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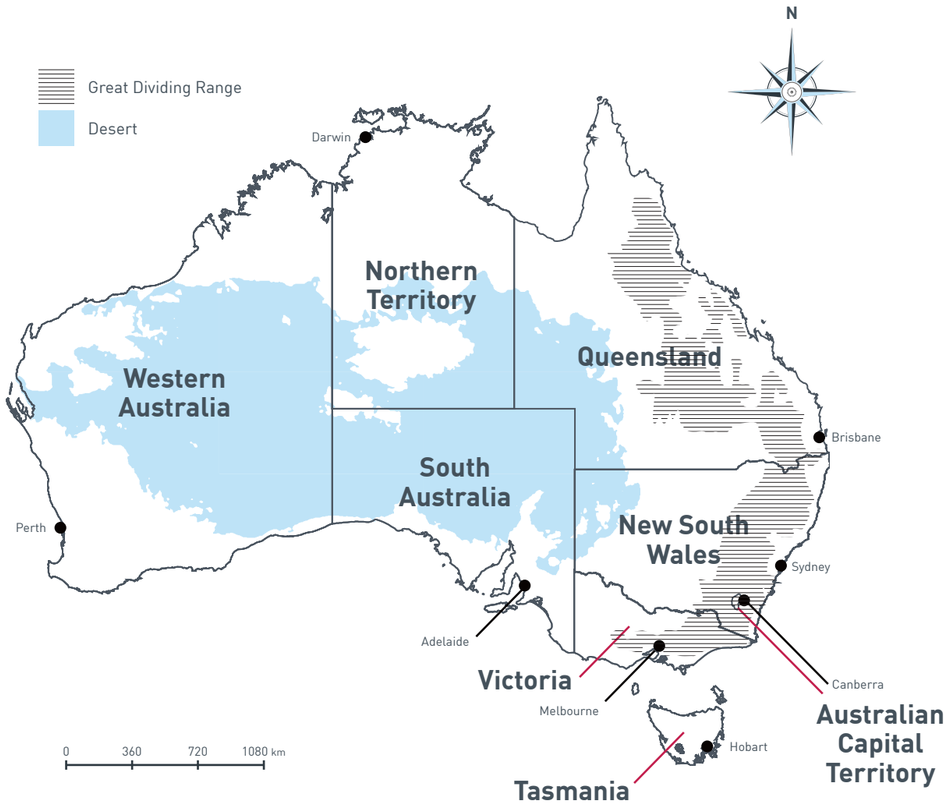
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FOREWORD

Welcome to the 2018 *Animal Health in Australia* report. This is the 26th edition in the *Animal Health in Australia* series – an annual summary of Australia's animal health system and status. This report provides information on significant terrestrial and aquatic animal diseases, and outlines the governance, surveillance, emergency management, animal welfare, food safety and international trade arrangements that support our animal health system. It highlights Australia's contribution to regional animal health activities and the key animal health research and development activities in Australia during the 2018 calendar year.

In May 2018, I was elected President of the World Organisation for Animal Health (OIE) World Assembly at the OIE General Session, a role which I will hold for three years. The presidency role provides an opportunity for Australia to contribute to and strengthen the intergovernmental organisation for improving animal health worldwide. I have already had the privilege of undertaking several engagements, including the conferences of the OIE Regional Commission for the Americas and for Europe, and collaborating with Chief Veterinary Officers from these regions on important animal health issues.

Throughout my term I intend to focus on improving engagement and participation in the development and implementation of international animal health and welfare standards; ensuring strong governance to maintain and protect the integrity and effectiveness of the OIE; and influencing global discussions so that animal health has a strong, coordinated voice – especially on issues such as antimicrobial resistance (AMR).

AMR remains a serious and long-term threat to human and animal health in Australia and around the world. Throughout 2018, a focus group worked to finalise the *Australian animal sector national antimicrobial resistance plan 2018* to align with and support the *National antimicrobial resistance strategy 2015–2019*. The animal-sector plan will also support Australia's second National antimicrobial resistance strategy and the One Health approach.

In November 2018, the first Australian Veterinary Antimicrobial Stewardship Conference was held on the Sunshine Coast and attracted global interest from veterinary, research, government, industry, producer and university stakeholders. The conference was an opportunity to showcase veterinary antimicrobial stewardship initiatives under way in Australia; identify collaboration opportunities on these initiatives; and address barriers that might impede progress to further strengthen antimicrobial stewardship efforts. I look forward to seeing this vital work progress.

Throughout 2018, we continued to focus on cross-sectoral approaches. The report from the World Health Organization's year-long Joint External Evaluation of Australia's implementation of International Health Regulations was published, recognising the strengths of Australia's animal and human health systems and making a number of recommendations. In collaboration with the Australian Government Department of Health, the recommendations were used to develop *Australia's national action plan for health security 2019–2023*.

We continued to review our animal health system to ensure its ongoing effectiveness amid evolving challenges. To complement the 2015 OIE Performance of Veterinary Services (PVS) evaluation of Australia, each state and territory participated in a PVS evaluation of their jurisdiction's animal health system. The

jurisdiction evaluations will be used by states and territories to identify areas where more focus is required, so resources and effort are directed to where they are needed most.

In 2018 we saw an increase in the distribution of African swine fever (ASF) into Western Europe and parts of Asia, including China. Australia has undertaken additional activities to ensure its biosecurity measures continue to protect our agriculture industries. This has included updating our science-based import conditions for porcine commodities, and increased surveillance at the border. Australia is also supporting East Timor and Papua New Guinea to raise awareness and improve their ability to detect this devastating disease. The global ASF situation remains challenging, and Australia is well placed to perform the roles essential to disease management: active monitoring, communication and collaboration.

Strong import and inspection requirements and an engaged and informed importer community have kept Australia free from exotic animal diseases in 2018. Industry and governments, working collaboratively with researchers and producers, have continued to improve on-farm biosecurity practices, traceability and sustainability in our animal industries.

This report is a valuable resource for both domestic and international audiences and I express my sincere thanks to our stakeholders for their cooperative efforts in preparing it.

Dr. Mark Schipp
Australian Chief Veterinary Officer

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OVERVIEW

Australia's animal health system relies on the government agencies, commercial companies, organisations, universities and individuals underpinning animal health and the livestock production chain. Together, they maintain Australia's high standard of animal health.

This report is a comprehensive summary of the status of Australia's animal health and the system that maintains it. It includes insights into ongoing programs, nationally significant terrestrial and aquatic animal diseases, and initiatives undertaken during 2018.

Organisation of the animal health system

Australia has strong, well established veterinary services that are founded on the principles of there being 'shared responsibility' among stakeholders for biosecurity. Stable arrangements are in place to ensure national coordination and collaboration on matters relating to animal health. Governments, industry bodies, producers and other stakeholders are committed to maintaining Australia's favourable animal health status, and recognise the resulting benefits.

Australia performs ongoing reviews of its animal health systems to ensure their continued strength amid evolving animal health risks. In 2018, an intergovernmental response to the report *Priorities for Australia's biosecurity system* was released and, separately, evaluations of the Performance of Veterinary Services of the states and territories were completed. Australia continues its history of being an active participant in the global animal health community, and providing leadership through the World Organisation for Animal Health (OIE).

Terrestrial animal health status

The status of the following diseases was notable in 2018.

The first occurrence of a strain of bluetongue virus (BTV) was identified in 2018 in archived samples from 2006 and 2014. Identification was completed using whole genome sequencing. This strain was serotyped as BTV-4, which had not previously been detected in Australia. The archived samples had been collected from sentinel cattle herds in the Northern Territory as part of routine surveillance sampling for the National Arbovirus Monitoring Program.

Australia made no immediate notifications to the OIE in 2018, the first time this has occurred since 2010. The identification of nationally notifiable diseases and the occurrence of new strains of disease demonstrate that Australia's animal health surveillance and reporting systems continue to function effectively.

Terrestrial animal disease surveillance and control programs

The **Agricultural Competitiveness White Paper** is funding projects focused on improving Australia's animal health, aquatic animal health and onshore surveillance for marine pests. Along with other projects supporting aquatic animal health and marine pest surveillance activities, some examples of terrestrial animal health surveillance activities supported by the 2017–18 White Paper funding included:

- enhancing the Laboratories for Emergency Animal Disease Diagnosis and Response network quality assurance (QA) program, with a focus on a test for influenza A antibodies
- evaluating exposure risk to, and incursions of, highly pathogenic avian influenza (HPAI) from Asia
- continuing the Australian Livestock Industry Health Studies project, a trial of a new approach to surveillance in the grass-fed cattle sector.

In 2018, Australia continued surveillance activities that demonstrated ongoing freedom from bovine brucellosis, bovine tuberculosis, equine influenza, HPAI and virulent Newcastle disease.

Wildlife Health Australia administers Australia's general wildlife health surveillance system. In 2018, a total of 772 wildlife disease investigation events were added to the national database. Approximately 40% of these events were related to bats (mostly exclusion testing for Australian bat lyssavirus); events related to birds accounted for a further 37% of investigations reported; and a further 13% related to marsupials.

In 2018, Australia confirmed it was free from significant exotic bee pests, such as *Varroa destructor*, through targeted surveillance activities at high-risk locations at Australia's airports and seaports. Over 14 600 data records were generated through multiple targeted surveillance activities.

Under the Northern Australia Quarantine Strategy, surveys of wild and domestic animal health across northern Australia and the Torres Strait were conducted in zones defined by risk profiles, to detect changes in the health status of target host populations. These surveys tested for specific

diseases (foot-and-mouth disease [FMD], classical swine fever, Aujeszky's disease and HPAI). They provided valuable observations of large groups of animals, and had the added benefit of engaging relevant stakeholders and increasing biosecurity awareness. No exotic diseases were detected in these surveys during 2018.

Managing terrestrial animal health emergencies

There were several outbreaks of anthrax in New South Wales, Queensland and Victoria in 2018. For each outbreak, control measures were implemented using the agreed national response policy. The disease did not spread beyond the affected properties. In 2018, there was one incident of Hendra virus infection reported in New South Wales. This incident was managed with well established biosecurity and public health responses.

A range of EAD preparedness activities were conducted in 2018, including four real-time FMD training courses in Nepal (where FMD is present) and one online FMD emergency preparation course. To date, 273 Australians have completed real-time training and 258 Australians have participated in the online course.

The Biosecurity Emergency Response Training Australia (BERTA) project continued, with training personnel gaining certificate III units in biosecurity emergency response qualifications. BERTA materials are expected to be complete in the first half of 2019.

In 2018, AHA conducted the following training activities: six workshops for livestock industry personnel to prepare them to work in the liaison function in an emergency animal disease (EAD) response; twice-yearly workshops for industry executives, technical specialists and senior government officers to prepare them to participate in the National Management Group (NMG) and the Consultative Committee on Emergency Animal Diseases (CCEAD); and collaboration with consultants to deliver additional CCEAD and NMG training to requesting jurisdictions.

Three updated components of AUSVETPLAN (the Australian Veterinary Emergency Plan) were published (the *AUSVETPLAN Overview*, the response policy brief for *Influenza A viruses in swine*, and the *Control centres management manual Part 1 and Part 2*).

Over 260 National Biosecurity Response Team members participated in Exercise Border Bridge in March 2018 (simulating a response to an outbreak of lumpy skin disease and an incursion of giant African snail simultaneously in Queensland and New South Wales), and mentors participated in a mentoring workshop in October 2018.

In January and February 2018, Exercise Dragonglass tested simulated supply and distribution of FMD vaccine and vaccination equipment from suppliers to a vaccine centre in Queensland. As a follow-up activity, Exercise Obsidian tested simulated supply and distribution of FMD vaccine and vaccination equipment from a vaccine centre in Queensland to the farm gate.

Exercise Judas (an incident management team exercise for Australian Pork Limited) was held in May 2018. In 2017–18, as part of monitoring compliance with Australia's swill-feeding legislation, there were 365 industry audits within the Australian Pork Industry Quality Assurance Program and 187 government inspections of piggeries, with no major incidents of swill feeding found.

Aquatic animal health

The response to the white spot disease event in prawns in southwest Queensland, which began in late November 2016, continues to be led by Biosecurity Queensland. Three farms in the Logan River area returned to prawn production in 2018. A national survey for white spot syndrome virus identified sampling sites around Australia based on an assessment of risk factors, and these sites were surveyed in 2018. The cause of the outbreak is yet to be determined.

AQUAPLAN 2014–2019, Australia's third national strategic plan for aquatic animal health, is in its final year. In 2018, significant achievements included endorsement and publication of the *National biosecurity plan guidelines for the land-based abalone industry* and *National biosecurity plan guidelines for Australian oyster hatcheries*, and further development of industry–government response arrangements for emergency aquatic animal diseases.

Nine projects funded under the **Agricultural Competitiveness White Paper** are well advanced and near completion. These include seven onshore projects involving modern diagnostics: validation of molecular tests for several aquatic diseases; national surveillance for megalocytiviruses; Neptune (a database of Australian aquatic animal pathogens and diseases); active disease surveillance for southern aquatic animal industry sectors; review of Australia's passive surveillance system for aquatic animal diseases; update of the *Aquatic animal diseases significant to Australia: identification field guide 5th edition*; and development of a national marine pest reference collection. Also included are two offshore projects: Asia–Pacific laboratory proficiency testing for aquatic animal diseases; and Indian Ocean Territories and Ashmore Reef marine pest surveillance.

Aquatic animal welfare remained a priority research area in 2018, and the next version of the Aquatic EAD Response Agreement is in negotiation and is intended to form the basis of formal agreement and ratification among prospective parties.

Livestock traceability, biosecurity and quality assurance programs

The National Livestock Identification System (NLIS) is Australia's system for livestock identification and traceability for all cattle, goats, pigs and sheep. NLIS is a permanent, whole-of-life system which tracks animals from property of birth to slaughter, for the purposes of food safety, product integrity and market access. NLIS enhances Australia's ability to track livestock during disease and food safety incidents. It reflects Australia's commitment to biosecurity and food safety and provides a competitive advantage in a global market. Australia's state and territory governments are responsible for the legislation that governs animal movements and implementation of NLIS.

Through the Farm Biosecurity program, research was commissioned to investigate how consultants viewed and promoted on-farm biosecurity. The results of this research will be used to ensure farm consultants are equipped with appropriate information, tools and resources. A follow-up survey of mixed grain and livestock producers indicated a greater awareness and uptake of on-farm biosecurity measures compared to the same group of producers in the 2017 survey. This signals success for several industry initiatives which promoted on-farm biosecurity and highlighted flow-on effects for enterprises producing more than one commodity.

QA and integrity programs promote animal health and biosecurity to minimise the impact of pests and disease and are important for food safety, product traceability and consumer confidence.

Animal health laboratories

Animal health laboratories in Australia are an integral part of the national animal health system and play a crucial role in disease preparedness and response. There is a network of world-class animal health laboratories throughout Australia, with the Commonwealth and state and territory governments, universities and the private sector all playing important roles. These laboratories undertake surveillance, diagnostic, QA and research work for endemic and/or EADs, including exotic and zoonotic diseases. CSIRO's Australian Animal Health Laboratory operates as the national laboratory.

Animal health laboratory functions underpin national and international trade along with market access for animals and animal products. They also help safeguard animal and public health in Australia. They have evolved over many years to meet various challenges, especially those associated with disease situations, technological advances, standards requirements, changing policy landscapes, operating environments and relevant socioeconomic issues. Chapter 7 highlights the national animal health laboratory structures, responsibilities, functions, programs and developments.

Research and development

CSIRO, Australia's universities, industry-based research and development corporations, and the Cooperative Research Centres (whose activities are being transferred to other bodies on 30 June 2019) all have active research programs in animal health, production and welfare.

Particular highlights in this area from 2018 include:

- The National Animal Biosecurity Research, Development and Extension Strategy was endorsed in August 2018, with the aim of underpinning the productivity, growth, competitiveness and sustainability of Australia's livestock industries and their access to markets.
- Australia's FMD vaccine bank will provide sufficient protection against internationally circulating FMD strains. Building of the SPREAD application is underway, to enable prediction of FMD virus spread between farms by wind.

Trade

Australia has been a member of the World Trade Organization (WTO) since 1995 and is a signatory to the Agreement on the Application of Sanitary and Phytosanitary Measures.

The Australian Government supports comprehensive free trade agreements (FTAs) that are consistent with the WTO rules and guidelines and which complement and reinforce the multilateral trading system. FTAs with key trading partners, including China, are reducing tariffs over time and increasing certainty of access to markets for Australian exporters. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership is a new FTA between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. It came into effect on 30 December 2018 for the first six countries, including Australia, that ratified the Agreement.

The expansion of the overseas personnel network of the Department of Agriculture and Water Resources takes the total to 22 counsellors in Asia, Europe, the Middle East and North and South America. Overseas officers work on distortions in international trade, market access, targeted technical assistance and agricultural cooperation, and international agricultural standards.

In 2018, the Department of Agriculture and Water Resources negotiated animal health requirements for the export of live animals and their genetic material to 36 countries. Under the *Export Control Act 1982* (Cwlth), the Department is responsible for regulatory oversight of listed prescribed animal and plant products. The Department also regulates the import of biological goods, live animals and reproductive material into Australia, under the *Biosecurity Act 2015* (Cwlth).

The National Residue Survey within the Department of Agriculture and Water Resources monitors the levels of residues in Australian animal and plant food products. In 2018, a high degree of compliance with Australian standards was shown. In 2018, the Department hosted successful audits and inspections of animal health and food safety systems conducted by delegates from Egypt, Indonesia and the United States of America.

As part of a wider initiative to strengthen agricultural exports and market access, the Department of Agriculture and Water Resources is improving the current agricultural export legislative framework, with the *Export Control Bill 2017* (Cwlth) currently before the Senate.

The Department is also conducting an operational review of import conditions on the Biosecurity Import Conditions database.

The Department also undertakes risk analyses in response to market access requests from other countries or proposals from Australian importers for new imports. In 2018, reviews for animal biosecurity included import risk for psittacine birds, prawns and prawn products, cooked duck meat from Thailand, and high-pressure processing as a risk-management measure for the importation of chicken meat.

Phase 2 construction of the Mickleham post-entry quarantine facility was finalised at the end of 2017, with delivery of a purpose-built facility for camelid and ruminant imports, additional capacity for cats and dogs, and completion and testing of the high-containment avian compound. Avian operations at Mickleham are scheduled to begin in 2019, and the avian facilities in Spotswood, Victoria and Torrens Island, South Australia will then be decommissioned.

Animal welfare

Welfare is a key priority for Australian animal industries because it contributes to productivity, profitability, sustainability, consumer acceptance of products and market access for industry.

In 2018, changes to regulation of the live animal export trade took place, including an independent review and the subsequent appointment of an external, independent Inspector General of Live Animal Exports.

States and territories made significant amendments to animal welfare legislation, regulation and overarching action plans in 2018.

Key animal welfare initiatives in 2018 included improving industry animal health and welfare management practices, providing recognised training, implementing animal welfare standards and guidelines, improved monitoring and traceability and research, development and extension for on-farm welfare issues.

One Health

Three proof-of-concept antimicrobial resistance (AMR) surveillance projects in the pig, chicken meat and layer chicken industries were completed in mid-2018. No resistance to colistin was found in these surveys. Discussions between the Department of Agriculture and Water Resources and other intensive animal industries are expected to develop further AMR surveillance activities.

A compendium report to capture the historical and current antimicrobial stewardship efforts of Australian livestock industries was released in November 2018.

Antibiotic Awareness Week was recognised by the Australian Chief Veterinary Officer (and current President of the OIE World Assembly) when he opened the inaugural Australian Veterinary Antimicrobial Stewardship Conference 2018, and by the release of a joint communiqué with the Australian Government Department of Health about taking simple actions to reduce the threat of antibiotic resistance.

The Department of Health and the Department of Agriculture and Water Resources have begun work on a National Action Plan for Health Security to address the recommendations arising from Australia's Joint External Evaluation of the International Health Regulations (2005).

In November 2018, the Communicable Diseases Network Australia (CDNA) published national guidelines to assist with public health management of Q fever cases.

Consumer protection – food

The Australian and New Zealand joint food regulation system remains strong, and is based on scientific evidence and expertise to protect the health and safety of consumers. It is a complex system that involves all levels of the Australian and New Zealand governments. Different roles are met by local, state and national governments, and international obligations are respected.

Members of the food regulation system routinely audit, inspect and monitor the food supply to ensure its safety for consumers. Good hygienic practices and food safety systems, based on the principles of hazard analysis and critical control points (HACCP), are used to ensure that meat, dairy, seafood, eggs and the products derived from these commodities are safe for human consumption.

Food Standards Australia New Zealand (FSANZ) has a key role in ensuring the safety of Australian foods, including developing food standards, assessing food-related health risks, setting and monitoring levels of contaminants in foods, coordinating national response activities and undertaking risk assessment and risk analysis. FSANZ also collaborates with a range of international agencies responsible for food standards, guidelines, codes of practice and other recommendations relating to food.

Regional animal health initiatives

The Australian Government undertakes a range of surveillance and capacity-building activities in near neighbour countries to get a better understanding of potential threats and assist those countries with managing animal health and preventing exotic disease incursions. These activities contribute to Australia's preparedness for EAD incursions and help maintain our most favourable animal health status.

In addition to the direct activities of the Department of Agriculture and Water Resources, other government departments undertake activities in the region aimed at strengthening animal health systems.

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1

ORGANISATION OF THE ANIMAL HEALTH SYSTEM

This introductory chapter describes the organisation of Australia's animal health system, including the roles of government and non-government organisations.

Effective national surveillance and control of animal diseases in Australia relies on cooperative partnerships among government agencies, organisations, commercial companies and individuals involved in animal industries. Australia's animal health system is comprised of all organisations – including government agencies, commercial companies and universities – and individuals involved in animal health and the livestock production chain.

The Australian Government advises on and assists with the coordination of national animal health policy. It is responsible for international animal health matters, including biosecurity, export certification and trade, and reporting to the World Organisation for Animal Health (OIE). Under the Australian Constitution, individual state and territory governments are responsible for animal health matters within their boundaries. Such matters include disease surveillance and control, emergency preparedness and response, chemical residues in animal products, livestock identification and traceability, and animal welfare. National coordination for animal health matters is supported through the Animal Health Committee (AHC) (see Section 1.1.1).

Australian governments have close association with livestock industries. This association supports consultation and collaboration to advance national animal health priorities. The livestock industries are active partners in policy development, supporting targeted animal health activities and contributing to veterinary emergency responses. Australia's livestock industries are outlined in Appendix A.

Links are maintained with human health agencies as part of a One Health approach, particularly for zoonoses (diseases that are transmissible between animals and humans) and antimicrobial resistance (see Chapter 11) and food safety issues (see Chapter 12). Links are also maintained with environmental agencies, particularly for wildlife health (see Section 1.1.2).

More than 16 000 veterinarians and other personnel are directly involved in animal health services in Australia (Table 1.1).

1.1 Consultative committees, organisations and partnerships

1.1.1 Australian Government committees

Consultative committees ensure that all components of the animal[1] health system work together to serve the interests of Australia. The committees advise and support senior national departmental and ministerial forums – that is, the Agriculture Senior Officials' Committee (AGSOC) and the Agriculture Ministers' Forum (AGMIN), respectively. Figure 1.1 illustrates the structure of the government animal health management committees and organisations in Australia.

National Biosecurity Committee

The National Biosecurity Committee (NBC) provides strategic leadership across state and territory governments to develop and oversee implementation of national approaches and policies for emerging and ongoing biosecurity matters. NBC membership comprises senior officials from the Australian, state, territory and New Zealand governments, with Animal Health Australia (AHA) and Plant Health Australia (PHA) included as observers. In 2018, the NBC was supported by two expert groups (National Biosecurity Emergency Preparedness Expert Group and the National Biosecurity Information Governance Expert Group, with the latter disbanding in October 2018 following the signing of national data-sharing protocols) and four sectoral committees (AHC, Environment and Invasives

Table 1.1 Veterinarians and other animal health personnel in Australia, 2018

Registered veterinarians		Auxiliary personnel	
Government	785	Stock inspectors, meat inspectors, etc	2464
Laboratories, universities, etc	988		
Private practitioners	10 574		
Other veterinarians	1632		
Total	**13 979**	**Total**	**2464**

1 Both terrestrial and aquatic animals.

Committee, Marine Pest Sectoral Committee and Plant Health Committee). AHC is the key government committee focusing on national animal health issues.

NBC advises agriculture senior officials and ministers on progress in implementing the Intergovernmental Agreement on Biosecurity (IGAB).[2] The IGAB came into effect in January 2012 and was reviewed as part of a broader independent review of the national biosecurity system that reported in 2017. In 2018, NBC prioritised developing a national response to the review, including a revised IGAB (IGAB2). The national response was agreed by all governments in November 2018 (see Section 1.4). Shortly after this, NBC provided IGAB2, which will continue to be an agreement between first ministers, for agriculture ministers' agreement.

Animal Health Committee

AHC[3] provides the Australian, state and territory governments with nationally coordinated scientific advice on animal health issues through NBC and AGSOC. AHC leads the development of government policies, programs, operational strategies and standards in national animal health, animal biosecurity and veterinary public health.

AHC members comprise the Australian, state and territory chief veterinary officers (CVOs), and the director of CSIRO's Australian Animal Health Laboratory (AAHL).

AHC observers are AHA, Wildlife Health Australia (WHA), the Australian Government Department of Environment and Energy and the Australian Government Department of Health. There is also participation from the New Zealand government on relevant matters.

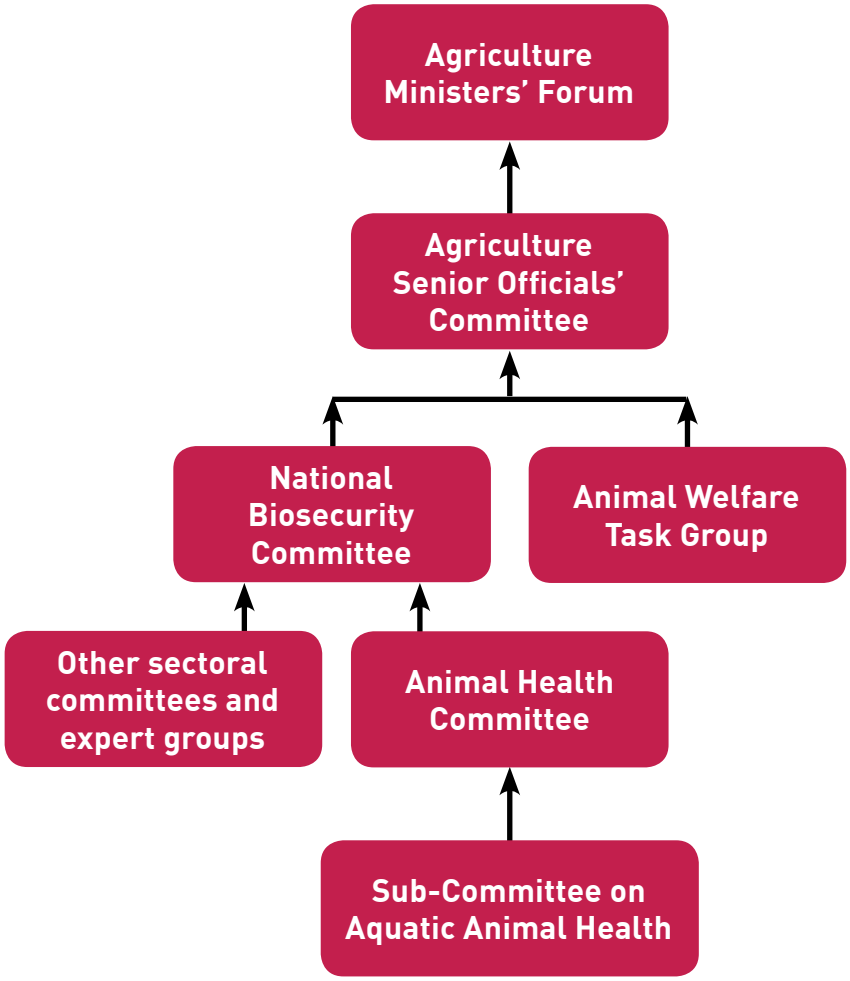


Figure 1.1 Key national government animal health management groups in Australia

2 www.agriculture.gov.au/biosecurity/partnerships/nbc/intergovernmental-agreement-on-biosecurity

3 www.agriculture.gov.au/animal/health/committees/ahc

AHC is advised on aquatic animal health issues by its Sub-Committee on Aquatic Animal Health (SCAAH). Specialist *ad hoc* working groups advise AHC on technical or policy issues as required.

AHC communicates and consults with its animal industry stakeholders through AHA industry forums and stakeholder sessions during AHC meetings, among other communication opportunities. In addition, aquatic industries are consulted through the National Aquaculture Council and the Australian Fisheries Management Forum. Stakeholders from the zoo or wild (including feral) animal sector are consulted through WHA.

Sub-Committee on Aquatic Animal Health

The SCAAH provides policy, scientific, technical and strategic advice to the AHC on aquatic animal health issues relating to capture fisheries, recreational fishing, aquaculture and the ornamental fish industry. SCAAH membership comprises representatives from the Australian, state, territory and New Zealand governments, AAHL, Australian and New Zealand universities and the National Aquaculture Council.

Animal Welfare Task Group

The Animal Welfare Task Group oversees the development of national animal welfare policies in areas referred to it by AGSOC and AGMIN. The group includes officials from the Australian, state, territory and New Zealand governments. AHA is an observer. The task group is overseeing the development of Australian animal welfare standards and guidelines for several types of animals (see Chapter 10). The standards and guidelines are developed with advice provided through open public consultation and Stakeholder Advisory Groups, which include industry representatives, veterinarians, researchers and animal welfare organisations.

1.1.2 Government–industry committees and organisations

Consultative Committee on Emergency Animal Diseases

The Consultative Committee on Emergency Animal Diseases (CCEAD)[4] is convened in the event of an emergency animal disease (EAD) outbreak. The CCEAD is chaired by the Australian CVO and comprises AHC members and technical representatives from relevant industries. Further information about CCEAD's membership and role is in Chapter 4.

Aquatic Consultative Committee on Emergency Animal Diseases

The Aquatic CCEAD is convened in the event of an emergency aquatic animal disease outbreak. The Aquatic CCEAD is chaired by the Australian CVO and comprises state/territory CVOs or directors of fisheries, and representatives from the Department of Agriculture and Water Resources and AAHL. Further information about the Aquatic CCEAD's membership and role is detailed in Chapter 5.

Animal Health Australia

AHA is an incorporated, not-for-profit, public company established in 1996 by the Australian, state and territory governments and major national livestock[5] industries. It is governed by an independently selected, skills-based board.

AHA's members include the Australian, state and territory governments, the major terrestrial livestock industries, and other animal health organisations and service providers.

Through the coordination and management of more than 60 national projects, AHA works in partnership with its members and other stakeholders to enhance preparedness for EADs and to improve animal health, strengthen biosecurity, enhance market access and foster the resilience and integrity of the Australian animal health system.

The strength of AHA is the ability of its members, both government and industry, to work together to deliver a world-class system for managing livestock biosecurity risks to help Australia maintain its enviable disease-free status. The current membership of AHA is shown in Table 1.2, with website details for these organisations provided in Appendix B.

4 www.agriculture.gov.au/animal/health/committees/ccead

5 For AHA definitional purposes, livestock are animals kept for use or profit, including any class of cattle, sheep, goats, pigs, horses (including mules and donkeys), poultry, emus, ostriches, alpaca, deer, camels, buffalo and farmed aquatic species.

AHA's four strategic priorities are to:

- effectively manage and strengthen Australia's EAD response arrangements through successful partnerships with members
- enhance the EAD preparedness and response capability of AHA and its members
- strengthen biosecurity, surveillance and animal welfare to enhance animal health and support market access and trade
- deliver member value, enhancement of organisational performance, and sustainable resourcing.

Following its three-year pilot from September 2016 to June 2018, the Livestock Biosecurity Network (LBN) operated as a subsidiary company of AHA. In the first half of 2018 the LBN Board, after consulting with its members, resolved that maintaining a subsidiary to deliver extension services was an unnecessary overhead. As a result LBN ceased operating at the end of June 2018, at which time additional staff joined AHA to continue delivering biosecurity extension services to the livestock industry in northern Australia. Maintaining continuity of this extension service remains a focus, as part of supporting the success of the livestock industry

Table 1.2 Members of Animal Health Australia

Government	Organisation
Australian Government	**Industry**
Commonwealth of Australia	Australian Alpaca Association Ltd
State and territory governments	Australian Chicken Meat Federation Inc.
Australian Capital Territory	Australian Dairy Farmers Ltd
Northern Territory	Australian Duck Meat Association Inc.
State of New South Wales	Australian Eggs Ltd
State of Queensland	Australian Horse Industry Council Inc.
State of South Australia	Australian Lot Feeders' Association Inc.
State of Tasmania	Australian Pork Ltd
State of Victoria	Cattle Council of Australia Inc.
State of Western Australia	Equestrian Australia Ltd
Service providers	Goat Industry Council of Australia Inc.
CSIRO – Australian Animal Health Laboratory (AAHL)	Harness Racing Australia Inc.
	Sheep Producers Australia Ltd
	WoolProducers Australia Ltd
	Associate members
	Australian Livestock Export Corporation Ltd (LiveCorp)
	Dairy Australia Ltd
	Meat and Livestock Australia Ltd
	National Aquaculture Council Inc.
	Racing Australia Ltd
	Veterinary Schools of Australia and New Zealand
	Wildlife Health Australia
	Zoo and Aquarium Association Inc.
	Service providers
	Australian Veterinary Association Ltd

in achieving animal health, welfare and biosecurity outcomes.

