiratory symptoms.

Granulomas caused by *M. avium*, consisting of inflammatory cells and mycobacteria, can develop anywhere in the body and are characteristic lesions. Microscopic detection of acid-fast organisms in tissues is required for definitive diagnosis. The faecal acid-fast stain test is not a reliable means of detecting infected birds as many infected birds do not shed the organism. Hence, if the faecal acid-fast stain test is positive, the bird is highly likely to be infected with the organism.

As detection of infected birds is difficult, preventing the introduction of an infected bird into a collection of birds can be difficult. The onset of clinical signs (and mycobacterial shedding) may not occur for years after infection. Despite this, precautionary measures including routine physical examination of all incoming birds and extended quarantine will help reduce the risk of introduction of infection. Quarantine may allow some birds in the early stages of infection time to develop signs that would not be seen when they first arrive. Keeping a relatively young flock where appropriate reduces shedding risk.

Infected birds that are shedding mycobacterium also present a risk of infection to humans who are in contact with them, particularly those who are immunosuppressed. Therefore, infected birds should be euthanased or kept in isolation from people and other birds. People involved in culling infected birds or cleaning infected premises should use personal protective equipment (PPE), such as gowns, gloves, goggles and masks, to reduce the risk of zoonotic infection.

Victoria

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

During the quarter in Victoria, 523 livestock disease investigations[39] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[40] The number of investigations by species of livestock is shown in Figure 17. Field investigations were conducted by government veterinary or biosecurity officers (106) and private veterinary practitioners (417). All diagnostic testing was conducted at state registered veterinary diagnostic laboratories or CSIRO Australian Animal Health Laboratory.

During the quarter the state veterinary diagnostic laboratory, AgriBio Veterinary Diagnostic Services, Bundoora, processed 458 livestock sample submissions[41] to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions (188) were also processed to substantiate proof of disease freedom certifications and for accreditation programs and targeted surveillance.

Victorian animal health data are collected from a number of sources, including targeted surveillance activities, monitoring programs, disease control programs, diagnostic laboratories, livestock producers and field investigations conducted by Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and private veterinary practitioners. In collaboration with the National Significant Disease Investigation Program, DEDJTR provides subsidies to private veterinarians for the investigation and reporting of significant disease events in livestock and wildlife in Victoria. These subsidies go toward the professional costs and laboratory fees associated with the investigation.

Most investigations carried out this quarter were in cattle. Across all species, non-specific clinical patterns were most commonly reported, followed by signs associated with the gastrointestinal tract and the central nervous system. The most commonly diagnosed disease this quarter was salmonellosis in cattle. Cases of clinical disease without a definitive disease agent were reviewed in the context of the surrounding circumstances, and exotic or emergency diseases were excluded where appropriate. Test results from exotic or emergency animal disease exclusion testing are routinely recorded as suspect emergency animal diseases and included in the table of nationally notifiable diseases (Table 16).

The following case reports are a selection of field investigations, chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

Acute bracken fern toxicity in adult cows

In late April, a herd of 68 beef cows in East Gippsland experienced bracken fern (*Pteridium aquilinum* var. *esculentum*) toxicity leading to the death of ten animals over a period of approximately 5 days.

The cattle were either found dead or observed to be depressed and ataxic for a short time before death. Anthrax was ruled out using a field immunochromatographic test (ICT) and transmissible spongiform encephalitis (TSE) samples collected at necropsy tested negative at AgriBio. Key observations of gross pathology included petechial haemorrhages on oral and vaginal mucosal and paintbrush haemorrhages on serosal surfaces. Loops of bowel were observed to contain bloody contents. A sample of bone marrow submitted for histology demonstrated markedly reduced myelopoiesis. Bracken fern contains a ptaquiloside toxin that causes profound bone marrow suppression that was responsible for pancytopaenia (leukopenia, anaemia and thrombocytopenia) as evidenced by widespread haemorrhage and immunosuppression leading to multiple infections, including bacterial and fungi pathogens in

39 Field investigation with laboratory diagnostic testing.

40 Emergency diseases are a subset of notifiable disease defined as diseases listed in the Emergency Animal Disease Response Agreement www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

