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Message from the Australian Chief Veterinary Officer

Welcome to the third issue of *Animal Health Surveillance Quarterly* for 2017.

Evidence-based assurances are a crucial part of veterinary public health activities. Whether it be assurances about the health status and practices associated with an individual animal, or those of a property, region or country, they can be instrumental to managing animal and public health, including the spread of disease. The assurances provided through surveillance underpin all levels of trade — between local properties, states and territories, or countries.

This issue of *Animal Health Surveillance Quarterly* features an article about the South Australian 'One Biosecurity' initiative — a platform that both assists farmers with on-farm biosecurity planning, and facilitates the sharing of verified information between potential vendors and buyers to support safer and more informed livestock-purchasing decisions.

The strength of a livestock supply chain relies on all of its parts, and collaboration from a number of stakeholders. This was reflected in the independent review of Australia's Intergovernmental Agreement on Biosecurity (IGAB), the agreement which defines the roles and responsibilities of signatory governments within Australia and outlines priority areas for collaboration. The final report from the review, *Priorities for Australia's biosecurity system*,[1] was released on 26 July 2017. The review promoted the concept of 'shared responsibility', recognising the importance of a partnership approach between stakeholders, including governments, industry and the community. It highlighted the need for strong environmental biosecurity that is supported by national systems, as well as the ability to adapt to emerging issues.

Antimicrobial resistance (AMR) was identified as an emerging issue in the past, and it has very much emerged. In September 2017, I travelled to Germany to participate in the Meeting of the Public Health and Veterinary Public Health Institutes of the G20 countries. We discussed results of surveys on activities to alleviate the threat of AMR in G20 countries, and workshops on infection prevention, rational antibiotic use and surveillance systems. There are growing consumer demands for responsible antibiotic use in production animals; Australia has amongst the lowest levels of antibiotic use in animals.

While the subject and rigour of assurances required by stakeholders will evolve and grow over time, animal disease surveillance remains a core component. This is true of surveillance in production, companion animal and wildlife sectors. The importance of wildlife surveillance to public health was the message of my presentation at the International Conference on One Health in Hong Kong in September 2017, and the importance of such surveillance to the other animal sectors should also be recognised.

I trust you will find this issue of *Animal Health Surveillance Quarterly*, outlining key animal health surveillance activities in Australia, valuable reading.

1 www.agriculture.gov.au/biosecurity/partnerships/nbc/intergovernmental-agreement-on-biosecurity/igabreview/igab-final-report

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

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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).**

One Biosecurity — the future starts now

Emma Rooke
Biosecurity SA, Primary Industries and Regions South Australia (PIRSA)

One Biosecurity is South Australia's new farm biosecurity management program, which recognises the role and importance of the individual producer and their on-farm management of biosecurity risks. The program aims to educate and support producers in the implementation of good on-farm biosecurity practices and is supported by an online risk management tool.

One Biosecurity has been designed by a joint Livestock Industry–Government working group, chaired by the President of Livestock SA, the peak industry body representing cattle, sheep and goat producers in South Australia. Technical inputs are provided largely by staff from Biosecurity SA,[2] a division of the South Australian Government Department of Primary Industries and Regions (PIRSA).

The One Biosecurity concept

At its simplest, One Biosecurity is an on-farm biosecurity planning tool. Livestock producers can use the program to guide them through a process to consider their biosecurity risks, assess their current practices and identify opportunities for strengthening their on-farm biosecurity.

An online portal will provide the latest disease information, best practice advice and biosecurity planning tools and allow producers to rate their current practices and assess their risk for a range of endemic diseases specific to their business and industry.

The strength of the One Biosecurity program is that it provides a platform through which producers can share information on farm biosecurity practices, with other producers, agents, veterinarians, abattoirs and government. The producer can make a declaration about two key issues: the biosecurity measures in place on farm, and the health status of their animals.

The best way to protect a farm's biosecurity status is through controlling what comes onto the farm. Livestock-buying decisions are crucial. One Biosecurity provides a buyer with the information needed to make an informed pre-purchase assessment of the suitability of livestock on offer.

Paper-based declarations are onerous and, in the context of saleyards, often not readily available during a sale. To improve this, One Biosecurity provides a 'standing declaration' available anytime on the internet to prospective buyers.

The detail

Central to the One Biosecurity program is a mobile-friendly online portal where producers can assess, manage and declare their farm biosecurity status. The One Biosecurity portal is interactive. Producers create an online profile with details of their farming enterprises and biosecurity practices, which livestock buyers can view.

The online software uses a simple scoring system to generate two important parameters: a biosecurity rating, and disease risk ratings for a series of relevant diseases. The biosecurity status of a property is based on a combination of both these ratings.

Ratings are generated based on a producer's response to a series of questions about general biosecurity practices (one to five stars) and practices to manage specific diseases (risk assessment), which currently include Johne's disease in cattle and sheep, pestivirus (bovine viral diarrhoea virus, or BVDV) in cattle, sheep lice, ovine footrot and ovine brucellosis.

Evidence in the form of photographs, veterinary certification, laboratory results or other relevant information can also be uploaded to the site as part of the producer profile.

The producer can update farm biosecurity practices, disease status and other data as frequently as needed, which can all be viewed online by other users. Producers can quickly generate and share their property biosecurity plan by email, or print a paper copy. One Biosecurity also generates livestock health declarations based on

2 Biosecurity SA is a division of South Australian Government Department of Primary Industries and Regions (PIRSA).

information supplied as part of the producer's profile.

One Biosecurity is designed to bring about a greater level of transparency in livestock trade, and linked to this, a greater level of biosecurity risk management. The mobile-friendly portal means that a producer attending a livestock sale, for example, will be able to ascertain the biosecurity credentials of a seller on location in the saleyard. Saleyard placards and more detailed documents about a particular group of animals for sale can be downloaded prior to a sale and provided for those who don't have internet capability at the saleyard.

Agents and prospective buyers could also use the portal to search for sellers of a specific class of animal with a specified biosecurity status. The portal creates a connection between potential vendors and buyers by providing detailed animal health information prior to sale.

Program credibility and verification

One Biosecurity will be supported by a verification framework that requires producers to provide evidence to support their biosecurity and disease-risk statuses.

Verification activities will use existing information to cross reference producer claims. These will be supplemented with on-farm and saleyard inspections to verify the veracity of claims made by a One Biosecurity participant. Inspections may be programmed in advance or in response to suspicious producer claims. Verification activities will be undertaken by Biosecurity SA Animal Health staff to ensure program credibility.

Background work

Biosecurity SA undertook quantitative and qualitative market research with producers located across South Australia to gain an insight into current attitudes towards biosecurity generally and the proposed One Biosecurity program.

An attitudinal survey of 1000 producers showed that, while a high percentage of respondents put biosecurity measures in place to avoid productivity losses, treatment costs and welfare problems, there was a general lack of awareness of the importance of farm biosecurity in meeting market access requirements and exotic disease preparedness.

Biosecurity SA subsequently conducted an on-farm research trial with 21 livestock producers in a number of different farming systems across the state to ensure that the concept was implementable in a wide range of situations. Feedback from the producers involved was that the new program was simple, understandable and easy to implement.

Animal Health staff then visited these same properties to conduct mock audits to validate the self-assessed biosecurity ratings. The audits revealed that 20 of the 21 producer-generated ratings were an accurate reflection of their farm biosecurity measures.

Biosecurity SA is also working with a local export abattoir and the state veterinary school on a research project to quantify the value of biosecurity practices as a measure of farm productivity, by demonstrating the association between biosecurity ratings and abattoir production outputs.

Program outcomes

The One Biosecurity program will raise the profile of on-farm biosecurity in the livestock community by emphasising the producers' role and responsibility in managing their own biosecurity and protecting their farm and industry from disease risks. It will do this by recognising existing biosecurity efforts and providing a pathway for continuous improvement.

One Biosecurity will assist producers, agents, buyers and abattoirs to make safer and more informed livestock-purchasing decisions that will better protect them from potential risks to reputation and business. It will provide an avenue for producers to promote their efforts and become part of an exclusive state-wide network of producers selling low-risk premium livestock.

Importantly, through good on-farm biosecurity practices, producers can reduce the risk of endemic and exotic diseases being introduced, increase the chances of early detection and slow any spread of disease across their farm and the industry.

In addition to on-farm benefits, the program will increase producer awareness that premium produce and strong market demand begins with credible and safe biosecurity practices in the paddock. That the biosecurity practices they perform on-farm are directly linked to the marketing of their premium product.

One Biosecurity will provide credible assurances and demonstrated evidence to domestic and international markets that South Australian producers meet existing and new market-access requirements. A better animal health status will provide South Australian producers with a marketing advantage, critical for securing and maintaining domestic and export markets.

Lastly, because One Biosecurity is underpinned by a verification framework, it provides demonstrated evidence to our markets that South Australian producers are actively aware of and engaged in good biosecurity practice. It will secure South Australia's status as a producer of healthy market-ready livestock.

Present status

With the One Biosecurity web portal completed, field trials will begin in late 2017. Sheep, beef and dairy cattle producers from across the state will be selected to validate the One Biosecurity program and provide feedback on the usability of the web interface. This will be followed with trials at a live sales event where sellers, buyers and livestock agents will interact with the information held in the One Biosecurity portal to make more informed purchasing decisions.

Biosecurity SA and Livestock SA staff have been working together to raise awareness of the new program in the producer community, promoting One Biosecurity and the farm biosecurity plan to hundreds of producers at meetings across the state.

Due to be launched in mid-2018, the first release of the One Biosecurity program[3] will target sheep, beef cattle and dairy cattle industries.

3 www.pir.sa.gov.au/biosecurity/animal_health/one_biosecurity

Bluetongue viruses monitoring and response

Peter Kirkland
NSW Department of Primary Industries

Bluetongue virus (BTV) is a major cause of economic loss to our livestock industries due to the effects on trade and market access. Production impacts are not seen in susceptible livestock in Australia as disease is not observed. Many high value export markets are 'bluetongue sensitive' in that they require live animals and donors of reproductive material (embryos, eggs and semen) to be either sourced from regions that are free of BTV infection or subjected to intensive laboratory testing. These importing country requirements limit the number of farmers who can supply animals and germplasm for export, and incur considerable extra costs for testing.

Occurrence and transmission

BTV is transmitted by insect vectors that have a well-defined geographical range so it is possible to clearly establish regions that are free from BTV transmission and to identify higher risk areas where animals might be exposed to insects that are capable of transmitting these viruses.

The principle insect vector, in which the virus multiplies and is then transferred to animals when the female takes a blood meal, is a small biting midge, *Culicoides brevitarsis*. Its geographical range extends across northern Australia, through central and coastal Queensland and down the New South Wales coast to a southern limit usually near Sydney (Figure 2). The distribution of the midge fluctuates around its southern and western limits depending on seasonal conditions. This midge breeds in cow dung during mild-to-warm moist weather conditions and consequently has a distinct seasonal abundance. While present in northern Australia in small numbers throughout the year, there are large peaks in summer–autumn. In New South Wales and southern Queensland, climate has a more distinct effect, resulting in large numbers of midges in late summer–autumn but complete absence during winter and spring.

Several other *Culicoides* species can transmit BTV but they have a much more limited distribution in northern Australia.

Host animal species

Culicoides midges have very distinct preferences for their source of blood meal. Some feed on birds, some on macropods, and others, such as *C. brevitarsis*, feed almost exclusively on ruminants. The profound influence of climatic conditions and host-feeding preferences determine which mammals become infected with BTV and other important midge-borne viruses (e.g. Akabane, Aino). In Australia, a much higher incidence of BTV infection is found in cattle than in sheep, goats or other species, such as alpaca. Far fewer sheep are raised in the regions where *C. brevitarsis* and BTV are common. Consequently, the likelihood of BTV infection and bluetongue disease in sheep is naturally lower because of management of the national sheep flock. This is in distinct contrast to some European countries, especially around the Mediterranean Sea, where sheep are raised in regions with abundant *Culicoides* species.

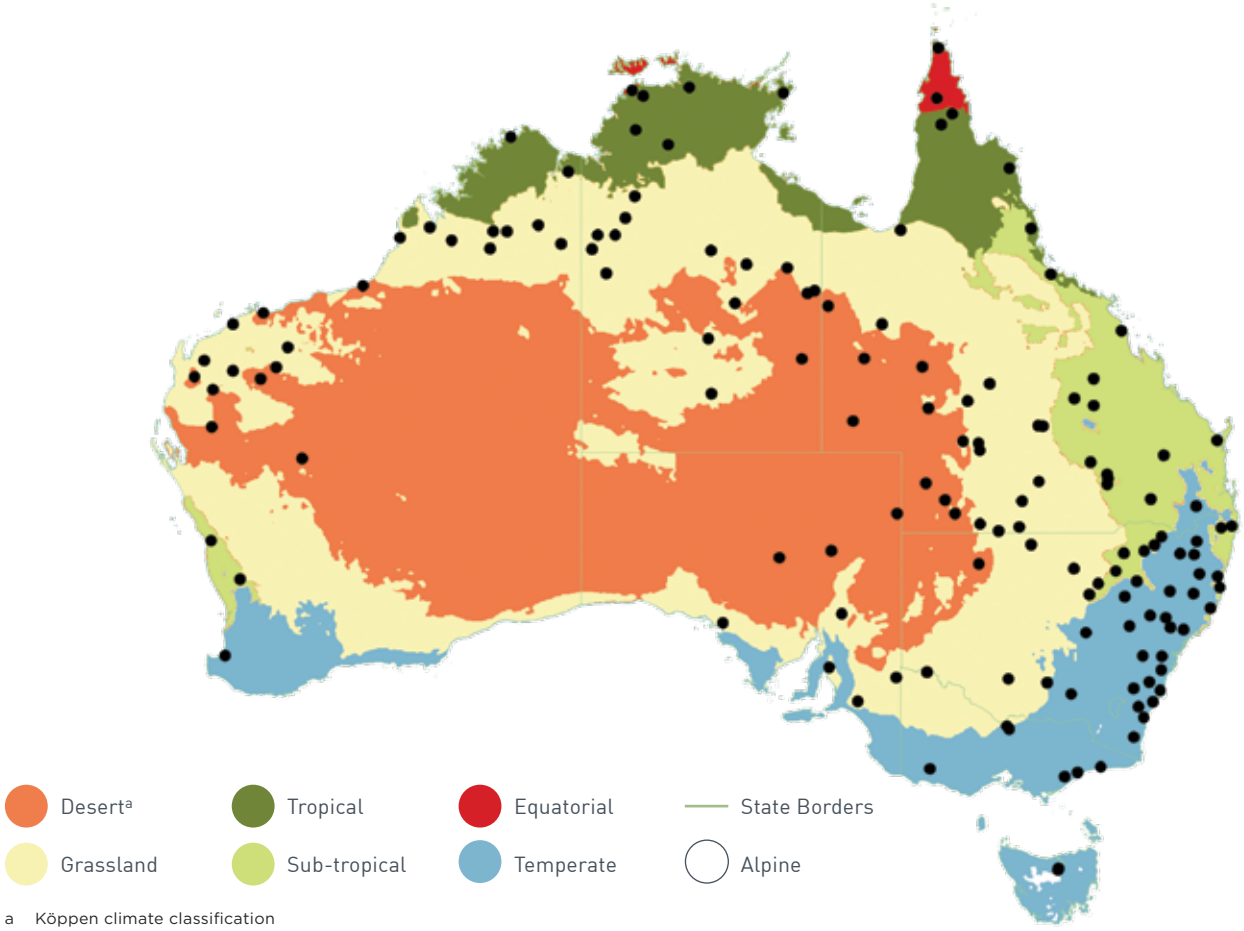
Signs of disease

BTV shows an extremely wide range in pathogenicity (its capacity to cause disease in a mammalian host).

Many strains of BTV show no clinical evidence of disease and infection can only be detected by using laboratory tests. There are, however, some strains that can cause disease of varying severity — they vary in virulence — ranging from mild illness through to moderately high mortality rates, even as high as 40%.

Clinical signs are the result of damage to blood vessels with leakage of serum and blood cells. Affected animals show swelling of the lips, face and ears with small haemorrhages in the conjunctiva, nose, mouth, around the coronary band at the top of the feet and in many internal organs.

Disease is usually limited to sheep but there is also variation in susceptibility with some breeds more severely affected than others.



a Köppen climate classification
http://www.bom.gov.au/climate/averages/climatology/gridded-data-info/metadata/md_koppen_classification.shtml

Figure 1 Sentinel herds monitored in the National Arbovirus Monitoring Program during 2016–17

Sheep that are naturally infected tend to be more severely affected than animals that are experimentally infected and held indoors. Environmental factors, such as high temperature and exposure to sunlight, play a role in disease expression but some contributing factors are poorly understood. Despite the known susceptibility of some Australian sheep breeds after experimental infection studies, disease has not been observed in commercial flocks, largely because of the separation between sheep flocks and virulent strains of BTV.

Although cattle are regularly infected and act as an amplifying host, disease in cattle is rare and has never been observed with Australian strains of BTV. Goats and other susceptible species infrequently show signs of disease.

Role of the National Arbovirus Monitoring Program

The National Arbovirus Monitoring Program (NAMP)[4] detects incursions of novel bluetongue virus strains and new *Culicoides* species, as well as changes in the distribution of endemic bluetongue, bovine ephemeral fever and Akabane viruses and their vectors, to protect exports of livestock and livestock products from Australia.

Through the NAMP, we monitor the activity of BTV and other important vector-borne viruses by regularly testing groups of sentinel cattle that are distributed throughout Australia (Figure 1).

Similarly, the occurrence of vector midges is monitored by the use of light traps that are located near sentinel cattle herds. These monitoring data allow areas that are free of BTV transmission and vector activity to be defined, to support the export of live animals and reproductive material (Figure 2).