Wildlife Health Australia

WHA is the peak body for wildlife health in Australia. It is a not-for-profit association that was initiated by the Australian Government, and is funded through a cost-share model with the Australian Government and all state and territory governments, with significant in-kind support from other stakeholders. WHA extends the work of the Australian Wildlife Health Network, which was established in 2002 as an Australian Government initiative and replaced by WHA in 2013.

WHA focuses on possible impacts of free-ranging populations of wild animals on Australia's animal health, human health, biodiversity, trade and tourism. It works closely with agriculture, human health and environment agencies, universities, veterinary clinics, zoos and wildlife parks.

WHA has more than 700 members, including wildlife health professionals; wildlife carers; private practitioners; institutional representatives from national, state and territory departments of agriculture, human health and environment, universities, zoos, hunting groups, wildlife groups and other industries; and diagnostic pathology service providers. Australia's OIE Focal Point for Wildlife is within WHA and provides support to Australia's OIE Delegate.

WHA promotes and facilitates collaborative links in the investigation and management of wildlife health to support animal and human health, biodiversity and trade. It coordinates and develops national wildlife health surveillance, wildlife health expertise and resources, and research needs and priorities. It collates national data on mass mortalities involving wildlife, and manages specific datasets, such as those from avian influenza surveillance in wild birds and Australian bat lyssavirus monitoring. WHA monitors for new and emerging diseases in wildlife, particularly those that could affect humans, production animals and biodiversity. WHA also facilitates and contributes to education and training courses in wildlife health and preparedness.

WHA's activities include:

- coordinating national wildlife disease surveillance programs and focus groups
- managing Australia's national database of wildlife health information
- organising and providing national communication about wildlife disease and emerging incidents
- participating in the development of regional and national strategies for wildlife health emergency preparedness and response
- facilitating, monitoring and supporting field investigations of disease incidents
- advancing education and training in wildlife health
- publishing fact sheets about diseases of national importance in wildlife
- providing information about wildlife health to the community.

These activities are underpinned by One Health principles, through actively fostering interdisciplinary work on wildlife health issues.

Plant Health Australia

PHA is the national coordinator of the government–industry partnership for plant biosecurity in Australia. PHA was established in 2000 as a not-for-profit company to service its members.

Funded by member subscriptions from all Australian governments and most plant industry peak bodies representing Australian growers and beekeepers, PHA independently advocates on behalf of the national plant biosecurity system to benefit plant industries and the environment.

A key strategic goal for PHA is to bring together the main stakeholders in the plant biosecurity system to agree on and implement actions which minimise pest impacts on Australia, enhance market access and contribute to industry and community sustainability.

PHA is responsible for the management of the National Bee Biosecurity Program, the National Bee Pest Surveillance Program (see Section 3.4.5) and the BeeAware website (see Section 6.2.2).[6]

SAFEMEAT

SAFEMEAT[7] is a partnership between the peak meat

6 www.beeaware.org.au

7 www.safemeat.com.au

industry bodies[8] and the Australian and state and territory governments. Reporting to AGSOC and peak industry councils, SAFEMEAT oversees and promotes sound management systems to deliver safe and hygienic products to the marketplace.

The strategic directions of SAFEMEAT are set out in its business plan, which has nine key programs of industry priority:

- standards and regulations
- emergency disease management
- animal diseases
- residues
- pathogens
- systems development and management
- communication and education
- emerging issues
- SAFEMEAT Initiatives Review – implementation of recommendations.

Programs and systems developed by SAFEMEAT include:

- targeted residue-monitoring programs for the export red meat industry, which are undertaken by the National Residue Survey
- the National Livestock Identification System (NLIS), which has been developed for cattle, sheep, goats and pigs
- a system of National Vendor Declarations (NVDs) about the food safety status of cattle, sheep, goats and pigs that are being traded
- strategies for animal disease issues affecting food safety, including the implications of transmissible spongiform encephalopathies such as bovine spongiform encephalopathy (BSE).

SAFEMEAT has several working groups that regularly convene to work through current issues, including traceability of livestock within and across state and territory jurisdictions; NLIS compliance in the live animal export sector; use of cotton trash for drought feed; improvements in the supply-chain management of cattle treated with hormonal growth promotants; and the use of the three-hole punch as a permanent identifier for Silirum®-vaccinated cattle to prevent these animals (which may potentially test positive for Johne's disease) from entering export-sensitive markets.

During 2018, key outcomes for SAFEMEAT included:

- reforming SAFEMEAT's structure and governance based on the recommendations of the SAFEMEAT Initiatives Review
- considering the Sheep Traceability Working Group's action plan to implement the recommendations outlined in the Sheepcatcher II report to ensure Australia has a strong traceability system for sheep (see Section 6.1.4)
- establishing the Jurisdictional Traceability Group to provide advice to NBC on a range of issues related to reform of the traceability systems including data collection and management
- introducing mandatory arrangements for PigPass from 1 February 2018
- finalising the use of the three-hole punch as a permanent identifier for Silirum® vaccinated cattle
- strengthening on-farm risk-management systems with recent changes to Livestock Production Assurance (LPA) to include Biosecurity and Animal Welfare requirements
- initiating discussions to achieve national consistency in use of the LPA NVD as a waybill.

The SAFEMEAT partnership continues to provide a valuable mechanism for industry to maintain a high level of food safety and market access for its products.

1.2 Service delivery

1.2.1 Australian Government animal health services

Under the Australian Constitution, the Australian Government is responsible for quarantine and international animal health matters, including disease reporting, export certification and trade negotiation. It also provides national coordination of EAD response activities, and coordinates and

8 Australian Livestock Exporters' Council Ltd, Meat & Livestock Australia, Sheep Producers Australia, WoolProducers Australia, Cattle Council of Australia, Australian Lot Feeders' Association, Australian Meat Industry Council, Australian Dairy Farmers Ltd, Australian Pork Ltd, Australian Livestock & Property Agents Association, Australian Livestock Markets Association, Goat Industry Council of Australia and Animal Health Australia.

provides advice on national policy on animal health and welfare. In some circumstances, it provides financial assistance for national animal disease control programs. The Australian Government Department of Agriculture and Water Resources delivers the Australian Government's activities in animal health and welfare. It works to deliver effective, risk-based services across the biosecurity continuum, that is, onshore, at the border and offshore.

The following areas in the Department of Agriculture and Water Resources are responsible for animal health and veterinary public health:

- Office of the Australian CVO
- Biosecurity Animal Division
    - Animal Biosecurity Branch
    - Animal Health Policy Branch
    - Animal and Biological Imports Branch
- Live Animal Export Division
    - Animal Welfare Branch
    - Live Animal Export Branch
- Exports Division
    - Export Standards Branch
    - Meat Exports Branch
    - Residues and Food Branch
- Biosecurity Operations Division
    - Assessment Services – Client Contact and Post Entry Quarantine
    - Science Services Group
    - Veterinary and Export Meat Services
- Office of the Chief Environmental Biosecurity Officer (CEBO)
- Inspector-General of Biosecurity.

This structure reflects a national approach to biosecurity and welfare, and aims to simplify domestic and international communications and improve responsiveness.

Office of the Australian Chief Veterinary Officer

The Australian CVO is the primary representative of, and adviser to, the Australian Government on matters relating to the maintenance and improvement of Australia's animal health status and its supporting systems. The Australian CVO provides leadership and strategic direction on policy issues relating to animal health in Australia, as well as being Australia's international reference point for animal health and welfare.

The Office of the Australian CVO assists the Australian CVO in providing national leadership and fulfilling Australia's obligations as a member of the OIE, including the official declaration of Australia's animal health status and participating in the development of international animal health and welfare standards. It provides strategic support to the Australian CVO when representing Australia in national and international forums and alliances and when delivering advice to Australian stakeholders and the international community.

The office also provides strategic, scientific and administrative assistance to AHC and CCEAD.

Biosecurity Animal Division

Animal Biosecurity Branch

The Animal Biosecurity Branch develops biosecurity policy, and provides technical and scientific advice on the safe importation of animals and animal products (including aquatic animals and their products), and on marine vessel biosecurity, using science-based risk analysis.

It provides scientific and technical support to gain, maintain and improve access for the export of Australian animals and their genetic material. It also contributes to the development and maintenance of international animal health standards.

Animal Health Policy Branch

The Animal Health Policy Branch leads Department of Agriculture and Water Resources activities on national animal health policies and programs for terrestrial and aquatic animals and marine pests. It also provides support on animal health matters to Australia's immediate neighbours to the north. The branch manages:

- national surveillance and disease preparedness activities
- international offshore surveillance and capacity-building programs with partner countries (Indonesia, Papua New Guinea and Timor-Leste)

- epidemiology and One Health programs, including wildlife health, veterinary public health and antimicrobial resistance issues.

Animal and Biological Import Assessments Branch

The Animal and Biological Imports Branch manages biosecurity risk by regulating the import of live animals, animal germplasm and other animal-derived materials into Australia. Animal-derived materials include veterinary and human therapeutics, pet foods, stockfeed supplements, foods for human consumption, fertilisers, bioremediation agents and laboratory materials. The branch implements science-based import conditions; assesses and grants import permits; audits overseas and domestic facilities; provides advice to importers and regulatory officers; and provides technical support for inspection, clearance and quarantine activities.

The Animal and Biological Imports Branch works collaboratively with Australian industries, governments and the community to minimise the risk of exotic animal pests and diseases entering Australia and maintain Australia's favourable animal health status. It monitors commodity import data and implements targeted verification activities to provide assurance that import conditions continue to effectively manage biosecurity risks.

Live Animal Export Division

Animal Welfare Branch

In 2018, the Animal Welfare Branch was formed to develop policies that underpin the welfare of livestock exported from Australia. This branch is responsible for reviewing applicable animal welfare standards, such as the Australian Standards for the Export of Livestock and the Heat Stress Risk Assessment model.

Live Animal Export Branch

The Live Animal Export Branch manages the Australian Government's legislative requirements for the export of live animals and animal genetic material from Australia. It oversees export inspection and certification for live animals and animal reproductive material that meet importing country requirements, sets operational policy, and assesses the regulatory performance of exporters in line with legislative requirements.

Exports Division

Export Standards Branch

The Export Standards Branch works to maintain, improve and establish new market access for meat, fish, dairy, eggs, animal by-products and other goods by negotiating agreed conditions of trade. It also assists with the clearance of distressed consignments, hosts foreign government delegations during in-country audits and reviews, develops Australian positions on international standard-setting for trade in food, delivers content for the Manual of Importing Country Requirements and provides chemical residue and microbiological policy oversight. The Australian Codex Alimentarius Contact Point and the SAFEMEAT Secretariat are located in this branch.

Meat Exports Branch

The Meat Exports Branch is responsible for national certification, verification, audit and inspection requirements for the export of meat (red meat, poultry and game meat) and the delivery and maintenance of export meat systems.

Residues and Food Branch

The Residues and Food Branch is responsible for the operational aspects of exports of dairy, fish and eggs, as well as of non-prescribed food (including organics) and animal by-products. The branch is also responsible for quota administration and certification and the National Residue Survey.

Biosecurity Operations Division

Assessment Services - Client Contact and Post Entry Quarantine

The Assessment, Client and Quarantine Branch manages biosecurity risks and facilitates market access by performing a range of frontline functions. These include regulating imports and exports by assessing import documents and issuing export certification; managing the husbandry and welfare associated with imported animals and plants in Post Entry Quarantine; and managing phone, email and online enquiries and inspection bookings related to biosecurity and exports.

Science Services Group

The Science Services Group provides on-the-ground operational advice, surveillance and diagnostic services for the Department nationally. Scientists and technical and support staff work to ensure risks of pest and disease are identified early and managed effectively through the use of innovative solutions, training and community awareness. The programs delivered by the Science Services Group include inspections at first-point-of-entry premises (e.g. airports, ports and mail centres); surveillance of high-risk premises (e.g. importers); monitoring of trade and traditional movements in northern Australia including Torres Strait; surveys of animals and plants in northern Australia, Torres Strait Islands, Solomon Islands and Papua New Guinea; and the identification, diagnosis of and advice on plant and animal pests and diseases.

Veterinary and Export Meat Services

The Veterinary and Export Meat Services branch undertakes regulatory functions by providing inspection and certification for the export of meat, meat products and the import and export of live animals and animal genetic material in order to meet importing country requirements and Australian legislative requirements. Inspection and verification services are provided at export-registered meat establishments at various locations across Australia by authorised export control officers responsible for administering appropriate export legislation and implementing ante-mortem, post-mortem and meat and meat product inspection services. Veterinary inspections and reviews of health certificates are performed for imported dogs, cats, birds, fertile eggs, animal genetic material, horses and laboratory and zoo animals. Export certification services are also provided, including veterinary inspection and issuance of export certification for dogs, cats, birds, laboratory animals, bees, aquatic animals, animal genetic material, horses, pigs, zoo animals and livestock.

Office of the Chief Environmental Biosecurity Officer

In 2018, the new role of CEBO within the Department of Agriculture and Water Resources was established (see Section 1.4) to assist in identifying and prioritising environmental and community biosecurity risks in Australia. It will also improve environmental biosecurity preparedness, surveillance and response capacity.

The CEBO will:

- ensure environmental biosecurity issues remain central to discussions
- work with government, industry, communities and environmental groups to protect Australia from pests and diseases that affect the environment
- take a strategic and transparent approach to national environmental biosecurity preparedness and investment
- work closely with the Australian Government Department of the Environment and Energy and the Threatened Species Commissioner.

The CEBO is the primary representative of and adviser to the Australian Government on all matters relating to environmental biosecurity risks. It is a national leadership role like the Australian CVO and Threatened Species Commissioner. As part of this role, the CEBO is the national point of notification for environmental pest and disease detections under the National Environmental Biosecurity Response Agreement, and is the Chair of the WHA Management Committee.

Inspector-General of Biosecurity

The Inspector-General has a broad scope to independently review how the Department of Agriculture and Water Resources implements biosecurity risk-management systems under the *Biosecurity Act 2015* (Cwlth).

The activities of the Inspector-General provide transparency – through independent assurance – of the adequacy of Australia's biosecurity risk-management systems, which in turn contributes to enhanced stakeholder confidence in these systems.

The Inspector-General publishes an annual review program on her official website,[9] carries out each review with appropriate consultation, and prepares a report on each review with the Department of Agriculture and Water Resources' response to recommendations. Final review reports and public submissions to each review are available on the

9 www.igb.gov.au

Inspector-General's website, unless they contain information that is considered prejudicial to the public interest.

Since commencement as an inaugural Inspector-General in July 2016, the Inspector-General has published the following reports:

- *Review of Department of Agriculture and Water Resources management of biosecurity risks posed by invasive vector mosquitoes*
- *Uncooked prawn imports: effectiveness of biosecurity controls*
- *Hitchhiker pest and contaminant biosecurity risk management in Australia*
- *Military biosecurity risk management in Australia*
- *Horse importation biosecurity risk management*
- *Implementation of Interim Inspector-General of Biosecurity recommendations.*

1.2.2 State and territory animal health services

Under the Australian Constitution, state and territory governments are responsible for animal health services within their respective borders (jurisdictions). State and territory animal health services aim to protect the interests of livestock producers and the community by providing world-class biosecurity systems that benefit the economy, the environment and public wellbeing. This is achieved through a combination of legislation and service delivery. Although the mechanisms differ between jurisdictions, AHC ensures a harmonised outcome by coordinating the jurisdictions' approaches to national animal health issues.

State and territory governments develop and administer legislation relating to surveillance, control, investigation and reporting of diseases; chemical residues and contaminants; and animal welfare. A summary of key biosecurity legislation is shown in Table 1.3.

Services are through government-appointed or government-accredited animal health personnel – district veterinarians, regional veterinary officers and local biosecurity officers – who administer the relevant state and territory legislation and provide extension services to industry and the community. The work of these personnel includes:

- surveying, controlling, investigating and reporting on livestock diseases of interest, including EADs
- contributing to the control of specified endemic livestock diseases, in partnership with relevant livestock industries
- monitoring and ensuring compliance with animal identification systems and the use of vendor declarations
- maintaining appropriate controls on the movement of livestock to ensure a high level of biosecurity
- investigating reports of chemical contamination in livestock products and implementing response plans to protect consumers from chemical residues
- contributing to producer awareness of best practice in local livestock management systems
- ensuring compliance with national and local standards for livestock welfare
- monitoring the health of feral animals and native wildlife to detect the emergence of new or exotic diseases
- educating livestock producers, industry organisations and service providers (transport and marketing) about their legislative obligations; relevant biosecurity, welfare and market assurance programs; and technological developments.

Notifiable diseases

Under state and territory legislation, certain diseases are proclaimed to be 'notifiable'. There is a legal requirement when notifiable diseases are suspected or diagnosed for them to be reported to the government animal health authorities.

The National List of Notifiable Animal Diseases[10] lists exotic, emergency and endemic terrestrial animal diseases of national significance. Australia also maintains a National List of Reportable Diseases of Aquatic Animals[11] (see Section 5.1). Notifiable diseases for each state and territory include diseases on the national list, together with

10 www.agriculture.gov.au/pests-diseases-weeds/animal/notifiable

11 www.agriculture.gov.au/animal/aquatic/reporting/reportable-diseases

Table 1.3 Summary of key state and territory legislation for animal biosecurity	
State/Territory	**Legislation**
Australian Capital Territory	• *Animal Diseases Act 2005*
New South Wales	• *Biosecurity Act 2015* • *State Emergency and Rescue Management Act 1989*
Northern Territory	• *Livestock Act 2016*
Queensland	• *Biosecurity Act 2014* • *Disaster Management Act 2003* • *Public Safety Preservation Act 1986*
South Australia	• *Livestock Act 1997* and Regulations • *Emergency Management Act 2004*
Tasmania	• *Animal Health Act 1995* • *Animal Health Regulations 2016* • *Animal (Brands and Movements) Act 1984* • *Animal (Brands and Movements) Regulations 2014* • *Emergency Management Act 2006*
Victoria	• *Livestock Disease Control Act 1994* • *Livestock Disease Control Regulations 2017*
Western Australia	• *Biosecurity and Agriculture Management Act 2007* and *Regulations* • *Biosecurity and Agriculture Management Rates and Charges Act 2007* • *Exotic Diseases of Animals Act 1993* and *Regulations* • *Emergency Management Act 2005* and *Regulations*

diseases that are of significance in a particular jurisdiction. Government-appointed veterinarians and biosecurity officers monitor notifiable diseases and implement regulatory control programs where necessary. They are authorised, in defined circumstances, to inspect, quarantine, test, treat and destroy affected livestock as part of regulated disease response or control.

Australia has a long history of eradicating many notifiable diseases because of the coordinated efforts of state and territory animal health services, often assisted by nationally harmonised arrangements. These include classical swine fever, contagious bovine pleuropneumonia, contagious equine metritis, bovine brucellosis, bovine tuberculosis, virulent Newcastle disease, equine influenza and highly pathogenic avian influenza (see Chapter 2).

Surveillance and other collaborative activities

State and territory animal health personnel conduct surveillance and applied research projects. Authorities are constantly alert to the possible emergence of new infectious diseases, recognising that early detection of disease facilitates more rapid control and eradication. This work requires close links with livestock producers, industry and community organisations, private veterinarians, veterinary laboratories, research organisations, universities, livestock transport and marketing agents, and other stakeholders.

State and territory animal health personnel provide disease diagnostic services, particularly for cases that are not routinely managed by private veterinarians, such as detailed investigations for exotic and emerging diseases. Field staff are supported by government or government-contracted

Image credit: Shutterstock

veterinary diagnostic laboratories, which provide reports to government. Many of the advances in Australia in understanding and managing livestock diseases have come from the partnership between government laboratories and field workers.

Data gathered during these activities are recorded in disease information databases to maintain disease profiles of districts and individual properties. Terrestrial animal health information collected and analysed by the state and territory animal health systems is collated through the National Animal Health Information System.

Aquatic animal disease status reports are recorded in the Quarterly Aquatic Animal Disease Database. This information is used to support the issuing of health certificates for domestic and international trade, and to produce reports on Australia's animal disease status for the OIE.

Collaboration with industry strengthens government animal health services and contributes to high-quality policy decisions. It also leads to joint government–industry activities to support awareness and improvement of biosecurity and welfare. AHA also trains livestock industry staff to work in EAD control centres, promoting further government–industry partnership.

Protecting human health from diseases and pests of animals is a key role of state and territory animal health personnel. They work closely with their government public health counterparts in a joint approach to zoonoses such as salmonellosis, chlamydophilosis, melioidosis and infections with avian influenza, Hendra virus and Australian bat lyssavirus.

In 2018, collaboration between the Department of Agriculture and Water Resources, state and territory departments, AHA and the livestock industries led to progress on national animal health priorities. The *National animal health surveillance and diagnostics (NAHSD) business plan 2016–2019* was developed to guide the efficient and effective delivery of surveillance activities in accordance with nationally agreed objectives and priorities. This business plan is being implemented by governments and industries in partnership, and a review continued in 2018. The National Laboratory Task Group (NLTG) (see Chapter 7) has also successfully developed the *National animal health diagnostics business plan for 2018–2020*, which forms part of the revised *NAHSD business plan*, discussed in Section 7.1.1.

Several initiatives relating to preparedness for foot-and-mouth disease (FMD) and other EADs continued in 2018. FMD is recognised as the single greatest EAD threat to Australia's red meat, dairy, wool and pig industries.[12] The priorities for Australia are to prevent the introduction of FMD, limit the impact of an FMD outbreak and enable a quick resumption of trade.

12 data.daff.gov.au/anrdl/metadata_files/pb_pseiFMDd9abbl20131011_11a.xml

Further information on Australia's animal health surveillance systems is contained in Chapter 3.

1.2.3 Veterinary statutory bodies

Each Australian state and territory has its own veterinary statutory body (VSB). The core purposes of VSBs are ensuring minimum standards of veterinary care and safeguarding public confidence in the profession.

As defined by the OIE, the key activities of VSBs include regulating veterinarians (and paraprofessionals) through licensing, determining the minimum standards of education that entitle registration, and defining the standards of professional conduct of veterinarians. State and territory legislation commonly distils these requirements into tasks such as registering veterinarians, evaluating domestic and foreign veterinary qualifications to determine acceptability for registration, licensing veterinary hospitals, protecting the title 'veterinarian', defining those classes of therapeutic agents and invasive procedures that are restricted to veterinarians, investigating complaints, applying disciplinary procedures, setting standards for continuous professional development, and assessing and registering veterinarians as specialists.

Each Australian state and territory also has its own regulatory authority and veterinary legislation. In principle, a veterinarian who is registered by one such VSB would therefore be restricted to practising within the territory administered by that VSB. These activities could not be delegated to any other body, either national or international. Steps have been taken to facilitate movement of veterinarians between jurisdictions without the need for *de novo* assessment of veterinarians by each registering jurisdiction. The *Mutual Recognition Act 1992* (Cwlth) amendments to veterinary legislation have been enacted in all state jurisdictions. Likewise, national recognition of veterinary registration has been adopted in all but two states and territories and is in draft legislation in Western Australia and Northern Territory. Progress has also been made in establishing mechanisms for evaluating components of some key tasks of VSBs that could be delegated to an overarching body. This is primarily to harmonise the standards of the VSBs. Australian VSBs have delegated many tasks to the Australasian Veterinary Boards Council (AVBC), such as accreditation of veterinary degrees, recognition of foreign qualifications, assessment of foreign veterinarians and assessment of specialists, although the final decision on registration is always that of the board.

1.2.4 Other national animal health bodies and programs

Animal health laboratories

Animal health laboratories are an integral part in Australia's animal health system. A network of world-class animal health laboratories exists throughout Australia with the Australian, state and territory governments, veterinary schools and the private sector all playing important roles. This network provides surveillance, diagnostic, quality assurance and research services for endemic and exotic animal diseases, including transboundary animal diseases and zoonoses. AAHL,[13] one of only six high-containment animal research laboratories in the world, serves as Australia's national animal health laboratory and as an OIE and/or national reference laboratory for several transboundary animal diseases. Some of the state-based laboratories also provide national leadership for diagnostic and research services through their internationally recognised expertise in EADs.

NLTG supports AHC in providing scientific and policy advice on terrestrial animal health diagnostics and laboratory matters. The Laboratories for Emergency Animal Disease Diagnosis and Response network, which represents a collaborative group of government-based laboratories, focuses on supporting national laboratory preparedness for and responses to targeted EADs. Some government, university and private laboratories also participate in specific national disease management programs (e.g. anthrax, arboviruses) or service business needs on an *ad hoc* basis. Further information about animal health laboratories is provided in Chapter 7.

1.2.5 Private veterinary services

Private veterinary practitioners play a vital role in communities by (among other activities) providing livestock owners with animal health, welfare and production advice and by investigating and

13 www.csiro.au/en/Research/Facilities/AAHL

treating disease. They also work with companion animals and wildlife and play an important public health role, managing and providing advice about potential zoonotic diseases. They have an integral role in programs for detecting and responding to significant animal disease incidents in Australia.

Under state or territory legislation, veterinary practitioners must be registered to practise veterinary science. Competence in recognising and diagnosing livestock diseases is an important part of veterinary education in Australia and a prerequisite for registration as a veterinarian. All veterinary practitioners must be able to recognise the possibility of an EAD and be familiar with the procedures to initiate an immediate response. To maintain this awareness, state and territory authorities conduct awareness programs on notifiable and exotic livestock diseases for private veterinarians, particularly those involved in livestock industries.

In 2018, Australian Government funding under the **Agricultural Competitiveness White Paper** (see Section 3.2.2) was used for private and government veterinarians to participate in real-time FMD training in Nepal. Private veterinarians were also among the attendees at the AAHL EAD symposium, an annual event focusing on emerging diseases of interest, surveillance initiatives and the role of veterinarians in EAD preparedness.

Many key conferences and training seminars for private veterinarians are held annually across the nation, providing Continuing Professional Development (CPD) opportunities for veterinarians. In 2018 there were a number of sessions covering EAD preparedness and prevention and antimicrobial resistance. This included at the Australian Veterinary Association Annual Conference 2018, the Australian and New Zealand College of Veterinary Scientists Science Week 2018, and a number of online and in-person training courses held by state and territory authorities and their affiliate organisations. Notably there has been an increase in CPD on antimicrobial stewardship within Australia for veterinarians at local, state and national level, including an inaugural Australian Veterinary Antimicrobial Stewardship Conference to coincide with world antibiotic awareness week in November 2018.

The national Accreditation Program for Australian Veterinarians[14] is designed to integrate private veterinary practitioners into the national animal health system, to support the international standing of Australia's animal health capability. The program accredits non-government veterinarians who can use their skills and knowledge effectively to contribute to government and industry animal disease control programs and export inspection and certification.

The National Significant Disease Investigation Program also engages private veterinarians in the national animal health system. It is described further in Section 3.3.2.

BIOCHECK® is a new program, launched in 2017 and managed by members of the Australian Cattle Veterinarians (ACV), a special interest group of the Australian Veterinary Association. The BIOCHECK® Biosecurity Plan is a tool which accredited private veterinarians can use to help farmers develop tailor-made biosecurity plans for their properties. It is designed to ensure that the farm has considered the major biosecurity risks and has appropriate risk-management strategies in place.

An additional software tool, WELFARECHECK®, was released by ACV in 2018. The WELFARECHECK® tool is for creating a farm welfare plan that would ensure the farm satisfies the farmer's LPA animal welfare component requirements. The aims are to allow producers to demonstrate that they have properly considered animal welfare risks for their individual farm and for the scheme to be recognised as promoting a higher standard of welfare management by processors, industry and the general public.

1.2.6 Veterinary education

Australia has seven veterinary schools – at Charles Sturt University, James Cook University, Murdoch University, the University of Adelaide, the University of Melbourne, the University of Queensland and the University of Sydney. All Australian veterinary courses include strong programs in the health of horses, companion animals, farmed livestock and wildlife, as well as in animal welfare, biosecurity and public health. The veterinary schools also provide research, continuing education and

14 www.animalhealthaustralia.com.au/training-centre/accreditation-program-for-australian-veterinarians-apav

Image credit: Shutterstock

postgraduate training relevant to Australia's livestock industries (see Chapter 8).

Once every seven years, the Veterinary Schools Accreditation Advisory Committee (VSAAC) visits each established Australian veterinary school and Massey University in New Zealand to audit the schools against 12 standards, including curriculum, facilities, staffing and outcomes. Since 1999, the AVBC[15] has provided oversight of the VSAAC audits. Most site visits include a representative from the Royal College of Veterinary Surgeons (United Kingdom) on the team. All seven Australian veterinary schools are accredited with the Royal College of Veterinary Surgeons and the South African Veterinary Council. In recent years, teams from the United States accreditation system have joined AVBC visits to American Veterinary Medical Association Council on Education-accredited schools at Massey University, Murdoch University, the University of Melbourne, the University of Queensland and the University of Sydney.

Schools must also submit annual reports, which are assessed against the 12 standards for veterinary accreditation.

As well as being responsible for accreditation, the AVBC advises on the standards for veterinary registration in Australia and New Zealand, and on the registration of veterinary specialists. It also assesses the skills of veterinarians who wish to migrate to Australia, and administers the National Veterinary Examination to recognise the skills of overseas-qualified veterinarians.

1.2.7 Agricultural colleges and other registered training organisations

Universities, agricultural colleges and other registered training organisations in the Australian vocational education and training sector provide training for veterinary nurses, animal technologists, farm managers and others involved in caring for animals. Students can participate in full-time training, mix part-time training with work, or begin their program while they are still at school. One of the hallmarks of the system is the active involvement of industry groups and employers in providing training opportunities and work experience. This training meets the requirements of national competency standards and vocational qualifications in the Australian Qualifications Framework. The standards are agreed to by industry, professional organisations and each jurisdiction.

In 2012, a suite of vocational qualifications in biosecurity emergency management at the levels of Certificate III, Certificate IV and Diploma was nationally endorsed by the National Skills Standards Council. These provide a training and qualification pathway for people engaged in EAD preparedness and response activities, including

15 www.avbc.asn.au

government employees and livestock producers. In 2016, a major project to develop a full suite of nationally consistent training and assessment materials was commenced to support the three qualifications, and is scheduled for completion in the first half of 2019.

1.3 Performance of Veterinary Services

Australia is committed to ensuring the effective Performance of Veterinary Services nationwide. In 2015, Australia underwent an OIE Evaluation of the Performance of Veterinary Services,[16] with 38 of the 47 criteria evaluated as part of the internationally recognised framework being given the highest competency level (level five). The remaining criteria were all assessed at either level four or three. The independent report recognised the widespread understanding of biosecurity and comprehensive measures in place in Australia, the country's technical proficiency, and the effectiveness of government–industry partnerships. To complement this national evaluation, in 2017–18, evaluations of each state and territory within Australia were performed using the same framework. Findings from these evaluations are being considered, and demonstrate Australia's commitment to continually reviewing its veterinary health services and ensuring their continued strength into the future.

1.4 National biosecurity reforms

Australia has a strong biosecurity system that protects human, animal and plant health as well as our unique environment, and that supports our reputation as a safe, reliable trading nation. This reputation has significant economic, environmental and community benefits for all Australians. To ensure that Australia's biosecurity system remains relevant and effective, areas of the system are undergoing reform. This will allow delivery of a more modern system that is even more responsive and targeted in a changing global trading environment.

As global trade increases, biosecurity risks are changing and pathways become faster and more complex. The challenge is how to adapt to meet the growing pressure of increasing trade, passenger movements and changing importer behaviour with finite resources. The objective of Australia's biosecurity system is to manage biosecurity risk to a very low level – not to zero – to ensure the safe movements of people, animals, plants, food and cargo into Australia. To do this, an integrated approach is being adopted, with complementary measures applied across the biosecurity continuum offshore, at the border and onshore.

Continuous review of the biosecurity system is essential to ensure it is contemporary and flexible, and that resources are allocated appropriately to reflect changing risks and priorities. Agriculture Ministers therefore agreed to a review of the capacity of the national biosecurity system, including its underpinning intergovernmental agreement, by an independent panel comprising Dr Wendy Craik AM (chair), Mr David Palmer and Dr Richard Sheldrake AM, with extensive stakeholder consultation across all relevant sectors throughout 2016 and 2017.

On 26 July 2017, Dr Craik presented the final report, Priorities for Australia's biosecurity system: an independent review of the capacity of the national biosecurity system and its underpinning intergovernmental agreement ('the review'), to the AGMIN. The review recognised the significant achievements made since the commencement of the IGAB in 2012.

Australian, state and territory agriculture ministers released their intergovernmental response to the review on 29 November 2018. The response shows governments' commitment to strengthen Australia's biosecurity system to ensure it is able to meet future challenges. Agriculture ministers have agreed, or agreed in principle, to all of the review's 42 recommendations. The response is structured according to the priority themes identified by the review: engagement and communication with system participants; financial sustainability of the system; system governance; risk and capability; and governance performance and accountability. The full response is available on the Australian Government Department of Agriculture and Water Resources website.