41 Some investigations involved multiple submissions.

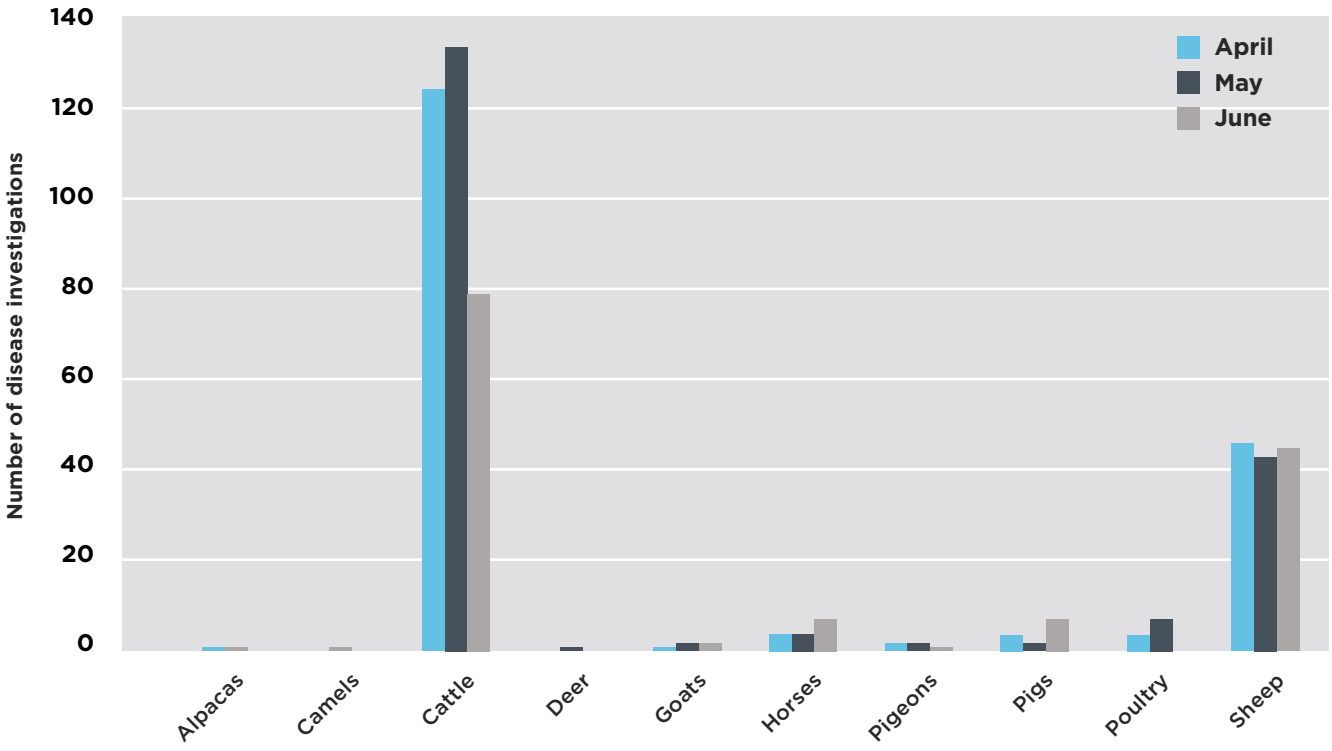


Figure 17 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Victoria, April to June 2018

the liver and abomasal wall, respectively.

Bracken fern toxicity outbreaks in adult cattle are unusual because mature cattle are usually reluctant to eat bracken fern unless there is a significant feed shortage.

In this outbreak, the herd was in a paddock containing bracken fern for a few weeks before being moved to the current paddock, which had no bracken fern, where most of the deaths occurred. The poor seasonal rainfall in the district over the previous year had created pronounced pasture deficits for most producers and led to a situation where cattle were eating forage they would not normally consume.

This investigation reinforces the importance of collecting a range of samples. For bracken fern toxicity, bone marrow (preferably a sample of the sternum) provides the diagnostic evidence.

Anthrax ruled out as the cause of death in cattle

A mass mortality event involving the death of 97 beef cows, 94 of which died in a single night, occurred in the high country in East Gippsland in late June 2018. Three adult cows were found dead on a Wednesday, and the remainder were found the next morning.

The owners thought the initial deaths might have been related to grass tetany because they were older cows that had recently calved. The government veterinarian was called when the mass mortalities were discovered in the morning.

The herd was divided into several groups of mature cows late in calf or recently calved, unjoined heifers, weaners and bulls. They were all being supplementary fed a combination or alternate sources of millet silage and grass hay, on alternate days.

Affected groups included three groups of mature cows/calves and one group of unjoined 2-year-old heifers. Mortality rates ranged from 18 to 52%. Feeding history pointed to silage feeding on the previous day as a risk factor, but not all groups were affected. For example, one group of yearlings that had been fed silage on the same day (Wednesday) as the groups with mortalities had experienced no deaths.

Anthrax was ruled out using ICT pen-side kits on three of the carcasses. Two necropsies were conducted with a range of samples collected, as well as hay, silage and dam water for testing. No pasture was collected for testing because there was very little growth in the paddock.

Blue–green algae toxicity was ruled out on water samples. Cyanide estimates on feed samples were low. Nitrate and nitrite estimates on four samples of aqueous humour were high; two animals had nitrate concentrations in the test range > 50 to < 100 mg/L (normal range < 10mg/L). Millet silage samples taken from each end of the silage row were tested and found to be 4100 and 9900 mg nitrate/kg dry matter, respectively. Feed concentrations of > 5000 mg/kg are considered potentially toxic to livestock. The variation in the millet silage nitrate levels was explained by differences between the location of two separate paddocks (one on a creek flat and

one on a rising hill paddock) having been sown and harvested for millet over the previous summer. This undoubtedly contributed to the fact that not all groups fed millet silage experienced deaths.

Millet is a forage crop that can be associated with nitrate poisoning. Contributing factors in this situation are likely to include seasonal stress on the crop due to lack of rainfall, variable susceptibility of the cattle associated with their dietary requirements, access to other feed (e.g. dry pasture in the paddock), and concurrent hay being fed.

TSE excluded in sheep with neurological signs

In late April, on a property located in south-west Victoria, 10 ewes died due to polioencephalomalacia (PEM) out of a group of 800 over a 1-week period. The ewes were due to lamb in late July and were all vaccinated against clostridial diseases. The flock had been grazing a bare paddock and were being supplementary fed with silage and oats. Most affected sheep were found dead, but those that were alive showed a range of signs before death including ataxia, staggering, opisthotonus (stargazing), recumbency and convulsions.

A clinical examination of one of the affected ewes showed ataxia, opisthotonus and vertical nystagmus. The necropsy was unremarkable other than a faint green fluorescence of the brain when exposed to ultraviolet light. Differential diagnoses included PEM and listeriosis. Blood and fresh and fixed tissue samples, including the brain, were collected and submitted to the DEDJTR AgriBio laboratory for TSE exclusion and analysis. No histological lesions suggestive of TSE were detected in the brain.

Two of four ewes treated with vitamin B_1 injections recovered.

A diagnosis of PEM was made based on the histological findings of laminar neuronal necrosis, increased size of Virchow–Robin spaces and endothelial hypertrophy in sections of the brain. The diagnosis was supported by the positive response to treatment with vitamin B_1 injections.

PEM is a sporadic disease seen across goat and sheep production areas of Australia in animals of all ages. The histological changes and signs are caused by a deficiency in thiamine (vitamin B_1). The deficiency can occur directly: from the lack of thiamine in the diet; destruction by bacterial thiaminases produced in the guts; increased sulfur intake that binds thiamine; or thiamine analogs that block absorption (e.g. amprolium). Outbreaks often occur a month or so after a change in diet due to changes occurring in the bacterial biome. High carbohydrate–low roughage diets are often implicated because they promote the growth of bacteria that are known to produce thiaminases. With many causes being related to diet, up to 30% of a group may be affected by the disease. Mortality rates can be quite high if the disease is left untreated.