4 www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/national-arbovirus-monitoring-program

Bluetongue serotypes in Australia

Some strains of BTV differ to such an extent that, after an animal has been infected with one strain, its immune system is not able to prevent infection with another slightly different strain. BTV strains that differ to such an extent are known as serotypes (a group of serotypes with common antigens is called a serogroup). Approximately 30 different BTV serotypes have been identified globally.

In countries where disease occurs, it is important to know which serotypes are circulating so that vaccines can be developed to provide protection against pathogenic strains. Because bluetongue disease has not been a problem in Australia, no vaccines are used. However, identification of different BTV strains by serotype is an international standard, and some Australian serotypes have been shown experimentally to cause disease in sheep, so BTV monitoring through NAMP aims to identify

which serotypes of BTV are present in different regions and which ones are circulating in a particular year.

In far northern Australia, mainly in the Northern Territory and the Kimberley region of Western Australia, 12 different serotypes have been identified over the 40-year period in which bluetongue viruses have been monitored. Only BTV serotypes 1 (BTV-1) and 21 (BTV-21) are found regularly, in northern Australia and throughout the bluetongue range in eastern Australia.

BTV transmission is detected each year, even towards the southern limits in New South Wales, although in most years, transmission in eastern Australia is dominated by one serotype, with the other playing a lesser role. It has been uncommon to see a high level of transmission of both serotypes with similar frequency. Neither BTV-1 or BTV-21 are considered to be pathogenic in sheep in Australia.

New knowledge

In December 2016, cattle from a property in the New South Wales North Coast region that were being tested for export gave positive results for antibodies to BTV. These results were not unexpected as infection with BTV-1 and BTV-21 is common in this region. However, subsequent serotyping identified antibodies to BTV serotype 16 (BTV-16).

Prior to 2016, BTV-16 had never been detected on the east coast of Australia and had only been occasionally detected in the Northern Territory.

Surveillance for NAMP in early 2016 had detected BTV-16 transmission on the Cape York Peninsula, spreading as far south as Townsville. Routine testing of herds in New South Wales during the 2016 season had detected BTV-1 in many herds and there was no evidence of BTV-21. Retrospective testing of stored blood samples from the New South Wales sentinel cattle using a new serotype specific real-time

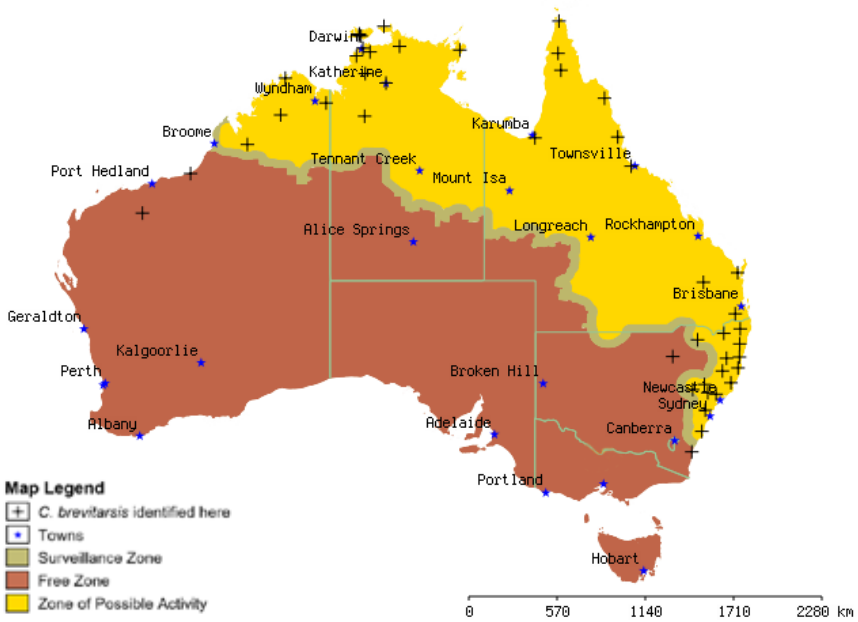


Figure 2 Map of *Culicoides brevitarsis* distribution in Australia during 2016–17 with the bluetongue virus transmission zone shown as at September 2017

polymerase chain reaction (qRT-PCR) assay, detected evidence of BTV-16 transmission in two North Coast sentinel herds in autumn 2016.

This finding raised concerns because previous strains of BTV-16 had been shown to cause significant disease in experimental studies in sheep.

The favourable seasonal conditions in the 2017 summer resulted in early transmission of BTV in herds in the New South Wales North Coast region. Soon after these first detections, BTV-16 activity was reported at Chinchilla in southern Queensland but there was no evidence of BTV-16 in the northern New South Wales herds.

In April 2017 there was another surprise result. Using qRT-PCR assay, BTV-16 was detected in sentinel herds in the New South Wales Hunter Valley, a known 'hot spot' for infections with vector-borne viruses. By the time the 2017 vector season came to a close in June, BTV transmission had reached the New South Wales south coast, with an extremely unusual virus transmission pattern. Both BTV-1 and BTV-21 were transmitted frequently, often at the same time in a herd and with a high incidence. Interestingly, BTV-16 was only detected in herds in the Hunter Valley. In these herds, all three serotypes were detected, sometimes in the same animals.

Risks to sheep

The BTV transmission patterns in 2017 have never been observed in Australia previously, with concurrent transmission of two and sometimes three serotypes in eastern Australia. While there are no known disease risks for cattle, the southern detection of BTV-16 has created a heightened concern for the sheep industries. Although some sheep in the Hunter Valley were infected with either BTV-1 or BTV-21, no infections with BTV-16 were detected and there was no evidence of disease.

So, what does the future hold? With virus transmission dependent on an insect vector that is sensitive to climatic conditions and the spectre of increasing climatic variability, combined with changing patterns of virus activity, the potential risk for a disease outbreak in sheep remains unknown but is increasing. Sheep producers in areas where *C. brevitarsis* might be found should be on the alert during the late summer and autumn.

Wildlife Health Australia

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

Wildlife Health Australia (WHA)[5] 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)[6] — including submissions by WHA subscribers, state and territory WHA coordinators, researchers, and university, zoo and sentinel clinic veterinarians. During the quarter, 194 wildlife disease investigation events were reported into eWHIS (Table 1) and samples were collected from 787 wild birds for avian influenza (AI) and avian paramyxovirus 1 (APMV-1) 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.

Wild bird mortality events — Newcastle disease and avian influenza exclusion

WHA received 41 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 the bird orders represented is presented in Table 2. Reports and samples from sick and dead birds are received from members of the public, private practitioners, universities, zoo wildlife clinics and wildlife sanctuaries. AI was excluded by polymerase chain reaction (PCR) testing for influenza A in 22 of the events as part of Australia's general (sick and dead bird) AI surveillance program. AI exclusion testing was not warranted in the remaining 19 events, based on clinical signs, history, prevailing environmental conditions or other diagnoses. In addition, avian paramyxovirus was excluded in 16 events by PCR testing specific for Newcastle disease (ND) virus and/or pigeon paramyxovirus 1 (PPMV-1).

Avian influenza and avian paramyxovirus 1 surveillance

Australia's National Avian Influenza Wild Bird (NAIWB) and Avian Paramyxovirus 1 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

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

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

Table 1 Number of disease investigations reported into eWHIS, July to September 2017[a]

Bats[b]	Birds[c,d]	Feral animals	Lizards & snakes	Marine mammals	Marine turtles	Marsupials	Monotremes
83	41	3	1	1	2	61	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 separately.
d Includes native and feral bird species.

Table 2 Wild bird disease investigations reported into eWHIS, July to September 2017

Bird order	Common name for bird order[a]	Events reported[b]
Anseriformes	Magpie Goose, ducks, geese and swans	3
Charadriiformes	Shorebirds	7
Columbiformes	Doves and pigeons	6
Falconiformes	Falcons	2
Gruiformes	Rails, gallinules, coots and cranes	1
Passeriformes	Passerines or perching birds	10
Pelecaniformes	Ibis, herons and pelicans	3
Psittaciformes	Parrots and cockatoos	11
Sphenisciformes	Penguins	5
Strigiformes	Typical owl and barn owls	1

a Common names adapted from: del Hoyo & 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 two wild bird events involved multiple bird orders. One event involved six bird orders, including Anseriformes, Charadriiformes, Ciconiiformes, Columbiformes, Gruiformes and Passeriformes; the other wild bird event involved the bird orders Columbiformes and Psittaciformes.

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). Surveillance activities were expanded to include testing for avian paramyxoviruses, predominantly targeting APMV-1 in 2017.

During the quarter, pathogen-specific, risk-based surveillance occurred at sites in New South Wales, Queensland and South Australia. Faecal environmental swabs were collected from 787 waterbirds, with 787 tested for AI and 670 for APVM-1. Results are pending.

Between July 2016 and June 2017, pathogen-specific, risk-based surveillance occurred at sites in New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia. Anseriformes (waterfowl) were primarily targeted, and a small number of Charadriiformes (shorebirds) were sampled. Sampling focused on areas with known mixing of shorebirds and waterfowl, or those in close proximity to poultry and humans, or both. Cloacal and faecal environmental swabs were collected from 4728 waterbirds, with 4728 tested for AI and 2297 tested for APVM-1. No highly pathogenic AI viruses nor virulent strains of APMV-1 were identified. However, surveillance activities continued to find evidence of a wide range of subtypes of low pathogenic AI viruses, including low-pathogenic H5 and H7, as well as H2-H4, H6 and H9-H11, and avirulent strains of APMV-1. The findings reiterate the need for poultry producers to remain alert and ensure that appropriate biosecurity arrangements and effective risk-reduction measures for AI are in place at their premises.

Given Australia's geographic and ecological isolation, it is important that assumptions about AI virus and APMV-1 epidemiology in Australia are not based entirely on studies from overseas. In particular, it is extremely important to maintain and update the capacity to rapidly and reliably test for AI virus and APMV-1 in Australian poultry and wild birds as these viruses undergo constant evolution. Detections of AI virus and APMV in poultry are relatively rare in Australia so samples from wild bird surveillance provide a principle source of AI virus and APMV-1 sequence data necessary to monitor the ongoing evolution of Australian-specific lineages.

This helps to reduce the possibility of detection failure that could result from tests based solely on historical or non-Australian strains. Surveillance activities will continue through to the end of 2017.

Toxicoses suspected in wild bird mortality event — avian influenza and avian paramyxovirus excluded

In September 2017, Burswood Park Board in Western Australia reported a number unusual bird deaths in the Burswood Park area.

More than 60 wild birds were found dead in the same area over the period of a week, including coots (*Fulica* sp.), crows (*Corvus* sp.), ducks (*Anas* sp.), feral pigeons (*Columba* sp.), gulls (*Larinae* sp.), honeyeaters (*Meliphagidae* sp.), magpies (*Cracticus* sp.), swans (*Cygnus* sp.) and heron (*Egretta* sp.). A number of birds were reported to be showing signs of weakness before death. One crow was observed to be frothing at the beak before dying.

The bird deaths were suspected to be a result of acute chemical toxicoses although there was no history of any unusual application of chemicals in the area. Burswood Park Board worked closely with the Department of Primary Industries and Regional Development (DPIRD), the Department of Biodiversity, Conservation and Attractions (DBCA) and the Department of Water and Environment Regulation (DWER) to investigate, which included collection of environmental samples.

All deceased birds were submitted to the DPIRD animal health laboratory for diagnostic investigation. There were no consistent pathological findings from necropsy and histopathology. However, on toxicological analysis, there were consistent and markedly decreased brain cholinesterase (ChE) levels detected in a number of birds, consistent with organophosphorus, carbamate or quaternary ammonium compound exposure.[7] However, no organophosphate or related metabolite was detected in any of the tissue samples (brain, lung, liver, feet and gut content) submitted to DPIRD for analysis. AI and APMV-1 were excluded via PCR assay from tracheal and cloacal swab collected from all birds submitted to the laboratory. This wild bird mortality event is consistent with a common environmental factor and is suspected to be due to a toxin based on the decreased brain ChE findings. Despite extensive testing and investigation, no toxin was confirmed.

After a period of 2 weeks, there were no further reports of bird mortalities from the area.

7 WHA 2017, Pesticide Toxicity in Australian Native Birds. Fact Sheet, June 2017, Wildlife Health Australia. www.wildlifehealthaustralia.com.au/FactSheets.aspx

Exudative facial dermatitis in a brushtail possum

A case of severe ulcerative moist facial dermatitis in a brushtail possum (*Trichosurus vulpecula*) from Darwin, Northern Territory, was reported in October 2017.

The animal was first presented to a private veterinarian in April 2017 with full-thickness cutaneous ulceration involving a large region of the face. The ulcerative lesions affected the eyelids and bridge of nose, with exposure of nasal bone and bone erosion into sinus (Figure 3).

Figure 3 Severe ulcerative moist facial dermatitis in a brushtail possum from Darwin, Northern Territory. Photo Berrimah Veterinary Laboratories

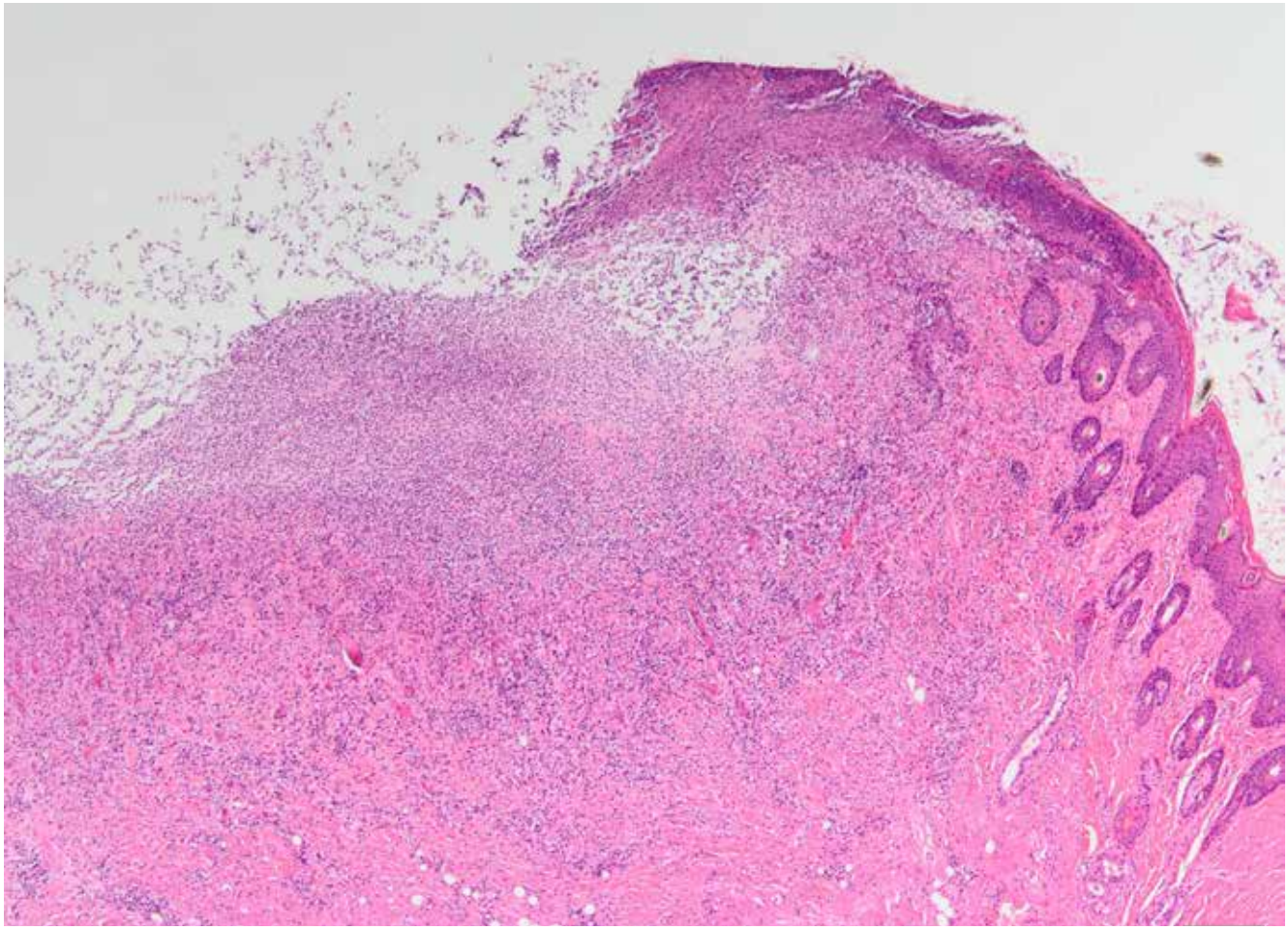


Figure 4 Histological image of margin of ulcerated skin with normal skin, right muzzle region of possum grossly depicted. HE, 40X magnification. Note abrupt transition from normal skin at right to full-thickness ulceration at left, with ulcer bed composed of granulation tissue markedly infiltrated with neutrophils. Photo Berrimah Veterinary Laboratories

The possum was euthanased at the clinic and sent to Berrimah Veterinary Laboratories, Darwin, where the syndrome of severe ulcerative moist facial dermatitis was diagnosed by gross and histological appearance (Figure 4). Bacterial culture yielded a coagulase positive *Staphylococcus* sp. and a group F *Streptococcus* sp. Sequencing of the 16S gene in the latter isolate identified *Streptococcus didelphis*.

Historically, from 2003 to February 2017, there have been four similar isolated cases submitted to Berrimah Veterinary Laboratories for diagnostic investigation following reports from wildlife carers or veterinarians in the Darwin area. Histology consistently reveals severe ulcerative dermatitis involving the skin of the head with Ziehl–Neelsen acid fast and fungal stains negative, similar to the recent case. The bacterial culture typically yields a variety of *Staphylococcus* spp. and *Streptococcus* spp.