16 www.agriculture.gov.au/animal/health/oie-evaluation-report

The response focuses on a number of priority areas as identified by the review to better prepare and respond to pests and diseases, increase biosecurity awareness across the community, enhance capability to manage environmental biosecurity and better manage risk through research and innovation. This will strengthen Australia's ability to test for and detect priority pests and diseases, enabling rapid responses if pre-border and border defences are breached.

To this end, governments have committed to ensuring the national biosecurity system is resourced to maintain an appropriate level of protection in response to increasing biosecurity risks. This approach includes gaining contributions from participants in the system where their actions create biosecurity risks.

The review has also guided the development of a revised IGAB (IGAB2) which will continue to be an agreement between first ministers. The national response will be implemented over the next five years.

Since the review's publication in July 2017, work has started through the NBC to deliver on a number of recommendations including:

- an enhanced focus on environmental biosecurity through the establishment of the new Environment and Invasives Committee, the Australian Government position of CEBO, and development of a national exotic environmental pest and disease priority list
- designing an Industry and Community Reference Group, which will raise emerging issues and consider matters referred to it by the NBC
- developing a National Biosecurity Statement through an independent working group to describe roles and responsibilities of system participants. The working group was formed to assist in preparing a draft statement for public consultation. Members of the group include representatives from relevant industry bodies.
- progressing a nationally consistent system for the allocation and use of property identification codes across the animal and major plant production sectors
- developing national data-sharing protocols to facilitate data-sharing between governments
- implementing national biosecurity research, development and extension priorities
- progressing the emergency response deeds for aquatic animal diseases and exotic production weeds.

Governments will continue to work together to implement the remaining recommendations. This will require the cooperation and contribution between governments, industry, importers, other key stakeholders and the wider Australian community, as part of our shared responsibility for biosecurity. The Australian Government's priorities for 2019 include the introduction of a new national biosecurity website, Biosecurity Imports Levy and Biosecurity Innovation Program, in response to specific recommendations. A secure national platform for sharing biosecurity data between government agencies will significantly advance our ability to identify passengers, imports and pathways most likely to expose Australia to exotic pests or diseases as well as manage any incursions.

1.5 International representation and collaboration

The Australian CVO is Australia's Delegate to the OIE. In 2018, the Australian CVO, Dr Mark Schipp, was elected as President of the OIE World Assembly with a corresponding position on the OIE Council. The OIE Presidency provides an unprecedented opportunity to increase Australia's international profile and strengthen our reputation as an international leader and contributor to global animal health. During his three-year term as President, Dr Schipp will focus on three key areas:

- engagement, participation and adoption of OIE international standards
- transparency and governance
- strengthening the global veterinary voice.

These three areas are critical to the ongoing effectiveness of the OIE and uptake of international standards worldwide. They also align with Australia's foreign policy approach to shaping international rules and institutions, agricultural trade interests and historical areas of influence at the OIE.

The Australian OIE Delegate is supported by designated 'OIE focal points'. These are direct points of contact in Australia for the OIE and a source of advice for the OIE Delegate on specific topics. Within Australia there are OIE focal points for animal disease notification, animal production food safety, animal welfare, aquatic animals, communication, veterinary laboratories, veterinary products and wildlife.

Other Australian experts held positions as President of the OIE Aquatic Animal Health Standards Commission (elected for a 3 year term), and a member of the OIE Working Group for Wildlife (appointment by the OIE Director General).

Several Australian experts participated in OIE *ad hoc* groups relating to:

- avian influenza
- tilapia lake virus
- animal welfare and pig production systems
- prioritisation of diseases for which vaccines could reduce antimicrobial use in cattle, sheep and goats
- alternatives for surveillance for demonstration of freedom from FMD and recovery periods
- BSE surveillance
- guidelines for public–private partnerships in veterinary services
- evaluation of classical swine fever status
- biological threat reduction in relation to identification, assessment and management of dual use in the context of responsible conduct in research.

The Australian CVO also represents Australia in the Animal Health Quadrilateral Group (Quads). The Quads' mission is to provide a forum for senior animal health officials of the Quads countries (Australia, Canada, New Zealand and the United States) to address strategic issues related to the health and welfare of terrestrial and aquatic animals and wildlife, especially as they affect international trade. By working collectively on significant and strategic animal health issues, outputs and outcomes are realised that would be more difficult – if not impossible – for each country to achieve individually.

Image credit: Animal Health Australia

2

TERRESTRIAL ANIMAL HEALTH STATUS

Australia has a long history of freedom from the major epidemic diseases of livestock. The geographical isolation of the continent provides a natural biosecurity barrier, which is supported by sound biosecurity policies and a history of successful disease eradication campaigns.

The spread of some endemic diseases of animals in Australia is limited by climate and the animal production enterprises present in a particular area. Tick fever, for example, occurs only in parts of northern Australia where the climate is suitable for the tick vectors.

State and territory governments manage the control and eradication of animal diseases, often with the support of industry accreditation schemes. Chapter 1 describes the coordinating mechanisms that are in place to provide national consistency, for example, the Animal Health Committee (AHC).

This chapter provides information about Australia's reporting system for animal diseases and Australia's status for all nationally significant terrestrial animal diseases.

2.1 Status of terrestrial animal health in Australia

Australia provides the World Organisation for Animal Health (OIE) with routine information about OIE-listed diseases through reports every six months. Table 2.1 shows Australia's status for OIE-listed diseases in 2018.

Table 2.1 Australia's status for OIE-listed diseases of terrestrial animals, 2018

Disease	Status	Date of last occurrence and notes
Multiple-species diseases		
Anthrax	Present	Limited distribution (see Figure 2.1)
Aujeszky's disease virus (infection with)	Free	Never occurred
Bluetongue	Virus present	Restricted to specific areas of Australia (see Figure 2.1). Sentinel herd and vector-monitoring programs are in place
Brucella abortus (infection with)	Free	Australia declared freedom in all terrestrial animal species in 1989
Brucella melitensis (infection with)	Free	Never occurred in terrestrial animals
Brucella suis (infection with)	Serological evidence	Maintained in feral pigs in parts of New South Wales and Queensland. Rare occurrence in domestic pigs. Sporadic detections in pig-hunting dogs (not OIE-notifiable occurrences)
Crimean Congo haemorrhagic fever	Free	Never occurred
Echinococcus granulosus (infection with)	Present	–
Echinococcus multilocularis (infection with)	Free	Never occurred
Epizootic haemorrhagic disease	Virus present	Disease has not been reported
Equine encephalomyelitis (eastern)	Free	Never occurred
Foot-and-mouth disease	Free	1872. Australia is officially recognised by the OIE as free without vaccination
Heartwater	Free	Never occurred
Japanese encephalitis	Serological evidence	Serological evidence suggestive of Japanese encephalitis detected seasonally in Torres Strait; however, no confirmed clinical cases since 2004
New World screw-worm fly (*Cochliomyia hominivorax*)	Free	Never occurred
Old World screw-worm fly (*Chrysomya bezziana*)	Free	Never occurred
Paratuberculosis	Present	National control and management programs are in place
Q fever	Present	–
Rabies virus (infection with)	Free	1867
Rift Valley fever virus (infection with)	Free	Never occurred

cont.

Disease	Status	Date of last occurrence and notes
Rinderpest virus (infection with)	Free	1923. With the global eradication of rinderpest in 2011, all countries are free
Surra (*Trypanosoma evansi*)	Free	Never occurred
Trichinella spp. (infection with)	Not reported	*Trichinella spiralis* is not present. *T. pseudospiralis* is present in wildlife
Tularaemia	Present	Two human cases reported in Tasmania in 2011, detected in archived samples from Tasmanian ringtail possums sampled in 2002
West Nile fever	Australian variants present	A previously unknown Australian strain of West Nile virus was identified following an outbreak of neurological disease in horses in 2011. No cases were reported in 2018
Cattle diseases		
Bovine anaplasmosis	Present	Transmission mainly in areas of northern Australia
Bovine babesiosis	Present	Transmission mainly in areas of northern Australia
Bovine genital campylobacteriosis	Present	–
Bovine spongiform encephalopathy	Free – 'negligible risk'	Never occurred. The National Transmissible Spongiform Encephalopathies Freedom Assurance Program includes surveillance. Australia has official OIE 'negligible risk' status
Bovine tuberculosis	Free	Australia declared freedom in 1997; the last case in any species was reported in 2002
Bovine viral diarrhoea	Present	Bovine viral diarrhoea virus 1 (BVDV-1) is present; BVDV-2 has never occurred
Enzootic bovine leucosis	The dairy cattle herd is free. Very low prevalence in beef cattle	Australian dairy herd achieved freedom on 31 December 2012
Haemorrhagic septicaemia	Free	Never occurred. Strains of *Pasteurella multocida* are present, but not the 6b or 6e strains that cause haemorrhagic septicaemia
Infectious bovine rhinotracheitis/ infectious pustular vulvovaginitis	Present	Bovine herpesvirus (BHV)-1.2b is present; BHV-1.1 and BHV-1.2a have never occurred
Lumpy skin disease	Free	Never occurred
Mycoplasma mycoides subsp. *mycoides* SC (contagious bovine pleuropneumonia) (infection with)	Free	1967. Australia declared freedom in 1973 and is officially recognised by the OIE as free
Theileriosis	Free	*Theileria orientalis* is present in Australia but OIE-listed species *T. parva* and *T. annulata* are not
Trichomonosis	Present	–
Trypanosomosis (tsetse borne)	Free	Never occurred

cont.

Disease	Status	Date of last occurrence and notes
Sheep and goat diseases		
Caprine arthritis–encephalitis	Present	Voluntary accreditation schemes exist
Chlamydophila abortus (enzootic abortion of ewes, ovine chlamydiosis) (infection with)	Free	Never occurred
Contagious agalactia	Free	*Mycoplasma agalactiae* has been isolated, but Australian strains do not produce agalactia in sheep
Contagious caprine pleuropneumonia	Free	Never occurred
Maedi–visna	Free	Never occurred
Nairobi sheep disease	Free	Never occurred
Ovine epididymitis (*Brucella ovis*)	Present	Voluntary accreditation schemes exist in all states
Peste des petits ruminants (infection with)	Free	Never occurred. Australia is officially recognised by the OIE as free
Salmonellosis (*Salmonella abortusovis*)	Free	Never occurred. Surveillance has shown no evidence of infection in sheep
Classical scrapie	Free	1952. The National Transmissible Spongiform Encephalopathies Freedom Assurance Program includes surveillance. Atypical scrapie has been detected several times
Sheep pox and goat pox	Free	Never occurred
Equine diseases		
African horse sickness virus (infection with)	Free	Never occurred. Australia is officially recognised by the OIE as free
Contagious equine metritis	Free	1980
Dourine	Free	Never occurred
Equid herpesvirus 1 (equine rhinopneumonitis) (infection with)	Present	–
Equine encephalomyelitis (western)	Free	Never occurred
Equine infectious anaemia	Present	Limited distribution and sporadic occurrence
Equine influenza virus (infection with)	Free	2007. Australia declared freedom according to OIE standards in 2008
Equine piroplasmosis	Free	1976
Equine viral arteritis (infection with)	Serological evidence	–
Glanders	Free	1891
Venezuelan equine encephalomyelitis	Free	Never occurred
Swine diseases		
African swine fever	Free	Never occurred

cont.

Disease	Status	Date of last occurrence and notes
Classical swine fever virus (infection with)	Free	1962. Australia is officially recognised by the OIE as free
Nipah virus encephalitis	Free	Never occurred
Porcine cysticercosis	Free	Never occurred
Porcine reproductive and respiratory syndrome	Free	Never occurred
Transmissible gastroenteritis	Free	Never occurred
Avian diseases		
Avian chlamydiosis	Present	–
Avian infectious bronchitis	Present	–
Avian infectious laryngotracheitis	Present	–
Avian mycoplasmosis (*Mycoplasma gallisepticum*)	Present	–
Avian mycoplasmosis (*M. synoviae*)	Present	–
Duck virus hepatitis	Free	Never occurred
Fowl typhoid	Free	1952
Highly pathogenic avian influenza virus (infection with)	Free	2013
Infectious bursal disease (Gumboro disease)	Present	Infectious bursal disease occurs in a mild form and was last reported in 2004. Very virulent strains are not present
Low pathogenicity avian influenza virus (poultry) (infection with H5 or H7 viruses)	Occasional	2013
Newcastle disease virus in poultry (infection with)	Lentogenic viruses present	Virulent Newcastle disease last occurred in poultry in 2002. In August 2011, a paramyxovirus not previously reported in Australia was detected in hobby pigeons in Victoria. Disease caused by this virus has not spread to poultry
Pullorum disease	Not reported	Last reported in 1992. *Salmonella* Pullorum has been eradicated from commercial chicken flocks
Turkey rhinotracheitis	Free	Never occurred
Lagomorph diseases		
Myxomatosis	Present	Used as a biological control agent for wild rabbits
Rabbit haemorrhagic disease	Present	Used as a biological control agent for wild rabbits. A new strain was detected in 2015[a] and another released in 2017[b]
Bee diseases		
Acarapis woodi (infestation of honey bees with)	Free	Never occurred
Paenibacillus larvae (American foulbrood) (infection of honey bees with)	Present	–

cont.

Disease	Status	Date of last occurrence and notes
Melissococcus plutonius (European foulbrood) (infection of honey bees with)	Present	–
Aethina tumida (small hive beetle) (infestation with)	Present	Restricted distribution
Tropilaelaps spp. (infestation of honey bees with)	Free	Never occurred
Varroa spp. (varroosis) (infestation of honey bees with)	Present?	*Varroa destructor* has never been reported in Australia. Incursion of *V. jacobsoni* was identified in June 2016 and the response is currently in proof-of-freedom phase
Other diseases		
Camel pox	Free	Never occurred
Leishmaniasis	Australian variant, *Leishmania macropodum*, present	Rare. Australian variant was first isolated in 2000 from macropods and occurs infrequently in a small region near Darwin. In 2017, it was isolated in a new species, captive Nabarlek (pygmy rock wallaby, *Petrogale concinna*), in the Northern Territory

OIE = World Organisation for Animal Health

a www.oie.int/wahis_2/temp/reports/en_imm_0000018075_20150707_183150.pdf

b www.oie.int/wahis_2/public/wahid.php/Reviewreport/Review?page_refer=MapFullEventReport&reportid=23377

The National List of Notifiable Animal Diseases[17] of terrestrial animals facilitates disease reporting and control. It is based on the list of diseases that are notifiable to the OIE and also includes endemic diseases of national significance. Occurrences of diseases on this list must be reported to government authorities and this requirement is contained in state and territory legislation.

Producers and veterinarians are also encouraged to report any unusual incidents involving animal mortality or sickness to ensure that any diseases of terrestrial or public health significance are investigated. The list is reviewed biennially by the AHC and a review commenced in 2017. Table 2.2 shows Australia's status for diseases on the National List of Notifiable Diseases of Terrestrial Animals that are not reportable to the OIE, for 2018.

States and territories also have their own lists of notifiable diseases, which contain all the diseases on the national list, as well as others that are of particular interest to an individual state or territory.

Table 2.2 Australia's status for diseases on the National List of Notifiable Diseases of Terrestrial Animals, 2018 (not reportable to the OIE)

Australian bat lyssavirus	Present	–
Brucella canis	Free	Never reported
Borna disease virus (infection with)	Free	Never reported
Bungowannah virus (porcine myocarditis) (infection with)	Present	2003. Restricted distribution, one piggery
Devil facial tumour disease	Present	Restricted distribution
Duck herpesvirus 1 (duck viral enteritis/ duck plague) (infection with)	Free	Never reported

cont.

17 www.agriculture.gov.au/pests-diseases-weeds/animal/notifiable

Disease	Status	Date of last occurrence and notes
Encephalitides (tick-borne)	Free	Never reported
Equine encephalosis virus (infection with)	Free	Never reported
Getah virus (infection with)	Free	Never reported
Hendra virus (infection with)	Present	Sporadic occurrence (see Figure 2.1)
Histoplasma farciminosum (epizootic lymphangitis) (infection with)	Free	Never reported
Influenza A viruses in swine (infection with)	Present	–
Jembrana disease virus (infection with)	Free	Never reported
Louping ill	Free	Never reported
Malignant catarrhal fever (wildebeest-associated)	Free	Never reported
Menangle virus (infection with)	Present	1997
Mycobacterium avium (avian tuberculosis) (infection with)	Present	–
Neorickettsia risticii (Potomac horse fever) (infection with)	Free	Never reported
Porcine epidemic diarrhoea virus (infection with)	Free	Never reported. National survey conducted in 2016 with negative results
Post-weaning multi-systemic wasting syndrome	Free	Never reported
Psoroptes ovis (sheep scab) (infection with)	Free	1896
Pulmonary adenomatosis (jaagsiekte)	Free	Never reported
Salmonella abortusequi (infection with)	Free	Never reported
Salmonella Enteritidis in poultry (infection with)	Present	National Salmonella Enteritidis Monitoring and Accreditation Program available for commercial egg producers. Two serological positives reported in poultry in New South Wales in 2018
Swine vesicular disease virus (infection with)	Free	Never reported
Taenia saginata (cysticercus bovis) (infection with)	Present	–
Teschovirus A (porcine enteroviral encephalomyelitis) (infection with)	Free	Never reported
Transmissible spongiform encephalopathies (chronic wasting disease of deer, feline spongiform encephalopathy)	Free	Two cases of feline spongiform encephalopathy have been diagnosed in imported animals in Australian zoos in 1992 (cheetah) and 2002 (Asiatic golden cat), where exposure before importation to feeds derived from bovine spongiform encephalopathy-affected cattle are thought to have caused the disease
Trypanosoma cruzi (Chagas disease) (infection with)	Free	Never reported
Vesicular exanthema	Free	Never reported
Vesicular stomatitis virus (infection with)	Free	Never reported
Warble fly infestation	Free	Never reported
Wesselsbron virus (infection with)	Free	Never reported

2.2 National reporting system for animal diseases in Australia

Australia's disease surveillance includes targeted and general activities delivered under the authority of the Australian Government and state and territory governments (jurisdictions). Each jurisdiction is required to comply with legislated obligations to detect the occurrence and prevalence of notifiable diseases. Data on disease investigations are held in jurisdictional field and laboratory databases, enabling disease control programs to be informed by property, regional and jurisdictional intelligence on diseases.

Under the National Animal Health Information Program (NAHIP), a subset of jurisdiction-held disease investigation data are collated nationally in Australia's National Animal Health Information System (NAHIS) database. NAHIS is a web-based database management system enabling online submission to discrete data projects, automation of data analysis and summary, and provision of customised output reports. The NAHIS database makes a current, consistent national dataset of important surveillance information available to the Australian Government Department of Agriculture and Water Resources for reporting to the OIE, for substantiating Australian claims to disease occurrence status and for trade negotiations.

NAHIP is managed by Animal Health Australia and governed by an ongoing collaboration of its member representatives: governments, livestock industries and Wildlife Health Australia. The NAHIP Advisory Committee facilitates effective cooperation for identifying needs and priorities for collating and reporting summary animal health information and required enhancements to the NAHIS database.

Data collated in the NAHIS database are routinely reported, together with topical surveillance-related news and case reports of veterinary investigations, in the *Animal health surveillance quarterly* newsletter,[18] and annually in this report (*Animal health in Australia*).

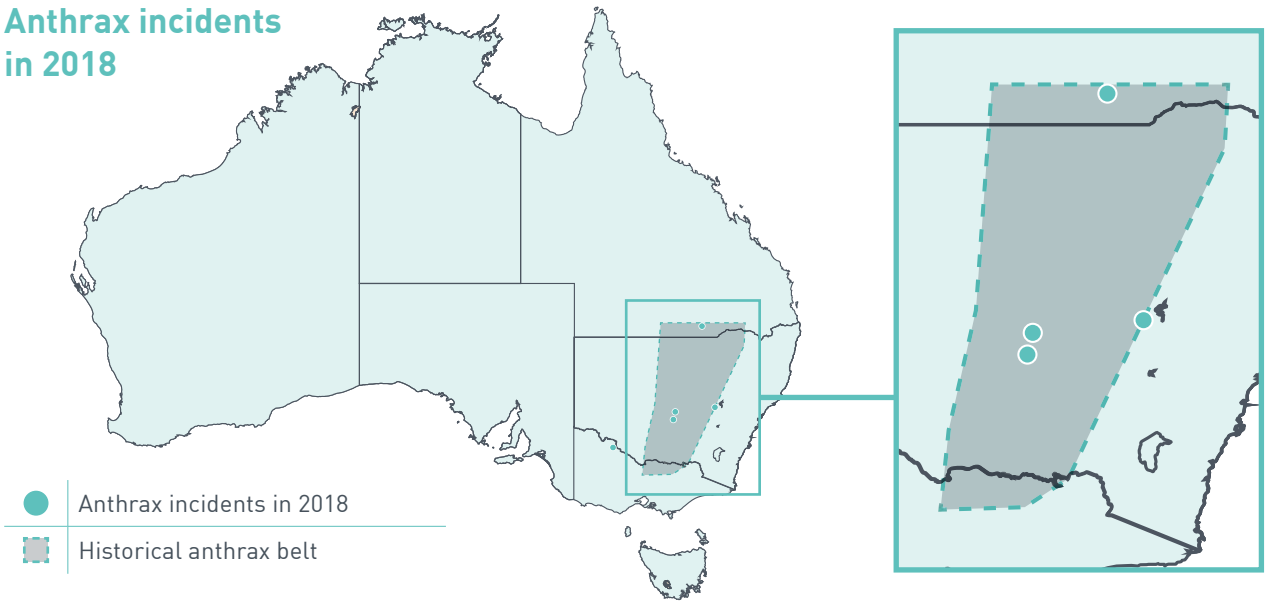
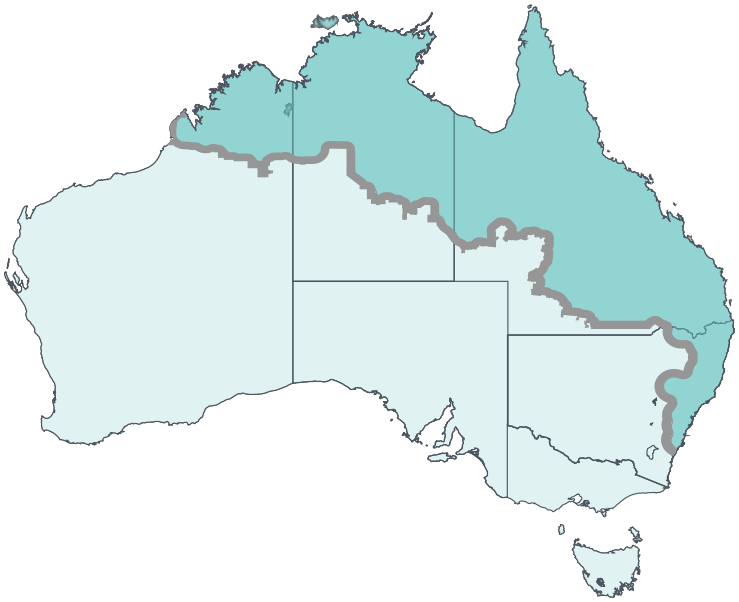


Figure 2.1 Distribution of selected terrestrial animal diseases in Australia

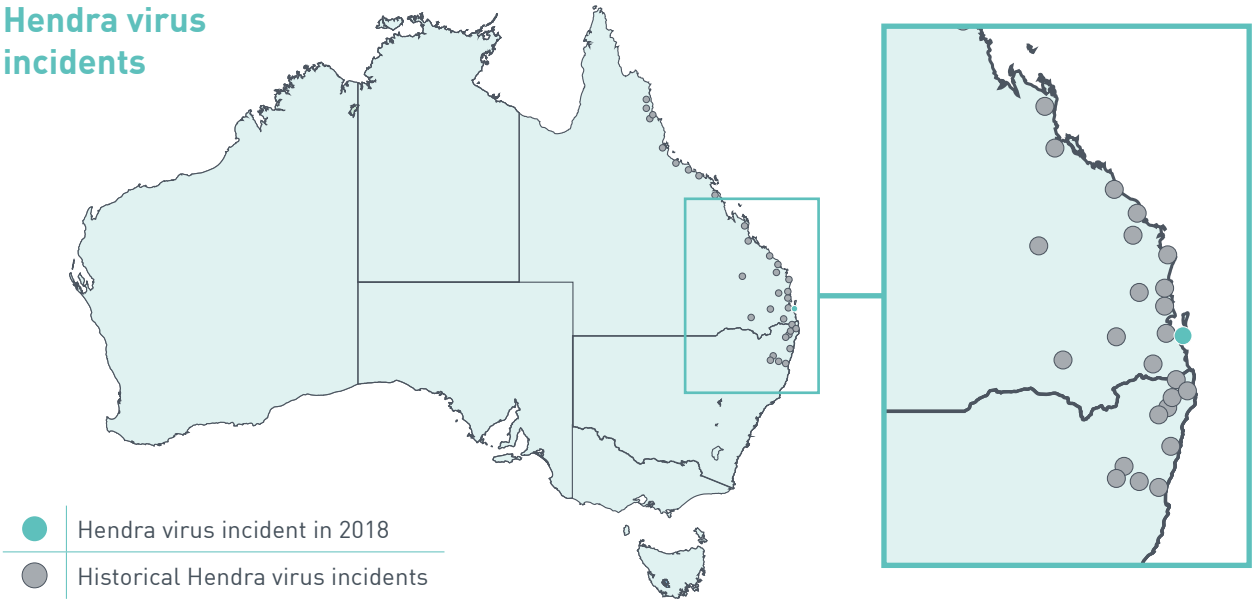
18 www.animalhealthaustralia.com.au/our-publications/animal-health-surveillance-quarterly



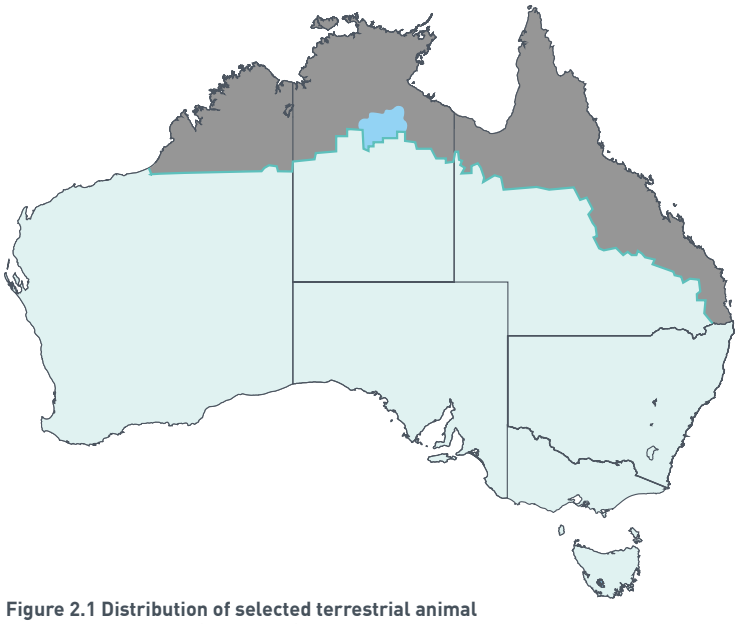
Bluetongue virus as at 31 December 2018

- Bluetongue virus transmission zone
- Bluetongue virus buffer zone
- Bluetongue virus free zone

Hendra virus incidents



- Hendra virus incident in 2018
- Historical Hendra virus incidents



Tick fever as at 31 December 2018

- Tick fever infestation zone
- Tick fever control zone
- Tick fever infestation boundary
- Tick fever free zone

Figure 2.1 Distribution of selected terrestrial animal diseases in Australia (continued)

Image credit: Taryn Mokotupu

3

TERRESTRIAL ANIMAL DISEASE SURVEILLANCE AND CONTROL PROGRAMS

Australia's surveillance and control programs for terrestrial animal diseases are supported by a network of government field veterinary officers, private veterinarians, government and private veterinary diagnostic laboratories, researchers and livestock producers.

This network undertakes surveillance to identify and treat risks from notifiable, exotic and emerging diseases. It is supported by the National Livestock Identification System (NLIS) (see Section 6.1), which enables livestock to be identified and traced from property of birth to slaughter, and by the National Animal Health Information System (NAHIS) (see Section 2.2) for data collation, analysis and reporting.

This chapter outlines the structure of Australia's surveillance systems and activities, and describes national surveillance initiatives undertaken in 2018. It also describes general surveillance and targeted programs at the national level, and programs specific to northern Australia, states and territories, and industry.

3.1 Australia's surveillance systems and activities

Australia's livestock industries are maintained within a strong biosecurity framework, supported by effective animal health surveillance systems and activities.

Surveillance is a critical element of an effective and efficient animal health system and is a core competency of Veterinary Services as described by the World Organisation for Animal Health (OIE). Surveillance activities enable the identification of exotic, emerging and nationally significant endemic animal diseases; provide the necessary information for disease control policies, programs and reporting requirements; support access to Australia's export markets for animal and animal products; and maintain the productivity and profitability of livestock industries.

The Intergovernmental Agreement on Biosecurity[19] has recognised that surveillance is a shared responsibility and all parties have a role in Australia's animal health surveillance system. The benefits of an effective surveillance system are substantial and far-reaching across governments, livestock industries and the wider community. With common interests and a diverse range of stakeholders, it is imperative to have a coordinated national approach to strengthening this system.

National technical policy for surveillance and diagnostic services is endorsed by chief veterinary officers (CVOs) through the Animal Health Committee (AHC) (see Section 1.1.1). Under the Australian Constitution, individual state and territory governments are responsible for animal health matters within their boundaries, including terrestrial animal health surveillance and monitoring. As well as administering legislation, state and territory animal health personnel conduct general surveillance and targeted research projects, and provide disease diagnostic services, particularly for cases that are not routinely managed by private veterinarians, such as detailed investigations for exotic and emerging diseases. Legislation in all jurisdictions requires that animal owners, veterinarians and laboratories report any suspicion of notifiable diseases, including emergency animal diseases[20] (EADs), to animal health authorities.

Field staff are supported by government veterinary laboratories or government-contracted veterinary diagnostic laboratories that meet prescribed standards. In all cases of suspect notifiable diseases, laboratory diagnosis is free of charge and samples are also submitted to CSIRO's Australian Animal Health Laboratory (AAHL). Laboratory quality assurance (QA) is maintained by compulsory accreditation of laboratories under the National Association of Testing Authorities as well as by participation of laboratories in inter-laboratory QA programs (see Chapter 7 for further information).

In some cases, private veterinarians are contracted to the government to investigate suspect notifiable diseases. In all jurisdictions, official government veterinarians establish relationships with private veterinarians in their districts to allow effective collaboration during investigation of unusual disease incidents. Several jurisdictions produce regular newsletters[21,22,23,24,25] and maintain websites, email lists and social media networks tailored to private veterinarians and other relevant stakeholders, to improve the exchange of surveillance information. A nationally consistent framework for subsidising disease investigations, laboratory expenses and training for private veterinarians is supported under the National Significant Disease Investigation Program (NSDIP, see Section 3.3.2).

Data gathered by field and laboratory staff are recorded in information management systems to maintain disease profiles of districts and individual properties. Property-of-origin health certificates and official reports to various authorities – including the OIE – can readily be extracted from

19 www.coag.gov.au/content/intergovernmental-agreement-biosecurity

20 www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

21 www.dpi.nsw.gov.au/about-us/publications/animal-health-surveillance

22 www.daf.qld.gov.au/news-media/newsletters/biosecurity-news

23 www.dpipwe.tas.gov.au/biosecurity-tasmania/animal-biosecurity/animal-health/information-for-veterinary-practitioners

24 www.agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/animal-diseases/vetsource/vetwatch

25 www.agric.wa.gov.au/newsletters/waldo-producers

these systems. Information collected and analysed by the state and territory animal health systems is collated through NAHIS for analysis, reporting and response (see Section 2.2). The information is also fed back to the veterinary networks through surveillance reports that keep state and territory field and laboratory staff, as well as private veterinarians, informed about disease patterns.

3.2 National surveillance

3.2.1 *National animal health surveillance and diagnostics business plan (2016–2019)*

The *National animal health surveillance and diagnostics business plan 2016–2019* was developed by governments and livestock industries to guide the delivery of surveillance activities in accordance with nationally agreed objectives and priorities. It outlines priority activities that build on existing strengths and addresses areas for improvement in Australia's animal health surveillance system.

The business plan contains many foundational or scoping activities that direct the subsequent development of surveillance activities.

Activities in the business plan continue to progress, with the Implementation Task Group providing oversight.

The business plan is available on the Department of Agriculture and Water Resources website.[26]

3.2.2 Agricultural Competitiveness White Paper

The **Agricultural Competitiveness White Paper**[27] was released in July 2015, and outlines the initiatives and commitments by the Australian Government to strengthen Australia's agriculture sector. It is a $4 billion investment to build a more profitable, more resilient and more sustainable agriculture sector to help drive a stronger Australian economy.