Due to the unusual number of cases in the flock and the supplementary feeding, it was likely that the disease was because of thiaminase-producing bacteria in the rumen rather than insufficient thiamine intake from the diet.

The producer was advised to treat any animals with clinical signs with vitamin B_1 injection as early as possible and to introduce good quality hay into the diet to provide additional roughage to change the ruminal biome.

Western Australia

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Department of Primary Industries and Regional Development

During the quarter in Western Australia, 521 livestock disease investigations[42] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[43] The number of investigations by species of livestock is shown in Figure 18. Field investigations were conducted by government veterinary or biosecurity officers (159) and private veterinary practitioners (362). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

During the quarter, the Department of Primary Industries and Regional Development (DPIRD) Diagnostic Laboratory Services (DDLS), South Perth, processed 611 livestock sample submissions[44] to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications and for accreditation programs and targeted surveillance.

DPIRD, 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 notifiable diseases and demonstrating Western Australia's absence of, and capacity to detect, notifiable diseases to support domestic and export market access for livestock and livestock products.

Given that notifiable diseases may present similarly to diseases endemic in Australia, a key objective is the prompt investigation of cases presenting with clinical signs consistent with a notifiable disease. This has the purposes of assisting the affected producer to manage the disease event by definitively diagnosing the cause. It also supports the wider livestock industry by demonstrating freedom from notifiable diseases. This function is vital to maintaining Western Australia and Australia's favourable animal health status and market access.

The following case reports are a selection of field investigations chosen to highlight surveillance and diagnostic capacity. Reports chosen are not necessarily representative of the full range of livestock disease incidents during the quarter.

Neurological signs in cattle in Great Southern region

A producer in the Great Southern region with a group of 1000 Angus heifers, aged 12 months, contacted their private veterinarian in April. The animals had been grazing regrowth canola for the past 10 days, and three animals showed signs of blindness before becoming recumbent and dying. Three more animals appeared to be affected by similar signs and died after the investigation.

A necropsy by the private veterinarian was unremarkable and potential diagnoses included polioencephalomalacia (PEM), trace element deficiency and lead or nitrate toxicity. A range of fixed and fresh tissues was submitted to the DPIRD laboratory along with blood and faeces.

Histopathology revealed a severe PEM, and this was supported by a low thiamine diphosphate concentration in the blood. Transmissible spongiform encephalopathy (TSE) was excluded through histopathology of the National TSE Surveillance Program (NTSESP) specified sites. Given the acute neurological presentation, the blood was tested for lead, which returned a result of 0.00 mg/L. The samples were negative by faecal ELISA for annual ryegrass toxicity and blood nitrate for nitrate toxicity.

A diagnosis of sulfur-induced PEM (rape blindness) was made based on grazing history, clinical signs, histopathology and biochemistry. Canola is a *Brassica* spp. known to potentially contain high sulfur concentrations. Sulfur is directly toxic to cattle through the production of hydrogen sulfide in

42 Field investigation with laboratory diagnostic testing.

43 Emergency diseases are a subset of notifiable disease defined as diseases listed in the Emergency Animal Disease Response Agreement www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

44 Some investigations involved multiple submissions.

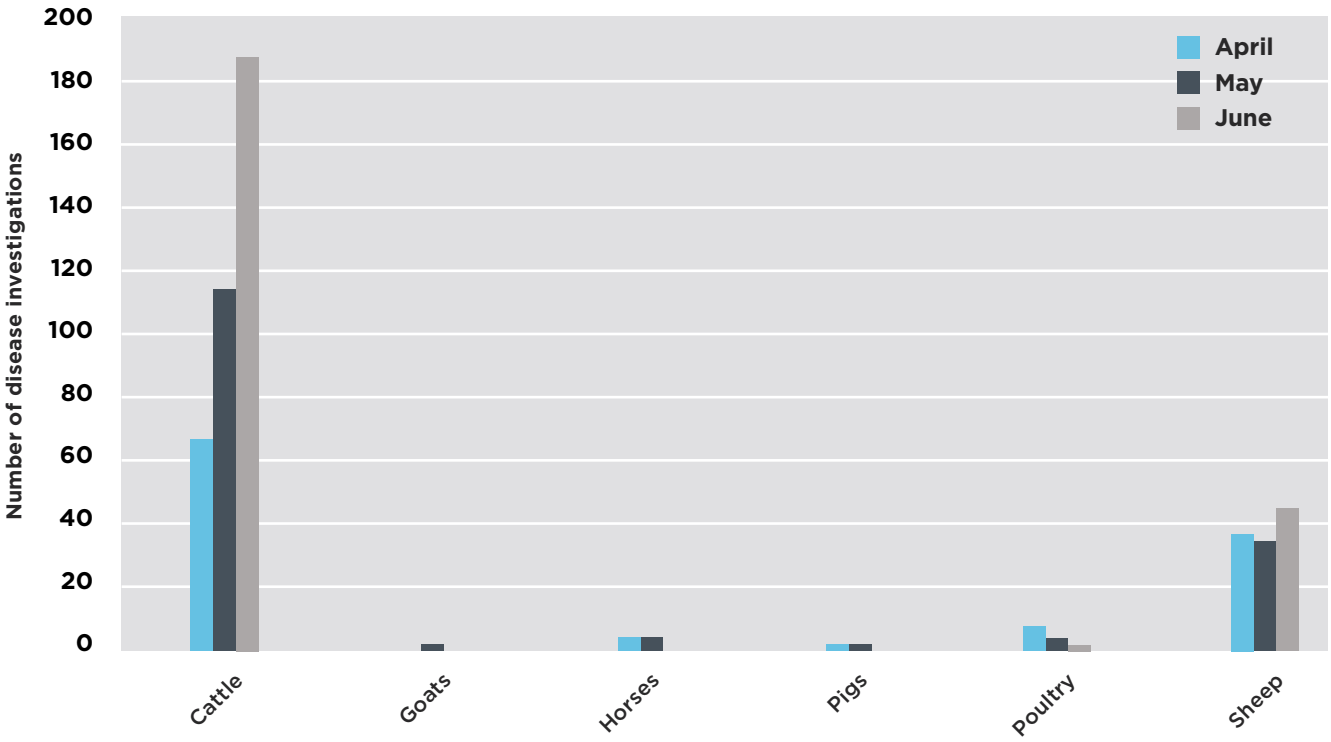

Figure 18 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Western Australia, April to June 2018

the rumen. Sulfur toxicity in animals may respond to thiamine treatment because sulfur is thiaminolytic.