In Queensland, *S. didelphis* has been previously isolated from swabs collected from the lesions of brushtail possums with severe, extensive and ulcerative exudative dermatitis.[8]

Wildlife care centres frequently receive brushtail possums presenting exudative dermatitis.[9,10,11] The aetiology is not fully understood, involves multiple pathogens, and mixed bacteria species are usually present.[12]

Stress is considered an important predisposing factor in the epidemiology of this syndrome. For example, cases may occur when there is population overcrowding, which in turn leads to increased competition for food sources and territorial disputes.[8] With severe and extensive lesions, particularly those involving necrosis of the eyelids, humane euthanasia is the typical course, although cases with less extensive lesions may respond to antibiotic treatment. Further research is required to fully understand the epidemiology of this syndrome to assist in appropriate treatment and management of cases.

8 Neagle E, Moss S, Kielly K, Jennison A, Smith H, Trott D & Cobbold R 2012, Isolation of a novel streptococcus species from exudative dermatitis cases in Australian possums, Australasian Society for Infectious Diseases Annual Scientific Meeting.

9 Rose, K 2005, Common Diseases of Urban Wildlife: Mammals. The Australian Registry of Wildlife Health.

10 Spielman, D, Krockenberger, M, Hemsley, S 2012, Necrotising Lesions in Possums, Zoonoses, Sydney: Australian Society for HIV Medicine.

11 Pollock, J 2006, Exudative Dermatitis in Common Brushtail Possums, Australian Wildlife Rehabilitation Conference, Darwin.

12 Vogelnest, L & Woods, R (Eds) 2008, *Medicine of Australian Mammals*, CSIRO Publishing, Collingwood.

Australian bat lyssavirus

Reports to WHA for the quarter included 91 bats tested for Australian bat lyssavirus (ABLV) from New South Wales, Northern Territory, Queensland, South Australia, Victoria and Western Australia.

Bat submissions were made for a variety of reasons:

- 27 cases involved contact with the potential for ABLV transmission to humans; of these
  - 7 were associated with trauma to the bat (e.g. barbed wire fence entanglement, fracture)
  - 6 involved contact with a pet dog or cat
  - 2 displayed neurological signs
  - 2 displayed other (non-neurological) signs
  - the remainder had no further history reported
- 42 cases involved contact with a pet dog (38) or cat (4)
- 7 bats displayed neurological signs (e.g. aggression, seizures)
- 5 bats were associated with a mass mortality event
- 4 cases were associated with trauma
- 2 bats displayed other (non-neurological) signs
- 2 bats had been found dead
- 2 bats had no further history reported at this time.

During the quarter, five flying-foxes were confirmed positive for ABLV by fluorescent antibody test and/or PCR testing for pteropid ABLV ribonucleic acid (RNA).

One unspecified flying-fox (*Pteropus* sp.) from New South Wales was found hanging low in a tree. It displayed neurological signs and was dehydrated. There had been potentially infectious human contact in this case and an experienced public health official provided appropriate counselling and information.

One black flying-fox was found dead under a roost in New South Wales as part of a mass mortality event.

A little red flying-fox from Western Australia presented with signs of aggression and subsequently died.

An unspecified flying-fox from Western Australia was found dead and was submitted for testing due to possible contact with a pet dog. Subsequent investigation determined a low level of likelihood of contact between the flying-fox and the dog.

A grey-headed flying-fox (*P. poliocephalus*) from Victoria was described as angry and had raspy breathing, as well as a suspected miscarriage post trauma. It failed to respond to treatment and was euthanased.

More information on ABLV testing of bats in Australia is available in ABLV Bat Stats.[13] 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.

National wildlife disease surveillance through sentinel veterinary clinics

Australia's general wildlife health surveillance system relies on the detection, submission, investigation and reporting of sick or dead free-living (both native and feral species) and captive wildlife. In recognition that veterinary hospitals perform an important role in disease surveillance of wildlife, WHA coordinates a Sentinel Clinic Wildlife Disease Surveillance Program. The program captures information from veterinary hospitals with a high or dedicated wildlife caseload into the general wildlife health surveillance system.

The program, which started in 2014, now has six clinics participating. The first clinics to join were based in Adelaide, Melbourne and Brisbane. The geographic and species coverage of the program has since expanded by inclusion of two clinics in Tasmania, and a Cairns-based veterinary clinic specialising in wildlife that treats animals as far north as Cape York. The program will soon include two additional clinics in northern Western Australia. The program is run alongside the Zoo Based Wildlife Disease Surveillance Program, which is jointly coordinated by WHA and the Zoo and Aquarium Association. Both the sentinel clinics and zoo-based wildlife clinics report wildlife disease events into WHA's eWHIS. The information collected through these programs complement data reported through government animal health agencies to Australia's general wildlife health surveillance system. The information is used to better understand disease threats to livestock, human health and biodiversity, and contributes to our national picture of wildlife health.

The sentinel clinic and zoo based surveillance programs provide valuable information on wildlife disease events from a broad geographic and species range, including threatened species. This increases Australia's capacity for early detection of emerging diseases.[14] More than 39,000 free-ranging wildlife cases are seen by clinics participating in the zoo and sentinel clinic surveillance programs each year, representing a significant surveillance effort.

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

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

State and territory reports

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

The ‘state and territory reports’ summarise disease investigations undertaken within jurisdictions and describe a selection of interesting cases. Test results from national notifiable animal disease investigations are reported in Table 17 of ‘Quarterly statistics’.

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

New South Wales

Rory Arthur
NSW Department of Primary Industries

During the quarter in New South Wales, 882 livestock and other animal disease investigations were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[15] The number of investigations by species is shown in Figure 5. Field investigations were conducted by government veterinary or biosecurity officers (519) and private veterinary practitioners (363). All diagnostic testing was conducted at the State Veterinary Diagnostic Laboratory, Menangle, or CSIRO Australian Animal Health Laboratory.

The State Veterinary Diagnostic Laboratory processed 506 livestock and other animal sample submissions during the quarter, 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 risks to government of failure to detect these diseases are managed by an active, district-based disease and pest surveillance program. Part of the program requires government veterinary officers to investigate potential notifiable disease outbreaks and unusual diseases that may be new, emerging or difficult to diagnose. Officers conduct targeted surveillance projects, inspections of stock at saleyards and monitoring of compliance programs. 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. District reports are aggregated at state level, for subsequent official reporting to Animal Health Australia and, through the Commonwealth, to the World Organisation for Animal Health (OIE). The surveillance program is supported by a government veterinary diagnostic laboratory with world-class diagnostic facilities and by research staff who design and improve diagnostic tests and, working with field veterinarians, investigate the epidemiology of diseases that have significant biosecurity effects.

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.

Anthrax update

During the quarter, there were no anthrax incidents in New South Wales but there were 40 mortality investigations where anthrax was excluded as the cause of death. Nine of these involved sheep where alternate diagnoses included hepatopathy, pneumonia, ketosis and intestinal obstruction. Thirty-one investigations involved cattle where alternate diagnoses included clostridial infection, pneumonia, hepatopathy, lead toxicity, urea toxicity and Cestrum toxicity. The immunochromatographic test (ICT) for anthrax was used in 30 of these mortality investigations with negative results. The other 10 investigations had anthrax excluded by other laboratory testing or clinical grounds based on alternate diagnoses.

Bluetongue virus exclusion

In July, a single Merino wether in the Upper Hunter district was examined by the district veterinarian. It was the only sheep affected in a mixed flock of 250 sheep grazing improved native pasture. Crusted erosive lesions were noted around the eyes and around the sheep's muzzle, extending to cover the

15 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

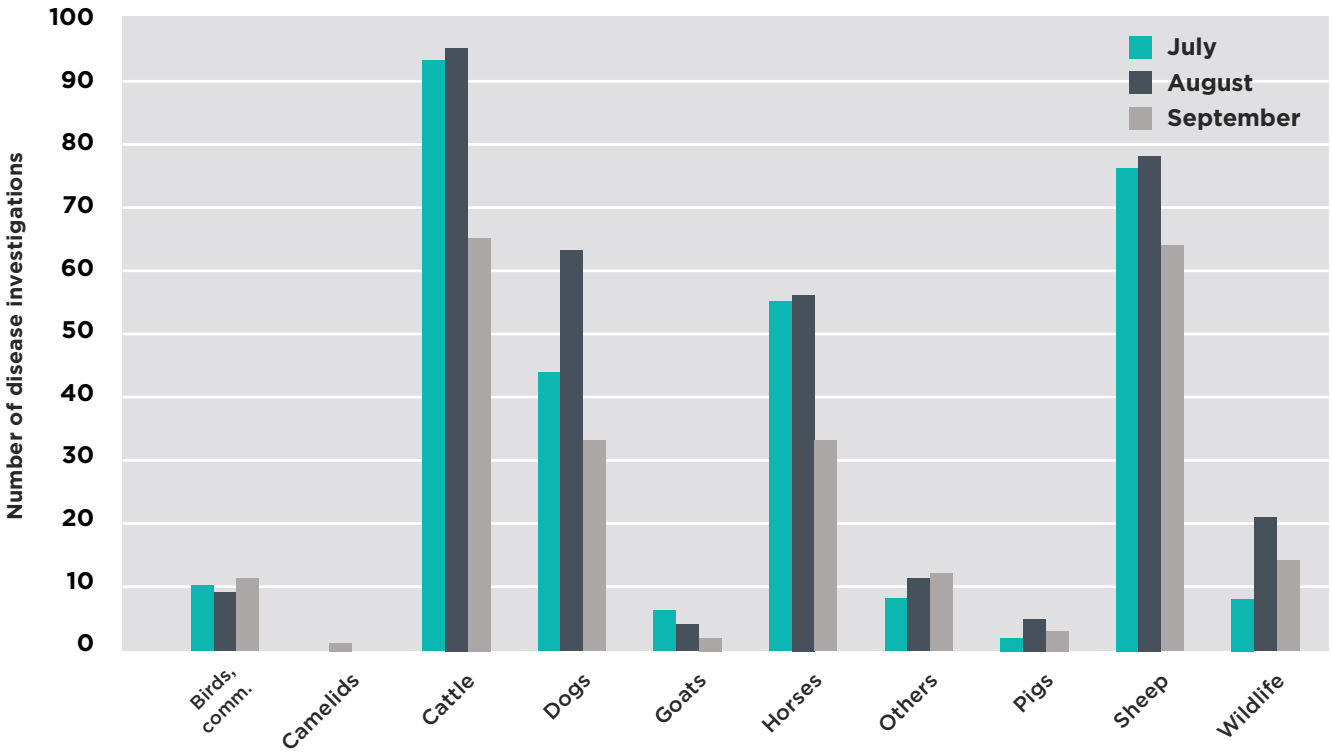


Figure 5 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in New South Wales, July to September 2017

Figure 6 Anthrax was not the cause of death in these young steers. Photo J McNally.

bridge of its nose (Figure 7). There was also swelling of the ears. No other abnormalities were noted on clinical examination. A probable diagnosis of photosensitisation was made.

Clinical signs in the affected sheep justified the exclusion of BTV in this case, especially given the recent identification of the bluetongue virus strain, BTV-16, in New South Wales surveillance under the National Arbovirus Monitoring Program. A jugular blood sample was collected, the sheep was euthanased and a necropsy was conducted. The liver appeared mildly discoloured. All samples were sent to the State Veterinary Diagnostic Laboratory for analysis.

A virus antibody enzyme-linked immunosorbent assay (ELISA) revealed that the sheep was seronegative for bluetongue. Analysis of the blood sample also revealed increased levels of liver enzymes and bilirubin, suggesting that the sheep had damage to the liver cells and reduced bile flow. Histopathology results showed extensive liver damage.

Photosensitisation was likely to have occurred secondarily to liver damage due to a plant toxicity, producing the skin lesions. The primary cause was not definitively identified.

Akabane virus detection in beef cattle on the Northern Tablelands

In July, a live newborn 36 kg Angus female calf from a property in the Tenterfield district was presented unable to rise and suckle. It had severe arthrogryposis (contracted joints) of the elbow, carpus and fetlock of the front limbs (Figure 8). The calf's head was a normal shape. The producer reported that there had been several late-term abortions and a pre-term live calf had been delivered 4 weeks earlier.

Both parents were confirmed free of arthrogryposis multiplex and developmental duplications prior to joining. These are both genetic defects that can present with arthrogryposis. The herd had been previously screened for bovine viral diarrhoea virus (BVDV)[16] and was part of an ongoing vaccination program for the disease.

Blood samples were collected from the presented calf before it was euthanased. The results showed an elevated serum immunoglobulin G (IgG) level of 197 µg/L (consistent with antigenic stimulation in utero from a probable infectious cause) and a positive Akabane ELISA result. The producer subsequently reported a further five abnormal calves, including two with neurological ataxia and one with a domed head.

A second property to the west of Tenterfield reported four deformed calves and 10 failures to calve from heifers that had been previously tested in-calf in a herd of 80 homebred heifers. Blood samples were collected from five dry heifers. All five samples were seropositive on Simbu group indirect antibody ELISA and were confirmed to be Akabane virus antibody ELISA positive. Additionally, one of the five was seropositive for *Neospora* spp. and *Leptospira pomona*. All were seronegative for BVDV antibody by agar gel immunodiffusion (AGID) test.

Figure 7 Affected sheep showed photosensitisation around the eyes and muzzle but was negative for clinical bluetongue disease. Photo J. Bennett.

Since February 2017, the district's National Arbovirus Monitoring Program sentinel herds have shown positive reactors for arboviruses, including Akabane, and have reported abnormal calves with arthrogryposis. For 12 years prior, there had been no evidence of Akabane seroconversions in northern New England cattle herds. This reflects the intermittent nature of Akabane epizootics.

Figure 8 Calf affected by Akabane virus infection in utero born with deformed limbs. Photo L Martin.

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

It was concluded that Akabane virus had caused the losses in both affected herds. Common presentations with Akabane virus include abortion, or calves born with fused joints and flexed legs, enlarged dome-shaped heads, apparent blindness, aimless wandering and incoordination.

A media release advised producers and veterinarians to be on the alert for signs of Akabane virus in local cattle herds. Producers were reminded that increased monitoring of calving herds and getting early help could mitigate the potential losses.

Lead poisoning in beef cattle

In September, lead poisoning was confirmed on a 1500 ha property with a cropping enterprise and approximately 200 cattle, located west of Boomi in the North West region. The owners phoned Local Land Services after cattle were found dead or unwell in a paddock of barley. Two were found dead, one cow had been seen to convulse before recovering and a steer was found standing blind and depressed along a fence line.

The history and reported burnt-out machinery in the paddock led to suspicion of lead poisoning (Figure 9). The district veterinarian visited the property and collected blood from the affected steer and conducted a brief necropsy on a heavily decomposed carcase.

Lead particles were found in the carcase, and the clinical signs in the affected steer (blindness, depression, wandering along fence lines) were typical for lead poisoning. Possible other differential diagnoses for the steer included polioencephalomalacia, salt poisoning and *Histophilus somni* infection.

Laboratory results showed an elevated level of lead in the steer. All animals were removed from the effected paddock and had blood samples collected for laboratory analysis at the State Veterinary Diagnostic Laboratory. All livestock have been permanently excluded from this paddock.

The property owner provided a biosecurity undertaking to the district veterinarian, which is an agreement to detain all lead affected animals. A total of 14 from 106 animals were detained due to blood lead levels over the maximum limit for lead of 0.24 µmol/L. The State Residue Coordinator was notified of the identity of the affected animals based on laboratory results. National Livestock Identification System (NLIS) lead-affected statuses were applied to these animals' records to prevent lead-affected animal products from entering human or animal food chains. Products from these animals can enter the food chain only once retesting has confirmed blood levels are below the maximum limit for lead.

Figure 9 The burnt-out machinery found in the paddock where cattle were showing signs of lead poisoning. Photo T Irwin.

Northern Territory

Susanne Fitzpatrick
Northern Territory Department of Primary Industry and Resources

During the quarter in the Northern Territory, 70 livestock disease investigations[17] were conducted to rule out emergency diseases or investigate suspect notifiable diseases.[18] The number of investigations by category of livestock is shown in Figure 10. Field investigations were conducted by government veterinary or biosecurity officers (39) and private veterinary practitioners (31). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

The state veterinary diagnostic laboratory, Berrimah Veterinary Laboratories, Darwin, processed 119 livestock sample submissions during the quarter[19] to rule out emergency diseases or investigate suspect notifiable diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications, and for accreditation programs and targeted surveillance.

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

Foot-and-mouth disease excluded in salivating cattle

In July, the manager of a property in the Alice Springs region reported four 2 to 3-year-old crossbred Hereford steers out of a group of 200 with signs of weight loss, salivation and ataxia. The steers had been recently yarded and were due to be transported for slaughter. On clinical examination, the affected steers were in poor condition, ataxic, salivating and in respiratory distress (Figure 11 and Figure 12). The most severely affected steer was euthanased for necropsy.

Necropsy revealed diffuse consolidation of the lungs and evidence of a healing tongue lesion. While it was suspected that the steer was persistently infected with bovine viral diarrhoea virus (BVDV),[20] samples were sent to the CSIRO Australian Animal Health Laboratory to exclude exotic diseases, including foot-and-mouth disease (FMD) and vesicular stomatitis (VS) for the tongue lesion, and haemorrhagic septicaemia and contagious bovine pleuropneumonia for the lung lesion.

FMD was excluded with negative multiplex Pirbright and Tetracore polymerase chain reaction (PCR) assays and negative antibody testing for serotypes A22 Iraq, Asia 1 and O Manisa. VS was excluded with negative multiplex Indiana and New Jersey PCR assays, and negative vesiculovirus antibody testing for serotype New Jersey and serotype Indiana. Virus isolation at CSIRO Australian Animal Health Laboratory using the BHK-21 and bovine thymus cell lines was negative for FMD and VS.