One of the priority areas of the **Agricultural Competitiveness White Paper** is accessing premium markets. As part of this priority, the Australian Government has committed $200 million over four years for biosecurity surveillance and analysis, including in northern Australia (see Section 3.5), to better target critical biosecurity risks and support market access. The funds are being used to help keep pests and diseases out of Australia and identify and respond to pests and diseases when they arrive, while also helping to enhance import and export processes. The biosecurity surveillance and analysis initiative contributes to four broad themes: strengthening surveillance; community-based action; improving scientific capability; and improving information and analysis. More information on the biosecurity surveillance and analysis initiative is available on the Department of Agriculture and Water Resources website.[28]

One of the many projects under the **Agricultural Competitiveness White Paper** is specifically focused on enhancing Australia's animal health, aquatic animal health and marine pest onshore surveillance system. This project has four main outcomes:

- improved early detection of exotic and emergency pests and diseases of animals and aquatic animals and marine pests
- enhanced surveillance programs to identify and target the highest risks
- improved management of specified threats to public health and biodiversity
- market access and trade supported and/or improved.

Along with some other projects supporting aquatic animal health and marine pest surveillance activities, terrestrial animal health surveillance activities that have commenced and were supported through 2017–18 funding as part of this project included:

- providing foot-and-mouth disease (FMD) real-time training in Nepal for veterinarians and stock handlers (see Section 4.2.3)
- providing training for veterinarians and other livestock workers in EAD identification, investigation and reporting

26 www.agriculture.gov.au/animal/health/surveillance-diagnostics

27 agwhitepaper.agriculture.gov.au

28 www.agriculture.gov.au/biosecurity/agwhitepaper-bio-surveillance-analysis

- enhancing the Laboratories for EAD Diagnosis and Response network QA program, focusing on a test for influenza A antibodies
- conducting the National Avian Influenza in Wild Birds (NAIWB) Surveillance Program (see Section 3.4.2)
- evaluating exposure risk and incursions of highly pathogenic avian influenza (AI) from Asia
- developing a diagnostic test for *Brucella abortus*
- developing an antibody test for sheep serum/plasma that is specific for *Chlamydia abortus*
- continuing the Australian Livestock Industry Health Studies project, a trial of a new approach to surveillance in the grass-fed cattle sector.

Other projects relevant to animal health surveillance that are being funded via the **Agricultural Competitiveness White Paper** include some initiatives in northern Australia, surveys in Indian Ocean territories, and collaborative offshore surveillance and capacity-building programs with partner neighbour countries.

The biosecurity surveillance and analysis activities funded through the **Agricultural Competitiveness White Paper** will provide long-term benefits to Australia, including reducing biosecurity risk, improving and helping to maintain market access, and improving our preparedness to respond to biosecurity incidents.

3.3 General surveillance

3.3.1 Surveillance activities for eradicated diseases

For diseases that have been eradicated within the previous 25 years, the *OIE Terrestrial animal health code* (OIE Code) recommends that countries follow pathogen-specific surveillance requirements in the OIE Code, if they exist. If there are no specific requirements, countries should follow the general recommendations on surveillance outlined in the OIE Code, provided that for at least the previous 10 years:

- the disease has been a notifiable disease
- an early detection system has been in place
- measures to prevent the introduction of the disease or infection have been in place
- no vaccination against the disease has been carried out unless otherwise provided for in the OIE Code
- infection is not known to be established in wildlife within the country.

Australia follows these recommendations, and has successfully eradicated bovine brucellosis, bovine tuberculosis (TB), equine influenza (EI), highly pathogenic AI (HPAI) and virulent Newcastle disease (ND) during the preceding 30 years.

Bovine brucellosis

In 1970, industry and Australian, state and territory governments united to form the national Brucellosis and Tuberculosis Eradication Campaign (BTEC). During the campaign to eradicate brucellosis, vaccination was used to contain the disease and testing and slaughter were used to eradicate the infection. Following a successful eradication campaign, in accordance with the recommendations in the OIE Code, Australia declared freedom from bovine brucellosis (*B. abortus*) in 1989. Targeted surveillance for *B. abortus* continued until the end of 1993.

Australia uses general surveillance to demonstrate its ongoing freedom from *B. abortus*. State and territory veterinary laboratories test for *B. abortus* as part of abortion investigations and for other reasons. Additional testing is done to meet export requirements for certain markets. Species other than cattle are also sampled. No cases of *B. abortus* were detected in 2018 (see Appendix Table C1 for more information).

Bovine tuberculosis

Following on from BTEC, Australia declared freedom from bovine TB (*Mycobacterium bovis*) in 1997, in accordance with the recommendations in the OIE Code. The last case of bovine TB was reported in 2002 in buffalo. In 2010, bovine TB surveillance data were evaluated quantitatively using a scenario-tree methodology.[29] This showed a very high level of confidence (approaching 100%) that Australia was free from bovine TB and that,

29 Martin P, Cameron A, Greiner M. Demonstrating freedom from disease using multiple complex data sources 1: a new methodology based on scenario trees. *Preventive Veterinary Medicine* 2007; 79: 71–97.

if the disease were present, it would have been detected.

Australia uses general surveillance to demonstrate its ongoing freedom from bovine TB. In addition, the *Australian standard for the hygienic production and transportation of meat and meat products for human consumption* (AS 4696:2007)[30] requires that all carcasses and their parts are inspected by a meat safety inspector. Because bovine TB is an exotic animal disease in Australia, suspicious granulomas identified when cattle carcasses are inspected at slaughter establishments, including export abattoirs, are submitted for testing to exclude *M. bovis* as a cause. Additional testing is done to meet export requirements for certain markets. No cases of *M. bovis* were detected in 2018 (see Appendix Table C1 for more information).

Equine influenza

In August 2007, Australia experienced a large outbreak of EI. Australian, state and territory governments and industry agreed on a national approach to contain and eradicate EI, through the Consultative Committee on Emergency Animal Diseases (CCEAD) and the National Management Group (NMG). The national approach was effective in eradicating the disease and the last case was reported in December 2007. In accordance with the recommendations in the OIE Code, Australia declared freedom from EI in December 2008.

Australia uses general surveillance to demonstrate its ongoing freedom from EI. As of 2018, there continues to be no evidence that EI is circulating in the Australian horse population. No cases of EI were detected in 2018 (see Appendix Table C1 for more information).

Highly pathogenic avian influenza

Australia's last outbreak of HPAI, caused by a H7N2 virus, was in October 2013. The outbreak affected two properties and was quickly contained and eradicated. In accordance with the recommendations in the OIE Code, Australia declared freedom from HPAI in February 2014.

Australia has a targeted surveillance program for HPAI in wild birds (see Section 3.4.2) and uses general surveillance and subsequent investigation to exclude HPAI infection and demonstrate ongoing freedom from HPAI in poultry populations. The results of targeted surveillance for AI in wild birds in Australia are reported in Section 3.4.2. No cases of HPAI were detected in 2018 (see Appendix Table C1 for more information).

Newcastle disease

Australia's last outbreaks of virulent ND were in 2002. The two incidents affected single properties, and the disease was eradicated using an agreed national approach through the CCEAD and NMG. In accordance with the recommendations in the OIE Code, Australia declared freedom from virulent ND in 2003. Non-pathogenic (lentogenic) ND virus strains are present in Australia.

Subsequent to the 2002 outbreaks, a National Newcastle Disease Management Plan (NNDMP)[31] was developed to minimise the risk of Australian-origin virulent ND outbreaks in commercial chicken flocks through vaccination. The NNDMP concluded in 2016. However, as of 2017, all long-lived chickens in flocks greater than 1000 birds are required to be vaccinated. In addition, broiler chickens in New South Wales and Victoria are required to be vaccinated. Vaccination of broilers in other jurisdictions is optional.

Australia uses general surveillance to demonstrate its ongoing freedom from virulent ND in poultry populations. No cases of virulent ND were detected in 2018 (see Appendix Table C1 for more information).

3.3.2 Private veterinarian surveillance activities

National Significant Disease Investigation Program

The NSDIP was initiated in June 2009 to facilitate investigation of significant disease events by private veterinarians. Significant disease events are defined as those that are clinically consistent with national notifiable animal diseases and are showing an increasing incidence and/or expanding geographical or host range but are not suspected to be an EAD.[32]

30 www.publish.csiro.au/book/5553

31 www.animalhealthaustralia.com.au/what-we-do/endemic-disease/newcastle-disease

32 www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

Where there is a genuine suspicion of an EAD, the disease event is considered to be outside the scope of NSDIP funding, and the relevant state or territory government department will lead and fund an investigation.

NSDIP is managed by Animal Health Australia (AHA) and delivered by state and territory governments and Wildlife Health Australia (WHA). It is funded from livestock industry and government member subscriptions to AHA. The program aims to boost Australia's capacity for early detection of national notifiable animal diseases and new or emerging diseases in livestock and wildlife by increasing the participation of private veterinarians in disease investigations. By promoting effective collaboration between non-government veterinary practitioners and governments, the program improves the quality (e.g. of sample submissions) and increases the quantity of significant disease events investigated.

Registered private veterinarians engaged in clinical veterinary medicine, including veterinary practitioners in university clinics, zoos and wildlife parks, are eligible to participate in the NSDIP. Disease investigation subsidies are available for field work (e.g. clinical evaluation, necropsy and collection of diagnostic samples), laboratory diagnostic work, and follow-up field investigation (if required). From July 2016, the scope of NSDIP activities was expanded to include training of private veterinarians in disease investigation, and to increase levels of knowledge, skill and confidence to investigate and report on disease events.

Further information on the NSDIP is available on the AHA website.[33]

Other support for disease surveillance by private veterinarians

State and territory government departments extend support for private veterinarians to undertake disease investigation and training through the provision of additional subsidies. For example:

- In 2018, the Western Australian Department of Primary Industries and Regional Development conducted a two-day workshop for private veterinarians on disease investigation and EAD topics. It was attended by 30 private and on-plant abattoir veterinarians. This workshop was followed by a full-day practical postmortem session attended by 12 private veterinarians.
- In South Australia, the Rural Practitioner Enhanced Disease Surveillance Program[34] promotes routine and thorough investigation of livestock disease incidents by rural private veterinarians through regular communication, provision of disease investigation and epidemiology education, and investigation and laboratory subsidies co-funded by the NSDIP.
- In addition to funding investigations of suspected nationally notifiable animal diseases, the Queensland Government's General Passive Surveillance Program fully subsidises laboratory investigations initiated by private veterinarians on suspicion of an emerging or state-regulated endemic disease. Approximately 2000 subsidised submissions are received from private veterinarians annually.

3.3.3 National Sheep Health Monitoring Project

The National Sheep Health Monitoring Project (NSHMP), which commenced in 2007 and is managed by AHA, monitors lines[35] of sheep in abattoirs for several important animal health conditions.

In the 2017–18 financial year, 6 734 985 sheep, from 28 666 lines, were monitored across 12 domestic and export abattoirs; some of these abattoirs were monitored periodically.

The NSHMP currently only reports significant endemic diseases that can be identified by inspecting viscera or at the adjoining carcass-inspection stage. Lines of sheep are monitored by qualified meat inspectors and company-based personnel. Attention focuses on diseases that are likely to cause significant production loss, animal welfare issues, or market access concerns based on food safety or product aesthetics. The peak councils

33 www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/national-significant-disease-investigation-program

34 pir.sa.gov.au/biosecurity/animal_health/veterinarians/rural_practitioner_enahanced_disease_surveillance

35 A line of sheep is a group of animals purchased from a single location, although the group may contain animals from multiple vendors, as may occur at a saleyard.

of the sheep industries, AHC and the Australian Meat Industry Council, have agreed that sheep lines will be monitored for a core group of conditions: arthritis, bladder worm (*Cysticercus tenuicollis*), cancer, caseous lymphadenitis, dog bites, grass seed contamination, fever/septicaemia, hydatids, knotty gut, liver fluke, lungworm, nephritis, ovine Johne's disease (OJD), pleurisy, pneumonia, rib fractures, *Sarcocystis* spp., sheep measles (*Taenia ovis* infection) and vaccination lesions.

Data collected under the NSHMP are stored in the Central Animal Health Database, which is maintained by AHA. Business rules determine the level of access to the data for an individual or organisation. State sheep health coordinators have access to the state dataset and return this information to producers in the form of individual animal health status reports on the lines inspected. Information has also become available to producers through the Livestock Data Link portal, developed by Meat & Livestock Australia, from July 2017. Processors are provided with a daily report for their own plants.

Monitoring livestock in abattoirs enables public health risk management for diseases such as hydatid disease. It also provides the opportunity to collect surveillance data, which can be used to inform domestic animal health management decisions and to support Australia's freedom from specified diseases. Information provided to individual producers can assist them to improve the productivity of their flocks and fine-tune animal health programs. For processors, there is the opportunity to reduce product non-compliance, thereby lifting productivity and reducing costs.

The NSHMP has generated a comprehensive, contemporary dataset[36] that provides a good indication of the animal health status of the Australian flock. This information can be used by governments, industry groups and processors as solid evidence in support of market access and to demonstrate the quality of Australian product.

Sheep Producers Australia (formerly the Sheepmeat Council of Australia) and WoolProducers Australia support the NSHMP. Both recognise the importance of individual producers having access to information about the sheep they have sold, so that producers can make sound and informed animal health management decisions.

3.3.4 Wildlife health surveillance

WHA administers Australia's general wildlife health surveillance system. Key elements of the system include a network of coordinators reporting into a web-enabled national database (eWHIS) that captures wildlife health information. The network includes WHA coordinators in each jurisdiction, coordinators at zoo wildlife hospitals, sentinel veterinary clinics and universities. Targeted projects and several focus or working groups coordinated by WHA are also a key part of the system.

WHA coordinators are appointed by their CVO and represent each of Australia's states and territories, including the Australian Antarctic Territory. This surveillance network also includes representatives from the Australian Registry of Wildlife Health, the Northern Australia Quarantine Strategy (NAQS) and AAHL. Wildlife hospitals at 10 zoos across Australia participate in the Zoo Based Wildlife Disease Surveillance Program, a collaborative project between WHA and the Zoo and Aquarium

Image credit: iStock

36 2017–18 report of NSHMP data available from www.animalhealthaustralia.com.au/nshmp

Association. Eight sentinel veterinary clinics with a large or dedicated wildlife caseload also contribute to the system, including two new contributing clinics from northern Western Australia, which joined the program in 2018. The national wildlife health surveillance system also includes contributions through university veterinary clinics and pathology departments.

WHA promotes and facilitates collaboration around Australia in the investigation and management of wildlife health, focusing on potential risks to domestic animal health, human health, trade and biodiversity. WHA administers a 'first alert system', sending email notifications on wildlife health issues to more than 700 individuals and agencies around Australia. WHA also produces a regular electronic digest of wildlife health information relevant to Australia. These digests are circulated nationally and to OIE member countries within the region.

In 2018, WHA's surveillance activities focused on:

- coordinating national wildlife disease surveillance in partnership with government and non-government agencies
- managing and coordinating the AI surveillance program in wild birds
- collating and moderating a national dataset on Australian bat lyssavirus (ABLV) testing in bats
- contributing to the work of NAHIS
- assisting in EAD events by providing relevant information on wildlife disease and facilitating communication with wildlife stakeholders
- coordinating a network of wildlife health expertise and organising working groups with a particular focus, including:
    - a group focusing on the contribution of university research to national wildlife health issues
    - a group focusing on bat health issues in Australia
    - the Zoo Animal Health Reference Group, which focuses on the zoo industry and its wildlife hospitals
- encouraging collaboration, communication and engagement among national, state and local government and non-government agencies.

In addition to surveillance, WHA assists with disease investigations and research in wildlife and feral animals, and facilitates education and training to ensure that Australia is well prepared for serious disease outbreaks that could involve native or feral wildlife populations.

General wildlife health surveillance system reporting focuses on six disease categories: diseases listed by the OIE, bat viral diseases, mass or unusual mortality events, cases of salmonellosis, arbovirus infections, and diseases that coordinators consider unusual or interesting. Disease events are reported to WHA by state and territory WHA coordinators, zoos, sentinel clinics, universities, private practitioners and members of the public. During 2018, 772 wildlife disease investigation events were added to the national database (Table 3.1). Approximately 40% of these events were bats (mostly submitted for exclusion testing for ABLV), bird events accounted for a further 37% of investigations reported, and a further 13% related to marsupials.

Table 3.1 Number of disease investigations reported into eWHIS, January–December 2018[a]

Animals	Number of investigations
Bats[b]	320
Birds[c]	286
Marsupials	102
Feral mammals	18
Freshwater and marine turtles	11
Snakes and lizards	10
Marine mammals	15
Monotremes	4
Fish	1
Exotic species (captive)	5

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

b Most bat disease investigations are single bats submitted for Australian bat lyssavirus testing.

c Includes free-ranging birds (native or feral species) and a small number of events involving birds from zoological collections and captive breeding programs.

Surveillance of diseases in bats

Surveillance of diseases in bats in Australia provides a better understanding of the ecology of these diseases, with a particular focus on pathogens that have the potential to affect livestock health, public health or biodiversity. Spillover of disease agents such as ABLV and Hendra virus from bats can have serious effects on humans and domestic animals. Diseases that threaten bat populations can interfere with the important ecological functions performed by bats, such as pollination and insect control, leading to ecological and economic losses. WHA coordinates a focus group that works to improve national coordination of issues associated with bat health.

Australian bat lyssavirus

ABLV is a nationally notifiable animal disease. Bats are the natural reservoir of ABLV, and both flying-foxes (*Pteropus* spp.) and insectivorous microbats can be infected. ABLV infection has been detected in bats from most jurisdictions. There have been three human cases of ABLV infection following a bite or scratch from a bat, all fatal. Two horses in Queensland with neurological disease were found to be infected with ABLV in 2013. In 2013, a dog that had had contact with a flying-fox was tested seropositive and was euthanased; however, there was no evidence of ABLV infection on postmortem testing.

State and territory animal and public health laboratories and AAHL continue to screen Australian bats for ABLV. Bats are tested for a variety of reasons, most commonly following potentially infectious contact with a human, for example, a bite or scratch, or with a domestic animal such as a pet dog or cat. WHA collates and publishes national ABLV bat testing data.[37] A total of 322 bats were tested for ABLV in 2018. Of these, 11 flying-foxes from New South Wales, Queensland and Victoria were found to be infected with ABLV. There were no detections of ABLV infection in 2018 in species other than bats.

Monitoring for diseases of biodiversity concern includes exclusion testing for the exotic disease white-nose syndrome (WNS) in microbats. WNS is a fungal disease that has killed millions of insectivorous bats in North America but has not been identified in Australia. The Department of Agriculture and Water Resources and WHA continue to work with stakeholders to reduce the risk of introduction of WNS into Australia, and to better prepare Australia for a possible incursion of this disease.[38,39,40]

Investigation of wild bird morbidity and mortality events

Investigation of significant morbidity and mortality events in wild birds contributes to the NAIWB Surveillance Program (see Section 3.4.2). Diagnostic testing for wild bird mortality events includes, when appropriate, exclusion of AI, avian paramyxovirus (APMV) (including ND and pigeon paramyxovirus) and West Nile virus. In 2018, WHA received 287 reports of wild bird mortality or morbidity investigations from around Australia, ranging from single animal to multiple animal (mass mortality) events.

Findings in wild bird disease investigations included aspergillosis, avian chlamydiosis, avian pox, botulism, coccidiosis, lorikeet paralysis syndrome, *Macrorhabdus ornithogaster* infection, *Salmonella* spp. infection, spironucleosis, parasitism, pigeon paramyxovirus 1 (PPMV1), poisoning, psittacine beak and feather disease, toxoplasmosis, trichomoniasis and trauma. PPMV1 was diagnosed in a number of feral pigeon (*Columba livia*) mortality events in Victoria and the Australian Capital Territory.

No wild bird mortality events were attributed to AI or West Nile virus. AI was specifically excluded by polymerase chain reaction (PCR) testing for influenza A in 122 of the events. In addition, APMV was excluded in 96 events by PCR testing specific for ND virus and/or PPMV-1. AI and APMV exclusion testing was not warranted in the remaining events on the basis of clinical signs, history, prevailing environmental conditions or other diagnoses.

Tasmanian devil facial tumour disease

Tasmanian devil facial tumour disease (DFTD) is a transmissible cancer which was first recorded

37 ABLV Bat Stats. www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.aspx

38 www.agriculture.gov.au/pests-diseases-weeds/animal/white-nose-syndrome

39 www.animalhealthaustralia.com.au/wp-content/uploads/AHAI1704-AHSQ-Q2-2017_FA2.pdf

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

in wild Tasmanian devils (*Sarcophilus harrisii*) in 1996[41,42] and has spread to affect nearly the entire species range. DFTD is caused by a directly transmissible cell line; living cancer cells are transmitted between individuals by close contact during social interactions.[43]

A second transmissible cancer, Devil Facial Tumour 2 (DFT2) was detected in Tasmanian devils in southeastern Tasmania.[44] DFT2 appears to behave like the first-observed DFTD (now referred to as DFT1) and individuals can be affected by both DFT1 and DFT2.

The species is estimated to have declined by 77% in less than 20 years,[45] with local population declines as high as 97%.[46,47] Tasmanian devils are now listed as an endangered species at both national and state levels, and are listed as threatened by the International Union for Conservation of Nature.[48] Tasmanian DFTD is listed as a nationally notifiable animal disease.

Management of the response to DFTD is coordinated by the Save the Tasmanian Devil Program (an Australian and state government initiative), and implemented by the Tasmanian Department of Primary Industries, Parks, Water and Environment. A robust captive insurance population of over 700 individuals is managed across a number of institutions, both within Tasmania and on the mainland. The current phase of the program is focused on securing wild Tasmanian devil populations, minimising the effect of DFTD and other ecological threats, and maximising the genetic diversity of the species, in addition to maintaining the insurance population. A disease-free population has been established on Maria Island and wild populations have been supplemented by captive and wild-born (born on Maria Island) releases at several sites across the state. It was found that captive-born devils were more prone to being killed on roads than wild-born devils, so all future translocations will be of wild-born devils.[49] Studies into immunotherapies, including development of a vaccine, continue.

3.4 Targeted national programs

3.4.1 National Arbovirus Monitoring Program

National Arbovirus Monitoring Program (NAMP) monitors the distribution of economically important arboviruses (insect-borne viruses) of livestock (cattle, sheep, goats and camelids), and associated insect vectors in Australia. Arboviruses monitored by NAMP include bluetongue, Akabane and bovine ephemeral fever (BEF) viruses. Bluetongue virus (BTV) infection does not adversely affect production in Australian livestock, and disease has not been reported from areas of known viral transmission.

NAMP provides credible data on the nature and distribution of important, specific arbovirus infections in Australia for use by the Australian Government and livestock exporters. NAMP supports Australian Government export certification that Australian ruminants are sourced from areas that are free from transmission of these specified arboviruses. In addition, NAMP data are used during market access negotiations.

NAMP is jointly funded by its primary beneficiaries: the cattle, sheep and goat industries; the livestock export industry; and the state, territory and Australian governments.

41 Hawkins CE, Baars C, Hesterman H, et al. Emerging disease and population decline of an island endemic, the Tasmanian devil *Sarcophilus harrisii. Biological Conservation* 2006; 131 ; 307-324.

42 Loh R, Bergfeld J, Hayes D, et al. The pathology of devil facial tumor disease (DFTD) in Tasmanian devils (*Sarcophilus harrisii*). *Veterinary Pathology Online* 2006; 43: 890-895.

43 Epstein B, Jones M, Hamede R, et al. Rapid evolutionary response to a transmissible cancer in Tasmanian devils. *Nature Communications* 2016: 7.

44 Pye RJ, Pemberton D, Tovar C, et al. A second transmissible cancer in Tasmanian devils. *Proceedings of the National Academy of Sciences* 2016; 113(2): 374-379.

45 Lazenby BT, Tobler MW, Brown WE, et al. Density trends and demographic signals uncover the long-term impact of transmissible cancer in Tasmanian devils. *Journal of Applied Ecology* 2018; 55(3): 1368-1379.

46 Hamede RK, Pearse A-M, Swift K, et al. Transmissible cancer in Tasmanian devils: localized lineage replacement and host population response. *Proceedings Biological Science* 2015; 282: pii: 20151468. doi: 10.1098/rspb.2015.1468.

47 Save the Tasmanian devil program (2015) The disease. www.tassiedevil.com.au/tasdevil.nsf/The-Disease/979FEB5F116CE371CA2576CB0011A26E

48 IUCN 2008. The IUCN Red List of Threatened Species. www.iucnredlist.org

49 Grueber CE, Reid-Wainscoat EE, Fox S, et al. Increasing generations in captivity is associated with increased vulnerability of Tasmanian devils to vehicle strike following release to the wild. *Scientific Reports* 2017; 7: 2161.

Objectives of the National Arbovirus Monitoring Program

NAMP has three specific objectives:

- market access – to facilitate the export of live cattle, sheep, goats and camelids, and their reproductive material, to countries that apply import conditions to mitigate the risk of introduction of bluetongue, Akabane and BEF viruses.
- bluetongue early warning – to detect incursions of exotic strains of BTV and vectors (*Culicoides* spp. biting midges) that have the potential to adversely affect livestock production in Australia and trade by surveillance of the northern BTV-endemic area.
- risk management – to detect changes in the seasonal distribution in Australia of endemic bluetongue, Akabane and BEF viruses and their vectors, to inform livestock producers and support trade.

Operation of the National Arbovirus Monitoring Program

NAMP data are gathered throughout Australia by serological monitoring of cattle in sentinel herds, strategic serological surveys of other cattle herds (serosurveys), and trapping of insect vectors.

The number and locations of herds (Figure 3.1) are selected to enable the distribution of the specified arboviruses to be determined and the arbovirus-free area is monitored to verify freedom. Areas that are known to be endemically infected are sampled to detect any new strains of virus and to assess the seasonal intensity of infection with each arbovirus.

Beatrice Hill, in the far north of the Northern Territory, is a focus for exotic BTV surveillance, and virus isolation is routinely undertaken on blood samples collected at this location. Serotyping, virus isolation and molecular testing are applied strategically in other herds in New South Wales, the Northern Territory, Queensland and Western Australia after seroconversions are detected. NAMP surveillance data relating to early warning of bluetongue infection are supplemented by targeted surveillance activities conducted by NAQS in remote coastal regions of northern Australia (Northern Territory, northern Queensland and Western Australia), including the Torres Strait Islands.

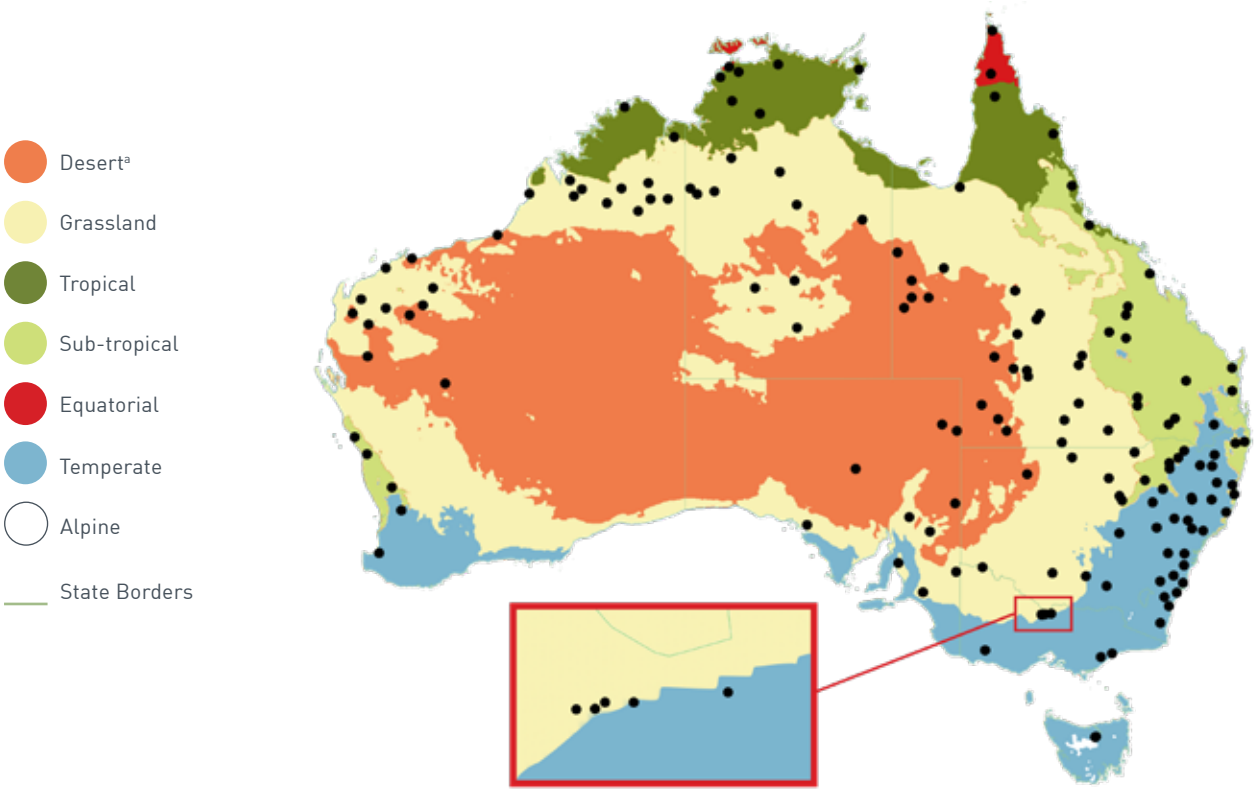


Figure 3.1 Locations of National Arbovirus Monitoring Program virology monitoring sites, 2017–2018 arbovirus transmission season

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

Epidemiology

Bluetongue, Akabane and BEF viruses are noncontagious and are biologically transmitted by their insect vectors. Climatic factors (rainfall, temperature, and prevailing wind speed and direction) determine the distribution of potential vectors. The arboviruses are transmitted only if vectors are present in sufficient density.

Culicoides brevitarsis is the main vector of both BTV and Akabane virus. There is a close correlation between the southern limits of *C. brevitarsis* and the distribution of the two viruses, although the viruses are less widely distributed than their vectors. Other vectors of BTV in Australia that are less widely distributed than *C. brevitarsis* are *C. actoni*, *C. dumdumi*, *C. fulvus* and *C. wadai*.

The main vector of BEF virus in Australia is generally considered to be the mosquito *Culex annulirostris*. *Culex annulirostris* has different ecological thresholds from *C. brevitarsis*, particularly its tolerance to lower temperatures, which accounts for its wider distribution and its occurrence in regions not affected by BTV or Akabane virus, such as southern Australia.

Research in Australia since the mid-1970s has provided a detailed understanding of the epidemiology of Australian BTV strains and their *Culicoides* midge vectors. Vector species enter northern Australia infrequently and entry is associated with significant weather events. This is a feature of the epidemiology particularly of BTV and explains the infrequent detection of new serotypes in northern Australia.

Many regions in Australia have never recorded the presence of transmission-competent *Culicoides* vectors and are therefore free from viral transmission of arboviruses that can only be spread by these vector species (BTV and Akabane virus). Climatic conditions have a significant effect on vector distribution and account for changes that occur to the boundary between areas where viral transmission occurs and areas free of transmission.

Recent monitoring results

Full monitoring results for the 2017–2018 arbovirus transmission season (September 2017 to August 2018) are published in the *NAMP 2017–2018 Report*.[50] Excerpts of the full report follow below to summarise the limits of distribution of the bluetongue, Akabane and BEF viruses.

Bluetongue virus distribution

The limits of BTV transmission in Australia are shown on the interactive Bluetongue Virus Zone Map[51] which defines areas in which no viral transmission[52] has been detected for the past two years.

BTV transmission is endemic in northern and northeastern Australia (New South Wales, Northern Territory, Queensland and Western Australia), and remains undetected in South Australia, Tasmania and Victoria (Figure 3.2). No new serotypes were detected in Australia from samples collected during 2017–2018; however, the first occurrence of BTV serotype 4 was identified from research on archived samples collected in the Northern Territory in 2006 and 2014. Testing of additional archived samples indicates that BTV serotype 4 has been present in Australia since 1995 and confirms the presence of 13 strains of BTV (serotypes 1, 2, 3, 4, 5, 7, 9, 12, 15, 16, 20, 21 and 23).

No competent vector species were detected in South Australia, Tasmania or Victoria, consistent with the serological evidence of virus absence.

Akabane virus distribution

The distribution of Akabane virus (Figure 3.3) varies within the limits of its vector, *C. brevitarsis*, occurring endemically in northern Australia and showing a distinct seasonal spread in New South Wales and southern parts of Queensland.

Akabane virus remains undetected in South Australia, Tasmania and Victoria.

Bovine ephemeral fever virus distribution

BEF virus is endemic in northern Australia, where BEF can occur in both the dry and wet seasons (spring, summer or autumn). In New South Wales and parts of southern Queensland, occurrence of the virus is limited by the effect of cold winters, restricting the distribution of its mosquito vector (Figure 3.4).