Risk-factors for the condition include rations with greater than 40% *Brassica* spp. content and a whole diet ration containing more than 0.5% sulfur. This information was provided to the private veterinarian who discussed treatment of individual affected animals and future preventative grazing management with the producer.

Foot-and-mouth disease exclusion in a cow

In June, a cattle producer in the Great Southern region contacted their private veterinarian because two cows out of a herd of 100 mature cows had been found dead earlier that week and one animal was now unwell.

The cows were either heavily pregnant or recently calved, and due to dry conditions in the area, the cows were in lean body condition and being fed a ration of oaten hay.

The attending private veterinarian found the affected cow was ataxic and drooling, with inflamed gums. No discrete vesicular lesions were noted, however, given the presence of drooling and oral inflammation, initial samples of blood and an oral swab in virus transport medium (VMT) were collected. Testing for FMD and

vesicular stomatitis at the CSIRO Australian Animal Health Laboratory was negative. FMD and vesicular stomatitis testing included PCR, ELISA and virus isolation, with tests conducted on an oral swab VTM, EDTA (ethylenediaminetetraacetic acid) blood or serum as relevant for the test.

Two days later, the affected cow was found dead after failing to respond to conservative medical treatment, and the private veterinarian revisited the property to collect extra samples from the dead cow.

On necropsy, the lungs were congested, and peritonitis was present. The reticulum was thickened, inflamed and oedematous and the liver contained multiple abscesses. The veterinarian made a provisional diagnosis of traumatic reticuloperitonitis with secondary peritonitis and embolic bacterial hepatitis.

In this case, histopathology supported the provisional diagnosis of traumatic reticuloperitonitis. Severe necrosuppurative hepatitis was present in addition to severe fibrinosuppurative serositis and peritonitis with granulation tissue formation and fibroplasia. Bacterial cultures of the liver yielded no significant growth, but this was likely due to antibiotic treatment before death.

The private veterinarian has discussed potential sources of foreign bodies that may cause traumatic reticuloperitonitis, and the producer has seen no further cases develop.

Ill-thrift and weakness in Dorper ewes

In April, a sheep producer in the Wheat belt region contacted their private veterinarian regarding ill-thrift, weakness and perinatal deaths in a flock of mature Dorper ewes. From a flock of 580 ewes, 30 had died, and 50 were affected. The ewes had all either recently lambed or were due to lamb and were being grazed on a paddock of barley stubble. Affected ewes would lose condition, abandon their lambs (if present), become recumbent and die. Some ewes also developed diarrhoea.

On visiting the property, the veterinarian found the ewes to be in below-average condition score. One affected ewe that was recumbent with altered consciousness and hypoaesthesia was euthanased for necropsy. A yellow friable liver, twin foetuses in utero, gastrointestinal parasitism and inflammation were noted. A provisional diagnosis of pregnancy toxaemia, hypocalcaemia and possibly helminthiasis was made, with samples submitted to DPIRD for testing. Brain and spinal cord samples for scrapie exclusion testing were submitted under the National TSE Surveillance Program.

DPIRD histology revealed extensive hepatic lipidosis and helminthiasis. Alanine transaminase and glutamate dehydrogenase were elevated on blood biochemistry, indicative of hepatocellular damage associated with hepatic lipidosis. Markers for dehydration and inflammation were present on biochemistry. A worm egg count from faeces of the necropsied animal was high (1700 eggs per gram). Larval culture and differentiation identified the majority of the worm burden as *Trichostrongylus* spp. (black scour worms).

Scrapie was ruled out after no histological lesions suggestive of transmissible spongiform encephalopathy were detected at specified brain sites.

Pregnancy toxaemia and helminthiasis were the final diagnoses in the flock of ewes. The private veterinarian used the diagnosis to work with the producer to formulate a complete ration and worm management plan for the coming months.

Quarterly Statistics

Endemic disease monitoring
Laboratory testing
Surveillance activities

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, camelids, deer and goats. Infection in sheep occurs to varying extents across the sheep-producing regions of southern Australia.

Investigations for Johne's disease in alpacas, cattle, deer, goats and sheep are reported in Table 16.

Approaches based on risk assessment and management have been developed to control Johne's disease in all affected species. Market assurance programs (MAPs) are in operation for alpacas, goats and sheep; the numbers of herds or flocks that have reached a status of Monitored Negative 1 or higher are shown in Table 3. For status definition, see the current species MAP manual.[45] Lists of alpaca, cattle and goat herds and sheep flocks assessed in the MAPs are available on the Endemic Disease Information System website.[46] Herd or flock testing is undertaken by a MAP-approved veterinarian. The MAP for cattle ceased on 1 November 2016, with herds moving to industry-specific (beef or dairy) assurance scores. These risk profiling tools have different levels of biosecurity and testing, with higher levels requiring veterinary supervision. 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.

Table 3 Herds or flocks[a] with a Market Assurance Program status of at least Monitored Negative 1, 1 October 2017 to 30 June 2018

Quarter	Alpacas	Goats	Sheep	Total
Oct–Dec 2017	12	26	383	421
Jan–Mar 2018	13	28	362	403
Apr–Jun 2018				
NSW	5	7	147	159
Qld	0	9	1	10
SA	7	10	148	165
Tas.	0	1	11	12
Vic.	0	4	55	59
WA	0	0	5	5
Aus.	**12**	**31**	**367**	**410**

a There are no herds or flocks in Northern Territory in the MAPs.