Bacteriology culture found moderate growth of *Pasteurella multocida* from the lung lesion. The histological diagnosis of the lung lesion was severe regional subacute to chronic fibrinonecrotic suppurative bronchopneumonia. The bacterial isolate and the fresh lung sample were sent to the CSIRO Australian Animal Health Laboratory for exclusion of haemorrhagic septicaemia and contagious bovine pleuropneumonia. While further serotyping is still pending, the exotic serotype of *P. multocida* causing haemorrhagic septicaemia (Asian serotype B:2 and B2:2,5) was excluded by

17 Field investigation with laboratory diagnostic testing.

18 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

19 Some investigations involved multiple submissions.

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

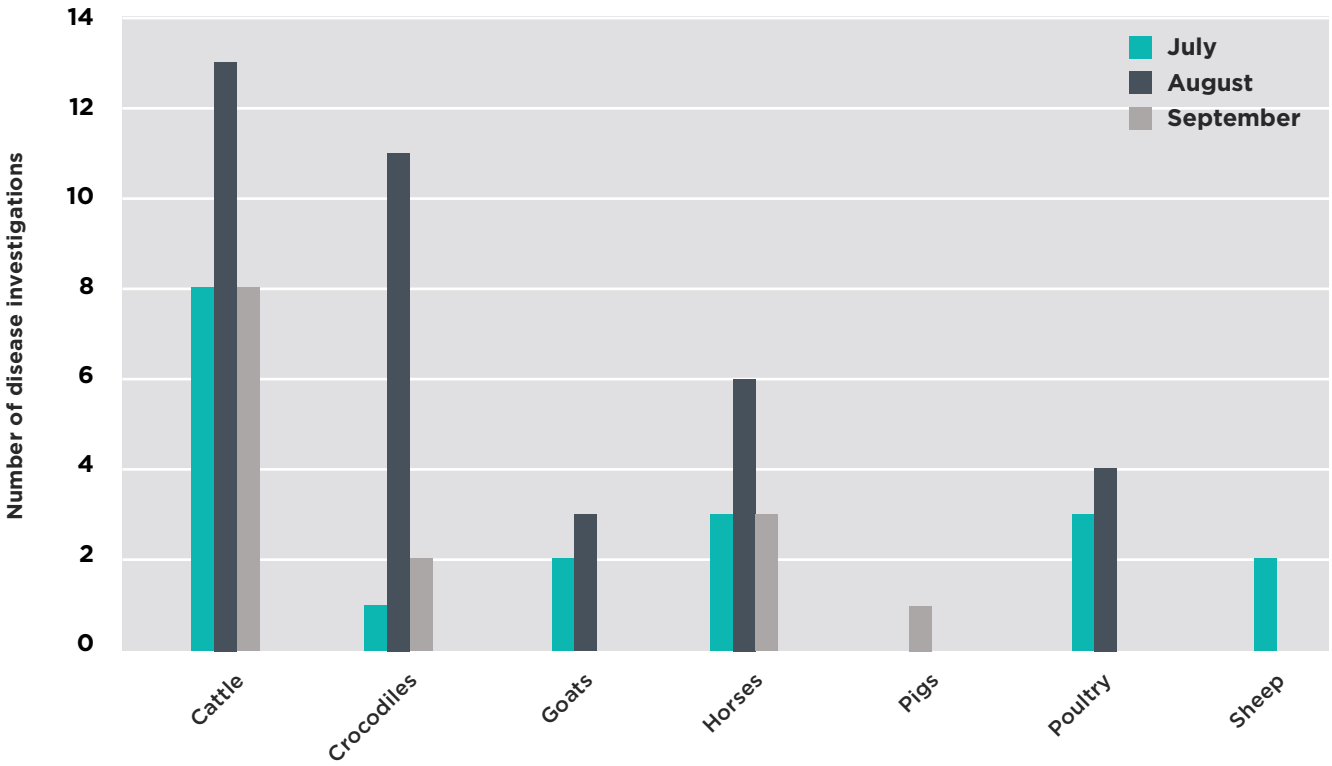


Figure 10 Number of field disease investigations to rule out emergency diseases or investigate suspect notifiable diseases, in the Northern Territory, July to September 2017

PCR assay. Contagious bovine pleuropneumonia caused by a member of the *Mycoplasma mycoides* cluster was excluded by respective PCR testing.

P. multicoda plays a leading role in the development of bovine respiratory disease (BRD). The pathologic condition commonly arises where the causative organism becomes established by secondary infection, following a primary bacterial or viral infection, which usually occurs after stress. In the case of BRD, pasteurellosis is usually preceded by viral infection with either infectious bovine rhinotracheitis (IBR) caused by bovine herpesvirus type 1 (BoHV-1), BVDV, parainfluenza type 3 (PI-3) or bovine respiratory syncytial virus (BRSV), which is an inflammation of the respiratory passage that initially causes lung lesions and suppresses immunity.

While the IBR serological test results were negative, a positive BVDV-1 antigen ELISA test and a negative BVDV-1 AGID antibody test confirmed the steer was persistently infected with BVDV.

Figure 11 The affected steer was salivating and in respiratory distress

Figure 12 Affected steer in poor condition

The *P. multocida* bacterial infection combined with the viral BVDV-1 infection may have led to the multi-factorial BRD syndrome, intensified by the stress of mustering and yarding.

BVDV-1 is endemic in the Northern Territory cattle population, and in utero infection can result in persistently infected animals that show signs of poor development and ill-thrift. Infections with bacterial and viral agents are more likely to be severe in persistently infected cattle which are immunosuppressed.

The property manager was advised to cull the remaining three clinically affected steers. Vaccination for BVDV-1 is not routinely practiced as a preventative measure in northern Australian beef herds and was not a management strategy used in this cattle herd. There have been no further clinical problems reported.

Pneumonic pasturellosis causes mortality in Brahman cows

In August, a private veterinarian investigated mortality in a group of 180 Brahman cows that had recently been transported to a property in the Katherine region. Over a 2-week period, approximately 50 cows had shown signs of nasal discharge and coughing and 30 had died.

On clinical examination, the affected cattle were dyspneic and tachypneic, with bilateral nasal discharge. A single 3-year-old cow was euthanased and a necropsy showed cranioventral consolidation of the lungs, with fibrin formation and pleural adhesions to the thoracic wall. Histology revealed a severe multifocal subacute fibrinosuppurative pneumonia, consistent with *Mannheimia haemolytica* infection. There was no microscopic evidence of viral involvement, and a heavy growth of *M. haemolytica* was cultured from lung samples. A diagnosis was made of pneumonic pasteurellosis, an important cause of BRD. While BRD usually involves infection caused by *P. multocida* in cattle, it may also be caused by *M. haemolytica* in the absence of *P. multocida*. It is likely that the recent stress of mustering, long-distance transport and yarding resulted in the high morbidity and mortality in this case.

Vaccines are commercially available for some respiratory viruses and bacteria that contribute to BRD, including vaccines to control IBR, BVDV and *M. haemolytica*. The vaccines, which are not widely used in the Northern Territory, should be administered prior to entry into the feedlot and mixing of cattle.

Figure 13 Other steers from the same group were in excellent condition

Queensland

Greg Williamson
Queensland Department of Agriculture and Fisheries

During the quarter in Queensland, 793 livestock disease investigations[21] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[22] The number of investigations by species of livestock is shown in Figure 14.

Terrestrial livestock disease investigations were conducted by government veterinary or biosecurity officers (87) and private veterinary practitioners (706). Diagnostic testing was conducted at Biosecurity Sciences Laboratory, Coopers Plains, and CSIRO Australian Animal Health Laboratory.

Disease investigations were also carried out on non-livestock terrestrial species (170) and aquatic animals (12).

The Biosecurity Sciences Laboratory processed sample submissions to substantiate proof of disease freedom certifications (236), for accreditation programs (14), regulatory activities (16) and targeted surveillance (317). Biosecurity Sciences Laboratory received 1558 animal health related submissions during the quarter.

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.

Screw-worm fly exclusion — cutaneous myiasis in a human returning from overseas

A human botfly (*Dermatobia hominis*) was removed from a tourist recently arrived in North Queensland from South America in August 2017 (Figure 15). The patient had presented at a hospital in the Burdekin region with an infected scalp wound and a single maggot was removed when cleaning the wound.

Examinations by both human health and veterinary entomologists led to preliminary identification as human botfly (*D. hominis*) and not a New World screw-worm fly (*Cochliomyia hominivorax*). Polymerase chain reaction (PCR) testing at the Queensland Health and Forensic Science Laboratory confirmed the maggot was *D. hominis*.

21 Field investigations with laboratory diagnostic testing.

22 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

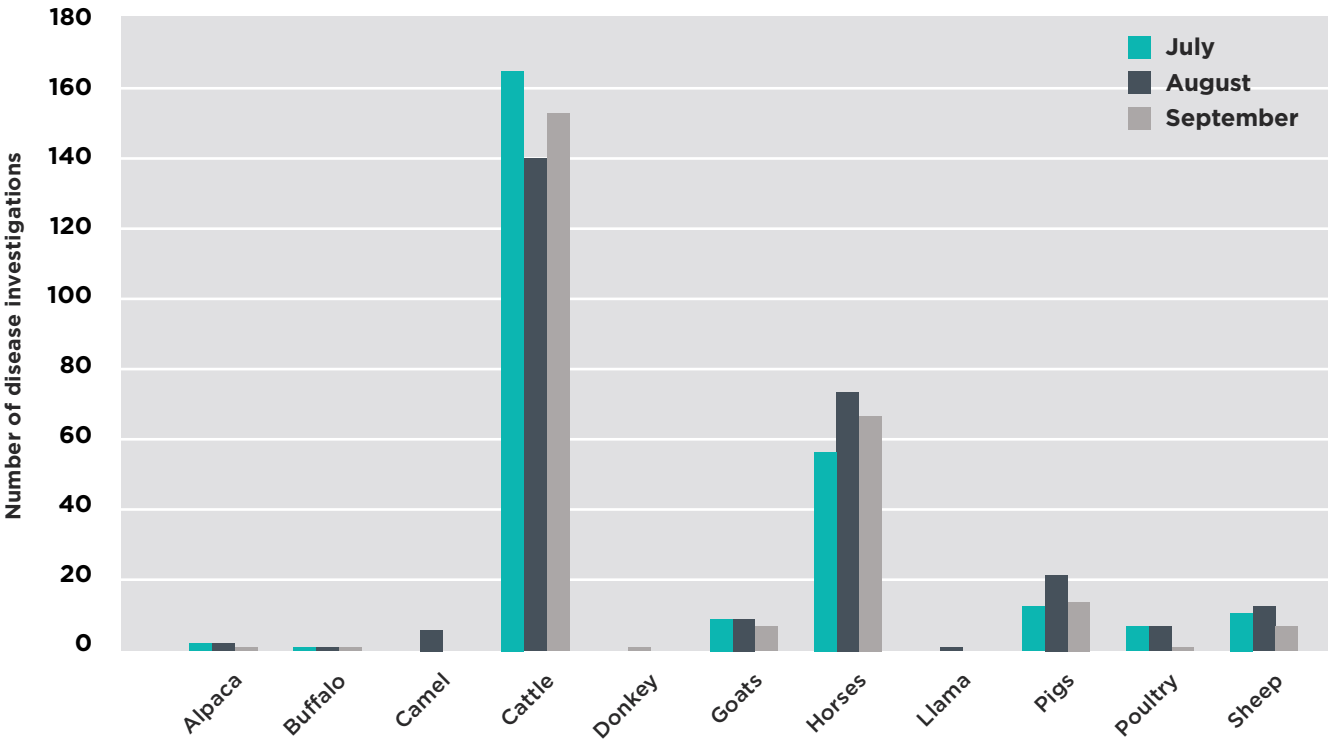


Figure 14 Number of terrestrial livestock disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Queensland, July to September 2017

The New World screw-worm fly is present in tropical areas of Central and South America. The New World and Old Worm screw-worm fly are not present in Australia. An outbreak of either type of screw-worm fly in Australia would have serious effects on the productivity of northern livestock, potentially costing more than $400 million per year in control costs and lost production.

The human botfly, or tropical warble fly, is a common parasite of livestock, companion animals and people in Central and South America. While human botfly is exotic to Australia, it is occasionally detected in returning tourists. In cattle it can cause extensive hide damage and secondary infections, resulting in debilitation and economic loss through condemnation of the hide at slaughter. Human botfly is not notifiable in humans or animals.

Biosecurity Queensland carries out adult fly trapping and an enhanced passive surveillance program for early detection of screw-worm fly myiasis as part of the national Screw Worm Fly Surveillance and Preparedness Program (SWFSPP). Further information about the SWFSPP is available from the Animal Health Australia website.[23]

Figure 15 Human botfly maggot removed from a tourist returning from South America. The fly was approximately 10 mm in length, with a pair of curved slicing mouthparts at the anterior end and circular rows of small hooked spines around its body.

Caprine arthritis and encephalitis excluded in a goat with melioidosis

A 6-month-old pigmy goat kid from a smallholder farm in the Lockyer Valley region was diagnosed with melioidosis in July 2017. The goat had difficulty grazing and a history of being up to date with worming but unvaccinated for clostridial diseases.

The goat was bright, alert and responsive and had an excellent appetite but it made painful responses when its vertebrae were manipulated. The differential

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

Figure 16 Ventro-dorsal view of the thoracic vertebrae of a 6-month-old female goat kid with melioidosis. Photo: Dr Anita Gordon, Biosecurity Queensland.

diagnoses included trauma, caprine arthritis and encephalitis (CAE), and an abnormal presentation of tetanus. The goat was given symptomatic pain relief. Blood samples submitted for exclusion of CAE by enzyme-linked immunosorbent assay (ELISA) were negative.

Within 2 weeks, the goat developed hindlimb paresis and was euthanased. Necropsy at the Biosecurity Sciences Laboratory, using appropriate personal protective equipment, revealed the the animal had been in excellent body condition. A purulent caudal mediastinal lymph node extended dorsally into a 2 cm abscess at the T9-10 vertebral junction (Figure 16). Histological examination revealed a severe, chronic, pyogranulomatous osteomyelitis, with extensive suppuration and necrosis of bone fragments. Clusters of small gram-negative bacilli were visible in Gram stained sections of thoracic vertebrae and mediastinal lymph nodes. Culture of *Burkholderia pseudomallei* confirmed the diagnosis of melioidosis.

The owner was informed of the zoonotic risks and received medical advice from local health practitioners.

Melioidosis is usually an environmentally acquired infection (sapronosis) but humans may be infected through direct contact with infected animal tissues. Contact with contaminated wet soil is the main risk factor for both animals and humans. Outbreaks are sporadic and more frequent after high rainfall. Within Australia, the disease has historically been identified in Northern Australia and is endemic in Queensland.

Avian influenza excluded in pastured layer poultry

Polyserositis due to non-haemolytic *Escherichia coli* caused an outbreak of sudden death in pastured layer hens on the Sunshine Coast, Queensland, in July 2017. Over a 3-week period, 13 birds died from a flock of 350. Necropsy revealed a severe diffuse serositis with dark-green discoloration of the tissues (Figure 17).

PCR testing of tracheal and cloacal swabs in virus transport medium excluded avian influenza and Newcastle disease; PCR on swabs of trachea and infraorbital sinus excluded infectious laryngotracheitis virus. Histology showed that the air sac and peritoneum were expanded by fibrin, with areas of necrosis and suppuration, focal aggregations of fibrin within the spleen, and thickening of the serosa of the liver. A non-haemolytic *E. coli* was the dominant pathogen cultured.

Follow-up investigation indicated a number of husbandry issues, including birds with high intestinal worm burdens, use of untreated dam water for cleaning, and restricted access to water for the flock.

Following a review of the establishment's biosecurity procedures, improved husbandry practices were implemented to reduce the flock's susceptibility to disease. No further losses were reported in subsequent follow-ups.

High mortalities, due to *E. coli* polyserositis, are commonly seen in chickens that are stressed. The underlying cause is often multifactorial, requiring improvement in husbandry procedures and protocols to reduce stressors to the flock.

Figure 17 Dark green to black discolouration of visceral tissues in a hen with polyserositis due to *E. coli* (non-haemolytic) infection.

South Australia

Allison Crawley
Biosecurity South Australia, Department of Primary Industries and Regions, South Australia

During the quarter in South Australia, 127 livestock disease investigations[24] were conducted to rule out emergency diseases and investigate suspect notifiable diseases.[25] The number of investigations by category of livestock is shown in Figure 18.

Subsidised field investigations were conducted by government veterinary or biosecurity officers (56) and private veterinary practitioners, who in 70 cases[26] submitted samples to the state diagnostic veterinary laboratory or CSIRO Australian Animal Health Laboratory for subsidised testing to exclude or confirm notifiable diseases. The state veterinary diagnostic laboratory, Gribbles VETLAB, also processes sample submissions requiring testing for export, 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 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 reflect a range of livestock disease incidents during the quarter.

Acute bovine pulmonary oedema and emphysema in Holstein steers

In August, a producer in the south-east reported 12 deaths out of 370 Holstein steers aged 12 months. Most animals were found dead but some had neurological signs and respiratory distress before death. Bleeding from the nose and eyes was observed in the dead animals. The affected animals had been grazing on a flat wetter paddock with lush Phalaris (*Phalaris aquatica*) pasture. The submitting veterinarian considered Phalaris poisoning as the main differential diagnosis.

Necropsy of one of the steers revealed patches of emphysematous lungs. No bacteria or fungi were cultured from the lung samples. Histopathology revealed fibrinous interstitial pneumonia with alveolar oedema, hyaline membranes and type II pneumocyte hyperplasia. Lesions typically associated with Phalaris poisoning were not noted in brain sections. In addition, an immunochromatographic test (ICT) for anthrax on peripheral blood was negative. These lesions were consistent with acute bovine pulmonary oedema and emphysema. This is a disease usually seen 4 to 10 days after cattle have been moved from a dry pasture to a fast-growing lush pasture with high protein levels. The rumen is unprepared for the sudden exposure to lush high-protein forage, which results in an increase in tryptophan levels in the rumen. Tryptophan is metabolised in the rumen to 3-methylindole, which enters the lung via the bloodstream. The cells lining the lungs become damaged, resulting in pneumonia.