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

51 namp.animalhealthaustralia.com.au

52 Viral transmission is defined as detection of evidence of viral infection based on serological monitoring of cattle.

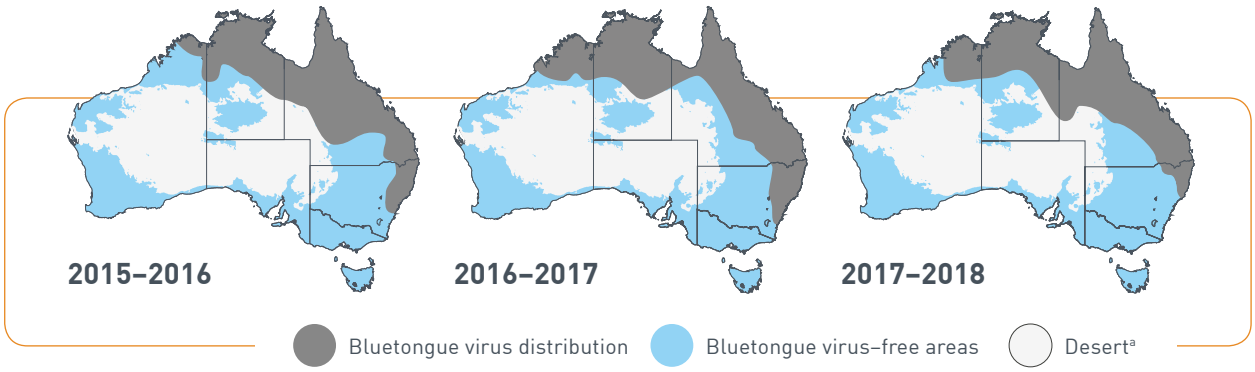


Figure 3.2 Distribution of bluetongue virus in Australia, 2015–2016 to 2017–2018

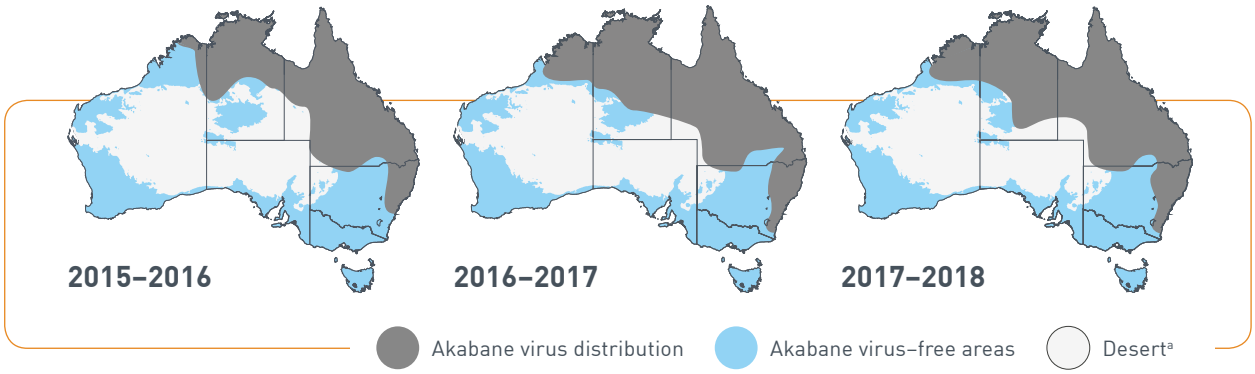


Figure 3.3 Distribution of Akabane virus in Australia, 2015–2016 to 2017–2018

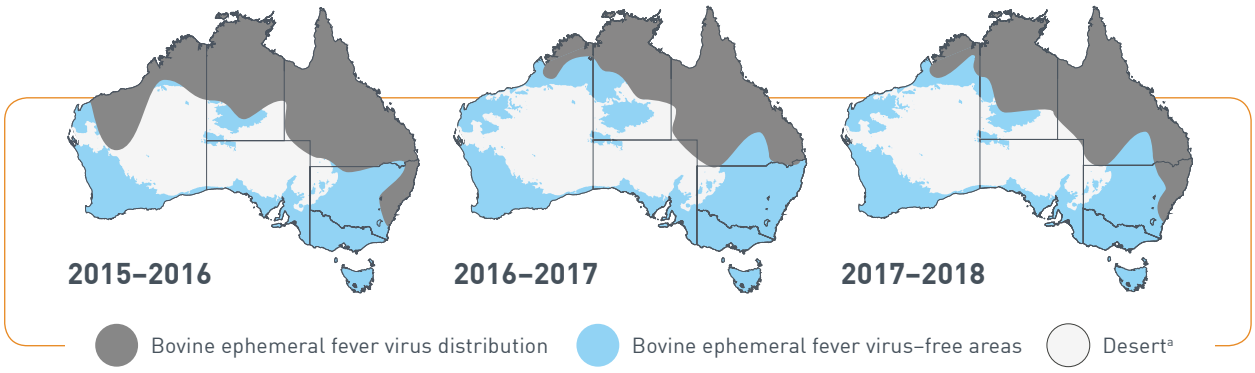


Figure 3.4 Distribution of bovine ephemeral fever virus in Australia, 2015–2016 to 2017–2018

a Köppen climate classification

BEF virus and BEF clinical diseases were not detected in South Australia, Tasmania or Victoria.

3.4.2 National Avian Influenza Wild Bird Surveillance Program

The NAIWB Surveillance Program is coordinated by WHA and activities occur Australia-wide. Surveillance for AI in wild birds comprises two sampling components: targeted surveillance via sampling of apparently healthy and hunter-killed wild birds; and general surveillance via investigating significant unexplained morbidity and mortality events in wild birds (see Section 3.3.4). Sources for targeted wild bird surveillance data include state and territory government laboratories, universities, and samples collected through the NAQS program. Samples from sick and dead birds include submissions from members of the public, private practitioners, universities, zoos and wildlife sanctuaries.

Anseriformes (waterfowl) were primarily targeted, with a small number of Charadriiformes

(shorebirds) also sampled. Locations focused on areas with known mixing of shorebirds and waterfowl and/or those in close proximity to poultry and humans. In 2018, a subset of samples collected as part of the AI targeted surveillance activities was also tested for APMV, predominantly targeting APMV-1.

Over 105 000 wild birds have been tested for AI viruses since July 2005. In 2018, pathogen-specific, risk-based surveillance was conducted by sampling apparently healthy, live and hunter-killed wild birds at sites in New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia. A total of 5775 faecal environmental, cloacal and/or oropharyngeal swabs collected from waterbirds were tested for AI viruses, with a subset (n = 1729) also tested for APMV-1. No HPAI viruses or virulent strains of APMV-1 have been identified. However, surveillance activities continue to result in evidence of a wide range of subtypes of AI viruses of low pathogenicity (sub-types H1, H2, H4, H5, H7, H9, H10 and H11) and avirulent strains of APMV-1.

The NAIWB Surveillance Program continues to provide valuable ecological and epidemiological background information that assists strategic risk management to minimise the potential effects of AI viruses – particularly HPAI – on human health, poultry industries and wildlife in Australia. Importantly, this program is a key source of samples that are positive for AI viruses, which are used to maintain and develop current and specific diagnostic primers and probes for PCR. These are essential for continued confidence that the tests being used in Australia will detect any H5 or H7 strains of HPAI in the event of an outbreak of these sub-types in poultry. The multi-agency and cross-jurisdictional approach of this project provides a forum for collaboration on technical aspects of influenza in humans, animals and wildlife.

3.4.3 Screw-worm Fly Surveillance and Preparedness Program

Old World screw-worm fly (OWS) (*Chrysomya bezziana*) and New World screw-worm fly (NWS) (*Cochliomyia hominivorax*) are exotic to Australia, and suspicion of infestation in animals is notifiable under state and territory animal health legislation.[53] Screw-worm fly (SWF) infestation in humans is not notifiable.[54]

OWS and NWS have similar biological profiles and fill similar ecological niches in Africa and Asia (OWS) and the Americas (NWS).[55] OWS myiasis (infestation with fly larva) is a significant production disease of livestock throughout its range. It is considered a greater threat to Australian livestock industries than NWS because of the proximity of the areas where it occurs to Australia and the return of livestock export vessels from Asia and the Middle East, where OWS is prevalent (see Figure 3.5), to Australian ports.

Although surveillance indicates a low likelihood of incursion of SWF into Australia, the potential for establishment and spread across several states and territories is significant. SWFs lay their eggs in the wounds of any living warm-blooded animal, and the Australian tropical climate is favourable to their life cycle. Modelling has indicated that most of tropical northern Australia and part of the eastern seaboard offer a suitable climate for OWS survival; in the south of Australia, extremes of temperature and moisture would limit survival.

Feral animals, livestock and wildlife would be important hosts for SWF in Australia. The large feral animal populations in the north, and the large numbers of both extensively and intensively reared livestock along the eastern seaboard mean that SWF could spread widely if it entered and became established in Australia.

AHA manages the Screw-Worm Fly Surveillance and Preparedness Program (SWFSPP)[56] in consultation with a committee of industry and government stakeholders. The program aims to detect an incursion early enough to ensure a high likelihood of success of an eradication program.

Program in 2018

The SWFSPP comprises four areas of work:

- surveillance (see Figure 3.6)
    - by fly trapping in the Northern Territory (two locations), Queensland (two locations) and Western Australia (four locations)

53 www.agriculture.gov.au/pests-diseases-weeds/animal/notifiable

54 www.health.gov.au/casedefinitions

55 Spradbery P. Screw-worm fly: a tale of two species. *Agricultural Zoology Reviews* 1994; 6: 1-62.

56 www.animalhealthaustralia.com.au/swf

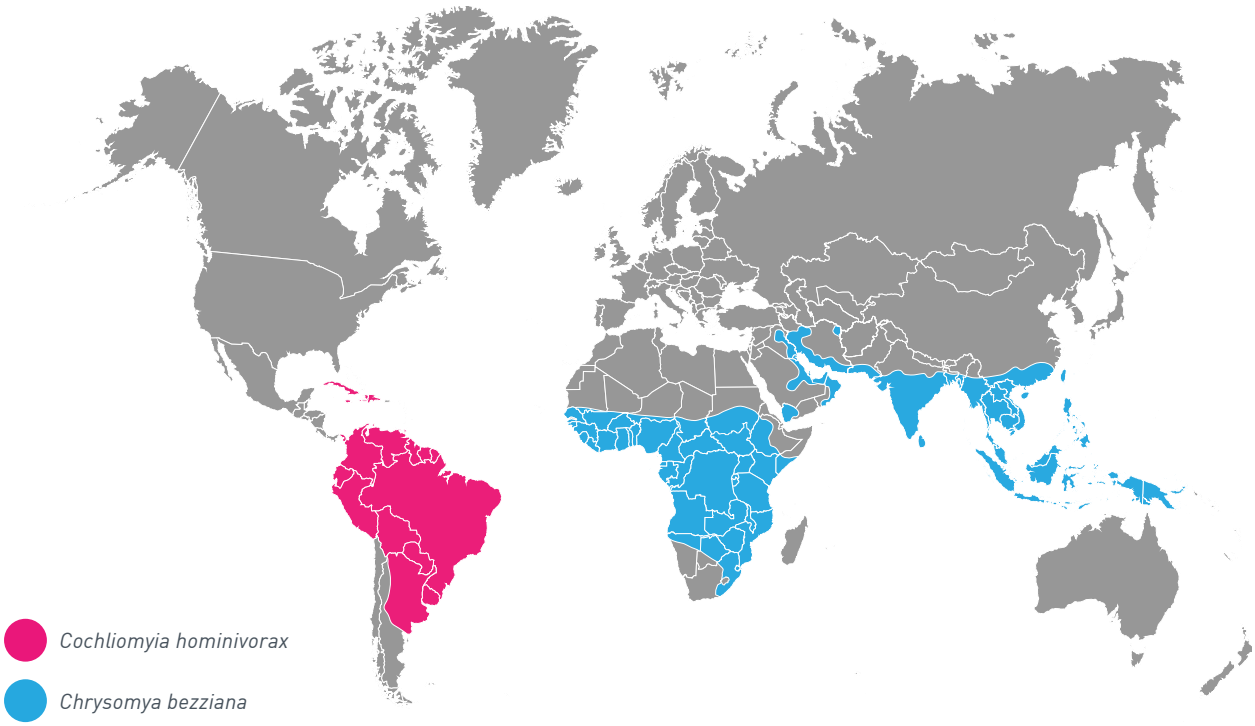


Figure 3.5 Global distribution of screw-worm fly

  - by targeted livestock wound surveys for myiasis in the Northern Territory (three locations), Queensland (three locations) and Western Australia (two locations)
- entomology training and development of reference resources
- awareness promotion to increase general surveillance for myiasis
- monitoring of the risk profile for SWF in Australia.

During 2017–18, fly trapping occurred at eight locations, 24 sites (within locations), and a total of 235 fly trapping events[57] were conducted. Targeted myiasis monitoring was conducted at eight locations and 20 sites (within locations), comprising 175 cattle or domestic animal surveys and a total of approximately 14 193 animals inspected. General surveillance data (investigations of myiasis to exclude SWF) are reported in Appendix Table C1. All investigation results were negative.

During 2018, maggot collection kits were distributed via state and territory government agencies to veterinary practices, livestock agents, cattle producers, cattle export depots, quarantine check points, and government offices and medical practices. NAQS also continues to provide awareness material through its engagement with local communities and visitors to the Torres Strait region.

Australia monitors the risk of OWS entry via returning livestock export vessels by trapping insects on board while vessels are in Australian

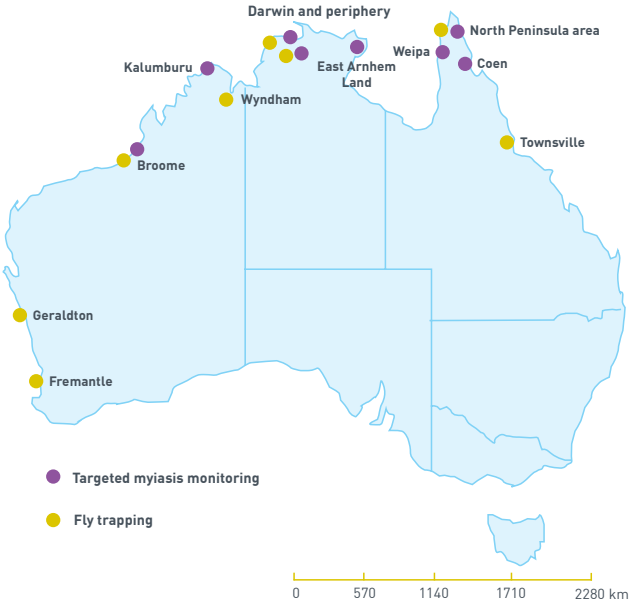


Figure 3.6 Locations of targeted myiasis monitoring and fly trapping in the revised Screw-Worm Fly Surveillance and Preparedness Program

57 One SWF trap is set for 10 days.

waters. A variety of dead insects are collected in 'insectocutors' and checked by entomologists for SWF. During 2018, no SWFs were detected.

3.4.4 Transmissible Spongiform Encephalopathies Freedom Assurance Program

In 2018, Australia maintained freedom from classical scrapie and continued to be recognised by the OIE as a country of negligible risk for bovine spongiform encephalopathy (BSE). These diseases are types of transmissible spongiform encephalopathies (TSEs). The purpose of the TSE Freedom Assurance Program (TSEFAP) is to increase market confidence that Australian animals and animal products are free from TSEs. This is achieved through the structured and nationally integrated management of animal-related TSE activities.

Projects that operate under the TSEFAP are:

- National Transmissible Spongiform Encephalopathies Surveillance Project (NTSESP)
- the Australian ruminant feed-ban scheme, including inspections and testing
- imported animal surveillance for certain imported cattle
- communications.

National Transmissible Spongiform Encephalopathies Surveillance Project

The NTSESP demonstrates Australia's ability to meet the requirements for a BSE-negligible-risk and classical-scrapie-free country, and provides early detection of these diseases should they occur. It involves the collection of samples from 'clinically consistent',[58] 'fallen'[59] and 'casualty slaughter'[60] cattle and from 'clinically consistent' sheep. Details of the sampling program for cattle and sheep are provided in *NTSESP national guidelines for field operations*.[61]

For cattle, Australia is assessed by the OIE as BSE-negligible risk. This means that Australia implements OIE type B surveillance, which is designed to detect at least one BSE case per 50 000 in the adult cattle population at a confidence level of 95%. Surveillance 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 surveillance points during a seven-year moving window. Australia also aims to meet OIE recommendations to investigate all clinically consistent cattle, and ensure that cattle from the 'fallen' and 'casualty slaughter' subpopulations are tested.

For sheep, the NTSESP is a targeted surveillance program that has an annual sampling intensity designed so that there would be at least a 99% probability of detecting scrapie if this disease accounted for 1% of the cases of neurological disease in sheep in Australia. This is achieved by the annual laboratory examination of a minimum of 440 sheep brains collected from animals showing clinical signs of a neurological disorder.

AHA manages the NTSESP with funding from 10 industry stakeholders (livestock and associated industries), the Australian Government, and the state and territory governments.

Table 3.2 shows the results from the NTSESP for the 2017–18 financial year. Data for other periods are available from the NAHIS database.[62]

Australian ruminant feed-ban scheme

Since 1997, Australia has had a total ban on feeding ruminant meat and bonemeal to ruminants. In 1999, this ban was extended to cover feeding of specified mammalian materials to ruminants. Since 2002, feeding of ruminants with any meals derived from vertebrates (including fish and birds) has been banned. The ban is enforced under legislation in each state and territory, and by a

58 Defined as 'an animal that is found with clinical signs considered consistent with BSE', analogous with 'clinical suspect' as in the OIE 2016 *Terrestrial animal health code*, Chapter 11.4, on surveillance for BSE.

59 Defined in the OIE 2016 *Terrestrial animal health code*, Chapter 11.4, as 'cattle over 30 months of age which are found dead or killed on farm, during transport or at an abattoir'.

60 Defined in the OIE 2016 *Terrestrial animal health code*, Chapter 11.4, as 'cattle over 30 months of age that are non-ambulatory, recumbent, unable to rise or to walk without assistance; cattle over 30 months of age sent for emergency slaughter or condemned at ante-mortem inspection'.

61 Animal Health Australia. National TSE Surveillance Project (NTSESP) national guidelines for field operations July 2017 to June 2018. www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/tse-freedom-assurance-program/surveillance-of-tses

62 www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/national-animal-health-information-system-nahip

Table 3.2 Summary of results from the National Transmissible Spongiform Encephalopathies Surveillance Project, cattle and sheep, 2017–18

	Cattle			Sheep	
State or territory	Number examined	Points	Number positive	Number examined	Number positive
New South Wales	217	37 011.6	0	161	0
Northern Territory	21	10 920.4	0	0	0
Queensland	169	56 929.9	0	29	0
South Australia	28	5 539.3	0	54	0
Tasmania	13	744.8	0	7	0
Victoria	107	27 096.8	0	92	0
Western Australia	35	15 051.9	0	225	0
Total	**590**	**153 294.7**	**0**	**568**	**0**

uniform approach to the inspection of all parts of the ruminant production chain. It does not include tallow, gelatine, milk products, or animal oils and rendered fats.

In the 2017–18 financial year, 513 operations were inspected by jurisdictional staff, from renderers to end users. This revealed 26 instances of non-compliance, of which all except one were successfully resolved in this period. During the same period, 7365 audits were completed through industry QA programs, very high levels of compliance were recorded and only four corrective action requests were issued.

Imported animal surveillance

All cattle imported between 1996 and 2002 from countries that have experienced a native-born case of BSE have been placed under lifetime quarantine, are electronically tagged as part of NLIS for cattle, and are inspected by government authorities every 12 months. These animals may not enter the human or animal feed chains. They are slaughtered, then incinerated or buried. As of November 2018, there are 12 of these imported cattle still present in Australia.

Program communications

During 2018, TSEFAP communications included:

- a pamphlet for producers, to encourage them to report animals with TSE-consistent clinical signs for sampling under the TSEFAP
- distribution of a series of pamphlets for stockfeed manufacturers and users, promoting awareness of their responsibilities under the ruminant feed-ban legislation
- updating of the AHA webpages on the components of the TSEFAP.

3.4.5 National Bee Pest Surveillance Program

Australia's freedom from exotic bee pests, such as *Varroa destructor*, has been achieved not only by Australia's isolation, but in many respects through the success of a strong industry–government biosecurity partnership. This partnership includes the industries that rely on pollination, all state and territory governments, NAQS and the Australian Government, as well as port staff and beekeepers.

Plant Health Australia (PHA) has been coordinating surveillance activities at ports nationwide as part of the National Bee Pest Surveillance Program (NBPSP) since 2012. The NBPSP is an early warning system to detect new incursions of exotic pest bees and bee pests. The program also provides technical, evidence-based information to support Australia's pest-free status claims during export negotiations and assists exporters to meet export certification requirements.

The Enhanced NBPSP 2016–21 came into effect in December 2016, building on existing activities and incorporating new methodologies. The program uses a variety of surveillance activities to detect

14 exotic bee pests and pest bees, as well as two regionalised but significant bee pests, across 32 airports and seaports (see Figure 3.7). It is funded by the Hort Frontiers Pollination Fund, part of the Hort Frontiers strategic partnership initiative[63] developed by Hort Innovation. This consists of contributions from nine pollinator-dependent-industry research and development levies, with co-investment from the Australian Honey Bee Industry Council,[64] Grain Producers Australia,[65] and contributions from the Department of Agriculture and Water Resources. In-kind contributions for the implementation of the program are provided by state and territory governments and volunteer beekeepers. At a national level, the program is coordinated and administered by PHA.[66]

Bee pest surveillance activities

Since January 2018, over 14 600 data records have been generated through multiple targeted surveillance activities.

As part of the program, sentinel hives[67] are maintained at high risk locations around Australia. These are routinely inspected for bee pests using various methodologies. In 2018, the jurisdictions deployed additional sentinel hives across the airports and seaports. These strategically placed hives were inspected for external exotic pests of bees (varroa mite, tropilaelaps mites, large African hive beetle and braula fly). Surveillance used either sticky mats and miticides or other methods, and generated over 4000 records. Although braula fly is known to be in Tasmania, with 35 'present' reports, all other reports were negative for exotic pests of bees. Over 6800 adult bees were dissected and inspected for internal mites (tracheal mite). A honey bee virus diagnostic network (initiated in 2017 through CSIRO and funded through the **Agricultural Competitiveness White Paper**) tested 240 bee samples in 2018 and confirmed the absence of five key exotic honey bee viruses.

The Asian hornet is a serious exotic pest of concern for European honey bee hives. In 2018, for the first time, specific traps were deployed at key Australian ports with high entry and establishment risks for this pest. This surveillance generated a significant amount of data confirming Australia is free of this pest. This work was undertaken by border surveillance staff, with funding support through the **Agricultural Competitiveness White Paper**.

Floral sweep-netting carried out near ports enables early detection of exotic pest bees. The nets are used to collect and identify foraging bees. A total of 130 floral sweep surveys took place in 2018. Funding support through the **Agricultural Competitiveness White Paper** enabled the states and territories to increase their floral sweep-netting activities at more port locations. During these floral sweep-nettings, the presence of bumble bee was detected seven times (all within known locations of Tasmania), while no other exotic pest bees were detected.

Strategically placed empty catchboxes as well as structures at ports may be colonised by honey bee swarms from local populations or newly arrived swarms from overseas. Whenever these colonies are detected they are captured, identified and inspected for all exotic bee pests. In 2018, a total of 60 bee swarms were captured. Of these, 29 were Asian honey bee swarms from Cairns in Queensland (where a current isolated population exists) and Port Dampier in Western Australia, the latter being a single swarm. Of the remaining swarms, 30 were European honey bees, of which 21 came from various port locations and were free of exotic internal and external mites, while one, found in vessel cargo in Port Melbourne in June 2018, contained *V. destructor*. In response to this detection, Australian Government border surveillance staff captured and destroyed the swarm and inspected it further for exotic pests. In addition, Agriculture Victoria undertook extensive sentinel hive and floral sweep netting surveillance activities around the port. In August 2018, surveillance was concluded, confirming that Australia was still free of *V. destructor*. This border detection displayed the effectiveness of the biosecurity surveillance system in action.

3.5 Surveillance in northern Australia

Australia is free from many agricultural pests and diseases that affect quality and production

63 www.horticulture.com.au/hort-innovation/our-work/hort-frontiers-strategic-partnership-initiative

64 www.honeybee.org.au

65 www.grainproducers.com.au

66 www.planthealthaustralia.com.au/national-programs/national-bee-pest-surveillance-program

67 Hives of European honey bees of known health status.

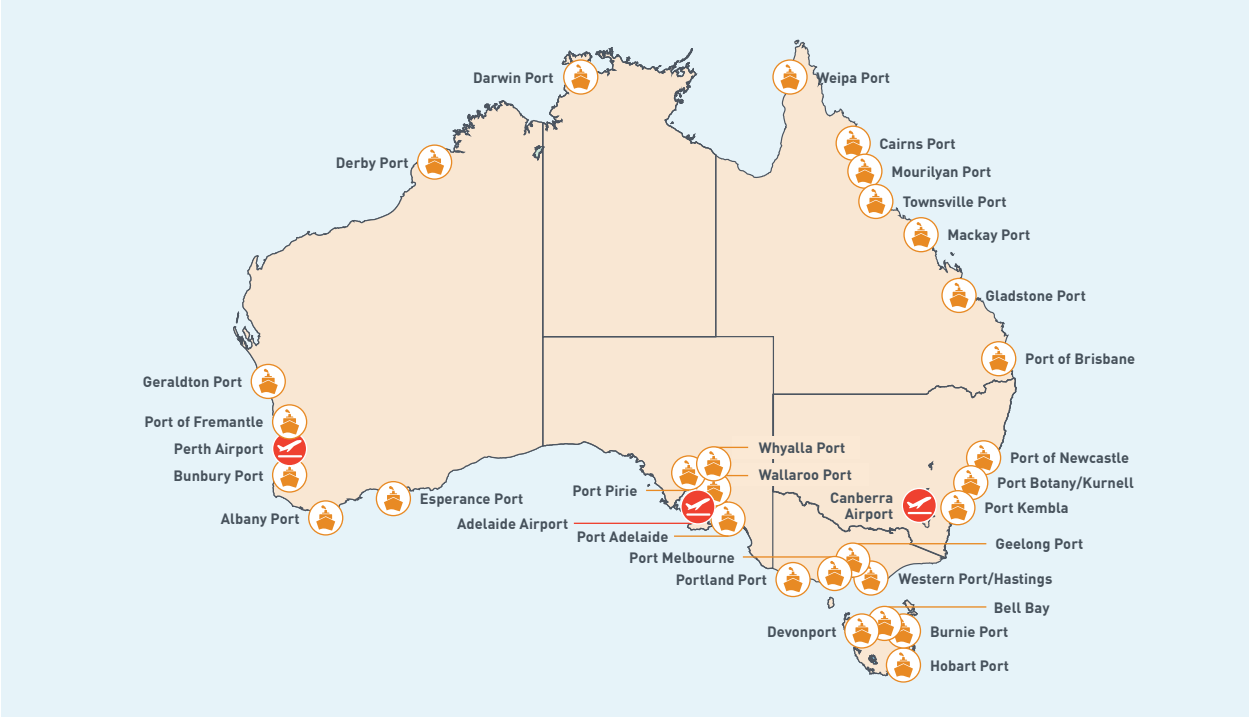


Figure 3.7 Locations of airports and seaports involved in the National Bee Pest Surveillance Program

of food and fibre sources. Although Australia is geographically isolated with an effective biosecurity system, the remote and vast northern coastline is vulnerable to the introduction and establishment of exotic agricultural pests and diseases from neighbouring countries. Established seaports and airports are controlled in accordance with relevant risk profiles; however, the northern coastline is exposed to wind and ocean currents, potentially unregulated or illegal vessels, busy shipping channels, marine debris and migratory animals, all of which could result in the arrival of unchecked biosecurity risk material.

3.5.1 Northern Australia Quarantine Strategy

This unique northern Australia biosecurity risk profile resulted in the formation of NAQS, a program of the Australian Government Department of Agriculture and Water Resources established in 1989 to address the risks associated with the vulnerability of the coastline between Broome and Cairns, and north through the Torres Strait.

Specific activities include:

- targeted animal health surveys and monitoring programs that contribute to broader national surveillance programs
- biosecurity surveillance services delivered by Aboriginal and Torres Strait Islander ranger groups and other stakeholders
- strategic collaborations with relevant state and territory biosecurity agencies and other stakeholders to ensure efficient delivery of biosecurity messaging and surveillance objectives
- collection and analysis of relevant risk data through the offshore and onshore surveillance activities.

NAQS surveillance is prioritised for the detection of pests and diseases that meet the following criteria:

- proximity to Australia and potential unregulated pathways for arrival
- likelihood of establishment and spread based on the nature of the organism and prevailing conditions in the event of introduction
- likelihood of significant effects on agricultural productivity and export markets as well as human and environmental health, and economic consequences of a response.

In 2018, priorities included:

- ongoing risk-based surveillance for key exotic pests and diseases including FMD, classical swine fever, Aujeszky's disease and HPAI

- contributing to national surveillance and animal health reporting programs including NAMP, SWFSPP, NAIWB, NAHIS and eWHIS
- activities supported under the **Agricultural Competitiveness White Paper** initiative:
    - distribution of a 'Ranger Application' as a tool for Aboriginal and Torres Strait Islander rangers to collect animal health data and enable easy submission of reports
    - progressing developments in diagnostic testing for bluetongue virus
    - developing integrated information technology systems and field applications to collect, analyse and store surveillance data for a range of NAQS activities
    - support and input into a variety of projects to improve preparedness for canine rabies in northern Australia
    - improving the Torres Strait Information System.

Specific disease surveillance strategies

Targeted surveys

Wild and domestic animal health surveys are conducted routinely across northern Australia and the Torres Strait, in zones defined by risk profiles, to detect changes in the health status of target host populations. In addition to testing for specific diseases and providing observations of large groups of animals, these surveys have the added benefit of engaging relevant stakeholders and spreading biosecurity awareness. No exotic diseases were detected during 2018. Data are reported through NAHIS, and contribute to Australia's capacity to demonstrate the absence of pests and diseases of significance to trading partners.

Indigenous ranger groups

A network of 69 Aboriginal and Torres Strait Islander ranger groups across northern Australia conduct fee-for-service biosecurity tasks, providing invaluable coverage and knowledge of vast tracts of remote land that would otherwise be impossible to survey or gather biosecurity risk information on. Funding through the **Developing Northern Australia White Paper** and the **Agricultural Competitiveness White Paper** has enabled a wide variety of projects designed to further the rangers' understanding of biosecurity and increase information available to the Department of Agriculture and Water Resources. During 2018, usage of the 'Ranger Application' increased, and has the potential to significantly increase efficiency and quality of animal health data collected from otherwise infrequently visited areas. The Carpentaria Land Council hosted a National Indigenous Ranger Forum in Burketown, Queensland for over 200 rangers, with several hands-on biosecurity activities and networking opportunities.

Screw-worm fly surveillance

Monitoring for SWF continues through a combination of adult fly traps and myiasis reporting with submission of maggots for identification. Adult fly traps are set quarterly in five key locations across the Northern Peninsula Area in Queensland. Myiasis inspections are conducted on all sentinel cattle, and also during NAQS animal health surveys. Aboriginal and Torres Strait Islander rangers collect data on wounds in animals and humans, and maggot collection kits are distributed to remote community health clinics, district hospitals, private vet clinics and pastoralists for submission of maggots found in wounds on live animals or people.

Japanese encephalitis surveillance

Monitoring for Japanese encephalitis virus (JEV) occurs during the monsoonal season, covering 13 sites throughout Queensland (the majority being in the north). JEV tests are also conducted on sentinel cattle, and also pigs, cattle and horses in routine feral and domestic animal health surveys.

JEV has not been detected on mainland Australia since 2004. However, routine surveillance activities report occasional seropositive results for JEV seasonally through the Torres Strait and Northern Peninsula Area. These seropositive results are often attributed to cross-reactions to other flaviviruses. In 2018, no clinical signs of Japanese encephalitis were reported and JEV was not isolated.

Avian influenza surveillance

Environmental faecal sampling forms the basis of surveillance for AI in northern Australia. Samples are collected twice yearly (at the beginning and end of the wet season) from known wild water fowl habitats, and are tested for type A influenza viruses. Samples that generate a positive result

Image credit: David Johnson

are evaluated to try to isolate and identify the various low pathogenic strains circulating within the population.

Biosecurity Top Watch

The Biosecurity Top Watch public awareness campaign is an important tool in improving the likelihood of early detection of an exotic pest or disease incursion. Various strategies have been used to encourage stakeholder and general public interest in biosecurity and in the consequences of an exotic pest or disease incursion into northern Australia. This includes the engagement of celebrity and industry biosecurity champions to endorse targeted messaging, under an **Agricultural Competitiveness White Paper** initiative.

Key surveillance achievements

Key surveillance achievements for 2018 include:

- seven animal health surveys, examining and testing 534 cattle, buffalo, banteng, goats, horses, donkeys, pigs, poultry and dogs, with no clinical signs or serological evidence of exotic disease
- a total of 1007 environmental faecal samples tested for AI viruses, with no HPAI viruses detected
- a total of 657 sentinel herd samples from 44 visits to six separate sites across northern Australia
- a total of 657 sentinel herd cattle inspections and 534 wild and domestic animal examinations with no evidence of SWF myiasis detected
- a total of 155 human and animal wounds reported by Aboriginal and Torres Strait Islander rangers, with a total of five maggot submissions; all tested negative for SWF by larval identification or molecular testing
- a total of 260 371 adult flies from 45 separate trapping events, processed either by morphology or molecular testing, with no SWF detections
- a total of 88 262 biting midges (*Culicoides* spp.) identified from 36 northern trap sites[68]
- a total of 44 cards[69] were sequenced for evidence of flaviviruses, with a small number of detections, none of which were JEV
- a total of 34 Aboriginal and Torres Strait Islander ranger groups submitted over 600 community animal health observations from 60 communities across northern Australia. Several observations of unusual findings were followed up with no suggestions of exotic disease.