Ovine brucellosis

Infection with *Brucella ovis*, is present in commercial sheep flocks at a low level that varies around the country. Voluntary accreditation programs (usually in stud flocks) for ovine brucellosis freedom operate in all states. Table 6 shows the number of accredited flocks at the end of the quarter.

Table 4 Ovine brucellosis accredited-free flocks, 1 April 2017 to 30 June 2018

State	Apr–Jun 2017	Jul–Sep 2017	Oct–Dec 2017	Jan–Mar 2018	Apr–Jun 2018
NSW	851	854	845	834	836
Qld	78	75	75	73	73
SA	533	542	538	495	497
Tas.	62	46	62	54	56
Vic.	454	448	456	427	419
WA	185	190	189	189	193
Aus.	**2163**	**2155**	**2165**	**2072**	**2074**

45 www.animalhealthaustralia.com.au/maps

46 edis.animalhealthaustralia.com.au/public.php?page=mapsearch&aha_program=3

Laboratory testing

Serological testing

Table 5 summarises the results of serological testing for two equine viruses on samples submitted to state and territory animal health laboratories during the quarter, including many submissions for export certification. Positive serological test results are not an indication of the presence of clinical disease.

Table 5 Results of serological testing for two equine viruses, 1 April 2017 to 30 June 2018

Quarter	No. of tests (equine infectious anaemia)	Positive (equine infectious anaemia)	No. of tests (equine viral arteritis)	Positive (equine viral arteritis)
Apr–Jun 2017	969	0	980	5
Jul–Sep 2017	704	2	627	2
Oct–Dec 2017	1415	3	605	4
Jan–Mar 2018	524	0	450	4
Jun–Apr 2018				
NSW	497	0	543	3
NT	5	0	0	0
Qld	4	0	1	0
SA	0	0	0	0
Tas.	0	0	0	0
Vic.	186	0	163	2
WA	2	0	0	0
Aus.	**694**	**0**	**707**	**5**

Table 6 summarises the results of laboratory testing for equine herpesvirus 1 on samples submitted to state and territory animal health laboratories during the quarter.

Table 6 Results of testing for equine herpesvirus 1 (EHV-1), 1 April to 30 June 2018

Syndrome	EHV-1 suspected but not confirmed	Negative	Positive	Total
Abortion	0	54	0	54
Neurological	0	9	0	9
Other	0	5	4	9
Total	**0**	**68**	**4**	**72**

Table 7 summarises the results of serological testing for three arboviruses on samples submitted to state and territory animal health laboratories for the National Arbovirus Monitoring Program (NAMP).[47] Positive serological test results are not an indication of the presence of clinical disease.

Table 7 Results of serological testing for three arboviruses, 1 April 2017 to 30 June 2018

Quarter	No. of tests (Akabane)	Positive (Akabane)	No. of tests (BEF)	Positive (BEF)	No. of tests (BTV)	Positive (BTV)
Apr–Jun 2017	580	84	1122	44	1594	123
Jul–Sep 2017	337	61	703	27	1030	49
Oct–Dec 2017	333	47	849	40	1166	46
Jan–Mar 2018	335	36	896	104	1543	105
Apr–Jun 2018	**710**	**59**	**1068**	**77**	**1797**	**83**

BEF = bovine ephemeral fever virus; BTV = bluetongue virus

47 namp.animalhealthaustralia.com.au

Surveillance activities

Bovine brucellosis

Australia declared freedom from bovine brucellosis (caused by *Brucella abortus*) in 1989.[48] Surveillance is maintained through abortion investigations and additional testing of cattle for export or other reasons. Table 8 shows 183 bovine abortion investigations and 1106 investigations for other reasons were performed during the quarter; all were negative for bovine brucellosis.

Table 8 Bovine brucellosis testing, 1 April 2017 to 30 June 2018

Quarter	No. of tests (abortion)	Positive (abortion)	No. of tests (other reasons)[a]	Positive (other reasons)
Apr–Jun 2017	279	0	902	0
Jul–Sep 2017	69	0	845	0
Oct–Dec 2017	125	0	1099	0
Jan–Mar 2018	139	0	256	0
Apr–Jun 2018				
NSW	0	0	1030	0
NT	0	0	0	0
Qld	50	0	1	0
SA	0	0	3	0
Tas.	2	0	0	0
Vic.	47	0	35	0
WA	95	0	37	0
Aus.	**194**	**0**	**1106**	**0**

a A proportion of this testing 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 might, therefore, vary, depending on total cattle exports to particular markets.

48 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,*[49] 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 9 shows the number of animals sampled for BSE and scrapie and the points tally for cattle in the NTSESP45 during the past 12 months. All samples tested were negative.

Table 9 Samples tested for transmissible spongiform encephalopathies (TSEs), 1 July 2017 to 30 June 2018

State	No. examined (cattle)	Points (cattle)	Positive (cattle)	No. examined (sheep)	Positive (sheep)
NSW	217	37,011.6	0	161	0
NT	21	10,920.4	0	0	0
Qld	168	56,929.2	0	29	0
SA	28	5,539.3	0	54	0
Tas.	13	744.8	0	7	0
Vic.	107	27,096.8	0	92	0
WA	35	15,051.9	0	225	0
Aus.	**589**	**153,294.0**	**0**	**568**	**0**

Avian influenza

Australia is currently free from highly pathogenic avian influenza (AI). A number of low pathogenic subtypes of AI have been found in wild birds. Please consult the Wildlife Health Australia report in this publication for information on AI in wild birds. During the quarter, 272 birds from 83 laboratory submissions were tested for AI (excluding surveillance reported in the Wildlife Health Australia and Northern Australia Quarantine Strategy reports); no positive AI strains were detected (Table 10). Tests included competitive ELISA (enzyme-linked immunosorbent assay), haemagglutination inhibition, agar gel immunodiffusion (AGID), reverse-transcriptase polymerase chain reaction (PCR) and virus isolation.

Table 10 Results of testing for avian influenza virus in poultry, 1 April to 30 June 2018[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.