There is no specific treatment for acute bovine pulmonary oedema and emphysema. Mild cases will recover without treatment but handling and moving severely affected cows can exacerbate the disease, often leading to death. Prevention is by limiting the initial time spent grazing on fast-growing lush pastures, especially in the first 10 days. Supplementing cattle with an ionophore can also help inhibit 3-methylindole production.

24 Subsidised field investigation with laboratory diagnostic testing.

25 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

26 Some investigations involved multiple submissions.

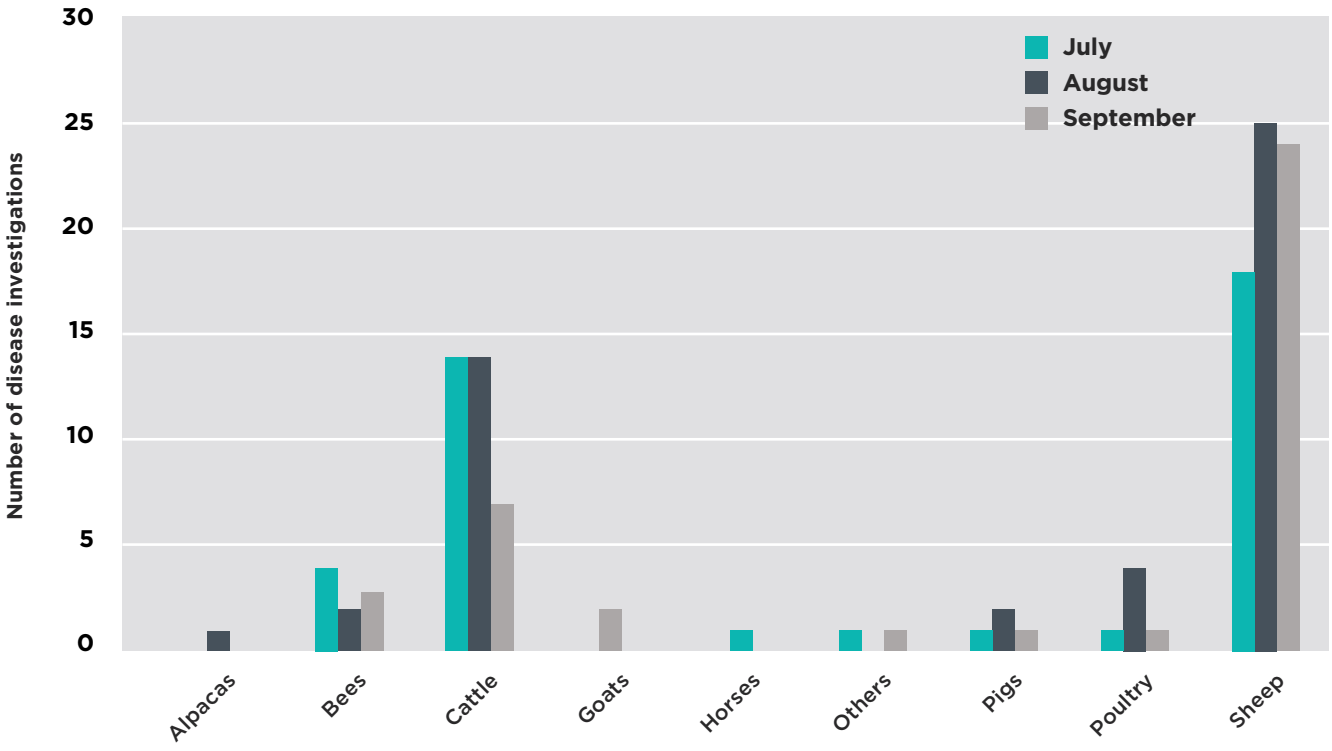


Figure 18 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in South Australia, July to September 2017

Bovine viral diarrhoea virus infection in Murray Grey calves

In July, a beef producer in the south-east lost seven 1 to 2-day old calves from 40 Murray Grey cows over a period of 1 week due to in utero bovine viral diarrhoea virus (BVDV)[27] infection. The calves were born weak with neurological signs including ataxia, head tremors, blindness and opisthotonos. Pyrexia was not detected. Necropsy was performed for three calves, with collection of fresh and fixed tissues and peripheral blood samples.

Histopathology showed hydrocephalus with periventricular oedema in two calves and/or marked hypoplasia and dysgenesis of the cerebellum and hydrocephalus with cerebrocortical atrophy or loss. These changes in the brain are strongly associated with in utero BVDV infection of naïve cows during the second trimester. BVDV antigen tested negative in tissues from three affected calves by polymerase chain reaction (PCR) testing, and the same calves had high serum antibody levels of greater than 3+ against BVDV.

When calves are infected between 120 and 150 days of gestation, this may result in foetal abortion, or birth of calves with congenital defects (especially of the central nervous system). Live calves are usually antibody positive, with or without detectable virus. Antibodies detected in calves up to 5 months of age may be passively transferred from the dam via colostrum, but in this case no colostrum was received by the calves, showing that the high

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

antibody titres reflected in utero exposure. Testing of the dams of the affected calves showed high antibody levels of 3+ but PCR tests were negative suggesting that they were not persistently infected individuals. Other cows in the herd were not tested.

Further investigation on this property is required to identify the persistently infected animals that were the source of infection for these particular cows. Testing could include ear notch, hair testing or serology to detect the presence of viral antigen.

Following quarantine of antigen-positive animals and retesting 28 days later, antigen positive animals on both occasions are considered to be persistently infected and should be culled.

Bluetongue virus, Akabane virus and other orthobunyaviruses were ruled out with negative serum results from two affected calves at CSIRO Australian Animal Health Laboratory.

Chronic copper toxicosis in stud rams

In late July, chronic copper poisoning killed 15 animals from a group 130 Merino rams in the western Eyre Peninsula. The producer observed that animals were going off their feed and were separating from the group. Animals were on average 14 months old. They were located in a small paddock and had adapted to being fed on rations of lupins, oats and hay for several weeks. It was also noted that affected animals appeared hunched with several seen head-pressing against the fence, and that they exhibited a mild foamy nasal discharge at death. Five animals died before the producer brought a mildly affected ram to the nearest private veterinary clinic.

The affected ram was bright and alert on presentation although it had shown signs of abdominal discomfort the previous evening. A full clinical examination revealed no abnormalities. Peripheral blood samples demonstrated significant changes indicating a renal azotaemia, including elevated urea, creatinine and potassium. Bilirubin and liver enzymes were within normal limits.

An additional ram was presented to the clinic after more rams died. This animal was recumbent and exhibited jaundiced mucous membranes. The ram was euthanased and a necropsy was conducted. All tissues were jaundiced, with pinpoint haemorrhages observed throughout the omentum, subcutaneous connective tissues and some muscle groups. The kidneys were enlarged and congested and the liver was also enlarged and friable. The bladder was distended and filled with dark red–brown urine. No abnormalities were noted in the lungs. The heart was flabby and jaundiced. Tissues, including the entire brain, were collected for further analysis.

On histopathology, severe spongiform change involving the white matter of the brainstem was compatible with hepatic encephalopathy secondary to chronic liver disease. In addition, there was diffuse hepatic fibrosis and biliary hyperplasia with hepatocellular swelling and pigment accumulation. In the kidney, there was moderate tubular dilation with scattered tubular epithelial cells containing small granules of golden brown pigment, interpreted to be haemoglobinuric nephrosis.

The liver lesions suggested chronic toxic hepatopathy, most likely due to previous exposure to pyrrolizidine alkaloids (e.g. potato weed or phomopsin toxin). The renal pathology was most likely due to copper toxicity superimposed on the hepatopathy. Prior liver damage due to a toxic insult, especially pyrrolizidine alkaloids is a significant pathogenic factor in development of outbreaks of chronic copper poisoning.

A diagnosis of copper poisoning was made and, after further consultation, the farmer informed the veterinarian that he cleans his troughs with a copper sulfate solution. The rams were drenched with a sodium molybdate solution daily at 100 mg/head/day for 14 days. The producer was advised to limit access to lupins and barley and feed the rams mainly good quality hay. Symptoms subsided and the deaths stopped. Molybdenum reduces copper absorption and enhances copper elimination. Adding penicillamine to the treatment regime does aid excretion of copper but this was cost prohibitive in this case with a large group of animals affected.

Acute primary photosensitisation in Awassi sheep

In mid-August, five ewes in a group of 1300 pure-bred Awassi sheep in the Bordertown region were observed with swollen heads and were drooling. The sheep had been grazing on a very rich standing barley crop. Two affected ewes were moved to a shed and within 24 hours the swollen head and ears had completely returned to normal but they were still drooling. Other groups of sheep on the property of the same age and breed that were grazing perennial veldt grass were unaffected.

Clinical examination of one of the affected ewes revealed slight oral erosion of the mucocutaneous junction, and obvious erythema and peeling of skin on the udder. The animal was euthanased and blood, major organs and skin samples were collected for further analysis. No other gross pathology was observed at necropsy.

On histopathology of the mucocutaneous skin and lip, there was severe ulcerative and suppurative dermatitis. The vascular endothelium was also

oedematous. There were minimal histopathological changes in the liver. These changes were consistent with primary photosensitisation. Foot-and-mouth disease (by PCR, virus isolation and ELISA), bluetongue virus (by ELISA) and vesicular stomatitis virus (by PCR and virus isolation) were all excluded at CSIRO Australian Animal Health Laboratory.

Animals were moved to different pasture and clinical signs did not recur. Groups of crossbred Awassi on similar barley crops did not appear affected, suggesting a possible breed predisposition to photosensitisation in Awassi sheep on certain feeds.

Exclusion of lumpy skin disease in cattle

During September in the Bordertown region, three animals from a group of 400 mixed-breed adult cattle developed abscesses and granuloma-like lesions on the sides of their bodies or around their heads (Figure 19 and Figure 20). One cow exhibited respiratory distress. Actinobacillosis (wooden tongue disease) was suspected.

Blood samples from all affected animals and a biopsy from a granuloma lesion of one animal were collected. Moderate growth of *Actinobacillus lignieresii* and *Trueperella pyogenes* (previously *Arcanobacterium pyogenes*) were cultured, with no anaerobes isolated. Capripoxvirus PCR testing of the skin lesion for lumpy skin disease was performed at CSIRO Australian Animal Health Laboratory, which was negative. BVDV testing of ear-notch samples was also negative to rule out persistent infection status. Histopathology of the skin sample demonstrated severe chronic pyogranulomatous dermatitis and cellulitis.

The histopathological findings were typical of those associated with chronic infection due to the organism *A. lignieresii*. This bacterium is considered part of the normal flora in ruminants. Lesions typically arise following inoculation at sites of mucosal trauma. Infection commonly affects the soft tissues of the head and neck, and spreads via lymphatics to the regional draining lymph nodes with pyogranulomas within the overlying skin. On occasion, there may be involvement of the walls of the forestomachs and lung. Cutaneous lesions are uncommon but may occur in areas of abrasion or trauma, including penetrating grass awns.

Figure 19 Affected animal showing abscesses and granuloma-like lesions on the side of the head

Figure 20 Affected animal showing abscesses and granuloma-like lesions on the side of the body

Tasmania

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

During the quarter in Tasmania, 332 livestock disease investigations[28] were conducted to rule out emergency diseases or investigate suspect notifiable diseases.[29] The number of investigations by category of livestock is shown in Figure 21. Field investigations were conducted by government veterinary or biosecurity officers (10) and private veterinary practitioners (322). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

The state veterinary diagnostic laboratory, Animal Health Laboratory, Launceston, processed 705 livestock sample submissions[30] during the quarter to rule out emergency diseases or investigate suspect notifiable diseases. Sample submissions were also processed to substantiate proof of disease freedom certifications, and for accreditation programs and targeted surveillance.

Ten field investigations were conducted by government veterinary or biosecurity officers and 322 investigations were undertaken by private veterinary practitioners. One of these investigations was 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 events clinically consistent with national notifiable diseases or suspected to be a new or emerging disease. These investigations receive 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.

Infectious coryza in chickens

Infectious coryza, caused by *Avibacterium paragallinarum* (formerly *Haemophilus paragallinarum*), was diagnosed as the cause of chronic respiratory disease in a small flock of chickens in southern Tasmania in July.

The mixed-breed flock consisted of two roosters and 45 hens. All were aged up to 14 months old. There had been no new birds introduced into the flock over the previous 7 weeks.

Over a 12-day period, 14 birds developed symptoms of respiratory disease, including nasal discharge, sneezing, laboured breathing, swelling around the face and lethargy.

One dead juvenile rooster was submitted for necropsy. Gross findings included excessive mucus in both nasal passages and trachea, and histopathology showed chronic diffuse sinusitis, rhinitis and tracheitis suggestive of a chronic bacterial infection of the upper respiratory tract. The differential diagnosis included *Mycoplasma gallisepticum* and *A. paragallinarum*. Tracheal and cloacal swabs tested negative for the presence of avian influenza type A viruses using TaqMan real-time polymerase chain reaction (PCR) assay. Neither *Salmonella* spp. nor Mycoplasma spp. were isolated on culture, and *Chlamydia* spp. was not seen using modified Z-N stain.
A. paragallinarum was isolated on culture.

This contagious bacterial respiratory infection occurs most often in adult birds. It may spread slowly, affecting only a small number of birds, or rapidly with a higher percentage of birds affected. The bacterium is spread through contact with infected birds or exudates. Infected birds using communal feed and water containers and aerosol spread via sneezing are common routes of infection. Recovered birds remain

28 Field investigation with laboratory diagnostic testing.

29 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

30 Some investigations involved multiple submissions.

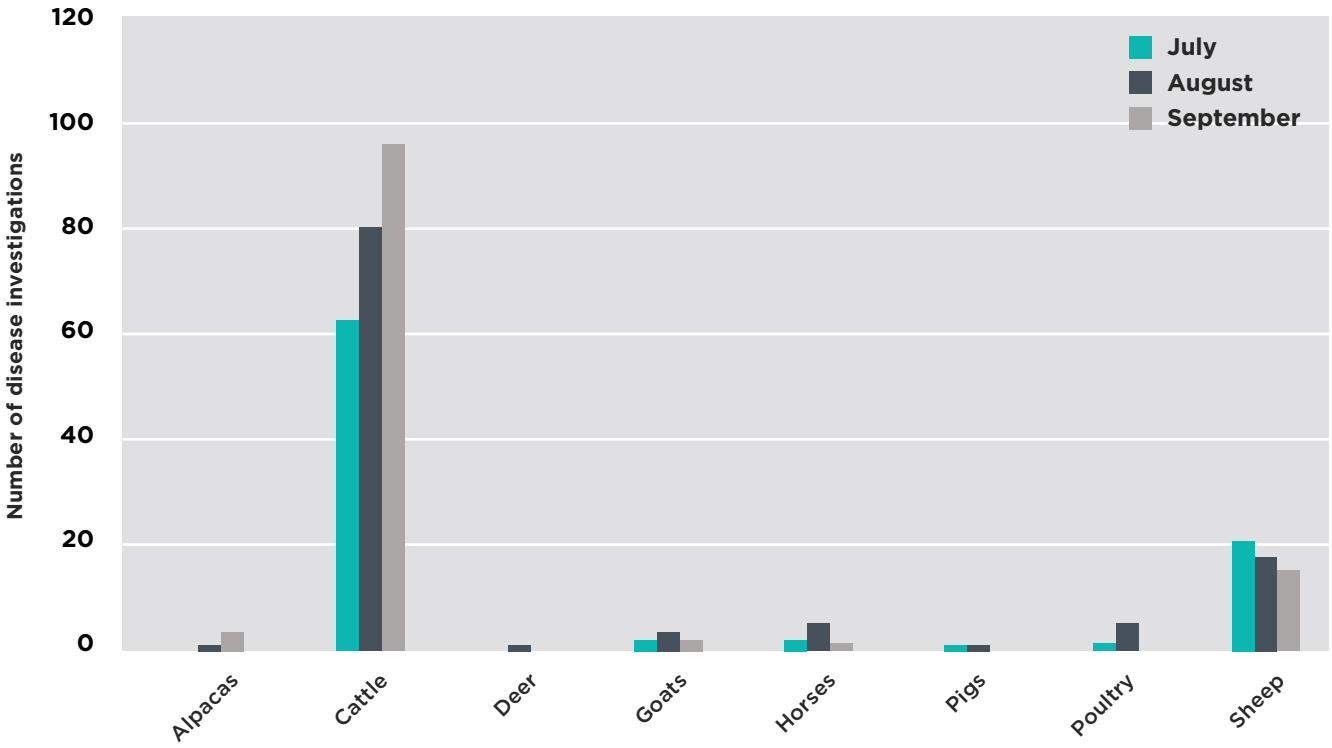


Figure 21 Number of field disease investigations to rule out emergency diseases or investigate suspect notifiable diseases, in Tasmania, July to September 2017

carriers of the bacteria for long periods, and chronic or healthy carriers are most often the reservoir for infection.

In this case, a bird introduced more than 7 weeks prior to the onset of clinical signs in the flock was most probably the primary reservoir for the infection.

Once a flock is infected, all birds must be considered as carriers. Stress factors, including cold weather and draughty shelter may trigger the onset of disease. Birds may also be more susceptible if already infected with other respiratory viral or bacterial infections. Infected birds may have recurring episodes of the disease their entire lives, predominantly during periods of stress.

Prevention is best achieved using biosecurity principles based on an all-in, all-out replacement policy and ensuring replacement birds are not infected. The bacterium survives 2 to 3 days outside the bird but is easily killed by heat, drying and disinfectants. If infection occurs, complete depopulation followed by thorough disinfection is the only way to eliminate the disease.