68 'Northern Culicoides trap sites' are all NAMP sites above latitude 26°S

69 Mosquitoes feed on honey-coated FTA® cards. Mosquitoes leave saliva on the cards, which contains viral nucleic acids that can be tested.

3.5.2 Northern Australia Biosecurity Framework

The Northern Australia Biosecurity Framework (NABF) reference group was established in 2016 under the **Agricultural Competitiveness White Paper** and **Developing Northern Australia White Paper** to facilitate collaboration among communities, industries and governments to safeguard Australia's biosecurity. The NABF is guided by a reference group comprising senior representatives from the Australian, Western Australian, Northern Territory and Queensland governments, PHA and AHA. A working group of key field and laboratory surveillance managers within each jurisdiction identified various new initiatives to expand existing collaboration at all levels to manage new and growing biosecurity risks in northern Australia.

The objectives are to:

- develop and share information on biosecurity prevention, detection and management for plant, animal and aquatic pests and diseases across northern Australia
- encourage cooperation between governments, agricultural industries and research institutions on biosecurity issues
- share resources, where possible, to deliver timely and well-informed decisions about biosecurity in northern Australia.

There are six initiatives as part of the NABF:

- Northern Australia Biosecurity Surveillance – improved plant, animal and aquatic health surveillance
- Modern Diagnostics – to support biosecurity networks, knowledge and facilities in northern Australia
- Better Data – to improve the accuracy and usefulness of field biosecurity data
- Offshore Biosecurity Surveillance – collaborative biosecurity surveys in Indian Ocean territories and neighbouring countries
- Community Engagement – expand information and tools available to educate the community and other stakeholders about potential biosecurity threats and facilitate reporting
- Indigenous Rangers – expand the scope and volume of biosecurity work undertaken by Aboriginal and Torres Strait Islander rangers.

Achievements for 2018 include:

- Identifying priority animal diseases – 12 priority diseases have been identified and will be considered in the NAQS risk area review as part of integration into the routine surveillance strategy. Work is progressing with the Northern Territory, Queensland and Western Australian agricultural agencies to progress surveillance plans at the jurisdictional level.
- Facilitating better engagement of private veterinarians through the establishment of a significant disease investigation (SDI) network for northern Australia. The network has engaged with 16 clinics across northern Australia, and through its support and training opportunities it has significantly increased the number and quality of SDIs across the region.
- Increasing awareness of priority animal diseases among stakeholder groups. Includes provision of training and resources to private veterinarians and producers, subsidies for vet student placements in the northern region, and further enhancement of the LookCheck App.[70]
- Improving the ability to integrate, analyse and use collated animal health surveillance data. The Better Data project is nearing Phase 1 completion whereby all NAQS plant and animal health surveillance data will be collected, stored, analysed and displayed through a series of integrated programs with a central Surveillance Information Management System.
- Advances in arbovirus diagnostic capability. Several research projects have developed specific molecular tests, for both insect vectors and cattle hosts, enabling a broader diagnostic capacity for a wider range of bluetongue viruses.
- Progression of a rabies management strategy for implementation in the event of spread to West Papua, Papua New Guinea, Torres Strait or mainland Australia. This includes modelling of introduction and spread, a triggered vaccination strategy, and production of appropriate communication tools for awareness and information.

Together, these initiatives will create long-term benefit to communities and farmers in Australia's

70 LookCheck app was developed by AHA as a tool for producers to engage with private veterinarians on animal health concerns. www.animalhealthaustralia.com.au/lookcheck

north by providing practical and innovative improvements to biosecurity surveillance and by fostering collaborative partnerships.

All NABF projects are on track for completion by the end of June 2019, with several legacy items to be carried forward under new funding or integrated into routine surveillance operations.

More information on NABF initiatives is available on the Department of Agriculture and Water Resources website.[71]

3.6 State, territory and industry disease management programs

Australia has a large landmass with wide variability in geography and climatic conditions. As a result, livestock production systems are vastly different depending on where they are located in the country. These factors strongly influence disease prevalence in Australia's states and territories, so disease-control programs vary in each state and territory depending on climate and the types of livestock production systems that are present.

3.6.1 *Brucella ovis*

Ovine epididymitis, caused by *Brucella ovis*, is endemic in commercial sheep flocks in some states, but its prevalence is low. It is not a nationally notifiable animal disease. Voluntary accreditation schemes (primarily for stud flocks) are well supported, and are managed by state animal health authorities and breed societies. The numbers of accredited flocks at the end of 2018 are shown in Table 3.3.

Ovine brucellosis accreditation schemes operate in New South Wales,[72] Queensland,[73] South Australia,[74] Tasmania,[75] Victoria[76] and Western Australia.[77]

Ovine brucellosis is a notifiable disease in Tasmania and Victoria.

Table 3.3 Flocks accredited as free of ovine brucellosis, at 31 December 2018

State or territory	Accredited free
New South Wales	837
Queensland	77
South Australia	491
Tasmania	62
Victoria	413
Western Australia	197
Australia	**2077**

3.6.2 Caprine arthritis–encephalitis

Caprine arthritis–encephalitis (CAE) is a multisystemic, inflammatory condition of goats caused by a caprine retrovirus. The disease is present in most countries, including Australia. It has been reported in all Australian states and territories except the Northern Territory and is not a nationally notifiable animal disease.

Australia does not have any official regulatory control programs for CAE; however, there are some voluntary state-based accreditation programs (New South Wales, Queensland, South Australia and Tasmania) that are based on serological testing. Animals that test positive for CAE are removed from the herd.

CAE is a notifiable disease in the state of Victoria – producers, private veterinarians and veterinary laboratories are required to notify Agriculture Victoria within seven days of detecting or suspecting this disease. It is recommended that affected animals are either euthanased or sent to slaughter.

Producers that achieve a negative-tested herd status may apply for accreditation under their respective state regulations.

71 www.agriculture.gov.au/biosecurity/partnerships/northern-australia-biosecurity-framework

72 www.dpi.nsw.gov.au/animals-and-livestock/sheep/health/ovine-brucellosis/ovine-brucellosis-scheme

73 www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/livestock/animal-welfare/pests-diseases-disorders/ovine-brucellosis

74 www.pir.sa.gov.au/biosecurity/animal_health/sheep/health/ovine_brucellosis

75 www.dpipwe.tas.gov.au/biosecurity-tasmania/animal-biosecurity/animal-health/sheep/brucellosis-in-sheep

76 www.agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/animal-diseases/sheep/ovine-brucellosis

77 www.agric.wa.gov.au/livestock-biosecurity/ovine-brucellosis

3.6.3 Cattle tick and tick fever

The cattle tick, *Rhipicephalus* (formerly *Boophilus*) *microplus* or *R. australis*, was introduced to Australia in the late 19th century. It spread steadily from Darwin across northern Australia, stabilising in its current distribution in the northern and north-eastern coastal regions by about 1918. The distribution of the cattle tick is largely determined by climatic conditions; high humidity and ambient temperatures of at least 15–20°C are needed for egg laying and hatching. Cattle ticks mainly infest cattle, but may occasionally affect other species such as horses, sheep, goats, camelids, deer and water buffalo.

Ticks also transmit tick fever (bovine babesiosis or anaplasmosis), caused by *Babesia bigemina*, *B. bovis* or *Anaplasma marginale*. Babesiosis and anaplasmosis are nationally notifiable animal diseases in tick-free areas.

Acaricide treatment is widely used for tick control in endemic areas. Inspection and treatment are compulsory for cattle leaving defined tick areas in the Northern Territory, Queensland and Western Australia, and for cattle leaving known infested properties in New South Wales. The spread of ticks from endemic areas is restricted by state-managed zoning policies. Many producers in the tick endemic area have changed to *Bos indicus*-type cattle because of a greater resistance to tick infestation in those breeds.

No incursions of cattle ticks or cases of tick fever were reported in South Australia, Tasmania, Victoria or Western Australia during 2018.

3.6.4 Enzootic bovine leucosis

Enzootic bovine leucosis (EBL) is a nationally notifiable animal disease with a low prevalence in Australia. All jurisdictions have carried out testing of their dairy herds for many years. In 2008, building on the state-based programs, the Australian Dairy Industry Council and animal health authorities implemented a national EBL eradication program.

Declaration of unconditional freedom from EBL in the Australian dairy herd, according to the requirements in the national *Standard definitions and rules for control and eradication of enzootic bovine leucosis in dairy cattle* (version 2.0, February 2009), was achieved in 2013. Maintenance of the status of the Australian dairy herd requires strict ongoing controls on the introduction of beef cattle, as EBL is still present at a very low prevalence in sectors of the Australian beef herd.

In Western Australia, additional EBL surveillance is funded by the Western Australian cattle industry. All Western Australian dairy herds undergo a bulk milk test annually, and an intensive bulk milk test is conducted each year on milking herds with more than 200 cows.

3.6.5 Ovine footrot

Ovine footrot, caused by *Dichelobacter nodosus* infection, causes significant economic loss in southern Australia. Virulent footrot is more prevalent in areas with higher rainfall and moist pastures that keep the feet of sheep wet and soft at times of the year when average daily temperatures are above 10°C. Ovine footrot is not a nationally notifiable animal disease.

Several states (New South Wales, South Australia and Western Australia) have eradication or control programs aimed at limiting spread of the disease. The biggest risk to the success of these programs is spread from uncontrolled flocks either within or outside of the jurisdiction attempting control. Tasmania and Victoria do not have official control programs for footrot, although legislation is available to quarantine properties if required.

Ovine footrot is a notifiable disease in the Australian Capital Territory, New South Wales, Queensland, South Australia, Victoria and Western Australia.

3.6.6 Paratuberculosis

Paratuberculosis (or Johne's disease [JD]) is a chronic mycobacterial infection that causes ill-thrift, wasting and death in several species of livestock. In Australia, there are two main strains of the causative organism (*Mycobacterium avium* subsp. *paratuberculosis*). These seem to have some degree of host preference; however, they can infect and move between multiple species. The sheep strain is mostly seen in sheep but is also found in cattle and goats, and the cattle strain affects cattle, goats, alpaca, deer and sheep. Paratuberculosis is a nationally notifiable animal disease.

The livestock industries collaboratively manage the National Johne's Disease Project (NJDP),

Image credit: Taryn Mokotupu

which aims to reduce the effects of the infection and manage the measures taken to control it. In partnership with governments, each affected industry has implemented strategies that suit its particular needs and disease situation. The NJDP includes Australian JD Market Assurance Programs for sheep, goats and alpaca (the cattle Market Assurance Program was discontinued in 2016). These provide a high level of assurance that participating herds and flocks are not infected with JD. Details of herds and flocks in the Market Assurance Programs are maintained in NAHIS, and are available on the AHA website.[78]

Alpacas

JD is rare in the alpaca industry, and no cases were detected in 2018.

Beef cattle

Since 2016, JD in cattle has been deregulated. The move away from the previous zoning system aimed to encourage producers to take increased responsibility for their own biosecurity for both JD and other endemic diseases.[79] JD remains a nationally notifiable animal disease.

JD in cattle has rarely been detected in the northern and western beef industry. JD is also uncommon in beef herds in south eastern Australia. To help protect this situation, producers are encouraged to use the voluntary assurance system for cattle (the Johne's Beef Assurance Score). Producers are also encouraged to use a National Cattle Health Declaration[80] to provide health information on cattle for sale and to assess the risk of cattle being purchased.

At the request of the Western Australian cattle industry, JD in cattle remains a regulated disease in Western Australia, and state border controls are enforced.

Dairy cattle

In south eastern Australia, the dairy industry promotes hygienic calf rearing to help reduce the incidence of JD in replacement heifers. Buyers seeking JD assurance are also encouraged to ask the seller for a written declaration of the National Dairy Bovine JD Assurance Score[81] for the cattle.

78 www.animalhealthaustralia.com.au/what-we-do/endemic-disease/market-assurance-programs-maps

79 www.animalhealthaustralia.com.au/wp-content/uploads/2016/02/BJD-Framework-Document_final.pdf

80 www.farmbiosecurity.com.au/toolkit/declarations-and-statements

81 www.animalhealthaustralia.com.au/what-we-do/endemic-disease/johnes-disease/jd-and-dairy-cattle/national-dairy-assurance-score

Image credit: Laurie L Snidow

Sheep

Following a major review in early 2018, the national sheep industries decided not to renew the national management program for OJD. The management of OJD now sits within the Sheep Health Project at AHA. Producers are encouraged to manage OJD and other diseases under their property biosecurity plan or work together with other producers in regional biosecurity areas (groups of producers working together voluntarily to keep disease out of the area) and continue to use the National Sheep Health Declaration.[82] The latter is a declaration by the owner about the sheep that enables buyers to assess the risk of OJD and other diseases. A vaccination program for OJD in endemic areas is strongly recommended.

Abattoir surveillance provides feedback to individual farmers and the wider sheep industry on the occurrence of OJD and other significant endemic diseases (see 3.3.4 NSHMP). In 2018, the sheep industry continued working with AHA and the meat-processing industry to support abattoir surveillance at 12 sites across southern Australia. In the 2017–18 financial year, approximately 2933 consignments, comprising 707 587 adult sheep, were inspected for evidence of OJD.

Goats

The goat industry has established a risk-based trading approach, which uses a National Goat Health Declaration[83] with a nationally agreed risk-ranking system. This owner declaration includes a risk rating for JD and provides herd information on other conditions that can easily spread from herd to herd with movement of goats. A component of the strategy is a National Kid Rearing Plan to help protect young goats from infections such as JD and CAE.

3.6.7 Porcine brucellosis

Porcine brucellosis is a zoonotic disease caused by *Brucella suis*. The disease is present in most countries, but it is rare in Australia. *B. suis* infection is widespread in Queensland's feral pig population and has also been detected in feral pigs in New South Wales. The domestic pig population is at risk of infection with *B. suis* if there is contact with feral pigs or their products. Infection with *B. suis* is a nationally notifiable animal disease.

Australia does not have any official regulatory control programs for porcine brucellosis. However, the New South Wales Department of Primary Industries administers the New South Wales

82 www.farmbiosecurity.com.au/toolkit/declarations-and-statements

83 www.farmbiosecurity.com.au/toolkit/declarations-and-statements

Porcine Brucellosis Herd Accreditation Program,[84] which provides a *B. suis* risk management option for the New South Wales pig industry.

Accreditation is achieved through a combination of risk assessment, herd management, biosecurity assessment and blood testing. Herds must have an acceptable pig herd health history to be eligible for accreditation.

3.6.8 *Salmonella* Enteritidis

Salmonella Enteritidis (SE) causes disease in poultry that may result in depression, poor growth, weakness, diarrhoea and dehydration. SE is a common cause of human foodborne illness; however, most Australian cases are acquired overseas. Possible sources of infection in commercial layer flocks include transmission from breeders, contaminated environments, infected vermin (including rodents) and contaminated feed. Transmission to progeny from breeders is mainly through eggshell contamination, although transmission through the egg may also occur. SE is a nationally notifiable animal disease.

The New South Wales Department of Primary Industries administers the National *Salmonella* Enteritidis Monitoring and Accreditation Program,[85] which is available to all commercial egg producers in Australia exporting eggs to overseas markets. The program offers a staged process to enable flocks to become accredited free from SE.

3.6.9 *Salmonella* Pullorum

Pullorum disease is an infectious poultry disease caused by *Salmonella* Pullorum (SP). The disease mainly affects young chicks. Transmission is primarily via the egg; however, SP can also be spread by direct or indirect contact (respiratory or faecal) with infected birds or contaminated feed, water or litter. SP may also be associated with disease in turkey poults and may be carried subclinically or lead to reduced egg production and hatchability plus a range of atypical signs in older birds. Reduced egg production and hatchability may be the only signs of pullorum disease. SP is a nationally notifiable animal disease.

The Joint New South Wales/Victoria *Salmonella* Pullorum Monitoring & Accreditation Program[86] is available to commercial producers in New South Wales and Victoria that export day old chicks, hatching eggs and other poultry products to overseas markets. Poultry species covered in the program include chickens, ducks, geese, turkeys and quail.

84 www.dpi.nsw.gov.au/animals-and-livestock/pigs/health/nsw-porcine-brucellosis-herd-accreditation-program/pbh-acc-program

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

86 www.dpi.nsw.gov.au/animals-and-livestock/poultry-and-birds/health-disease/jnswvic-spmap

Image credit: Taryn Mokotupu

4

MANAGING TERRESTRIAL ANIMAL HEALTH EMERGENCIES

This chapter describes the arrangements that are in place to prepare for and respond to terrestrial emergency animal diseases (EADs). It also provides information on terrestrial animal disease incidents that occurred during 2018.

Information on the management of aquatic animal health emergencies and aquatic animal disease incidents during 2018 is provided in Chapter 5.

4.1 Response plans and coordination

Australia's response planning and coordination is supported by collaborative arrangements between governments, industry and other key stakeholders. These arrangements include:

- the Emergency Animal Disease Response Agreement (EADRA), a government and livestock industry cost-sharing deed
- the Australian Veterinary Emergency Plan (AUSVETPLAN)
- nationally agreed standard operating procedures (NASOPs)
- use of established consultative committees and management groups such as the Consultative Committee on Emergency Animal Diseases (CCEAD) and the National Management Group (NMG) (see Section 4.1.1).

4.1.1 Emergency Animal Disease Response Agreement

The EADRA is a legally binding agreement between the Australian Government, state and territory governments, livestock industries (currently 13 industries) and Animal Health Australia (AHA). The agreement minimises uncertainty over the management and funding arrangements for responses to EAD incidents, allows for all affected parties to have a say in the decision-making process and facilitates rapid and effective responses.

The EADRA is a world first; it establishes basic operating principles and guidelines, and defines roles and responsibilities of the parties involved. It provides for formal consultation and dispute resolution between government and industry on resource allocation, funding, training, risk management and ongoing biosecurity arrangements.

The signatories to the EADRA are committed to:

- minimising the risk of EAD incursions by developing and implementing biosecurity strategies and plans for their jurisdictions or industries
- maintaining capacity to respond to an EAD by having adequate numbers of trained personnel available to perform the functions specified in AUSVETPLAN
- participating in decision making relating to EAD responses, through representation on the CCEAD and the NMG
- sharing the eligible response costs of EAD incidents using pre-agreed formulas.

The EADRA is reviewed on an ongoing basis so it remains relevant, flexible and functional. It has been formally reviewed every five years since its inception, with the last formal review conducted in 2017. The current version of the EADRA is on the AHA website.[87]

4.1.2 Australian Veterinary Emergency Plan

AUSVETPLAN[88] provides the planning framework for Australia's response to EADs. It contains the nationally agreed roles, responsibilities, coordination arrangements, policies and procedures for the responses to EAD incidents in Australia. AUSVETPLAN has been developed and agreed on by governments and relevant industries in non-outbreak times to ensure that a fast, efficient and effective EAD response can be implemented consistently across Australia with minimal delay.

Governments are ultimately responsible for developing and implementing national disease response policies. AHA manages AUSVETPLAN on behalf of its members. The company works in consultation with its government and industry members and other key stakeholders to prepare and review the AUSVETPLAN manuals and supporting documents.

For each disease listed in the EADRA, a disease-specific response policy or strategy has been developed. These contain the agreed policy (and supporting technical information) for the response to an incident – or suspected incident – of the disease in Australia. The disease strategies and response policy briefs are complemented by operational manuals, enterprise manuals, and other resource and guidance documents. The AUSVETPLAN Overview document describes the components of AUSVETPLAN and outlines their functional relationships.

In 2018, three updated AUSVETPLAN components were published:

- *AUSVETPLAN Overview* (which replaced the AUSVETPLAN summary document)
- *AUSVETPLAN Response policy brief: Influenza A viruses in swine*
- *Control centres management manual Part 1* and *Part 2*.

This year, AHA has also made progress in reviews of disease-specific response strategies for avian influenza (AI), Newcastle disease, bluetongue, scrapie, Australian bat lyssavirus, rabies, screw-

87 www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

88 www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents

Image credit: Shutterstock

worm fly, Japanese encephalitis, vesicular stomatitis, foot-and-mouth disease (FMD), lumpy skin disease and porcine epidemic diarrhoea.

4.1.3 Nationally agreed standard operating procedures

NASOPs have been developed for use by states and territories during responses to EAD incidents and emergencies. They support national consistency and provide guidance for response personnel undertaking operational tasks. Although not formally part of AUSVETPLAN, NASOPs underpin elements of AUSVETPLAN and describe the actions typically undertaken during a response to an incident. They are provided to guide states and territories in developing local procedures and work instructions.

NASOPs currently published on the AHA website[89] address topics relevant to animal disease emergencies, such as personal decontamination, collecting samples, managing stock during a national livestock standstill, and transporting carcasses, as well as generic topics such as briefing, debriefing and handovers in a biosecurity response.

89 www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/nationally-agreed-standard-operating-procedures

4.1.4 What happens in an emergency animal disease response?

Australia's governments, livestock and affiliated industries, CSIRO, AHA, private veterinarians and laboratories, and other animal health workers, all work together to ensure successful outcomes to EAD responses.

Operational responsibility for the response to an EAD lies with the relevant jurisdiction, which develops an EAD response plan (EADRP). In most jurisdictions, the government department of agriculture or primary industries manages the response to an EAD outbreak and implements the EADRP. State and territory chief veterinary officers (CVOs) have leadership roles in the response, which also involves state emergency services, public safety services and other government departments, as needed. Pre-existing emergency management and whole-of-government arrangements allow agriculture or primary industries departments to draw on resources and expertise from these agencies.

The CCEAD provides technical review of the EADRP and has responsibility for the national technical coordination of the response. The Australian CVO or delegate chairs the committee, which comprises the state and territory CVOs, the Director of the

CSIRO Australian Animal Health Laboratory (AAHL), and members of the Australian Government Department of Agriculture and Water Resources. Industry bodies also typically participate. Representatives of AHA attend CCEAD meetings as observers.

When cost-sharing of the response under the EADRA is sought, the CCEAD provides technical advice to an NMG that is established for that incident. The Secretary of the Department of Agriculture and Water Resources chairs the NMG; members are chief executives of the state and territory agriculture or primary industries departments, and chief executives from each affected industry. Representatives of AHA attend NMG meetings as observers.

When the NMG receives technical advice from the CCEAD, it considers policy and financial issues associated with the EADRP. The NMG's agreement to an EADRP is an undertaking to share eligible costs under the EADRA.

CVOs implement disease-control measures as agreed in the EADRP and in accordance with relevant legislation. They make ongoing decisions on follow-up disease-control measures in consultation with the CCEAD and, when applicable, the NMG, based on epidemiological information about the outbreak.

When cost-sharing of the response under the EADRA is sought, technical representatives from relevant industries participate in the CCEAD. Industry representatives comprise one nominee agreed to by all industry parties and one nominee from each of the affected industries.

The specific responsibilities of the CCEAD and the NMG in a cost-shared EAD response are documented more fully in the EADRA.[90]

4.1.5 Improved national arrangements for emergency preparedness and response

Under Schedule 7 of the Intergovernmental Agreement on Biosecurity[91] the Australian, state and territory governments, AHA and Plant Health Australia (PHA) are committed to working together to improve emergency preparedness and response arrangements, across all biosecurity sectors. The primary mechanism for improving this collaboration is the National Biosecurity Emergency Preparedness Expert Group. In 2018, the expert group contributed to:

- reviewing and updating the interstate deployment arrangements for biosecurity response
- oversight of the National Biosecurity Response Team (NBRT) (see Section 4.2.1)
- oversight of the Biosecurity Emergency Response Training Australia (BERTA) project to develop national training and assessment materials to support the delivery of three biosecurity response qualifications (see Section 4.2.1).

During 2019, the expert group will continue to promote preparedness activities, in particular the implementation of the national suite of training and assessment materials.

4.2 Preparedness

4.2.1 Emergency animal disease training programs

In the event of an EAD incident, government officers, livestock producers, private veterinary practitioners and emergency workers are called on to help eradicate or control the disease.

AUSVETPLAN describes how the response to an EAD incident is to be conducted and the functions that require specific training.

A range of EAD training activities are implemented across Australia, including the provision of education and training in the various EAD response functions.

EAD awareness training

Face-to-face EAD awareness training provides government officers, private veterinary practitioners and livestock industry members with an understanding of Australia's agreed response strategies. For example, the states and territories hold regular EAD awareness workshops for private veterinary practitioners, to help them recognise EADs and to remind them of their reporting obligations.

90 www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

91 www.coag.gov.au/content/intergovernmental-agreement-biosecurity

Jurisdictional training

Each state and territory is responsible for maintaining a team of personnel capable of responding to biosecurity emergencies. A 'first response' team manages the initial response to an EAD, including staffing control centres and beginning field activities. First-response team members receive training in their response functions from jurisdictional training programs. This may include formal accredited training covering the skills and knowledge needed to perform a function during an EAD response.

National Biosecurity Response Team

The NBRT is funded by governments. AHA manages the team in non-outbreak times and the Department of Agriculture and Water Resources manages their deployment in an EAD response. The National Biosecurity Emergency Preparedness Expert Group provides guidance to support both AHA and the Department of Agriculture and Water Resources in the management of the NBRT (see Section 4.1.5). The NBRT is a group of almost 70 government response personnel with expertise in emergency management positions. The NBRT is cross-sectoral and can deploy in response to an animal, plant, aquatic animal or environmental biosecurity incident. During their three-to-five-year membership on the team, members take part in professional development activities to maintain and develop their response skills. NBRT members participated in Exercise Border Bridge in March 2018 as their professional development activity (see Section 4.2.2). NBRT mentors also participated in a specialised mentoring workshop in October 2018.

National training and assessment materials

As part of the BERTA program, a training and assessment materials project is under way to develop a suite of training and assessment materials for three biosecurity response qualifications: Certificate III in Public Safety (Biosecurity Response Operations), Certificate IV in Public Safety (Biosecurity Response Leadership) and Diploma of Public Safety (Biosecurity Response Management). The BERTA training and assessment materials project, which is managed by AHA, will provide a nationally consistent approach to biosecurity emergency response training. The completion of these qualifications will accredit the participating government and industry officers in responding to biosecurity incidents. The project is scheduled to be complete in the first half of 2019.

EAD training program

This AHA program involves the development of EAD training materials and training members for participation in certain roles in EAD responses. The program also provides professional development for trainers. The National Animal Health Training Reference Group (NAHTRG), comprising representatives from government and livestock industry organisations, provides guidance for the AHA EAD training program and reports to AHA members. The NAHTRG facilitates national consistency in the delivery of EAD preparedness and response training, and helps prioritise the AHA training work program.

Training materials

AHA facilitates the development of training resources that can be shared nationally and delivered to government and industry response staff by qualified, experienced trainers. Training resources include online modules such as the online Emergency Animal Disease Foundation course[92] (a generic introduction to emergency response arrangements in Australia) and training modules, videos and face-to-face workshops.

CCEAD and NMG training

AHA holds twice-yearly workshops in Canberra to prepare industry executives, technical specialists and senior government officers for service on the two key decision-making bodies, the NMG and the CCEAD (see Section 4.1.4), during an EAD response. In 2018, AHA collaborated with consultants to deliver additional CCEAD and NMG training to jurisdictions requesting it.

Livestock industry training

In 2018, AHA conducted six workshops for livestock industry personnel who may be required to work in a liaison function in an EAD response affecting their industry sector.

Professional development for trainers

AHA sponsors professional development programs

92 www.animalhealthaustralia.com.au/emergency-animal-disease-training-program

for jurisdictional and industry biosecurity response trainers. Updates on training and assessment are discussed at the NAHTRG annual meeting. In addition, AHA sponsors an annual workshop to promote continued professional development for trainers. This helps to ensure that biosecurity response trainers are qualified to deliver accredited training under the Australian Qualifications Framework. In 2018, training personnel participated in a three-day workshop to enable them to obtain and deliver the newly developed core Certificate III units in the Biosecurity Emergency Response qualifications. This workshop also included a community-of-practice component to build relationships between biosecurity trainers across Australia.

4.2.2 Emergency animal disease exercises

Formal exercises help maintain and enhance Australia's EAD preparedness and response capability. In 2018, several key EAD exercises were held.

Exercise Border Bridge

Exercise Border Bridge was a large simulated biosecurity response exercise held in March 2018. More than 260 people across Australia participated in the exercise, including representatives from government and industry.

Exercise Border Bridge involved the establishment and management of two separate state coordination centres in New South Wales and Queensland, and a joint local control centre in southern Queensland. The exercise simulated the response to a hypothetical outbreak of lumpy skin disease and a hypothetical incursion of giant African snail, a plant pest, which affected the two states simultaneously.

The exercise advanced Australia's capabilities to respond to a nationally significant cross-border biosecurity emergency and strengthened partnerships across a range of biosecurity stakeholders.

Exercises Dragonglass and Obsidian

Two simulation exercises took place in January and February 2018. The aim of Exercise Dragonglass was to test the arrangements for the supply and distribution of simulated FMD vaccine and vaccination equipment from the suppliers to a designated vaccine centre in Queensland. The aim of Exercise Obsidian was to test the arrangements for supply and distribution of simulated FMD vaccine and vaccination equipment from the jurisdictional designated vaccine centre to the farm gate.

Image credit: Biosecurity Queensland

Participants in the exercise included the Australia Department of Agriculture and Water Resources, AHA, the Queensland Department of Agriculture and Fisheries, and Merial (now part of Boehringer Ingelheim).

Activities included assessment of import documentation, timelines, and cold-chain maintenance for importation and distribution of FMD vaccine from Australia's vaccine bank in the United Kingdom to farm level in Queensland. The exercises showed that while the cold chain was maintained from the United Kingdom to arrival in Queensland, maintenance of the cold chain during distribution to farms was more challenging, particularly when using long-distance road transport. Some minor areas for improvements in documentation, processes and procedures along the supply chain are being addressed now the exercise has finished.

Exercise Judas

Exercise Judas 2018 was an Australian Pork Limited (APL) Incident Management Team exercise conducted in May 2018, part of crisis and incident-management training for APL. The exercise was an opportunity to test and validate PorkSAFE incident-management arrangements and related documents. The exercise was based on a hypothetical infectious disease scenario (African swine fever) at a piggery in Mareeba, Queensland. APL welcomed the involvement of AHA and the Department of Agriculture and Fisheries Queensland as observers and participants. APL continues to evaluate the outcomes of Exercise Judas, with implementation of resulting recommendations planned for 2019.

4.2.3 Foot-and-mouth disease training

Since 2012, the Department of Agriculture and Water Resources has engaged the European Commission for the Control of Foot-and-Mouth Disease of the Food and Agriculture Organization of the United Nations to provide real-time and online FMD training for Australian veterinarians and livestock workers. This is to provide them with the skills necessary to identify and manage an outbreak of FMD.

Costs of the agreement were shared between the Australian Government (funded through the **Agricultural Competitiveness White Paper**), certain state governments, and industry organisations.

During 2018, four real-time courses were held in Nepal (where FMD is present) and one online FMD emergency preparation course was conducted.

To date, 273 Australians have completed real-time training and 258 Australians have participated in the online course. Real-time participants have reported more than 400 post-course activities to increase FMD awareness among veterinarians and students, producers and livestock industry organisations.

4.2.4 Modelling studies to support planning for emergency animal diseases

An important part of EAD planning and preparedness in Australia is to assess and test 'what if' scenarios and control strategies in the event of an EAD outbreak. Part of this planning has been the development of Australia's first national-scale simulation model for animal disease spread and control, the Australian Animal DISease model (AADIS). AADIS came into operation in 2015 through a collaboration between the Department of Agriculture and Water Resources and the University of New England. It offers full, national-scale modelling capability, and addresses the needs of disease managers to capture complex disease epidemiology, regional variability in transmission (e.g. due to different livestock movement patterns, production systems and climates) and different jurisdictional approaches to control and eradication. In 2018, AADIS was used in several national and international studies.

The AADIS model is being used in the FMD Ready Project, funded through the Rural R&D for Profit Program, which aims to strengthen preparedness for an EAD outbreak, using FMD as a model. The work will provide robust guidelines for responding to an FMD outbreak, including approaches to post-outbreak surveillance and management options for vaccinated animals, to support proof-of-freedom and a faster return to trade.

Work has also continued to equip AADIS with vector-borne disease modelling capability via a collaboration between the Department

of Agriculture and Water Resources and the University of Melbourne. Building on previous work to include a vector ecology module, ongoing work is focused on developing a module to represent infection dynamics in the vector population and spread between vector and livestock populations.

To strengthen EAD preparedness, Australia also collaborates with other countries on epidemiology and disease modelling. In 2018, Australia continued to contribute actively to multi-country FMD-modelling studies coordinated through the EpiTeam, a sub-group of the quadrilateral countries (Australia, Canada, New Zealand and the United States).

4.2.5 Vaccine banks

The AHA Emergency Preparedness and Response Services business stream oversees several other preparedness initiatives on behalf of its members, including the management of Australia's vaccine banks for FMD and anthrax.