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

Newcastle disease

Australia is currently free from virulent Newcastle disease or exotic Newcastle disease (caused by avian paramyxovirus serotype 1) 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[50] in all Australian jurisdictions. Vaccination exceptions for broilers apply in Tasmania, Western Australia, Queensland and South Australia. During the quarter, 325 birds from 78 laboratory submissions were tested for Newcastle disease (Table 11). Please consult the Wildlife Health Australia report in this publication for information on avian paramyxovirus in wild birds.

Table 11 Results of testing for Newcastle disease (ND) testing in poultry, 1 April to 30 June 2018[a]

Virulent strain of ND virus positive	Peats Ridge strain of ND virus positive	Lentogenic V4 or V4-like strain of ND virus positive	Other paramyxovirus positive
0	0	1	1

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 12 summarises *Salmonella* spp. isolations from animals reported to NEPSS.

Table 12 Salmonella notifications reported to the National Enteric Pathogen Surveillance Scheme (NEPSS), 1 April to 30 June 2018

Salmonella serovar	Birds[a]	Cats	Cattle	Dogs	Horses	Pigs	Sheep	Other	Total
Bovismorbificans	0	0	6	0	0	3	0	0	9
Dublin	0	0	13	1	0	0	0	0	14
Infantis	0	0	0	0	0	0	0	0	0
Typhimurium	1	0	35	1	0	4	3	0	44
Other	0	0	21	0	1	25	0	2	49
Total	**1**	**0**	**75**	**2**	**1**	**32**	**3**	**2**	**116**

a Includes both poultry and wild birds.

50 'Commercial chicken flocks' are defined in state and territory legislation.

Northern Australia 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 (NAMP) and the electronic Wildlife Health Information System (eWHIS). Table 13 summarises NAQS animal testing for specific target diseases in Australia during the past five quarters.

Table 13 Disease testing and pest surveillance under the Northern Australia Quarantine Strategy (NAQS), 1 April 2017 to 30 June 2018

Target disease	Apr–Jun 2017		Jul–Sep 2017		Oct–Dec 2017		Jan–Mar 2018		Apr–June 2018	
	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Aujeszky's disease[a]	46	0	44	0	147	0	69	0	375	0
Avian influenza[a]	29	0	0	0	0	0	0	0	2	0
Classical swine fever	46	0	44	0	147	0	69	0	375	0
Japanese encephalitis	60	0	0	0	0	0	52	0	44	0
Surra (*Trypanosoma evansi*)	84	0	76	0	193	0	75	0	410	0

a Excludes testing in wild birds.

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.[51] 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 investigations of myiasis (reported in 'National notifiable animal disease investigations' and Table 16). 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 (NPA) of Queensland. Table 14 summarises fly trapping events over the past year. No screwworm flies were detected. Further information on the screw-worm fly program is available on the Animal Health Australia website.[52]

Table 14 Summary of fly-trapping events conducted, 1 July 2017 to 30 June 2018[a]

Risk entry pathway	Conducted by	Jul–Sep 2017	Oct–Dec 2017	Jan–Mar 2018	Apr–June 2018
Torres Strait	NAQS	15	15	15	15
Livestock export ports	NT, Qld and WA governments	45	52	43	34

NAQS = Northern Australia Quarantine Strategy
a Excludes traps with identification results pending.

51 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 5 August 2018).

52 www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/screw-worm-fly

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[53] and quarterly in the journal *Communicable Diseases Intelligence* and are replicated in *Animal Health Surveillance Quarterly* (Table 15) for five important zoonoses.

Table 15 National notifications of five zoonotic infections in humans, 1 April 2017 to 30 June 2018

Quarter	Brucellosis[a]	*Chlamydia*[b]	Leptospirosis	Listeriosis	Q fever
Apr–Jun 2017	6	0	25	20	102
Jul–Sep 2017	3	4	26	13	89
Oct–Dec 2017	7	6	18	15	90
Jan–Mar 2018	11	3	34	41	92
Apr–Jun 2018					
ACT	0	0	0	0	1
NSW	0	1	24	1	40
NT	0	0	1	0	0
Qld	3	0	18	2	61
SA	0	0	0	1	6
Tas.	0	0	0	0	0
Vic.	1	0	2	1	8
WA	0	0	0	3	1
Aus.	**4**	**1**	**45**	**8**	**117**

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'.

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

National notifiable animal disease investigations

During the quarter, 867 national notifiable animal disease investigations[54] were conducted into suspect disease events. National notifiable animal diseases include a subset of emergency diseases.[55] Table 16 lists investigations conducted by disease finding confirmed. Note that more than one disease may be investigated for a single disease event (an outbreak of morbidity or mortality). In addition, a single investigation may involve more than one animal.

Details about selected investigations are provided in the 'State and territory reports' section of this publication and are available by contacting the relevant state or territory NAHIS program coordinator (see contact details on last page).

Information regarding Australia's emergency preparedness and outbreak response management is available from the Australian Government Department of Agriculture and Water Resources.[56]

Table 16 Investigations for national notifiable animal diseases, 1 April to 30 June 2018

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
African swine fever	**Pig**	**National total**	**2**	**0**	**2**
		NSW	1	0	1
		Tas.	1	0	1
Anaplasmosis in tick-free areas	**Cattle**	**National total**	**1**	**0**	**1**
		WA	1	0	1
Anthrax	**Cattle**	**National total**	**62**	**1**	**61**
		NSW	36	0	36
		Qld	9	1	8
		SA	2	0	2
		Vic.	13	0	13
		WA	2	0	2
	Horse	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Pig	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Sheep	**National total**	**42**	**1**	**41**
		NSW	19	1	18
		Vic.	23	0	23
Australian bat lyssavirus[a]	**Cattle**	**National total**	**2**	**0**	**2**
		Qld	2	0	2
	Dog	**National total**	**4**	**0**	**4**
		Qld	2	0	2
		Vic.	2	0	2
	Horse	**National total**	**2**	**0**	**2**
		Qld	2	0	2