Victoria

Karen Moore
Victorian Department of Economic Development, Jobs, Transport & Resources

During the quarter in Victoria, 720 livestock disease investigations[31] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[32] The number of investigations by species of livestock is shown in Figure 22. Field investigations were conducted by government veterinary or biosecurity officers (190) and private veterinary practitioners (530). All diagnostic testing was conducted at state registered veterinary diagnostic laboratories or CSIRO Australian Animal Health Laboratory.

The state veterinary diagnostic laboratory, Veterinary Diagnostic Services, Bundoora, processed 474 livestock sample submissions[33] during the quarter to investigate suspect notifiable diseases or rule out emergency diseases. Sample submissions (243) were also processed to substantiate proof of disease freedom certifications, and for accreditation programs and targeted surveillance.

Across all species, non-specific clinical patterns were most commonly reported, followed by signs associated with the gastrointestinal tract and the central nervous system. Overall, salmonellosis and internal parasites were the most commonly diagnosed diseases in cattle this quarter with internal parasites also being an issue in sheep and goats. Cases of clinical disease where no definitive disease agent was identified were reviewed in the context of the surrounding circumstances, and exotic or emergency diseases

31 Field investigation with laboratory diagnostic testing.

32 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

33 Some investigations involved multiple submissions.

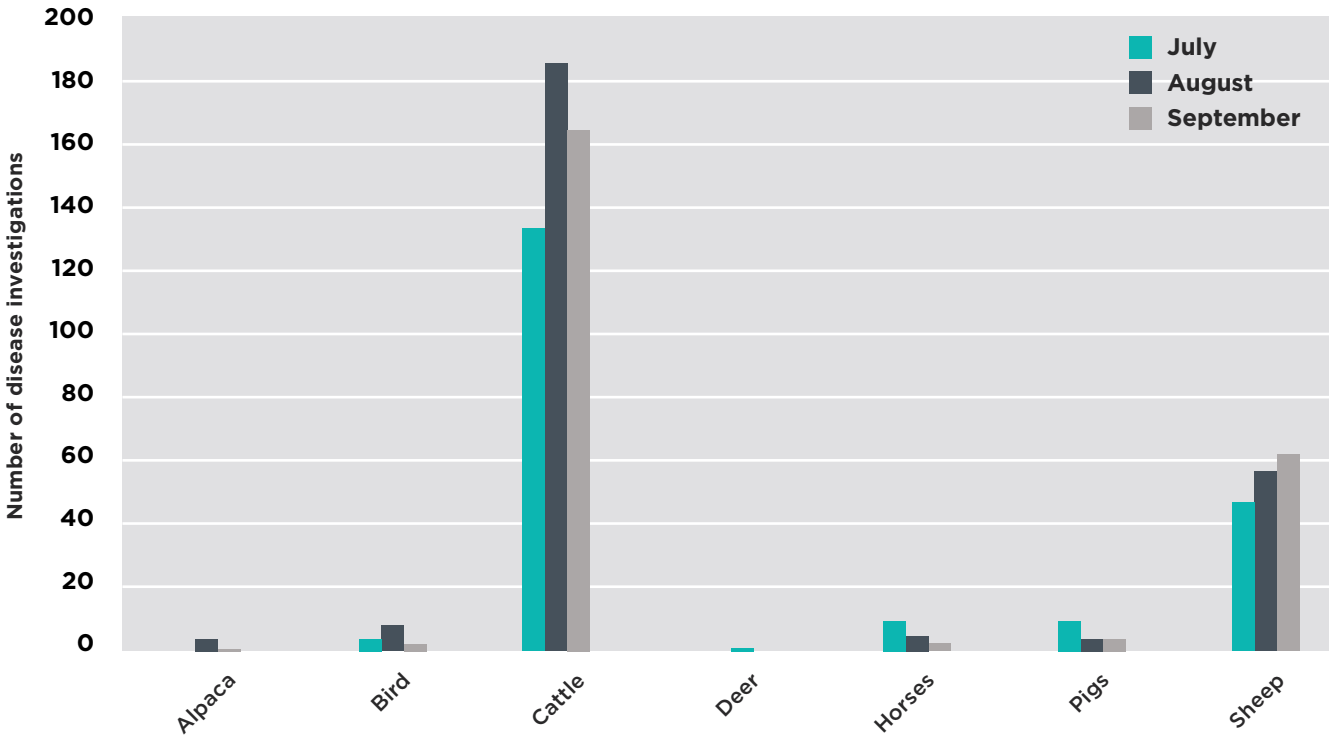


Figure 22 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Victoria, July to September 2017

were excluded where appropriate. Test results from exotic or emergency animal disease exclusion testing are routinely recorded as suspect emergency animal diseases (Table 17).

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 & Resources (DEDJTR) and private veterinary practitioners. In collaboration with the National Significant Disease Investigation Program, DEDJTR provides subsidies to private veterinarians for the investigating and reporting of significant disease events in livestock and wildlife in Victoria. These subsidies go toward the costs and laboratory fees associated with the investigation.

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.

Foot-and-mouth disease excluded in a Murray Grey steer

Sheep-associated malignant catarrhal fever (MCF) killed a 20-month-old beef steer from a herd of seven on a property in Bunyip, Gippsland, at the end of July.

A private veterinarian attended the property to find the steer in lateral recumbency shortly before it died. The remaining seven steers had been, until a week prior, grazing alongside a flock of sheep. The producer had noticed the steer showing increased periods of recumbency and reluctance to walk prior to its death. At necropsy, the veterinarian noticed sloughing of the nasal epithelium, erosions and ulcers of the nasal mucosa, oral mucosa, dental pad and tip of the tongue. Bilateral corneal opacities were also present. The remainder of the necropsy revealed no other gross abnormalities.

Laboratory samples were forwarded to the CSIRO Australian Animal Health Laboratory where foot-and-mouth disease and vesicular stomatitis were excluded. Samples sent to AgriBio for panpestivirus, bovine herpesvirus and infectious bovine rhinotracheitis testing were universally negative. A positive diagnosis of MCF was made based on the classical histological appearance of tissues and the history of cattle and sheep co-grazing. The diagnosis was confirmed by detection of ovine herpesvirus 2 (OHV-2) by PCR on a sample of spleen.

Virtually all domestic sheep are infected asymptomatically with OHV-2, the cause of MCF in cattle. The highest period for excretion in nasal secretions by sheep is between 6 and 9 months of age.

As MCF is untreatable and almost always leads to death in cattle, the best way to prevent infection is to avoid contact between cattle and sheep. Most notably in this instance, the private veterinarian recognised oral lesions and rang the Emergency Animal Disease Watch Hotline for advice.

Acute bovine pulmonary oedema and emphysema in a Jersey cow

In September, acute bovine pulmonary oedema and emphysema was diagnosed as the cause of death of one cow and suspected as the cause of respiratory disease in a further 28 cows on a dairy farm in south-western Victoria. The outbreak occurred in early spring, in cattle that had been grazing lush pasture for several months. Affected cows were to first-calf heifers that had been calved between 1 and 3 months.

Respiratory symptoms were tachypnoea and increased respiratory effort, with wheezes, crackles and friction rubs. Other clinical signs included weight loss, production loss and pyrexia. Six dairy cattle displaying similar respiratory symptoms were also seen in a nearby herd in the same week.

Serum was collected from seven affected cows, and a tracheal wash was performed on two of the cows. All seven cows had antibodies to adenovirus 3 ELISA, bovine herpesvirus 1 (IBR) ELISA, bovine respiratory syncytial virus ELISA and parainfluenza 3 ELISA, indicating prior exposure to these viruses. The tracheal washes were negative for IBR PCR assay and *Histophilus* spp. culture. One of the tracheal washes grew a light growth of *Mannheimia haemolytica*.

One of the affected cows died the next day and necropsy findings showed oedematous and emphysematous lungs with cranio-ventral consolidation and fibrin tags (Figure 23). Frothy exudate was present in the trachea and larger bronchi. Histological examination revealed lung changes typical of the subacute stage of acute bovine pulmonary oedema and emphysema.

The remaining sick cows showed little apparent response to antibiotic therapy with oxytetracycline and ceftiofur but gradually recovered over the next 2 weeks. The cattle treated with oxtetracycline had milk withheld from the vat for 60 hours (five milkings) following the last injection, as per label instructions. Ceftiofur has no milk withholding period.

Acute bovine pulmonary oedema and emphysema is also known as atypical interstitial pneumonia or fog fever syndrome. It is a sudden onset respiratory distress syndrome of adult cattle that is reported to occur in the autumn a few days after cattle are moved from dry to lush rapidly growing pastures. Lush pasture can contain high levels of DL-tryptophan, which is converted in the rumen to the 3-methylindole, the cause of toxic injury to the lung.

Thrombotic meningoencephalitis in Jersey calves

In July, thrombotic meningoencephalitis (TME) was diagnosed in six calves in south-western Victoria. A further 14 calves were also affected. The affected calves were among 50 unweaned Jersey heifers ranging from between 3 and 10 weeks of age.

Calves presented with hollow abdomens and pyrexia but continued to drink. Further symptoms that developed included bruxism (teeth grinding), blindness and opisthotonus.

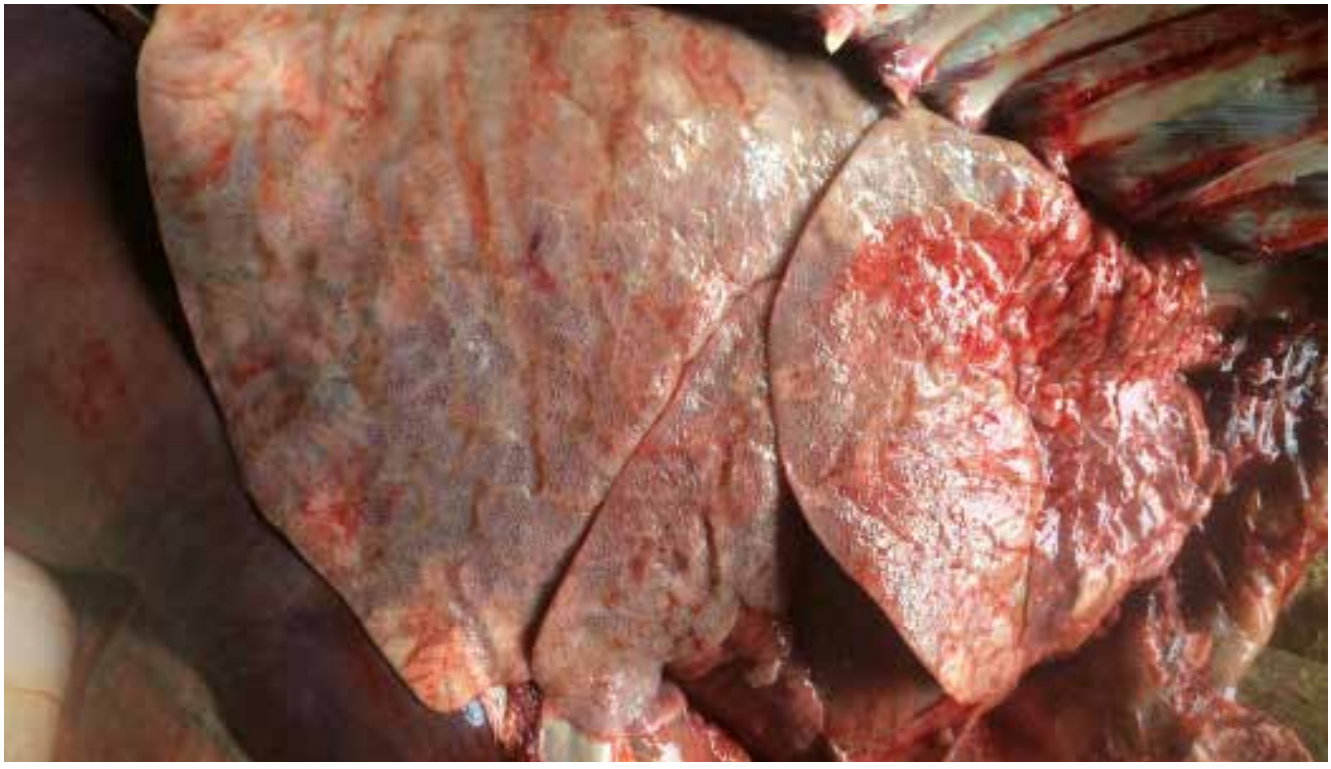


Figure 23 Lung of affected cow showing oedema, cranio-ventral consolidation and fibrin tags

Polioencephalomalacia was suspected, and the calves were treated with thiamine injections, anti-inflammatory agents and antibiotics. Initial antibiotic treatment with trimethoprim and sulphadiazine was not successful; subsequently calves were treated with penethemate and oxytetracycline with progressively better results.

A calf that was recumbent and convulsing after 5 days of treatment was euthanased for necropsy. Three affected calves were consigned to a knackery for slaughter after they did not respond to several days of treatment. A further two calves died. The remaining 14 calves made a full recovery.

No gross lesions were observed in the necropsied calf, and histological examination of fixed tissues indicated septicaemia with thrombotic meningoencephalitis.

TME is one of a range of conditions caused by *Histophilus somni* (formerly *Haemophilus somnus*). Other clinical syndromes include pleuropneumonia, myocarditis and polyarthritis. *H. somni* is frequently found as a commensal organism in cattle and only rarely causes disease. TME, pleuropneumonia and myocarditis caused by *H. somni* most commonly occurs in feedlot calves aged 6 to 12 months of age.

H. somni was not isolated in this case, likely due to antimicrobial treatment, however the central nervous system microscopic lesions were considered to be characteristic of this infection. The affected calves were shedded and fed a combination of whole milk, calf pellets and straw. The cause of this outbreak is unclear.

Infection with influenza A detected in swine

Influenza A was detected in weaner pigs from a large-scale free-range piggery in south-west Victoria. One of five fresh lung tissue samples submitted in July to AgriBio by a private veterinarian was confirmed as having influenza A infection based on real-time PCR assay.

Viral sequencing analysis at the CSIRO Australian Animal Health Laboratory confirmed the virus as influenza A H1N1. Sequencing indicated that it was a seasonal H1N1 virus strain known to currently circulate in both pigs and humans, and not a novel virus.

Influenza A viruses are considered ubiquitous in pig populations worldwide and have been detected in Australian pig populations but have not been associated with significant animal production or public health issues. Influenza A in swine is not included in the list of World Organisation for Animal Health (OIE) notifiable diseases.

Good farm biosecurity and management practices are the most effective measures to prevent the introduction and spread of influenza A viruses. Staff at the piggery are offered seasonal flu vaccination annually. There had been no increase in illness in piggery staff above the expected population norm, and no staff had missed work due to illness at the time of the investigation. The piggery, which has a herd health plan, was advised to continue with the monthly herd health monitoring and to report any increased respiratory syndromes to their pig veterinary consultant for investigation.

Western Australia

Emily Glass
Department of Primary Industries and Regional Development, Western Australia

During the quarter in Western Australia, 276 livestock disease investigations[34] were conducted to investigate suspect notifiable diseases or rule out emergency diseases.[35] The number of investigations by species of livestock is shown in Figure 24. Field investigations were conducted by government veterinary or biosecurity officers (76) and private veterinary practitioners (200). All diagnostic testing was conducted at the state veterinary diagnostic laboratory or CSIRO Australian Animal Health Laboratory.

The state veterinary diagnostic laboratory at Department of Primary Industries and Regional Development (DPIRD) in Perth processed 502 livestock sample submissions[36] 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 reportable diseases and demonstrating Western Australia's absence of, and capacity to detect, reportable diseases to support domestic and export market access for livestock and livestock products.

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

In July, a producer in the Wheatbelt region reported to their veterinarian a case of sudden onset neurological disease and death in a herd of 400 Angus cows that were approximately 8 years old. Of the herd of 400, seven had died and one cow was reported to be unwell with signs of head tilt, opisthotonus, increased salivation and incoordination.

The affected cow was treated with a vitamin B1 injection but did not recover, and was subsequently euthanased. The private veterinarian conducted a necropsy and noted intestinal parasitism, a dry rumen, a large amount of intestinal contents and increased cerebrospinal fluid.

Samples were submitted to the DPIRD laboratory, including blood, fresh and fixed tissues and rumen content, with a provisional diagnosis of thiamine deficiency. Given the neurological signs displayed by the affected cow, the veterinarian also collected and submitted samples from the specific brain sites for transmissible spongiform encephalopathy (TSE) exclusion, including the medulla at the level of the obex, the medulla through the caudal cerebellar peduncles and midbrain through the rostral colliculus.