These vaccine banks allow rapid production, storage and delivery of FMD or anthrax vaccine should it be required in an outbreak situation. AHA also has contracts in place for cold storage and distribution of the vaccines. The current manufacture, storage and supply agreements for the FMD vaccine banks are in place until December 2019, and for the anthrax vaccine bank until June 2019. In 2018, Exercises Dragonglass and Obsidian tested the arrangements for the supply and distribution of simulated FMD vaccine and vaccination equipment from the suppliers to a designated vaccine centre in Queensland (see Section 4.2.2).

4.2.6 International Animal Health Emergency Reserve

Australia is a signatory to the International Animal Health Emergency Reserve (IAHER), an arrangement between Australia, Canada, Ireland, New Zealand, the United Kingdom and the United States to share personnel and resources during an EAD outbreak. Activation of the IAHER arrangement allows Australian personnel to receive valuable practical response experience and this strengthens Australia's response capacity.

In 2017, under the IAHER arrangement, New Zealand requested assistance for a response to an outbreak of *Mycoplasma bovis*. Between August and November 2017, Australia provided a total of 15 veterinary epidemiological and laboratory personnel from the Department of Agriculture and Water Resources and AAHL to assist with the response. In August 2018, Australia deployed a field epidemiologist to assist for eight weeks.

4.3 Increasing awareness and understanding

4.3.1 National communication arrangements for biosecurity incidents

The *Biosecurity incident public information manual*, which is an AUSVETPLAN resource document, has been finalised and is available on the AHA website.[93] The Manual guides personnel working in the public information function within a local control centre, state coordination centre or in the national coordination centre. It describes the communication and engagement activities that are required for an effective response, and outlines the national arrangements in place to make sure these activities are effective and coordinated across Australia.

The National Biosecurity Communication and Engagement Network (NBCEN) produces nationally consistent public information in response to emergency pest and disease outbreaks that affect Australia's livestock and plant industries. Members are communication managers from the Australian, state and territory government agencies responsible for biosecurity, AAHL, the Australian Government Department of Health, AHA and PHA. Observers from Wildlife Health Australia (WHA), the Australian Local Government Association and the Centre for Invasive Species Solutions are included.

The NBCEN supports the consultative committees and the NMG during biosecurity incidents. It also coordinates communication and engagement activities that support pest and disease prevention and preparedness.

93 www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents

In the animal sector, NBCEN created nationally consistent messaging to assist the Aquatic CCEAD with their responses to detections of Pacific oyster mortality syndrome in South Australia and the Consultative Committee for Introduced Marine Pest Emergencies (CCIMPE) with soft-shell clam in Tasmania.

NBCEN continued to support the ongoing response to white spot disease in Queensland, particularly as some growers return to production (see Section 5.4.1). NBCEN continues to share communication initiatives reinforcing messages about good fishing practices with commercial and recreational fishers, regardless of which waterway they use in Australia.

The NBCEN meets twice a year, face-to-face, and publishes a communiqué after each meeting that is available on the NBCEN page on the Outbreak website.[94]

4.3.2 Strategic foresight

As the complexity of important national issues and their rates of change increase, strategic foresight becomes necessary for managing uncertainty. The Department of Agriculture and Water Resources uses strategic foresight to consider emerging issues with the potential to significantly affect animal health in Australia.

Some of the strategic foresight activities in 2018 included the following:

- environmental scanning in the areas of biotechnology, emerging diseases, science and society, climate change and One Health
- evaluation of key emerging issues relating to consumer trends, food traceability and labelling, and changing global patterns of disease spread (e.g. African swine fever).

By scanning the environment for emerging issues and considering them from a range of perspectives, significant issues can be identified before they become critical.

Representatives of the Department of Agriculture and Water Resources participate in the Australasian Joint Agencies Scanning Network (AJASN), which consists of representatives from 16 government and academic agencies from Australia and New Zealand. The AJASN is a facilitated horizon-scanning service shared by agencies. Horizon scanning is the systematic gathering of insights to identify, monitor and assess the signals (weak or strong) that precede emerging issues (whether they are threats or opportunities) for organisations. The AJASN prepares regular horizon-scanning reports and newsletters.[95] In 2018, the second two-day AJASN forum was held and included Australian and international participants.

4.3.3 Swill feeding compliance and awareness

The Prohibited Pig Feed (Swill) Compliance and Awareness Project, which commenced in 2015, was developed by a working group of industry (APL) and Australian, state and territory government representatives, facilitated by AHA. The working group also developed the Australian Prohibited Pig Feed (Swill) Compliance National Uniform Guidelines, which are now used for monitoring compliance and enforcement actions relating to the prohibition on feeding swill to pigs. In 2017–18, there were 365 industry audits within the Australian Pork Industry Quality Assurance Program (APIQ✓®) and 187 government inspections of piggeries, with no major incidents of swill feeding found in any of them. Four penalty notices were issued by one jurisdiction for a swill-feeding incident (to one property and three food outlets), which has now been resolved.

4.4 Biosecurity planning

As signatories to the EADRA, Australia's livestock industries and governments have committed to an ongoing process to mitigate the risks of EADs. As part of this, livestock industries develop, implement and maintain biosecurity plans at industry, regional and farm levels for their sector. The farm-level biosecurity plans describe measures to mitigate the risks of disease entry or spread. The plan for each EADRA party is endorsed by the other EADRA parties and is subject to ongoing review and maintenance.

94 www.outbreak.gov.au/about/biosecurity-incident-national-communication-network

95 www.ajasn.com.au

Image credit: Shutterstock

AHA works with its industry members to ensure that the biosecurity plans are science-based, relevant, cost-effective and contemporary. Designed as an industry resource, the plans can be used by producers to gauge their own biosecurity requirements and implement biosecurity practices suitable for their particular circumstances. The practices listed in the plans have been incorporated as standards into a range of industry quality assurance (QA) and verification programs. These programs include the APIQ✓® program, Egg Corp Assured and the National Feedlot Accreditation Scheme (see Section 6.2). For these programs, a third party audits each of the participating producers annually against the standards. In October 2017, a biosecurity module commenced for Livestock Production Assurance, the QA program for cattle, sheep and goats. This is based on the *AHA National farm biosecurity reference manual for grazing livestock production*.

All farm-level biosecurity plans can be found on the AHA[96] and Farm Biosecurity websites.[97]

96 www.animalhealthaustralia.com.au/what-we-do/biosecurity-services/biosecurity-planning-and-implementation

97 www.farmbiosecurity.com.au/toolkit/plans-manuals

4.5 Preparedness for specific diseases

4.5.1 African swine fever

Following the detection and subsequent spread of African swine fever (ASF) in China in August 2018, Australia provided support to countries in South East Asia. Australian governments, AAHL, AHA and APL have increased efforts to prevent, detect and prepare for an incursion of ASF into Australia, including the following:

- AAHL provided reagents for surveillance testing to a number of South East Asian countries and is developing a stockpile of reagents on behalf of the Food and Agriculture Organization of the United Nations (FAO) for regional preparedness.
- With support from FAO and the World Organisation for Animal Health (OIE), AAHL continued to manage a proficiency testing program for laboratories in Asia, which has been in operation since 2012.
- ASF is a priority disease for capability development in an OIE Laboratory Twinning project between AAHL and the Regional Animal Health Office No. 6 laboratory in Ho Chi Minh City, South Vietnam.

- The Department of Agriculture and Water Resources is undertaking a review of risk pathways for ASF entry into Australia.
- The Department of Agriculture and Water Resources is publishing information to improve veterinarians' awareness of the clinical signs of ASF.
- AHA is initiating a review of the AUSVETPLAN strategy for ASF.
- The Animal Health Committee is reviewing further activities for 2019 to improve ASF preparedness.

4.5.2 Avian influenza

Australia has not experienced an outbreak of highly pathogenic AI (HPAI) since October 2013 (an occurrence of H7N2). On 21 February 2014, after resolution of the outbreak, Australia declared resumption of its status as a country free from HPAI, in accordance with the World Organisation for Animal Health (OIE) *Terrestrial animal health code* (see Section 3.3.1).

There is a high level of HPAI activity globally, highlighting the need for Australia to be prepared for HPAI. In 2018, overseas detections of H5N8 predominated and H5N1, H5N2 and H5N6 combinations were also reported in poultry. The low pathogenicity AI (LPAI) H7N9 strain continued to cause human deaths in China in 2017. This virus has mutated to HPAI in poultry populations, with H7N9 HPAI and LPAI reported in poultry and humans in China on multiple occasions over the past 12 months.

Australia provides ongoing assistance with control of HPAI and other zoonotic and emerging diseases in neighbouring countries, by delivering capacity-building programs that help countries prevent, detect and respond to disease in animals. Although Goose/Guangdong H5 HPAI lineage viruses have never been detected in wild birds or poultry in Australia, preparedness is a high priority. Australian governments and AHA work with the Australian poultry industries to strengthen preparedness and response capacities for AI on a continuous basis, and to maintain awareness of biosecurity among poultry owners.

A research project, funded through the **Agricultural Competitiveness White Paper** and conducted by Deakin University, commenced in 2018 to evaluate the risk of exposure and incursions of H5 HPAI from Asia. This includes developing a panel of H5 influenza reference viruses and sera for comparative serological analysis on samples from non-migratory and migratory wild birds. This will help determine the risk of transmission to domestic poultry in Australia.

There was further analysis in 2018 of an **Agricultural Competitiveness White Paper**-funded project at AAHL on AI viruses detected in wild birds. Next-generation sequencing and phylogenetic analyses of the viruses show evidence of mixing of viral populations across Australia with regular introductions of LPAI viruses to Australia from Eurasia.

Through WHA, the Department of Agriculture and Water Resources coordinates a national surveillance program for AI in wild birds (see Section 3.4.2). The program provides information on the prevalence and subtypes of AI viruses in wild birds and acts as an early warning system for the poultry industry.

In 2018, surveillance of poultry flocks for AI continued. In August 2018, LPAI (H4N6) was detected in a single bird in a backyard poultry flock in Victoria. On the basis of histopathological and polymerase chain reaction test results, infectious laryngotracheitis and infectious coryza were diagnosed as the causes of mortality in the flock. It is believed that LPAI was an incidental finding. In August 2018, LPAI virus (H1N2) was detected following a disease investigation in a backyard flock of mixed poultry species in Queensland. The property was monitored following the incident with no further unusual mortalities reported. No other cases of AI were detected in commercial poultry flocks in Australia in 2018.

4.5.3 Foot-and-mouth disease

FMD is the most important biosecurity threat to Australia's livestock industries, because most of Australia's livestock production is exported and an incursion would severely affect market access. An outbreak in Australia could have devastating consequences for our community in lost production, trade and tourism. It could also have significant social consequences resulting from movement restrictions and response activities during an outbreak.

Preparedness for an outbreak of FMD is a high priority for governments in Australia, and this view is shared by peak industry bodies. In 2018, areas of work included:

- improving the likelihood of early detection by training veterinarians and industry members in the clinical signs of FMD (see Section 4.2.3)
- targeted research and development activities to inform policy, including epidemiological modelling (see Section 4.2.4), diagnostic technologies (see Section 7.2.5) and studies on vaccine matching
- raising awareness of the risks of swill feeding, and promoting a nationally consistent approach to legislation and compliance (see Section 4.3.4).

4.6 Emergency animal disease responses in 2018

This section details incidents and responses involving disease livestock. Significant disease events that primarily involved wildlife are discussed in Section 3.3.4.

4.6.1 Anthrax in New South Wales, Queensland and Victoria

Anthrax is a nationally notifiable animal disease and is subject to government controls, including quarantine, disposal of carcasses, and vaccination and tracing of at-risk animals and their products. Areas at risk of anthrax occurrence, which are well defined, include the northern and northeastern districts of Victoria, and central New South Wales (Figure 2.1). In these areas, anthrax has a low prevalence and occurs only sporadically.

The National Anthrax Reference Laboratory (at AgriBio, Centre for AgriBioscience, within the Victorian Department of Economic Development, Jobs, Transport and Resources provides and maintains diagnostic capability in bacteriological and molecular methods to detect *Bacillus anthracis* in biological specimens. The reference laboratory has a wide range of capabilities to characterise isolates, including genotyping assays and whole-genome sequencing.

In 2018, outbreaks of anthrax were reported in three states. In New South Wales, four cattle died on a property near Cumnock in March; 20 lambs died on a property in the central west region in May; and 12 cattle died on a property near Tullibigeal in the central west in September 2018. In Queensland, one

Image credit: Animal Health Australia

cow died on a property in the St George district in south-west Queensland in January; one cow died on a property in the Dirranbandi region of south-west Queensland in May; and two steers died on a property in the Dirranbandi region in July. In Victoria, anthrax was diagnosed in 19 sheep that died on two properties near Swan Hill in March and more than 30 sheep on a new property in the Swan Hill area in November.

In each case, control measures were implemented based on agreed national response policy, including quarantine and tracing, burning of carcasses and vaccination of livestock. Human health authorities were notified, and public health precautions were implemented.

4.6.2 Hendra virus in New South Wales

Hendra virus (HeV) is a zoonosis that causes natural infection and disease in horses and humans and is a nationally notifiable animal disease. Numerous HeV incidents have occurred in New South Wales and Queensland since 1994, involving more than 90 horses (Figure 2.1). Most infected horses have died as a result of the disease.

Flying foxes are the natural host for HeV, and research suggests that infection can occur in flying-fox populations across Australia. Regardless of the likelihood that flying-foxes in any particular area are infected, it is prudent risk management for horse owners to take steps to minimise the potential for contact between flying-foxes and horses, and to vaccinate their horses against HeV.[98]

In 2018, one incident of HeV infection was reported near Tweed Heads in New South Wales.

The New South Wales government implements well established biosecurity and public health responses to HeV incidents.[99]

98 Middleton D, Pallister J, Klein R, et al. Hendra virus vaccine, a One Health approach to protecting horse, human, and environmental health. *Emerging Infectious Diseases* 2014; 20: 3: 372-379. doi: 10.3201/eid2003.131159

99 www.dpi.nsw.gov.au/animals-and-livestock/horses/health-and-disease/hendra-virus

Image credit: Shutterstock

5

AQUATIC ANIMAL HEALTH

Australia's national aquatic animal health arrangements are in place to support aquaculture productivity, product quality, trade, fisheries resource management and biodiversity.

This chapter provides information on the status of aquatic animal health in Australia, including details about national aquatic animal health policy and programs, aquatic animal disease emergency preparedness, disease events in 2018, research and development, and regional initiatives on aquatic animal health.

5.1 Status of aquatic animal health in Australia

Australia has a robust reporting system for aquatic animal diseases of national significance. Australia's National List of Reportable Diseases of Aquatic Animals[100] includes all the diseases currently reportable to the World Organisation for Animal Health (OIE) and other aquatic animal diseases of national significance.

Consistent and accurate reporting is important to demonstrate Australia's claims to freedom from diseases of international significance, to support trade of seafood products and to justify our biosecurity measures. Australia's disease reporting demonstrates transparency to trading partners and a commitment to disease management and biosecurity.

In 2018, ten fish diseases, seven mollusc diseases, nine crustacean diseases and three amphibian diseases were reportable to the OIE. Australia is free from most of these diseases. Australia's status for each OIE-listed aquatic animal disease in 2018

100 www.agriculture.gov.au/animal/aquatic/reporting/reportable-diseases

is shown in Table 5.1. For OIE-reportable diseases that are present, the maps in Figure 5.1 indicate states and territories from which those diseases are reported.

Australia's status in relation to other nationally reportable aquatic animal diseases in 2018 is listed in Table 5.2.

Table 5.1 Australia's status for OIE-listed diseases of aquatic animals, 2018

Disease or agent	Status
Finfish diseases	
Infection with *Aphanomyces invadans* (epizootic ulcerative syndrome)	2017
Epizootic haematopoietic necrosis disease	2012
Infection with *Gyrodactylus salaris*	Never
Infection with HPR-deleted or HPR0 infectious salmon anaemia virus	Never
Infectious haematopoietic necrosis virus	Never
Koi herpesvirus disease	Never
Red sea bream iridoviral disease	Never
Infection with salmonid alphavirus	Never
Spring viraemia of carp	Never
Viral haemorrhagic septicaemia	Never
Mollusc diseases	
Infection with abalone herpesvirus	2011
Infection with *Bonamia ostreae*	Never
Infection with *B. exitiosa*	2018
Infection with *Marteilia refringens*	Never
Infection with *Perkinsus marinus*	Never
Infection with *P. olseni*	2018
Infection with *Xenohaliotis californiensis*	Never
Crustacean diseases	
Acute hepatopancreatic necrosis disease	Never
Infection with *Aphanomyces astaci* (crayfish plague)	Never
Infection with *Hepatobacter penaei* (necrotising hepatopancreatitis)	Never
Infectious hypodermal and haematopoietic necrosis	2018
Infection with infectious myonecrosis virus	Never
Infection with *Macrobrachium rosenbergii* nodavirus (white tail disease)	2008
Infection with Taura syndrome virus	Never
Infection with white spot syndrome virus	2018
Infection with yellowhead virus genotype 1	Never
Amphibian diseases	
Infection with *Batrachochytrium dendrobatidis*	2018
Infection with *B. salamandrivorans*	Never
Infection with ranavirus	2018

OIE = World Organisation for Animal Health.

Note: Aquatic animal diseases that were reportable to the OIE in 2018 are those listed in the 2017 OIE *Aquatic animal health code*.

Image credit: Shutterstock

Table 5.2 Australia's status for other significant diseases of aquatic animals, 2018	
Disease or agent	**Status**
Finfish diseases	
Aeromonas salmonicida – atypical strains	2007
Bacterial kidney disease (*Renibacterium salmoninarum*)	Never
Channel catfish virus disease	Never
Enteric redmouth disease (*Yersinia ruckeri* – Hagerman strain)	Never
Enteric septicaemia of catfish (*Edwardsiella ictaluri*)	2014
European catfish virus/European sheatfish virus	Never
Furunculosis (*Aeromonas salmonicida* subsp. *salmonicida*)	Never
Grouper iridoviral disease	Never
Infectious pancreatic necrosis	Never
Infectious spleen and kidney necrosis virus (ISKNV)-like viruses	2015
Piscirickettsiosis (*Piscirickettsia salmonis*)	Never
Viral encephalopathy and retinopathy	2018
Whirling disease (*Myxobolus cerebralis*)	Never
Mollusc diseases	
Infection with *Bonamia* species	2018
Infection with *Marteilia sydneyi*	2018
Infection with *Marteilioides chungmuensis*	Never
Infection with *Mikrocytos mackini*	Never
Infection with ostreid herpesvirus 1 microvariant	2018
Iridoviroses	Never
Crustacean diseases	
Acute hepatopancreatic necrosis disease	Never
Gill-associated virus	2018
Monodon slow growth syndrome	Never

Figure 5.1 Distribution of OIE-listed aquatic animal diseases in Australia

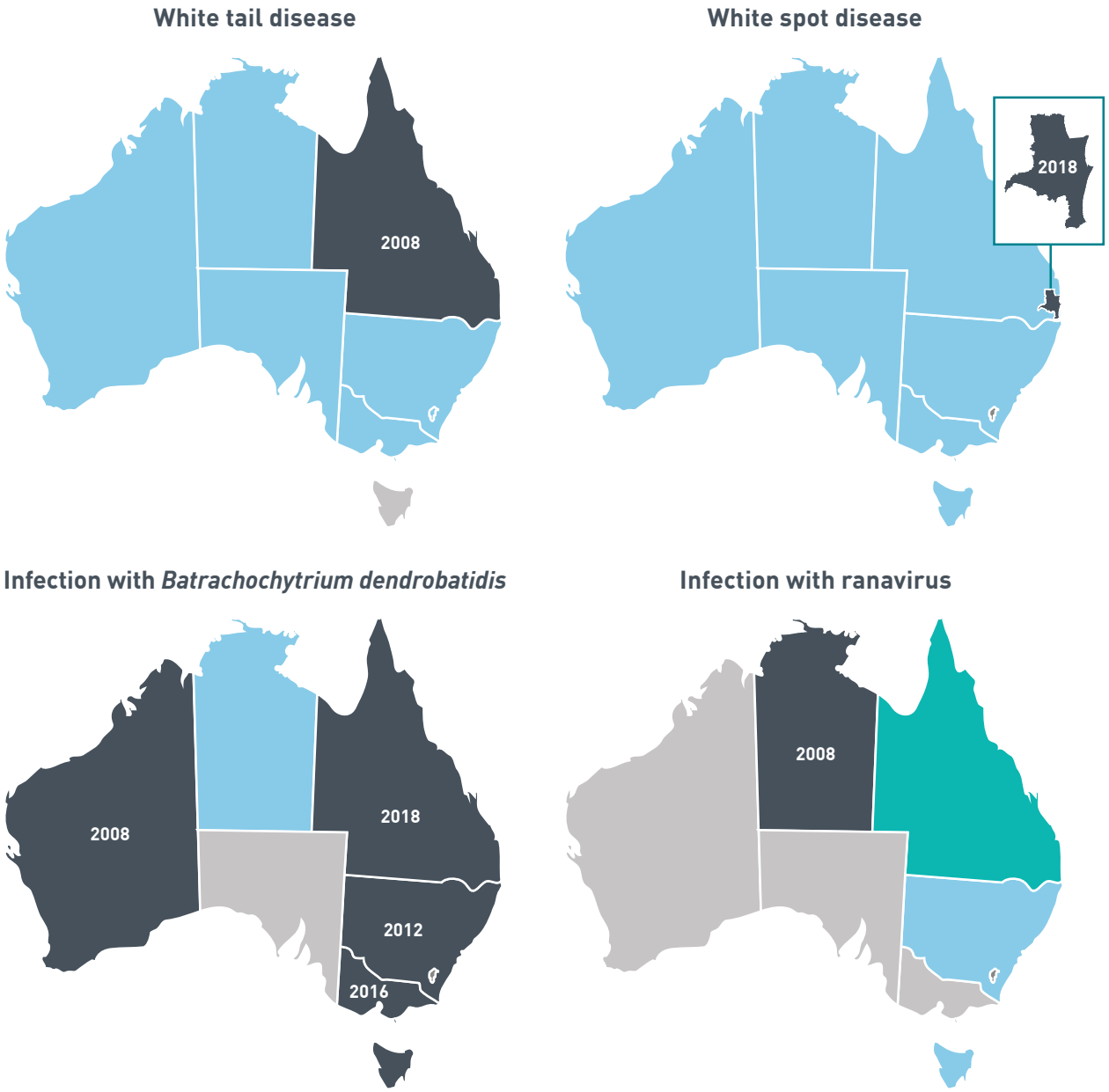


Figure 5.1 Distribution of OIE-listed aquatic animal diseases in Australia (*continued*)

5.2 National aquatic animal health policy and programs

Australia's national aquatic animal health policy and programs are developed from sound scientific evidence. The Sub-Committee on Aquatic Animal Health (SCAAH) is an advisory committee to the Animal Health Committee (AHC) (see Section 1.1.1). It supports AHC in its animal health policy deliberations by providing robust scientific and technical advice on aquatic animal health issues. SCAAH comprises representation from the Australian Government, the state and Northern Territory governments, the New Zealand Government, CSIRO's Australian Animal Health Laboratory (AAHL) and Australian universities. The AHC reports to the National Biosecurity Committee for high-level endorsement of decisions and policy (see Figure 1.1 for the structure of animal health management organisations and committees).

5.2.1 *AQUAPLAN 2014–2019*

AQUAPLAN 2014–2019[101] is Australia's third national strategic plan for aquatic animal health. It outlines the priorities to strengthen Australia's arrangements for managing aquatic animal health, and to support sustainability, productivity, market access and, ultimately, the profitability of Australia's aquatic animal industries. AQUAPLAN is a collaborative initiative that is developed and implemented by the Australian, state and territory governments, and aquatic animal industries. The Australian Government Department of Agriculture and Water Resources coordinates AQUAPLAN programs. AHC and SCAAH, in close collaboration with industry, oversee the national implementation of AQUAPLAN activities and projects.

AQUAPLAN 2014–2019 has five objectives:

- improving regional and enterprise-level biosecurity
- strengthening emergency disease preparedness and response capability
- enhancing surveillance and diagnostic services
- improving availability of appropriate veterinary medicines
- improving education, training and awareness.

Each objective is supported by activities to address specific aquatic animal health issues associated with infectious diseases of finfish, molluscs and crustaceans. The plan covers aquatic animal health issues relevant to aquaculture, commercial fisheries, recreational fisheries, the ornamental fish industry, the tourism industry and the environment.

5.2.2 Development of a biosecurity plan template

The *Aquaculture farm biosecurity plan: generic guidelines and template*[102] was developed by a SCAAH writing group under AQUAPLAN 2014–2019. This document aims to guide the development of biosecurity plans for application at the farm level. It was developed as a generic document that is targeted at the general aquaculture sector and can be adapted to a range of aquaculture enterprises and production systems. The purpose of an aquaculture biosecurity plan is to:

- reduce the risk of diseases being introduced into farms (entry-level biosecurity)
- reduce the risk of diseases spreading within farms (internal biosecurity)
- reduce the risk of diseases escaping from farms (exit-level biosecurity)
- provide emergency response protocols for a disease outbreak (all levels of entry, internal and exit biosecurity).

Under *AQUAPLAN 2014–2019*, National biosecurity plan guidelines were developed for interested aquaculture industry sectors. These guidelines and templates set out best-practice biosecurity planning that are sector specific.

Sector-level guidance enables a nationally consistent approach to biosecurity planning and risk management. Sector-specific plans finalised in 2018 included:

- the *National biosecurity plan guidelines for the land-based abalone industry*[103]
- the *National biosecurity plan guidelines for Australian oyster hatcheries*.[103]

Sector-specific biosecurity plans for the Australian

101 www.agriculture.gov.au/animal/aquatic/aquaplan

102 www.agriculture.gov.au/animal/aquatic/guidelines-and-resources

103 www.agriculture.gov.au/animal/aquatic/guidelines-and-resources

Image credit: iStock

barramundi industry and the Australian Prawn Farmers Association are expected to be finalised in early 2019.

5.2.3 Domestic proficiency testing program

The Proficiency Testing Program for Aquatic Animal Disease for Australian laboratories, established in 2010, enables Australian laboratories to assess their capabilities to correctly detect priority aquatic animal diseases using molecular methods. The program is funded by the Department of Agriculture and Water Resources and implemented by AAHL in partnership with the Australian National Quality Assurance Program. Participants include private, university and state and territory government laboratories.

The program was reviewed in 2013 and 2015. The reviews found that participating laboratories benefit from benchmarking to support reproducibility and validation of tests, strengthening competencies and laboratory techniques, and supporting accreditation.

Australian laboratories can participate in proficiency testing for the following eight aquatic animal diseases over three annual rounds of testing:

- abalone herpesvirus
- yellow head virus genotype 1
- ostreid herpesvirus 1 microvariant
- nervous necrosis virus
- white spot syndrome virus
- megalocytiviruses
- *Bonamia exitiosa*
- *Perkinsus olseni.*

Program results have confirmed that Australia has strong diagnostic capabilities for these priority aquatic animal diseases.

5.2.4 Strengthening surveillance

The Department of Agriculture and Water Resources is managing several projects under the **Agricultural Competitiveness White Paper** for both aquatic animal health and marine pests (see Section 3.2.2). Current aquatic animal health projects include:

- Onshore and modern diagnostics:
    - validation of molecular tests for several aquatic diseases

- national surveillance for megalocytiviruses
- Neptune – a comprehensive database of Australian aquatic animal pathogens and diseases
- active disease surveillance for southern aquatic animal industry sectors
- review of Australia's passive surveillance system for aquatic animal diseases
- update of the *Aquatic animal diseases significant to Australia: identification field guide 5th edition* (web and mobile phone app versions)
- development of a national marine pest reference collection.

- Offshore projects:
  - Asia–Pacific laboratory proficiency testing for aquatic animal diseases
  - Indian Ocean Territories and Ashmore Reef marine pest surveillance.

Many of these projects are well advanced and near completion. Reports will be made available through the Department of Agriculture and Water Resources' website.[104]

5.2.5 Seafood traceability

Ensuring the safety and traceability of Australia's seafood exports is vital to maintaining consumer confidence in product quality, safety and authenticity. The *Export control (fish and fish products) orders 2005* require export-registered manufacturing establishments to obtain raw materials only from other export-registered establishments. It is the responsibility of the export-registered manufacturing establishments to comply with legislative requirements to ensure the safety and traceability of the products sourced. Compliance of export-registered establishments with these requirements is subject to audit by Department of Agriculture and Water Resources officers.

Legislative requirements applicable to the sourcing of fishery products for export include the requirement for the receiving establishment to have a fully documented food safety management system in place ('approved arrangement'). The approved arrangement describes the controls the establishment has implemented to ensure compliance with:

- identification and control of potential hazards
- structure and hygiene requirements for catcher boats
- harvesting and sourcing fish product standards.

Under Australia's food standards code, fish must be sourced from suppliers with traceability systems in place, and up-to-date records of supplier details. This enables each fish lot and ingredients, where applicable, to be traced back to the supplier.

5.2.6 Antimicrobial use and resistance in aquaculture

The Australian Government's National Antimicrobial Resistance Strategy (see Section 11.1.1) guides actions on issues relating to antimicrobial resistance and use. The strategy coordinates activities among stakeholder groups, including the aquaculture sector.

There are no registered antibiotics for use in Australia for food-producing aquaculture species. Instead, a permit-based system allows only a few types of antibiotics for use. The Department of Agriculture and Water Resources continues to monitor and regulate frameworks for the appropriate use of antimicrobial agents to prevent development of antimicrobial resistance and ensure the aquaculture sector has access to appropriate veterinary chemicals for responsible and sustainable farming.

5.3 Aquatic animal disease emergency preparedness

Australia's national system for preparing for, and responding to, aquatic emergency animal diseases (EADs) encompasses all activities relating to disease surveillance, planning, monitoring and response. These activities are carried out by the Australian Government, state and territory governments, aquatic animal industries, universities, CSIRO, and private veterinarians and laboratories.

104 www.agriculture.gov.au

5.3.1 Development of aquatic animal disease response arrangements

The Aquatic Consultative Committee on Emergency Animal Diseases (Aquatic CCEAD) coordinates the national response to aquatic animal disease emergencies, which helps to ensure the most effective technical response. The Aquatic CCEAD comprises:

- the Australian Chief Veterinary Officer
- representatives from the Department of Agriculture and Water Resources
- the Chief Veterinary Officer (or the director of the fisheries department) in each state and territory government
- the Director of AAHL.

As with terrestrial animal disease emergencies, operational responsibility for the response to an aquatic EAD in an Australian state or territory primarily lies with the relevant jurisdiction. Each state and territory government brings together a broad range of resources to help fisheries, aquaculture and aquatic animal health authorities address disease incidents. Experts from other jurisdictions may be called in to assist in the response, if required. The Department of Agriculture and Water Resources provides a national coordination role for response activities through chairing and supporting the operation of the Aquatic CCEAD. The Aquatic CCEAD assesses the current situation and provides advice on the management of the outbreak until it is collectively decided that the disease is no longer a threat and that a national response is no longer required.

The Aquatic CCEAD met on six occasions in 2018 to coordinate response, surveillance and biosecurity activities for the 2016 white spot disease in farmed prawns from southeast Queensland. The committee also met on two more occasions to discuss the detection of Pacific oyster mortality syndrome in feral oysters in South Australia's Port Adelaide River, and once to discuss megalocytivirus in ornamental fish in Tasmania. The white spot disease event in Queensland is discussed in Section 5.4.1 and the Pacific oyster mortality syndrome event in Section 5.4.2. The Aquatic CCEAD continues to meet and provide technical expertise to Queensland as the responses progress.

5.3.2 Aquatic Deed

EADs are capable of causing major impacts on aquaculture, fisheries, aquatic resources and the environment. They present challenges for emergency responses because they are often difficult to eradicate; may be new, emerging or unknown to science; and are able to spread rapidly across aquatic resources. If an aquatic EAD outbreak occurs, a rapid and collaborative response among affected industries (private sector) and governments (public sector) is essential for a successful response.

The Aquatic EAD Response Agreement (the 'Aquatic Deed'), will be an industry–government agreement for managing and funding responses to aquatic EAD outbreaks. It includes obligations for risk mitigation to lessen the likelihood of disease outbreaks occurring in the first place. It will be one formal, legally binding agreement among governments and aquatic animal industry sector peak bodies that choose to sign it.

The Aquatic Deed symbolises and provides a structure for partnerships between aquatic animal industries and government signatories to improve biosecurity, productivity, and public and environmental outcomes. It follows the approaches of two existing industry–government emergency response agreements in place for the terrestrial animal sector (the EAD Response Agreement, ratified in 2002) and plant sector (the Emergency Plant Pest Response Deed, ratified in 2006).

The Aquatic Deed project team has worked closely with aquatic animal industries, state and territory governments and the Australian Government to develop the Aquatic Deed over the past four years. The project team is funded and led by the Department of Agriculture and Water Resources, with contributions from a project officer and Animal Health Australia staff throughout the project. The Aquatic Deed working group is the primary mechanism for prospective parties to develop the draft deed text and supporting policy, which has members from all prospective industry and government parties.