Cont

54 National List of Notifiable Animal Diseases at www.agriculture.gov.au/pests-diseases-weeds/animal/notifiable

55 Emergency Animal Disease Response Agreement, Schedule 3 at www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-responseagreement

56 www.agriculture.gov.au/animal/health/livestock-movement-australia

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
	Sheep	**National total**	**2**	**0**	**2**
		Vic.	1	0	1
		WA	1	0	1
Avian influenza	**Bird**	**National total**	**83**	**0**	**83**
		NSW	24	0	24
		Qld	12	0	12
		SA	6	0	6
		Tas.	8	0	8
		Vic.	21	0	21
		WA	12	0	12
Babesiosis in tick-free areas	**Cattle**	**National total**	**16**	**6**	**10**
		NSW	15	6	9
		WA	1	0	1
Bluetongue — clinical disease	**Cattle**	**National total**	**16**	**0**	**16**
		WA	16	0	16
	Sheep	**National total**	**6**	**0**	**6**
		NSW	1	0	1
		Qld	1	0	1
		SA	2	0	2
		Vic.	1	0	1
		WA	1	0	1
Bovine virus diarrhoea type 2	**Cattle**	**National total**	**12**	**0**	**12**
		WA	12	0	12
Brucella abortus	**Cattle**	**National total**	**194**	**0**	**194**
		Qld	50	0	50
		Tas.	2	0	2
		Vic.	47	0	47
		WA	95	0	95
	Sheep	**National total**	**7**	**0**	**7**
		Vic.	7	0	7
Brucella canis	**Dog**	**National total**	**2**	**0**	**2**
		SA	1	0	1
		Vic.	1	0	1
Brucella melitensis	**Sheep**	**National total**	**10**	**0**	**10**
		SA	2	0	2
		Vic.	7	0	7
		WA	1	0	1

Cont

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
Brucella suis	**Cattle**	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Dog	**National total**	**134**	**23**	**111**
		NSW	106	21	85
		Qld	25	2	23
		Vic.	3	0	3
	Pig	**National total**	**5**	**0**	**5**
		NSW	4	0	4
		NT	1	0	1
Contagious agalactia	**Sheep**	**National total**	**3**	**0**	**3**
		NSW	2	0	2
		WA	1	0	1
Contagious equine metritis	**Horse**	**National total**	**1**	**0**	**1**
		WA	1	0	1
Duck virus hepatitis	**Bird**	**National total**	**2**	**0**	**2**
		Qld	2	0	2
Enzootic bovine leucosis	**Cattle**	**National total**	**1**	**0**	**1**
		WA	1	0	1
Equine encephalomyelitis (Eastern, Western and Venezuelan)	**Horse**	**National total**	**4**	**0**	**4**
		WA	4	0	4
Equine infectious anaemia	**Horse**	**National total**	**10**	**0**	**10**
		NT	5	0	5
		Qld	3	0	3
		WA	2	0	2
Equine influenza	**Horse**	**National total**	**2**	**0**	**2**
		Qld	1	0	1
		Vic.	1	0	1
Equine viral arteritis	**Horse**	**National total**	**3**	**0**	**3**
		NSW	2	0	2
		Vic.	1	0	1
Foot-and-mouth disease	**Camelid**	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Cattle	**National total**	**20**	**0**	**20**
		NSW	4	0	4
		SA	1	0	1
		Vic.	1	0	1
		WA	14	0	14
	Goat	**National total**	**2**	**0**	**2**
		NSW	2	0	2

Cont

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
	Sheep	**National total**	**6**	**0**	**6**
		NSW	2	0	2
		SA	2	0	2
		WA	2	0	2
Haemorrhagic septicaemia	**Cattle**	**National total**	**2**	**0**	**2**
		NT	1	0	1
		WA	1	0	1
Infection of bees with *Melissococcus plutonius* (European foulbrood)	**Bees**	**National total**	**34**	**5**	**29**
		Qld	30	3	27
		SA	4	2	2
Infection of bees with *Paenibacillus larvae* (American foulbrood)	**Bees**	**National total**	**219**	**58**	**161**
		ACT	2	0	2
		NSW	32	10	22
		Qld	30	17	13
		SA	155	31	124
Infection with Aujeszky's disease virus	**Pig**	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Infection with *Chlamydophila abortus* (enzootic abortion of ewes, ovine chlamydiosis)	**Sheep**	**National total**	**3**	**0**	**3**
		WA	3	0	3
Infection with classical swine fever virus	**Pig**	**National total**	**9**	**0**	**9**
		NSW	1	0	1
		SA	3	0	3
		Tas.	1	0	1
		WA	4	0	4
Infection with equid herpesvirus 1 (EHV-1) (abortigenic and neurological strains)	**Horse**	**National total**	**72**	**4**	**68**
		NSW	42	0	42
		Qld	18	0	18
		Vic.	3	1	2
		WA	6	0	6
Infection with Hendra virus	**Alpaca**	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Camelid	**National total**	**2**	**0**	**2**
		NSW	2	0	2
	Dog	**National total**	**1**	**0**	**1**
		Qld	1	0	1

Cont

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
	Donkey	**National total**	**2**	**0**	**2**
		NSW	1	0	1
		Qld	1	0	1
	Horse	**National total**	**215**	**0**	**215**
		NSW	48	0	48
		NT	3	0	3
		Qld	157	0	157
		SA	1	0	1
		Vic.	3	0	3
		WA	3	0	3
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Infection with influenza A viruses in swine	**Dog**	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Pig	**National total**	**4**	**1**	**3**
		Qld	1	0	1
		WA	3	1	2
Infection with *Mycobacterium avium* (avian tuberculosis)	**Chicken**	**National total**	**1**	**1**	**0**
		Tas.	1	1	0
Infection with M*ycoplasma mycoides* subsp. *mycoides* SC (contagious bovine pleuropneumonia)	**Cattle**	**National total**	**8**	**0**	**8**
		NT	1	0	1
		WA	7	0	7
Infection with rabies virus	**Sheep**	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
Infection with *Salmonella* Abortusequi	**Horse**	**National total**	**3**	**0**	**3**
		WA	3	0	3
Infection with *Salmonella* Enteritidis in poultry	**Bird**	**National total**	**1**	**0**	**1**
		Qld	1	0	1
Infection with *Salmonella* Gallinarum (fowl typhoid)	**Bird**	**National total**	**2**	**0**	**2**
		Qld	1	0	1
		WA	1	0	1
Infection with *Theileria parva* (East Coast fever) or *T. annulata* (Mediterranean theileriosis)	**Cattle**	**National total**	**5**	**0**	**5**
		Qld	5	0	5
Infection with vesicular stomatitis virus	**Camelid**	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Cattle	**National total**	**15**	**0**	**15**
		NSW	3	0	3
		SA	1	0	1