Testing at the laboratory included biochemistry, histopathology and annual ryegrass toxicity (ARGT) testing on the rumen content. Biochemistry indicated acute muscle injury, inappetance and dehydration and ARGT testing was negative. On histopathology of the three TSE sites, there were no lesions consistent with TSE. In the brainstem, there was a

34 Field investigation with laboratory diagnostic testing.

35 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

36 Some investigations involved multiple submissions.

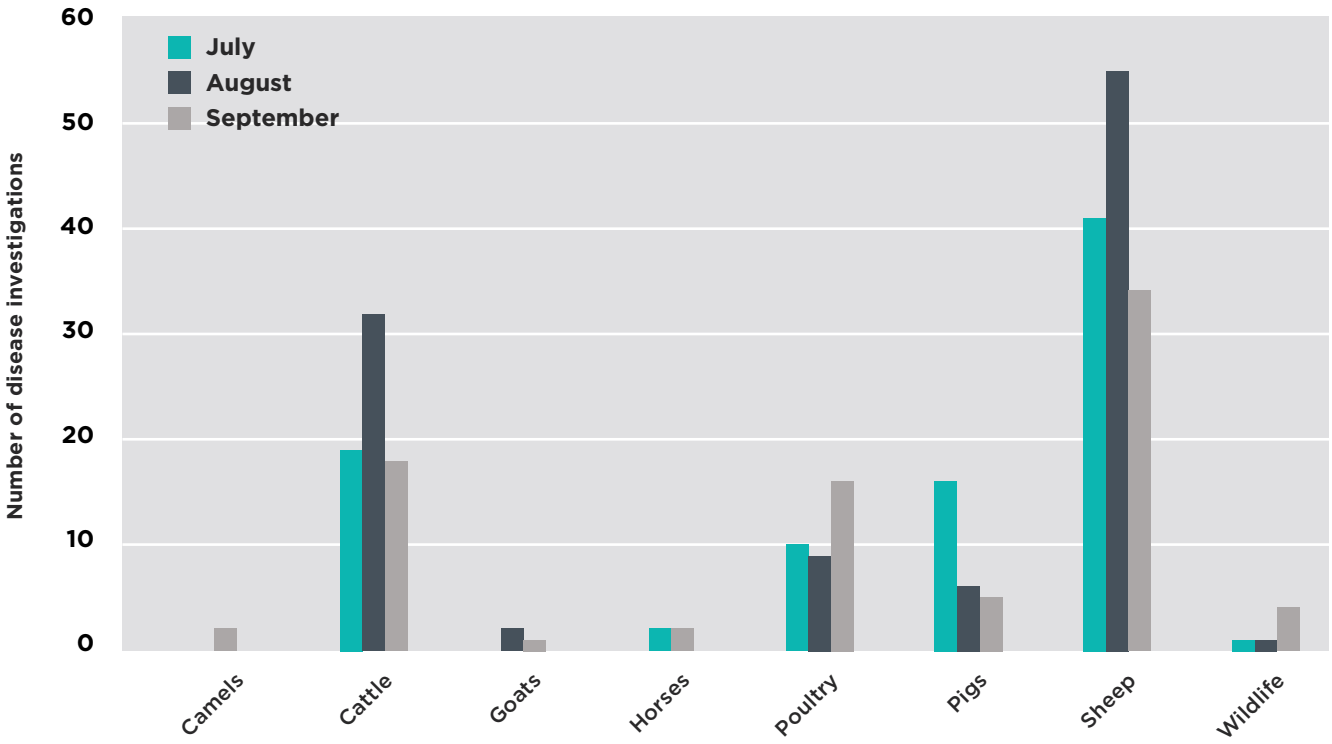


Figure 24 Number of field disease investigations to investigate suspect notifiable diseases or rule out emergency diseases, in Western Australia, in July to September 2017

moderate necrosuppurative encephalitis with lymphocytic vasculitis, micro abscesses and glial nodules.

This pattern of reaction is highly characteristic for listeriosis, which is also consistent with the history and the time of the year. The private veterinarian subsequently worked with the producer to investigate possible sources of the bacteria, particularly silage. No further disease was reported by the producer.

Paralysis in piglets in the Great Southern Agricultural region

In July, a pig producer in the Great Southern Agricultural region contacted DPIRD with a report of high fever, tremors and paralysis in piglets.

The affected animals were 7-week-old female mixed-breed piglets in an outdoor commercial piggery. The producer reported that from a group of 1000 piglets, 100 were affected and 4 had died. In addition to the clinical signs of fever and tremors, the producer reported that some pigs appeared normal but would suddenly fall down and were unable to rise. The herd had a history of porcine circovirus 2 (PCV-2) infection.

Necropsy revealed a slight enlargement of the spleen and kidney, and pale lungs with petechial haemorrhages. Blood samples and fresh and fixed tissues were submitted to the DPIRD laboratory with a provisional diagnosis of PCV-2 infection.

On histopathology, there was a moderate diffuse interstitial pneumonia. Due to this finding, possible reportable viral causes of interstitial pneumonia were investigated. Testing for reportable diseases at DPIRD included influenza virus antibody-detection ELISA. Samples were also sent to the CSIRO Australian Animal Health Laboratory, where a TaqMan polymerase chain reaction (PCR) assay for European and North American strains of porcine respiratory and reproductive syndrome on lung was conducted. All testing for reportable disease was negative.

Bacteriology at the DPIRD laboratory cultured a pure growth of *Erysipelothrix rhusiopathiae* from the liver and spleen. Immunohistochemistry for PCV was negative in lung sections but displayed light multifocal sustaining in the lymph nodes and spleen. This finding was indicative of subclinical PCV-2 infection, and erysipelas was determined to be the likely cause of clinical signs in the herd.

DPIRD provided this information to the producer, who worked with their private veterinarian to control disease in the herd.

Vesicular disease exclusion in an abattoir

In July, a Department of Agriculture and Water Resources on-plant veterinarian (OPV) notified DPIRD and collected samples to undertake a very low to negligible level of suspicion exclusion testing for foot-and-mouth disease (FMD) and vesicular stomatitis (VS) from a sheep at an abattoir in the Great Southern Agricultural region.

The affected sheep was a Merino ewe that was found dead in the holding pen at the abattoir during ante-mortem inspection. On examination, it was broken mouthed and had lesions on the lower jaw and dental pad that appeared to be traumatic lesions relating to the broken teeth. The remainder of the oral cavity and tongue was normal. Necropsy by the on-plant veterinarian found no other significant findings indicative of vesicular disease.

The remainder of the animals at the abattoir were not displaying any clinical signs. The provisional diagnosis was oral trauma but the on-plant veterinarian collected blood and a range of fresh and fixed tissues and submitted them to the DPIRD laboratory to exclude other potential causes of the oral lesions.

Given the clinical finding of oral erosions, exclusion testing for FMD and VS viruses was conducted at CSIRO Australian Animal Health Laboratory. Testing included FMD multiplex qPCR on blood and tissues, FMD cELISA (serotype O, Asia 1 and A22 Iraq), FMD multiplex Pirbright and Tetracore RT-TaqMan assay, vesiculovirus serum neutralisation test for antibody for serotype Indiana and VS virus multiplex Indiana and NewJersey TaqMan assay. All testing for reportable disease was negative at CSIRO Australian Animal Health Laboratory.

On histopathology at DPIRD, there was a mild lymphadenitis of the local lymph nodes, which was likely secondary to the oral lesions. There were no other significant findings. The aetiology of the oral lesions was determined most likely to be mouth trauma.

Australian OPVs are Australian Government-authorised officers with veterinary qualifications based on export registered slaughtering establishments. Their role is to verify that animal health, animal welfare, food safety, product integrity and certification and, market access requirements are identified and delivered to comply with Australian and international standards.

Increased mortality in a commercial poultry flock

Avian influenza and Newcastle disease were excluded as the cause of a production drop and increased mortality in a commercial poultry flock in August.

The affected group of birds was from a shed of 28,000 70-week-old Hyline layers in the northern outskirts of Perth. The producer reported a drop in egg production and increased mortality rates to their private veterinarian.

Other sheds of birds on the property were not affected. The veterinarian conducted an on-farm investigation and necropsy of a sample of deceased birds from the affected shed, which revealed peritonitis, perihepatitis and pericarditis. Swabs and fresh and fixed tissues were collected and submitted to the DPIRD laboratory with a provisional diagnosis of bacterial infection.

On histopathology at DPIRD, all birds had a severe, multifocal acute fibrinous splenitis with bacilli, and some displayed hepatitis, epicarditis and pneumonia. A heavy pure growth of haemolytic *Escherichia coli* was cultured from the liver and coelomic swabs. The diagnosis for this case was colibacillosis.

The reportable diseases avian Influenza and Newcastle disease were excluded as a cause of disease in the flock through PCR assay of tracheal and cloacal swabs at DPIRD.

The private veterinarian used the diagnosis to assist the producer to manage disease in the flock.

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 17. There is also reporting of sheep flocks infected with Johne's disease through quarterly reporting of the National Sheep Health Monitoring Project (NSHMP) and the number of property identification codes (PICs) identified as having one or more infected animals. Sampling is from participating abattoirs and data is only for animals older than 2 years sourced directly from a property. Table 3 shows the number of PICs inspected and found with one or more infected animals.

Table 3 Summary of National Sheep Health Monitoring Project (NSHMP) inspected and infected line results, 1 July to 30 September 2017

State	Number of animals inspected	Number of PICs inspected	Number of PICs infected	Percentage of PICs infected
NSW	55,415	100	2	2
NT	0	0	0	0
Qld	2,614	6	0	0
SA	202,187	776	9	1.2
Tas.	10,578	70	0	0
Vic.	29,514	139	14	10.1
WA	0	0	0	0
Aus.	**300,308**	**1091**	**25**	**2.3**

PIC = property identification code

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 4. For status definition, see the current species MAP manual.[37] Lists of alpaca and goat herds and sheep flocks participating in the MAPs are available on the Endemic Disease Information System website.[38] 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 4 Herds or flocks[a] with a Market Assurance Program status of at least Monitored Negative 1, 1 April to 30 September 2017

Quarter	Alpacas	Goats	Sheep	Total
Apr–Jun 2017	15	24	380	419
Jul–Sep 2017				
NSW	4	7	148	159
Qld	0	8	2	10
SA	7	8	161	176
Tas.	0	1	13	14
Vic.	1	1	55	57
WA	0	0	4	4
Aus.	**12**	**25**	**383**	**420**

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

37 www.animalhealthaustralia.com.au/maps

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

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 5 shows the number of accredited flocks at the end of the quarter.

Table 5 Ovine brucellosis accredited-free flocks, 1 July 2016 to 30 September 2017

State	Jul–Sep 2016	Oct–Dec 2016	Jan–Mar 2017	Apr–Jun 2017	Jul–Sep 2017
NSW	861	861	851	851	854
Qld	72	72	74	78	75
SA	539	539	533	533	542
Tas.	56	59	62	62	46
Vic.	436	436	423	454	448
WA	184	180	170	185	190
Aus.	**2,148**	**2,147**	**2,113**	**2,163**	**2,155**

Laboratory testing

Serological testing

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

Table 6 Results of serological testing for two equine viruses, 1 July 2016 to 30 September 2017

Quarter	No. of tests (equine infectious anaemia)	Positive (equine infectious anaemia)	No. of tests (equine viral arteritis)	Positive (equine viral arteritis)
Jul–Sep 2016	473	0	446	2
Oct–Dec 2016	1,303	16	547	0
Jan–Mar 2017	758	0	652	1
Apr–Jun 2017	969	0	980	5
Jul–Sep 2017				
NSW	400	0	403	0
NT	0	0	0	0
Qld	25	2	10	0
SA	0	0	0	0
Tas.	0	0	0	0
Vic.	279	0	214	2
WA	0	0	0	0
Aus.	**704**	**2**	**627**	**2**

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

Table 7 Results of testing for equine herpesvirus 1 (EHV-1), at 30 September 2017

Syndrome	EHV-1 suspected but not confirmed	Negative	Positive	Total
Abortion	0	63	3	66
Neurological	0	9	0	9
Other	0	11	3	14
Total	**0**	**83**	**6**	**89**

Table 8 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).[39] Positive serological test results are not an indication of the presence of clinical disease.

Table 8 Results of serological testing for three arboviruses, 1 July 2016 to 30 September 2017

Quarter	No. of tests (Akabane)	Positive (Akabane)	No. of tests (BEF)	Positive (BEF)	No. of tests (BTV)	Positive (BTV)
Jul–Sep 2016	454	28	757	39	1,021	32
Oct–Dec 2016	197	3	577	10	888	57
Jan–Mar 2017	341	37	938	56	1,417	111
Apr–Jun 2017	580	84	1,122	44	1,577	123
Jul–Sep 2017	**337**	**61**	**703**	**27**	**1,030**	**49**

BEF = bovine ephemeral fever virus; BTV = bluetongue virus

39 namp.animalhealthaustralia.com.au

Surveillance activities

Bovine brucellosis

Australia declared freedom from bovine brucellosis (caused by *Brucella abortus*) in 1989.[40] Surveillance is maintained through abortion investigations and additional testing of cattle for export or other reasons. Table 9 shows 69 bovine abortion investigations and 845 investigations for other reasons were performed during the quarter; all were negative for bovine brucellosis.

Table 9 Bovine brucellosis testing, 1 July 2016 to 30 September 2017

Quarter	No. of tests (abortion)	Positive (abortion)	No. of tests (other reasons)[a]	Positive (other reasons)
Jul–Sep 2016	121	0	316	0
Oct–Dec 2016	33	0	147	0
Jan–Mar 2017	137	0	1367	0
Apr–Jun 2017	279	0	902	0
Jul–Sep 2017				
NSW	1	0	797	0
NT	0	0	0	0
Qld	11	0	42	0
SA	2	0	0	0
Tas.	12	0	3	0
Vic.	15	0	3	0
WA	28	0	0	0
Aus.	**69**	**0**	**845**	**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 may therefore vary, depending on total cattle exports to particular markets.

40 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*[41], involves testing of samples from cattle and sheep with clinical signs consistent with BSE or scrapie respectively, as well as from fallen and casualty slaughter cattle. Points are assigned to cattle samples according to the animal's age and subpopulation category (i.e. the likelihood of detecting BSE). Australia's target is to achieve a minimum of 150,000 points over a rolling 7-year period. Table 10 shows the number of animals sampled for BSE and scrapie and the points tally for cattle in the NTSESP[42] during the past 12 months. All samples tested were negative.

Table 10 Samples tested for transmissible spongiform encephalopathies (TSEs), 1 October 2016 to 30 September 2017

State	No. examined (cattle)	Points (cattle)	Positive (cattle)	No. examined (sheep)	Positive (sheep)
NSW	240	33,942.6	0	151	0
NT	15	5,221.1	0	0	0
Qld	182	64,560.8	0	43	0
SA	22	9,558.2	0	41	0
Tas.	22	4,797.8	0	9	0
Vic.	99	24,301.1	0	92	0
WA	31	15,660.0	0	157	0
Aus.	**611**	**158,041.6**	**0**	**493**	**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, 502 birds from 96 laboratory submissions were tested for AI (excluding surveillance reported in the Wildlife Health Australia and Northern Australia Quarantine Strategy reports). One positive low pathogenic AI strain (H9N2) was detected in a commercial poultry breeder farm (Table 11). The owner voluntarily depopulated and disposed of the flock via composting and implemented decontamination procedures to minimise any potential environmental viral persistence. Tests included competitive ELISA (enzyme-linked immunosorbent assay), haemagglutination inhibition, agar gel immunodiffusion (AGID), reverse-transcriptase polymerase chain reaction (PCR) and virus isolation.

Table 11 Results of testing for avian influenza virus in poultry, 1 July to 30 September 2017[a]

H5 positive	H7 positive	Positive for a non-H5, non-H7 strain
0	0	1

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

41 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

42 www.animalhealthaustralia.com.au/programs/biosecurity/tse-freedomassurance-program

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[43] in all Australian jurisdictions. Vaccination exceptions for broilers apply in Tasmania, Western Australia, Queensland and South Australia. During the quarter, 396 birds from 86 laboratory submissions were tested for Newcastle disease (Table 12). Please consult the Wildlife Health Australia report in this publication for information on avian paramyxovirus in wild birds.

Table 12 Results of testing for Newcastle disease (ND) testing in poultry, 1 July to 30 September 2017[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	2	0

a Excludes testing for import purposes.

Salmonella surveillance

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

Table 13 Salmonella notifications reported to the National Enteric Pathogen Surveillance Scheme (NEPSS), 1 July to 30 September 2017

Salmonella serovar	Birds[a]	Cats	Cattle	Dogs	Horses	Pigs	Sheep	Other	Total
Bovismorbificans	0	0	12	0	0	0	0	0	12
Dublin	0	0	4	0	0	0	0	0	4
Infantis	0	0	4	0	0	1	0	0	5
Typhimurium	3	1	31	2	0	10	0	0	47
Other	2	0	19	2	0	17	0	0	40
Total	**5**	**1**	**70**	**4**	**0**	**28**	**0**	**0**	**108**

a Includes both poultry and wild birds.

43 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 14 summarises NAQS animal testing for specific target diseases in Australia during the past five quarters.

Table 14 Disease testing and pest surveillance under the Northern Australia Quarantine Strategy (NAQS), 1 July 2016 to 30 September 2017

Target disease	Jul–Sep 2016		Oct–Dec 2016		Jan–Mar 2017		Apr–Jun 2017		Jul–Sep 2017	
	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Aujeszky's disease	196	0	189	0	0	0	46	0	44	0
Australian bat lyssavirus	0	0	0	0	1	0	0	0	0	0
Avian influenza[a]	0	0	0	0	123	3*	29	0	0	0
Classical swine fever	196	0	189	0	0	0	46	0	44	0
Japanese encephalitis	0	0	45	0	53	3**	60	0	0	0
Surra (*Trypanosoma evansi*)	244	0	207	0	3	0	84	0	76	0

a Excludes testing in wild birds.

* A routine NAQS domestic animal survey was conducted in March 2017 in the Torres Strait Islands. Out of 55 chickens and 5 duck samples collected, 3 chickens and 2 ducks returned positive titres on Influenza A ELISA. These samples were followed up by H5N1 haemagglutination inhibition test for which 3 samples returned positive titres. The NAQS veterinary officer who conducted the survey reported that all animals sampled were clinically healthy but returned in April to perform a follow-up bleed. 51 chickens and 6 ducks within the same area were sampled for further testing during follow-up survey. No signs of clinical sickness was observed during the re-visit and final tests conducted ruled out AI H5N1.

** During the same survey conducted in March, serology on 3 horse samples collected returned positive titres for Japanese encephalitis virus (JEV). Japanese encephalitis circulates seasonally in the islands of Torres Strait, but there is no conclusive evidence of JEV circulation on mainland Australia. No locally-acquired human cases of clinical encephalitis associated with JEV infection have been confirmed in Australia since 1998. Surveillance of the susceptible animal population will continue.