Cont

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
		Vic.	1	0	1
		WA	10	0	10
	Goat	**National total**	**2**	**0**	**2**
		NSW	2	0	2
	Sheep	**National total**	**5**	**0**	**5**
		NSW	2	0	2
		SA	2	0	2
		WA	1	0	1
Infestation of bees with *Varroa destructor* or *V. jacobsoni* (varroosis)	**Bees**	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
Japanese encephalitis	**Horse**	**National total**	**3**	**0**	**3**
		WA	3	0	3
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Lumpy skin disease	**Cattle**	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
Maedi-visna	**Sheep**	**National total**	**2**	**0**	**2**
		WA	2	0	2
Malignant catarrhal fever — wildebeest-associated	**Cattle**	**National total**	**2**	**0**	**2**
		NSW	2	0	2
	Sheep	**National total**	**1**	**0**	**1**
		NSW	1	0	1
Newcastle disease	**Bird**	**National total**	**77**	**0**	**77**
		NSW	24	0	24
		Qld	11	0	11
		SA	6	0	6
		Tas.	2	0	2
		Vic.	22	0	22
		WA	12	0	12
Paratuberculosis — Johne's disease	**Alpaca**	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Camel	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Camelid	**National total**	**1**	**0**	**1**
		WA	1	0	1
	Cattle	**National total**	**48**	**8**	**40**
		NSW	13	0	13
		Qld	8	1	7
		Vic.	21	7	14

Cont

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
		WA	6	0	6
	Deer	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
	Goat	**National total**	**3**	**0**	**3**
		NSW	1	0	1
		Qld	1	0	1
		Vic.	1	0	1
	Sheep	**National total**	**10**	**7**	**3**
		NSW	1	0	1
		Vic.	6	6	0
		WA	3	1	2
Porcine reproductive and respiratory syndrome	**Pig**	**National total**	**1**	**0**	**1**
		WA	1	0	1
Pullorum disease (*Salmonella* Pullorum)	**Bird**	**National total**	**1**	**0**	**1**
		Qld	1	0	1
Salmonellosis (*Salmonella* Abortusovis)	**Sheep**	**National total**	**1**	**0**	**1**
		WA	1	0	1
Screw-worm fly —New World (*Cochliomyia hominivorax*)	**Cattle**	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Dog	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Horse	**National Total**	**1**	**0**	**1**
		Qld	1	0	1
	Sheep	**National Total**	**1**	**0**	**1**
		Qld	1	0	1
Screw-worm fly — Old World (*Chrysomya bezziana*)	**Cattle**	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Dog	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Horse	**National Total**	**1**	**0**	**1**
		Qld	1	0	1
	Sheep	**National Total**	**1**	**0**	**1**
		Qld	1	0	1
Sheep pox and goat pox	**Sheep**	**National total**	**1**	**0**	**1**
		WA	1	0	1
Surra (*Trypanosoma evansi*)	**Horse**	**National total**	**1**	**0**	**1**
		NT	1	0	1

Cont

Disease	Species	Jurisdiction	No. of investigations	Number positive	Number negative
Transmissible spongiform encephalopathies (bovine spongiform encephalopathy, chronic wasting disease of deer, feline spongiform encephalopathy, scrapie)	**Cattle**	**National total**	**174**	**0**	**174**
		NSW	65	0	65
		NT	8	0	8
		Qld	42	0	42
		SA	10	0	10
		Vic.	25	0	25
		WA	18	0	18
	Sheep	**National total**	**169**	**0**	**169**
		NSW	56	0	56
		Qld	13	0	13
		SA	15	0	15
		Tas.	4	0	4
		Vic.	34	0	34
		WA	47	0	47
Tuberculosis (*Mycobacterium bovis*)	**Cattle**	**National total**	**1**	**0**	**1**
		NT	1	0	1
West Nile virus infection — clinical	**Horse**	**National total**	**16**	**0**	**16**
		NSW	12	0	12
		WA	4	0	4
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1

a Australian bat lyssavirus (ABLV) testing is reported in the Wildlife Health Australia report.

National Animal Health Information System contacts

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

EMERGENCY ANIMAL DISEASE WATCH HOTLINE

1800 675 888

There were 986 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.

986 CALLS

THIS QUARTER

Name	Role	Phone	Email
Ian Langstaff	NAHIS Program Manager	02 6203 3909	ILangstaff@animalhealthaustralia.com.au
Robert Gurney	Aquatic Animal Health	02 6272 2172	Robert.Gurney@agriculture.gov.au
Janene Kingston	Australian Government NAHIS coordinator	02 6272 3218	Janene.Kingston@agriculture.gov.au
Tiggy Grillo	Wildlife Health Australia	02 9960 7444	TGrillo@wildlifehealthaustralia.com.au
Courtney Lane	National Enteric Pathogens Surveillance Scheme	03 8344 5701	Courtney.Lane@unimelb.edu.au
Mark Trungove	National Notifiable Diseases Surveillance System	02 6289 8315	Mark.Trungove@health.gov.au
Emily Sears	Surveillance Information Coordinator	02 6203 3906	ESears@animalhealthaustralia.com.au
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Guy Weerasinghe	Northern Australia Quarantine Strategy	0429 129 059	Guy.Weerasinghe@agriculture.gov.au
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