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.[44] 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 17). Fly trapping is conducted at locations suitable for local OWS establishment following a potential incursion; in areas neighbouring livestock export ports and the Northern Peninsula Area (NPA) of Queensland. Table 15 summarises fly trapping events over the past year. No screw-worm flies were detected. Further information on the screw-worm fly program is available on the Animal Health Australia website.[45]

Table 15 Summary of fly-trapping events conducted, 1 October 2016 to 30 September 2017[a]

Risk entry pathway	Conducted by	Oct–Dec 2016	Jan–Mar 2017	Apr–Jun 2017	Jul–Sep 2017
Torres Strait	NAQS	15	15	15	15
Livestock export ports	NT, Qld and WA governments	61	55	54	42

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

Public health

The National Notifiable Diseases Surveillance System (NNDSS) coordinates the national surveillance of more than 50 communicable diseases or disease groups. Unit records of disease notifications made to the state or territory health authority, under the provisions of the public health legislation in their jurisdiction, are supplied daily to the Office of Health Protection, Australian Government Department of Health. The data are published weekly on the NNDSS website[46] and quarterly in the journal Communicable Diseases Intelligence and are replicated in *Animal Health Surveillance Quarterly* (Table 16) for five important zoonoses.

Table 16 National notifications of five zoonotic infections in humans, 1 July 2016 to 30 September 2017

Quarter	Brucellosis[a]	Chlamydia[b]	Leptospirosis	Listeriosis	Q fever
Jul–Sep 2016	6	5	19	13	121
Oct–Dec 2016	6	9	26	21	132
Jan–Mar 2017	2	2	55	22	124
Apr–Jun 2017	6	0	25	20	102
Jul–Sep 2017					
ACT	0	0	0	0	0
NSW	0	2	2	3	37
NT	0	0	0	0	0
Qld	1	1	13	3	43
SA	1	0	0	3	5
Tas.	0	0	0	0	0
Vic.	1	0	10	2	3
WA	0	1	1	2	1
Aus.	**3**	**4**	**26**	**13**	**89**

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'.

44 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 9 November 2017).

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

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

National notifiable animal disease investigations

During the quarter, 861 national notifiable animal disease investigations[47] were conducted into suspect disease events. National notifiable animal diseases include a subset of emergency diseases.[48] Table 17 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.[49]

Table 17 Investigations for national notifiable animal diseases, 1 July to 30 September 2017

Disease	Species	State	Month	Response code[a]	Finding
African swine fever	Pig	NT	Sep	3	Negative
	Pig	WA	Sep	3	Negative
Anaplasmosis in tick-free areas	Cattle	NSW	Sep	2	Negative
	Cattle	WA	Jul	2	Negative
	Cattle	WA	Aug	2	Negative (2 unrelated investigations)
Australian bat lyssavirus[b]	Dog	Qld	Jul	2	Negative
	Dog	Qld	Aug	2	Negative (2 related investigations)
	Horse	Qld	Aug	2	Negative
	Horse	Qld	Sep	2	Negative (4 unrelated investigations)
Babesiosis in tick-free areas	Cattle	NSW	Sep	2	Negative
	Cattle	WA	Jul	2	Negative
	Cattle	WA	Aug	2	Negative (2 unrelated investigations)
	Cattle	WA	Sep	2	Negative (2 unrelated investigations)
Bluetongue — clinical disease	Cattle	SA	Jul	3	Negative
	Sheep	NSW	Aug	2	Negative
	Sheep	Qld	Aug	2	Negative (3 related investigations)
	Sheep	SA	Aug	2	Negative
	Sheep	SA	Sep	2	Negative
	Sheep	Vic.	Aug	2	Negative
	Sheep	Vic.	Sep	2	Negative
	Sheep	WA	Jul	2	Negative (2 unrelated investigations)
	Sheep	WA	Aug	2	Negative
Bovine virus diarrhoea type 2	Cattle	WA	Aug	2	Negative (4 unrelated investigations)
Brucella abortus (excl. cattle)	Cat	Qld	Aug	3	Negative

Cont

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

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

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

Disease	Species	State	Month	Response code[a]	Finding
Brucella canis	Cat	Qld	Aug	3	Negative
	Dog	Qld	Aug	3	Negative
Brucella melitensis	Cat	Qld	Aug	3	Negative
	Goat	SA	Aug	2	Negative
Brucella suis	Cat	Qld	Aug	3	Negative
	Dog	ACT	Jul	2	Negative
	Dog	NSW	Jul	2	Negative (36 unrelated investigations)
	Dog	NSW	Jul	2	Positive (6 unrelated investigations)
	Dog	NSW	Aug	2	Negative (50 unrelated investigations)
	Dog	NSW	Aug	2	Positive (9 unrelated investigations)
	Dog	NSW	Aug	3	Negative
	Dog	NSW	Sep	2	Negative (21 unrelated investigations)
	Dog	NSW	Sep	2	Positive (6 unrelated investigations)
	Dog	Qld	Jul	2	Negative (8 unrelated investigations)
	Dog	Qld	Jul	2	Positive (2 unrelated investigations)
	Dog	Qld	Aug	2	Negative (2 related investigations)
	Dog	Qld	Aug	2	Negative (10 unrelated investigations)
	Dog	Qld	Aug	2	Positive
	Dog	Qld	Sep	2	Negative (10 unrelated investigations)
	Dog	Qld	Sep	2	Positive (2 unrelated investigations)
	Dog	Vic.	Aug	3	Negative
	Dog	Vic.	Sep	3	Negative (2 unrelated investigations)
	Pig	NT	Sep	3	Negative
	Pig	Qld	Aug	2	Negative (2 unrelated investigations)
	Pig	WA	Sep	2	Negative
	Sheep	Qld	Jul	2	Negative
Contagious agalactia	Sheep	WA	Jul	2	Negative
	Sheep	WA	Aug	2	Negative (2 unrelated investigations)
Enzootic bovine leucosis	Cattle	NSW	Sep	2	Negative
Equine encephalomyelitis (Eastern, Western and Venezuelan)	Horse	WA	Sep	3	Negative (3 unrelated investigations)
Equine piroplasmosis (*Babesia equi, B. caballi* and *Theileria equi*)	Horse	Vic.	Jul	3	Negative
Foot-and-mouth disease	Cattle	NSW	Aug	3	Negative (2 related investigations)
	Cattle	NSW	Aug	3	Negative (3 unrelated investigations)
	Cattle	NSW	Sep	3	Negative (3 unrelated investigations)
	Cattle	NT	Jul	3	Negative
	Cattle	NT	Aug	2	Negative
	Cattle	NT	Aug	3	Negative

Cont

Disease	Species	State	Month	Response code[a]	Finding
	Cattle	Vic.	Jul	3	Negative (4 unrelated investigations)
	Cattle	Vic.	Aug	3	Negative (2 unrelated investigations)
	Pig	NSW	Aug	3	Negative
	Pig	WA	Aug	3	Negative (2 unrelated investigations)
	Sheep	SA	Aug	3	Negative
	Sheep	SA	Sep	3	Negative
	Sheep	Vic.	Aug	3	Negative (2 unrelated investigations)
	Sheep	WA	Jul	3	Negative
	Sheep	WA	Aug	3	Negative
Haemorrhagic septicaemia	Cattle	NT	Aug	3	Negative
	Sheep	WA	Sep	2	Negative
Infection of bees with *Melissococcus plutonius* (European foulbrood)	Bees	NSW	Sep	2	Positive
	Bees	Qld	Jul	2	Negative (11 unrelated investigations)
	Bees	Qld	Jul	2	Positive (2 unrelated investigations)
	Bees	Qld	Aug	2	Negative (19 unrelated investigations)
	Bees	Qld	Aug	2	Positive
	Bees	Qld	Sep	2	Negative (36 unrelated investigations)
	Bees	Qld	Sep	2	Positive (8 unrelated investigations)
	Bees	SA	Aug	2	Negative
	Bees	SA	Sep	2	Negative
Infection of bees with Paenibacillus larvae (American foulbrood)	Bees	NSW	Aug	2	Positive
	Bees	NSW	Sep	2	Positive (2 unrelated investigations)
	Bees	Qld	Jul	2	Negative (5 unrelated investigations)
	Bees	Qld	Jul	2	Positive (8 unrelated investigations)
	Bees	Qld	Aug	2	Negative (8 unrelated investigations)
	Bees	Qld	Aug	2	Positive (12 unrelated investigations)
	Bees	Qld	Sep	2	Negative (19 unrelated investigations)
	Bees	Qld	Sep	2	Positive (25 unrelated investigations)
	Bees	SA	Jul	2	Negative (9 unrelated investigations)
	Bees	SA	Jul	2	Positive (4 unrelated investigations)
	Bees	SA	Aug	2	Positive
	Bees	SA	Aug	2	Negative (8 unrelated investigations)
	Bees	SA	Aug	2	Positive
	Bees	SA	Sep	2	Negative
	Bees	SA	Sep	2	Negative (7 unrelated investigations)
	Bees	SA	Sep	2	Positive (3 unrelated investigations)
Infection with Aujezsky's disease virus	Pig	Qld	Sep	3	Negative
Infection with Borna disease virus	Sheep	WA	Jul	3	Negative

Cont

Disease	Species	State	Month	Response code[a]	Finding
Infection with Bungowannah virus (porcine myocarditis)	Pig	WA	Jul	2	Negative
Infection with *Chlamydophila abortus* (enzootic abortion of ewes, ovine chlamydiosis)	Sheep	WA	Jul	2	Negative
	Sheep	WA	Aug	2	Negative
Infection with classical swine fever virus	Pig	NT	Sep	3	Negative
	Pig	WA	Jul	2	Negative (5 unrelated investigations)
	Pig	WA	Jul	3	Negative
	Pig	WA	Aug	2	Negative
	Pig	WA	Sep	2	Negative (2 unrelated investigations)
	Pig	WA	Sep	3	Negative
Infection with Hendra virus	Dog	NSW	Aug	2	Negative
	Dog	NSW	Aug	3	Negative (3 related investigations)
	Horse	NSW	Jul	2	Negative (36 unrelated investigations)
	Horse	NSW	Jul	3	Positive
	Horse	NSW	Aug	2	Negative (37 unrelated investigations)
	Horse	NSW	Aug	3	Negative
	Horse	NSW	Aug	3	Positive (2 unrelated investigations)
	Horse	NSW	Sep	2	Negative (14 unrelated investigations)
	Horse	NT	Aug	2	Negative
	Horse	NT	Sep	2	Negative
	Horse	Qld	Jul	2	Negative (55 unrelated investigations)
	Horse	Qld	Aug	2	Negative (71 unrelated investigations)
	Horse	Qld	Sep	2	Negative (40 unrelated investigations)
	Horse	Tas.	Jul	3	Negative
	Horse	Vic.	Jul	3	Negative (3 unrelated investigations)
	Horse	WA	Jul	3	Negative
	Pig	Qld	Sep	3	Negative
Infection with influenza A viruses in swine	Pig	Vic.	Jul	2	Negative
	Pig	Vic.	Jul	3	Positive
	Pig	WA	Jul	2	Negative (3 unrelated investigations)
	Pig	WA	Jul	3	Positive
	Pig	WA	Aug	2	Negative
Infection with *Mycoplasma mycoides* subsp. *mycoides* SC (contagious bovine pleuropneumonia)	Cattle	NT	Aug	3	Negative (2 unrelated investigations)
	Cattle	WA	Jul	2	Negative
	Cattle	WA	Aug	2	Negative
	Cattle	WA	Sep	2	Negative

Cont

Disease	Species	State	Month	Response code[a]	Finding
Infection with porcine epidemic diarrhoea virus	Pig	Qld	Jul	3	Negative (2 unrelated investigations)
	Pig	WA	Jul	3	Negative
	Pig	WA	Sep	2	Negative
Infection with *Salmonella abortus-equi*	Horse	WA	Sep	2	Negative
Infection with swine vesicular disease virus	Pig	WA	Aug	3	Negative
Infection with Taenia saginata (*Cysticercus bovis*)	Cattle	Vic.	Jul	2	Positive
Infection with *Theileria parva* (East Coast fever) or *T. annulata* (Mediterranean theileriosis)	Cattle	NSW	Sep	2	Negative
	Cattle	WA	Jul	2	Negative
Infection with vesicular stomatitis virus	Cattle	NSW	Aug	3	Negative (2 unrelated investigations)
	Cattle	NSW	Aug	3	Negative (3 unrelated investigations)
	Cattle	NSW	Sep	3	Negative (3 unrelated investigations)
	Cattle	NT	Jul	3	Negative (2 unrelated investigations)
	Cattle	NT	Aug	3	Negative
	Cattle	Vic.	Jul	3	Negative (4 unrelated investigations)
	Cattle	Vic.	Aug	3	Negative (2 unrelated investigations)
	Pig	NSW	Aug	3	Negative
	Pig	WA	Aug	3	Negative
	Sheep	SA	Aug	3	Negative
	Sheep	SA	Sep	3	Negative
	Sheep	Vic.	Aug	3	Negative (2 unrelated investigations)
	Sheep	WA	Jul	3	Negative
	Sheep	WA	Aug	3	Negative
Infestation of bees with *Varroa destructor* or *V. jacobsoni* (varroosis)	Bees	Vic.	Sep	2	Negative (2 unrelated investigations)
	Bees	Vic.	Sep	3	Negative
Japanese encephalitis	Sheep	WA	Jul	3	Negative
Leishmaniosis of any species	Dog	Qld	Sep	3	Negative
	Dog	Tas.	Aug	3	Negative
Louping ill	Sheep	WA	Jul	3	Negative (2 unrelated investigations)
Lumpy skin disease	Cattle	SA	Sep	3	Negative
Nipah virus infection	Pig	Qld	Sep	3	Negative

Cont

Disease	Species	State	Month	Response code[a]	Finding
Paratuberculosis — Johne's disease	Alpaca	Vic.	Aug	2	Negative
	Alpaca	Vic.	Sep	2	Negative
	Camel	Qld	Aug	2	Negative
	Camel	Vic.	Aug	2	Positive
	Cattle	NSW	Jul	2	Negative (2 unrelated investigations)
	Cattle	Qld	Jul	2	Negative
	Cattle	Vic.	Jul	2	Negative (2 unrelated investigations)
	Cattle	Vic.	Jul	3	Negative (2 unrelated investigations)
	Cattle	Vic.	Aug	2	Negative (2 unrelated investigations)
	Cattle	Vic.	Sep	2	Negative
	Cattle	Vic.	Sep	2	Positive
	Cattle	WA	Jul	2	Negative (2 unrelated investigations)
	Cattle	WA	Aug	2	Negative (5 unrelated investigations)
	Cattle	WA	Sep	2	Negative
	Goat	WA	Aug	2	Negative
	Goat	WA	Sep	2	Negative
	Sheep	NSW	Jul	2	Negative
	Sheep	NSW	Aug	2	Negative
	Sheep	NSW	Sep	2	Positive
	Sheep	Vic.	Aug	2	Negative (2 unrelated investigations)
	Sheep	Vic.	Aug	2	Positive
	Sheep	Vic.	Sep	2	Positive
	Sheep	WA	Jul	2	Negative (3 unrelated investigations)
	Sheep	WA	Jul	2	Positive
	Sheep	WA	Aug	2	Negative (4 unrelated investigations)
	Sheep	WA	Sep	2	Negative (3 unrelated investigations)
Porcine reproductive and respiratory syndrome	Pig	WA	Jul	2	Negative
	Pig	WA	Aug	3	Negative
Post-weaning multi-systemic wasting syndrome	Pig	WA	Aug	3	Negative
Salmonellosis (*Salmonella abortus-ovis*)	Sheep	Vic.	Jul	2	Negative (3 unrelated investigations)
	Sheep	Vic.	Aug	2	Negative (3 unrelated investigations)
	Sheep	Vic.	Sep	2	Negative
	Sheep	WA	Jul	2	Negative
	Sheep	WA	Aug	2	Negative
Screw-worm fly — New World (*Cochliomyia hominivorax*)	Cattle	NT	Aug	2	Negative
	Primate	Qld	Aug	2	Negative
Screw-worm fly — Old World (*Chrysomya bezziana*)	Cattle	NT	Aug	2	Negative
	Primate	Qld	Aug	2	Negative
Sheep pox and goat pox	Sheep	WA	Jul	2	Negative

Cont

Disease	Species	State	Month	Response code[a]	Finding
Surra (*Trypanosoma evansi*)	Cattle	NT	Jul	3	Negative (2 unrelated investigations)
Transmissible gastroenteritis	Pig	Qld	Jul	3	Negative (2 unrelated investigations)
	Pig	WA	Jul	3	Negative
	Pig	WA	Aug	2	Negative
	Pig	WA	Sep	2	Negative
Transmissible spongiform encephalopathies (bovine spongiform encephalopathy, chronic wasting disease of deer, feline spongiform encephalopathy, scrapie)	Mouse	Vic.	Jul	3	Negative
Trypanosomosis (tsetse fly associated)	Cattle	NT	Jul	3	Negative
Tuberculosis (*Mycobacterium bovis*)	Cattle	WA	Jul	2	Negative
West Nile virus infection — clinical	Horse	Qld	Sep	3	Negative
	Horse	WA	Sep	3	Negative (3 unrelated investigations)
	Pig	Qld	Sep	3	Negative

a Key to response codes
1 = Field investigation by government officer
2 = Investigation by state or territory government veterinary laboratory
3 = Specimens sent to the CSIRO Australian Animal Health Laboratory (or CSIRO Entomology)
4 = Specimens sent to reference laboratories overseas
5 = Regulatory action taken (biosecurity or police officers)
6 = Alert or standby
7 = Eradication

b 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 1040 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.

Name	Role	Phone	Email
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Tiggy Grillo	Wildlife Health Australia	02 9960 7444	TGrillo@wildlifehealthaustralia.com.au
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Mark Trungove	National Notifiable Diseases Surveillance System	02 6289 8315	Mark.Trungove@health.gov.au
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