The framework of the Aquatic Deed includes six desirable elements:

- *Participation and cooperation* – parties to the deed would commit to joint decision making, both during a response and when no responses are in progress, for risk-mitigation activities.
- *Risk management* – parties would commit to improving biosecurity practices to prevent disease outbreaks and to have appropriate capabilities in place if there is an outbreak.
- *Detection and response* – the deed would provide incentives for early reporting to facilitate earlier detection and response to disease, which would provide an increased likelihood of a successful response. Systems would also be in place to ensure response activities are rapid, cost-effective and represent the shared biosecurity objectives of all parties. Response objectives would include containment and eradication, and an option to transition to ongoing management if needed.
- *Arrangements to share response costs* – costs of a response would be shared equitably among those who benefit. This would include the ability to reimburse owners who experience direct losses associated with measures aimed at achieving an agreed response objective.
- *Training* – industry and government personnel would be supported to participate in response training as part of their ongoing responsibilities under the deed.
- *Communication and awareness* – industry and governments would work together to raise awareness of risk mitigation and biosecurity measures and formulate agreed communication messages during a response.

A complete draft has now been produced and prospective parties are considering comments and any necessary amendments. The next phase of revision of the deed will include further policy analysis on some specific issues, development of communication materials for industry and government, and extensive consultation and legal drafting to produce the next version. Subject to negotiation among prospective parties, the next version of the Aquatic Deed is intended to form the basis of formal agreement and ratification. Further information about the project can be found on the Animal Health Australia website.[105]

105 www.animalhealthaustralia.com.au/aquatic-services/aquatic-deed/

5.3.3 AQUAVETPLAN

AQUAVETPLAN is a series of technical response plans that describe the proposed Australian approach to an aquatic EAD. The plans provide technical information and preferred policy approaches to guide responses to a disease outbreak in Australia.

AQUAVETPLAN aligns with the Australian Veterinary Emergency Plan (AUSVETPLAN), which is for terrestrial animal disease responses. Disease strategy manuals provide guidance for animal health professionals to respond appropriately to outbreaks of specific EADs in Australia. Operational manuals address important procedural issues (e.g. destruction, disposal and decontamination) and complement the disease strategy manuals.

Manuals are considered for revision every five years or in the event of significant new developments. The revised disease strategy manuals *Viral encephalopathy and retinopathy* and *Infectious salmon anaemia* were revised and published in 2017 and 2018, respectively. Operational manuals covering decontamination and disposal and the disease strategy manual for withering syndrome of abalone have been revised and are undergoing the endorsement process.

A new control centres manual is being developed and this will closely align with the style and much of the content of the AUSVETPLAN control centres manual.

AQUAVETPLAN manuals can be downloaded from the Department of Agriculture and Water Resources website.[106]

5.4 Disease events in 2018

5.4.1 White spot disease

Mass mortalities and clinical signs of white spot disease in giant tiger prawns (*Penaeus monodon*) on a farm on the Logan River, Queensland, were reported in late November 2016. On 1 December 2016, the presence of white spot syndrome virus was confirmed by AAHL and an immediate

106 www.agriculture.gov.au/animal/aquatic/aquavetplan

notification was made to the OIE. By February 2017, seven properties, all along the Logan River, were confirmed as being infected with white spot syndrome virus.

Containment was immediately implemented for all affected farms, along with response and surveillance plans with a view to eradication. Containment activities included the destruction and disposal of stock and decontamination of ponds on all affected farms. To assist with virus eradication, decontaminated ponds remained fallow until May 2018.

Three farms in the Logan River area have returned to prawn production in 2018. These farms are conducting on-farm surveillance as part of the larger surveillance effort of the Queensland Government, which continues to conduct surveillance of wild crab and prawn populations in the Logan River and Brisbane River and in Moreton Bay.

The Queensland Government maintains movement restrictions prohibiting raw prawns, marine yabbies and marine worms being moved from the restricted area, which extends from Caloundra to the New South Wales border. High-value crustacean products, solely for human consumption, are exempted from this movement restriction. Fishing remains prohibited near land-based prawn farms and waterways within the restricted area.

A national surveillance plan for white spot syndrome virus, endorsed by the Aquatic CCEAD, is under way. The plan outlines a staged approach to surveillance that ultimately aims to demonstrate Australia's freedom from white spot syndrome virus, if the virus does not establish in the wild.

The plan identified specific sample sites around Australia based on an assessment of risk factors. These sites were surveyed in 2018. The cause of the outbreak is yet to be determined.

A range of biosecurity measures implemented by the Department of Agriculture and Water Resources at the Australian border and after border crossing, in collaboration with state governments, is part of a concerted effort to reduce risks of spreading the disease.

5.4.2 Pacific oyster mortality syndrome

Pacific oyster mortality syndrome (POMS) is caused by ostreid herpesvirus 1 microvariant. The disease has caused high mortalities of farmed Pacific oysters (*Crassostrea gigas*) in Europe, New Zealand and Australia. It affects Pacific oysters and Portuguese oysters (*C. angulata*). It does not affect the native Sydney Rock oyster (*Saccostrea glomerata*) or flat oyster (*Ostrea angasi*). There are no known human health or food safety implications associated with POMS.

The disease was first reported in the Georges River estuary, New South Wales, in 2010. It caused mass mortalities in both farmed and wild Pacific oyster populations in the estuary, as well as wild populations in the Parramatta River in 2011. It was later detected during mass mortalities of farmed Pacific oysters in the Hawkesbury River estuary, New South Wales, in 2013. In February 2016, Pacific oyster production sites in the south-east of Tasmania were affected by mass mortalities due to POMS.

In February 2018, POMS was detected in feral Pacific oysters in the Port River estuary in Adelaide, South Australia. The estuary is a shipping port, not a commercial growing area. Surveillance indicated the POMS virus was contained to the Port River estuary and was not present in the state's oyster-growing regions. The nearest commercial growing area is about 60 km away. As a precautionary measure, industry prohibited the movement of oysters and this was followed by a gazette standstill notice.

The South Australian Government initiated a limited response in the affected Port River estuary, involving diagnostic testing and destruction of feral oyster populations. To further reduce the risk, a ban on the removal of all bivalve shellfish from the Port River was put into place and will remain for some time. Guidelines on vessel and equipment cleaning and removal of marine organisms from the Port River were issued to fishers and boat owners.

The Aquatic CCEAD was twice convened in March and April 2018 to discuss the South Australian EAD response plan for POMS. By the end of April 2018, the South Australian Government declared the situation under control and the Aquatic CCEAD was stood down.

5.5 Research and development

The Australian aquatic animal industry has seen strong financial growth, with the gross value of production increasing by 1% in 2016–17, to $3.06 billion. The aquaculture industry continues to grow and currently contributes $1.35 billion to the Australian economy, accounting for 44% of the total value of aquatic animal production, which includes commercial wild fisheries.

The Aquatic Animal Health Subprogram of the Fisheries Research and Development Corporation (FRDC) was established to develop, support and manage national aquatic animal health and biosecurity-related research, and research into new and emerging aquaculture species.

The FRDC invests in areas of research and development that are intended to benefit all sectors of Australian fisheries: the commercial sector (wild catch, aquaculture and processing), the recreational sector and the Indigenous sector.

The FRDC continues to lead national research and development infrastructure addressing whole-of-industry and community priorities. These priorities include sustainable fishing, improved productivity and profitability for fishing and aquaculture, and development of new and emerging aquaculture growth opportunities.

Aquatic animal welfare research was nominated as a priority area by FRDC stakeholders at the 2017 FRDC stakeholder workshop. FRDC has since commenced a project in August 2018 to understand aquatic animal welfare research currently available to industry. The project aims to enhance industry adoption of materials developed under the Aquatic Animal Welfare Working Group as part of the Australian Animal Welfare Strategy. FRDC will review their adoption, uptake rates and utility.[107]

More information including the Aquatic Animal Health Subprogram research and development plan can be found on the Subprogram website.[108]

107 frdc.com.au/project/2017-221

108 frdc.com.au/en/Partners/National-Priorities-and-Subprograms/Aquatic-health-and-biosecurity

5.6 Regional aquatic animal health initiatives

Australia collaborates with many countries, particularly its neighbours in the Asia–Pacific region, to help improve aquatic animal health. Australia's cooperation extends through its membership of the Network of Aquaculture Centres in Asia–Pacific (NACA), the Food and Agriculture Organization of the United Nations (FAO), the OIE Regional Representation for Asia and the Pacific, Secretariat of the Pacific Community, the Association of Southeast Asian Nations and the Asia–Pacific Economic Cooperation forum. Participation in these forums ensures that Australia is actively engaged in projects that address aquatic animal disease threats to the region.

5.6.1 Network of Aquaculture Centres in Asia–Pacific

NACA focuses on building capacity in aquaculture production through education and training, improving support to government institutions, and facilitating effective research and development and information sharing. The improvement of aquatic animal health management in the region is a key activity for NACA.

The Asia Regional Advisory Group on Aquatic Animal Health was established under the auspices of NACA to provide advice to member countries on aquatic animal health management. Members of the Advisory Group include aquatic animal disease experts, the OIE, the FAO and collaborating regional organisations, and a representative from the Department of Agriculture and Water Resources. The advisory group meets annually and its report is available on the NACA website.[109]

Active participation in the advisory group of NACA provides Australia with improved knowledge and intelligence of new and emerging threats while promoting regional cooperation to mitigate biosecurity risks. Through NACA, Australia also facilitates joint regional and international initiatives to build capacity in the region for aquatic animal

109 enaca.org/?id=975

diagnostic, health surveillance, disease reporting and EAD response activities.

5.6.2 International standards

Australia continues to contribute strongly to the development of international aquatic animal health standards of the OIE. The Department of Agriculture and Water Resources seeks comment from a network of Australian experts on draft standards proposed by the OIE Aquatic Animal Health Standards Commission.

Australia provides aquatic animal disease experts to a number of OIE *ad hoc* groups, and a departmental officer is the current President of the Aquatic Animals Health Standards Commission.

5.6.3 Regional proficiency testing program

The Australian Government is jointly managing with AAHL an aquatic animal disease proficiency testing program for laboratories in the Asia–Pacific region. This program is funded through the **Agricultural Competitiveness White Paper** with two rounds per year for a three-year period.

The Australian Government previously funded a regional aquatic proficiency testing project from 2012 to 2014. Review of that program indicated that it was successful in achieving its objective to strengthen regional capability to diagnose important aquatic animal diseases that affect trade, productivity and the environment. The review also indicated an ongoing need for an aquatic proficiency testing program in the Asia–Pacific region.

The current program allows more than 30 laboratories in 13 countries to further improve the accuracy and reliability of molecular assays for the diagnosis of 10 pathogens of significance to the region. The first round of testing was conducted in June–July 2018 and reports were provided to participants in August–September 2018. The second round of testing was conducted in October–November 2018. Data collection included quantitative and qualitative results of diagnostic testing as well as details of methodologies and technology platforms to provide a comprehensive picture of testing capability across the Asia-Pacific region. A written survey has been conducted with participants to identify issues of importance, particularly those that affect diagnostic capability. A workshop for participants hosted by the Department of Agriculture and Water Resources and AAHL is scheduled for March 2019 in Bangkok. This will provide an opportunity to review the results of the first two rounds, trouble-shoot common problem areas, such as quality assurance, and discuss issues that affect diagnostic capability in the region.

The project will be reviewed on completion to determine its effect on diagnostic capability, the benefits to individual participants, and likely models for ongoing participation by laboratories.

Image credit: Australian Lot Feeders' Association

6

LIVESTOCK TRACEABILITY, BIOSECURITY AND QUALITY ASSURANCE PROGRAMS

The National Livestock Identification System (NLIS) is Australia's system for livestock identification and traceability. All cattle, goat, pig and sheep producers must identify their stock and record their movements onto and off properties in the NLIS database. All movements to and from saleyards and to abattoirs must also be recorded.

NLIS is a permanent, whole-of-life system that allows animals to be identified – individually or by mob – and tracked from property of birth to slaughter, for the purposes of food safety, product integrity and market access. NLIS enhances Australia's ability to track livestock during disease and food safety incidents. It reflects Australia's commitment to biosecurity and food safety and provides a competitive advantage in a global market.

NLIS combines three elements to enable the lifetime traceability of animals:

- an animal identifier (a visual or electronic ear tag known as a device)
- identification of a physical location by means of a property identification code
- a web-accessible database to store and correlate movement data and associated details.

Australia's state and territory governments are responsible for the legislation that governs animal movements and implementation of NLIS. Jurisdictions monitor compliance with NLIS requirements throughout the livestock supply chain, checking the consigning, receiving and slaughtering of stock.

Information on animal movements is recorded on movement documents (National Vendor Declarations [NVDs]) and submitted to the NLIS database by producers, saleyard operators, livestock agents and processors. The Integrity Systems Company (a wholly owned subsidiary of Meat & Livestock Australia) administers the NLIS database on behalf of industry and government stakeholders. This includes managing the development and operation of the database according to stakeholder requirements.

NLIS is endorsed by major producer, feedlot, agent, saleyard and processor bodies and is International Organization for Standardization (ISO) 9001-certified.

The Integrity Systems Company 2018 producer survey revealed 99% awareness of NLIS among red meat producers.

In 2017–18, NLIS movement recording compliance was 97%. The peak livestock industry associations contribute to national animal health policies and strategies, implement industry biosecurity plans, and promote sound animal health management practices to livestock producers. Quality assurance (QA) and biosecurity programs in the livestock industries are central to on-farm biosecurity and food safety practices. Some livestock industry QA and biosecurity programs are detailed in this chapter.

6.1 Livestock identification and traceability programs

6.1.1 NLIS for alpacas and llamas

The NLIS (Alpaca and Llama) tracing system is under development. The industry is advocating the use of identification tags that incorporate radio-frequency identification accompanied by movement documentation.

6.1.2 NLIS for cattle

NLIS (Cattle) is an electronic identification system in which each animal is tagged with a radio-frequency identification device and accompanied by movement documentation (an NVD) when moved from a property. As well as recording animal movements from properties, the system enables the residue and disease status of animals to be identified. A tracing exercise for NLIS (Cattle), Exercise Cowcatcher III, occurred in June 2018.

In 2017–18, a total of 25.4 million NLIS cattle movements were recorded by the NLIS database, representing a 7% decrease from 2016–17.

6.1.3 NLIS for pigs

Australian Pork Limited (APL) is continuing to develop NLIS (Pigs), which is known to the pork industry as PigPass. It is a mob-based system based on tattoos and brands to identify the property of birth, along with movement documents. Voluntary movement reporting continues through the PigPass portal, with a high uptake to report movements under the voluntary arrangements.

Since February 2018, state and territory governments have been progressively implementing mandatory reporting and amendments to incorporate the revised NLIS pig identification requirements for all pigs. Movement reporting is made to the PigPass database, which is uploaded to the NLIS database in real time.

6.1.4 NLIS for sheep and goats

NLIS (Sheep and Goats) is a mob-based system for tracing mobs of sheep and farmed goats. It uses visually readable ear tags labelled with property identification codes (codes allocated by state or territory departments to properties). When mobs are transported, they are accompanied by a movement document, such as an NVD or a waybill. Movements of mobs are recorded in the NLIS database, allowing animals to be traced.

In Victoria, all sheep and goats born on or after 1 January 2017 now require an electronic NLIS (Sheep) identification tag before being dispatched from their property of birth. From 31 March 2018, property-to-property movements of electronically tagged sheep and goats in Victoria must be recorded on the NLIS database by the person

Image credit: Animal Health Australia

receiving the livestock. Mandatory scanning of all electronically tagged sheep and goats in Victorian abattoirs commenced from 31 December 2017 and at all saleyards from 31 March 2018.

In 2017–18, approximately 23 million NLIS sheep and goat movements were recorded by the NLIS database, representing a 7.9% increase from 2016–17.

6.1.5 Industry identification and traceability programs

Chicken meat traceability

Due to the highly vertically integrated nature of the chicken meat industry, the processing companies are able to maintain comprehensive records on batches of chicken processed, which allows tracing of chicken processed at any time to the specific farms and sheds within a farm. Product can be further traced back to the hatchery where the chicks were hatched, and the breeder farm which supplied the fertile eggs from which those chicks hatched.

Individual chicken traceability is currently not viable due to the size of the birds, the costs associated with individual identification technologies and the necessity to avoid contaminants entering the processing plant. Individual bird identification is not considered necessary, given that chickens are managed on a flock basis from the hatchery to the farm and into the processing plant.

Traceability as described above applies to all product which leaves the processing plant. Traceability of product to the flocks processed on a specific day, in the case of chicken products leaving the processing plant in bulk (i.e. not in final packaging), depends on the robustness of the records and the traceability systems of customers, which range from bulk wholesalers to retail outlets and quick-service restaurants.

6.2 Livestock industry quality assurance programs

6.2.1 B-QUAL

The honey industry recognises that quality and food safety standards are required by customers, wholesalers and regulators. The industry must comply with the requirements of Food Standards Australia New Zealand (FSANZ). One requirement includes the development of a hazard analysis and critical control points (HACCP)-based food safety program to ensure that honey products meet international, national, and state and territory food safety requirements.

The B-QUAL food safety program is a voluntary program for apiarists and honey-processing businesses, ensuring that the honey bee industry's standards meet best practice, and domestic and international market demands. The program is owned by the Australian Honey Bee Industry Council (AHBIC), managed by the B-QUAL Australia Board and administered by AUS-QUAL (a certification body

accredited by the Joint Accreditation System of Australia and New Zealand).

The B-QUAL standards encompass all facets of honey production and industry services, including honey production, queen bees, pollination and honey packing. B-QUAL is a cost-effective and easy-to-use program. Beekeepers who wish to become certified first undergo training in HACCP principles and the B-QUAL requirements. The nationally recognised training is provided by AUS-MEAT through its registered training organisation. Groups of beekeepers can attend face-to-face workshops, or individual beekeepers can complete a self-learning pack.

Once a beekeeper has integrated the B-QUAL requirements into their operation, the business is audited by an Exemplar Global third-party auditor. Certification is provided by AUS-QUAL. Beekeepers selling direct to the public are audited every year. Those selling bulk honey to packers only are audited every two years.

The B-QUAL program provides comprehensive work instructions and record forms that must be maintained for:

- hive management (identification, location, movement and disease status)
- extraction (process, facilities and equipment)
- traceability from hive to retail
- biosecurity
- hygiene (personal, machinery maintenance, sanitation and vermin control)
- purchases (inventory lists and stocktake activities)
- equipment calibration
- internal and external audit results
- staff training
- occupational health and safety.

The B-QUAL Board is committed to maintaining the integrity of the B-QUAL program and ensuring it remains relevant and beneficial to the industry.

The B-QUAL Board is currently reviewing the program to make sure it includes all provisions under the *Australian honey bee industry biosecurity code of practice* (the Code). This will allow the state departments that put the provisions of the Code into legislation to accept B-QUAL auditing to show the beekeeper is complying with the Code.

The Board continues to monitor the program regularly to meet changes in government and industry requirements.

6.2.2 National Bee Biosecurity Program

Plant Health Australia (PHA) are the managers of the National Bee Biosecurity Program[110] (NBBP), which includes the employment of Bee Biosecurity Officers (BBOs) and stewardship of the Code.

The NBBP, through the Code, aims to improve the management of established bee pests and diseases (particularly American foulbrood) and increase the preparedness of beekeepers for exotic pests (including pest bees).

The main role of BBOs is to help beekeepers understand their biosecurity obligations under the Code, and to provide general advice on pest and disease-management practices. This is accomplished through a variety of extension and education-based activities performed by the BBOs, including attendance at industry field days, presentations at beekeeper club meetings, delivery of workshops and apiary visits. BBOs are now employed in New South Wales, South Australia, Tasmania, Victoria and Western Australia. A BBO contract is currently being finalised for Queensland, and a BBO should be in place there by early 2019.

The Biosecurity for Beekeepers eLearning course was developed by PHA, in consultation with AHBIC, to enable beekeepers to meet the pest and disease training requirements under the Code.

The course covers:

- checking hives for pests and diseases
- identifying exotic and established pests and diseases of honey bees
- taking action after finding a serious pest or disease in their hive
- minimising the impact of pests and diseases on their hives.

110 www.planthealthaustralia.com.au/national-programs/national-bee-biosecurity-program

Since the course was launched in April 2017, there has been a steady increase in enrolments by both hobby beekeepers (fewer than 50 hives) and commercial beekeepers (50 or more hives). At the end of 2018, there were 1068 people enrolled in the course. Further details about the course are available on BeeAware.[111]

BeeAware[112] contains substantial supporting materials for the Code, including templates to facilitate better record keeping for hive inspections. The website also contains detailed information on established and exotic pests and diseases.

In November 2018, PHA launched the Honey Bee Health Survey. This survey, funded by AgriFutures Australia, examines the level of knowledge of the Code and biosecurity awareness among Australian beekeepers. The survey was open to all Australian beekeepers and ran for a six-week period. The results from this survey will be used within the program, highlighting the specific areas where additional resources and activities are required. This survey is planned to be an annual occurrence, with the intention being to analyse changes and the perception of bee biosecurity in Australia.

6.2.3 Alpaca industry biosecurity programs

The widely used alpaca QA program, Q-Alpaca, is at the early stages of a review. It is hoped that a new biosecurity program for the alpaca industry will be completed in 2019.

The eAlpaca herd registry system, which records pedigree and ownership details of all registered alpacas in Australia, has been in place for a year. This online system will be used as a key part of the new biosecurity program, allowing Australian Alpaca Association members and their veterinarians to work together electronically.

The *National South American camelid declaration and waybill* was revised in 2017 and is available from the Farm Biosecurity[113] and Australian Alpaca Association[114] websites. The form is recommended for use both as a vendor health declaration and as a waybill for interstate alpaca movements.

6.2.4 Australian Chicken Meat Federation's quality systems

The Australian Chicken Meat Federation maintains and promotes the *National farm biosecurity manual for chicken growers.*[115] This manual sets out the minimum biosecurity requirements that must be implemented on meat chicken farms in Australia. Compliance with the manual is obligatory for chicken growers under their contractual arrangements with the chicken-processing companies they supply. The manual includes an auditable checklist and companies periodically assess their growers for compliance with the measures identified in the manual. A review of the manual was initiated in 2017, with the revised version expected to be available in 2019.

Implementation of the procedures in the manual also mostly satisfy the requirements for poultry farming specified in the *Primary production and processing standard for poultry meat* issued by FSANZ. This standard came into effect on 20 May 2012, and has been incorporated into state and territory legislative frameworks. Under the standard, all meat chicken farms must have an appropriate food safety management system in place. Depending on the jurisdiction, farms may have to be licensed, and their food safety management system audited by the relevant jurisdictional authority and/or the processor to whom the farmer is contracted, to confirm that appropriate measures are in place to ensure food safety.

A biosecurity induction video resource is available to industry; its purpose is to help farmers ensure their staff are aware of biosecurity risks and understand and apply good biosecurity practices on their farms. This resource was partly funded by the AgriFutures Australia Chicken Meat Program and is available on the Australian Chicken Meat Federation YouTube channel.[116] Additional industry resources are under development to improve industry preparedness for emergency animal disease outbreaks.

111 beeaware.org.au/training

112 beeaware.org.au

113 www.farmbiosecurity.com.au/wp-content/uploads/South-American-Camelid-Declaration-and-Waybill.pdf

114 www.alpaca.asn.au/20-resource-centre/animal-welfare-and-biosecurity/105-animal-health-welfare-security-publications

115 www.chicken.org.au/wp-content/uploads/2017/09/National-Farm-Biosecurity-Manual-for-Chicken-Growers-Feb-2010-web.pdf

116 https://www.youtube.com/ChickenMeatAustralia

Chicken meat processing companies must also meet the standards required by their key customers, such as the major supermarket chains and quick-service restaurants. These standards cover food safety, animal welfare and animal health and, in many cases, compliance with the standards is independently audited. Some customers have global supplier farm and animal welfare standards and assurance programs with which Australian chicken meat suppliers must also comply.

Most chickens farmed with access to an outside range area are accredited under the Free Range Egg and Poultry Australia certification program. Compliance with these standards is independently assessed. Most chicken meat producers in Australia comply with the Royal Society for the Prevention of Cruelty to Animals (RSPCA) Approved Farming Scheme standards, and RSPCA staff assess compliance with scheme standards.

6.2.5 Australian Pork Industry Quality Assurance Program

The Australian Pork Industry Quality Assurance Program (APIQ✓®) is a key platform providing confidence to consumers, regulators, markets and the Australian public that pig production standards are of a high level. APIQ✓® is an independently audited program, which verifies producer compliance with management, food safety, animal welfare, biosecurity, traceability, environment and transport standards.

A producer can be certified as:

- APIQ✓®, which indicates that their pigs are primarily indoors
- APIQ✓® Free Range, which means that all pigs live outdoors with free access to shelter at all times
- APIQ✓® Outdoor Bred, Raised Indoors on Straw, which means that breeding stock have free access to paddocks at all times and piglets have free access to paddocks at all times, until weaning, when they are moved to indoor group housing with bedding.

APIQ✓® also provides voluntary verification options for specific customers or markets, such as:

- Gestation Stall Free
- Customer Specifications for Coles.

APIQ✓® certification incorporates the legal requirements set out in the *Model code of practice for the welfare of animals: pigs.*[117] Certification enables producers to show that they are meeting relevant national, state and territory legislation and following good agricultural practice.

The APIQ✓® standards are outcome focused and supported by performance indicators.

Supplementary information to help producers comply with the standards is provided in manuals, including a compliance guide and auditor guide for auditors found on the APIQ✓® website.

The APIQ✓® program undergoes an annual system audit which is conducted by an independent certifying body to ensure that its policies, processes and administration are robust, reliable and of a high standard.

An independent panel of experts, the APIQ✓® Panel, oversees the management of critical incidents involving producers and auditors and the revision of the APIQ✓® standards, including making recommendations to the APL Board QA Committee.

APIQ✓® underpins the PigPass NVD, which includes sections relating to pig ownership and health status. When the PigPass NVD is linked to a certified and audited on-farm QA program such as APIQ✓®, it meets the requirements of the state food and agriculture authorities, Australian Government export market requirements, and FSANZ *Australian standard for the hygienic production and transportation of meat and meat products for human consumption* (AS 4696:2007).

Current status

APIQ✓® certification covers more than 89% of Australian commercial sows in production. Gestation Stall Free compliance has reached 85% of APIQ✓®-certified sows in production, and the proportion of sows in outdoor production (Free Range or Outdoor Bred) systems is just over 11% of all APIQ✓®-certified sows.

The Australian pork industry routinely reviews and considers opportunities for improvements to APIQ✓® policy, process, standards and practice. From January 2018, APIQ✓® moved to independent,

117 www.publish.csiro.au/ebook/download/pdf/5698

Image credit: Shutterstock

third-party auditing with AUS-MEAT appointed to undertake the audits.

During 2018, the APIQ✓® outdoor standards were reviewed by a working group of outdoor producers, retail veterinarians and auditing specialists. The APIQ✓® Panel considered the suggestions of the working group in detail and made recommendations to the APL Board with the Quality Assurance and Animal Welfare (QAAW) Committee to make amendments to the APIQ✓® standards as a result. The revised standards include improving the transparency around confinement and husbandry practices, and have been endorsed by the Committee and APL Board and will take effect on 1 January 2019.

6.2.6 Dairy industry quality assurance program

The dairy industry in Australia is a highly regulated sector with comprehensive food safety practices across the supply chain from farm to consumers. FSANZ sets the national standards (specifically Standard 4.2.4 *Primary production and processing standard for dairy products*) and they are adopted and implemented within state-based regulatory requirements. Dairy businesses wishing to export must also comply with the requirements of the Department of Agriculture and Water Resources *Export control (milk and milk product) orders 2005*.

The Australian dairy industry has developed and implemented quality management systems that are underpinned by the comprehensive regulatory requirements. Customer needs, food safety and product traceability are paramount for the quality systems but other factors such as animal welfare, biosecurity and environmental sustainability are also important considerations in the development of the quality management programs. Industry QA programs require all sectors of the supply chain to take responsibility for food safety.

SAFEMEAT has recognised dairy on-farm QA programs as meeting the food safety requirements of the *Australian standard for the hygienic production and transportation of meat and meat products for human consumption* (AS 4696:2007).

Elements of these requirements include:

- From farm to product storage, all dairy businesses must be licensed by state food regulatory authorities. Individual food safety programs for farms and factories are approved by food regulatory authorities before licences are granted, and compliance is monitored through regular audits of both farms and factories.
- The Department of Agriculture and Water Resources has arrangements in place with food regulatory authorities for the enforcement of standards for exported dairy products.

- State departments of agriculture and primary industries enforce regulations for use of chemicals on farms, animal welfare, control of animal disease and biosecurity, including traceability.

Industry and government support programs underpin the dairy QA programs, and the partnership between industry and government is a critical factor in its success. The food safety requirements of the dairy industry on-farm QA program are complemented by recommended biosecurity elements to protect animal health; they cover provisions of national disease control programs, including for enzootic bovine leucosis for dairy cattle, and Johne's disease.

All on-farm dairy food safety programs are HACCP-based. They cover the following core areas, which are relevant to both milk and meat production:

- physical, chemical and microbiological contaminants
- herd health programs (including safe and responsible animal treatments)
- dairy milking premises
- hygienic milking
- water supply and quality
- cleaning and sanitisation
- identification of animals from birth
- traceability systems for farm inputs (including animal feeds and pasture) and farm outputs (milk, and animal or meat products)
- appropriate records to enable verification
- competence of personnel.

All dairy companies have product identification and traceability systems to follow raw materials and products from farm to consumer.

6.2.7 Egg Standards of Australia

Australian Eggs Limited has developed Egg Standards of Australia (ESA),[118] a voluntary national egg QA program, on behalf of the egg industry. The program is part of the egg industry's commitment as a signatory to the Emergency Animal Disease Response Agreement (see Chapter 4) and the industry's responsibility to the community to ensure the production of safe, quality eggs.

ESA is a unique QA scheme with two components; it provides different levels to encourage adoption across the different scales of egg production and processing; and it facilitates the adoption of QA systems across the industry. ESA provides a compliance framework for a range of egg industry good practices for pullet rearing and egg production, grading and packing. It addresses:

- hen welfare
- egg quality
- biosecurity
- food safety
- work health and safety
- environmental management.

ESA for Rearing and Laying Farms has been in operation since April 2017, replacing the previous QA program (Egg Corp Assured). ESA for Grading and Packing Floors was released in November 2018.

The scheme is governed by certification rules, a registration and licensing process, and a suite of policies and procedures. An independent third party manages administration and audit operations, and four independent, third-party certification bodies manage the auditors.

Since the launch of ESA for Rearing and Laying Farms in April 2017, all farms under the previous scheme have now transitioned to the ESA program. With the ESA for Grading and Packing Floors now in operation, all participating grading floors will now begin transitioning to the new Standard.

ESA for Rearing and Laying Farms currently covers most of the national laying flock, and it is envisaged that ESA for Grading and Packing Floors will have a similar reach to the previous QA scheme and cover most of the nation's grading floors.

Australian Eggs Limited entrusts audit management of ESA to four independent certification bodies whose auditing staff have Exemplar Global accreditation in food safety, as a minimum qualification. Auditors must also attend the ESA auditor-training program held each year by Australian Eggs Limited. A program of verification and unannounced audits (following formal complaints) form part of the program.

118 www.australianeggs.org.au/for-farmers/egg-quality-standards

6.2.8 Livestock Production Assurance for the red meat industry

The Australian red meat industry (cattle, sheep and goats) has developed and implemented integrity systems to verify and assure food safety and other quality attributes of livestock.

Livestock Production Assurance (LPA),[119] which commenced in 2004, is an on-farm assurance program for cattle, sheep and goats covering food safety, biosecurity and animal welfare. LPA provides evidence of livestock history and on-farm practices when transferring livestock through the supply chain. Producers declare this information on LPA NVDs, which are required for any movement of stock to processors and saleyards or between properties if they have different property identification codes.

The program (including LPA QA) is managed on behalf of the red meat industry by the Integrity Systems Company, a wholly-owned subsidiary of Meat & Livestock Australia, and is independently audited.

Producers who choose to become LPA-accredited commit to carrying out on-farm practices that support the integrity of the entire system. The seven LPA requirements are:

- property risk assessment – to assess the risk of livestock on a property being exposed to areas that are contaminated with organochlorides or other persistent chemicals
- safe and responsible animal treatments – to ensure that livestock intended for human consumption do not contain unacceptable chemical residues or physical hazards
- stock foods, fodder crops, grain and pasture treatments – to ensure that livestock are not exposed to feeds containing unacceptable contamination, especially animal products or unacceptable chemical residues
- preparation for dispatch of livestock – to ensure that livestock to be transported are fit for the journey and not unduly stressed, and that contamination is minimised during on-farm assembly and transport to the destination
- livestock transactions and movements – to ensure that the movement of livestock can be traced, if necessary, and that the livestock are accompanied by information on their status with regard to exposure to chemical residues
- biosecurity – to ensure that the risk of introducing infectious diseases to livestock production properties and the risk of spreading diseases between properties is minimised
- animal welfare – to ensure that livestock management is consistent with requirements of the Australian animal welfare standards and guidelines.

The last two elements (biosecurity and animal welfare) were introduced in October 2017, together with a three-yearly LPA accreditation-renewal process, involving an assessment and supporting online learning modules.

As of 30 June 2018, about 213 051 property identification codes were accredited in the LPA program (Figure 6.1) and about 29 280 accreditations were completed under the new process, including 7166 from new LPA members (see Figure 6.1).

The Integrity Systems Company 2018 producer survey revealed 93% awareness of the LPA program among red meat producers, representing an increase of 19% on 2017 awareness levels.

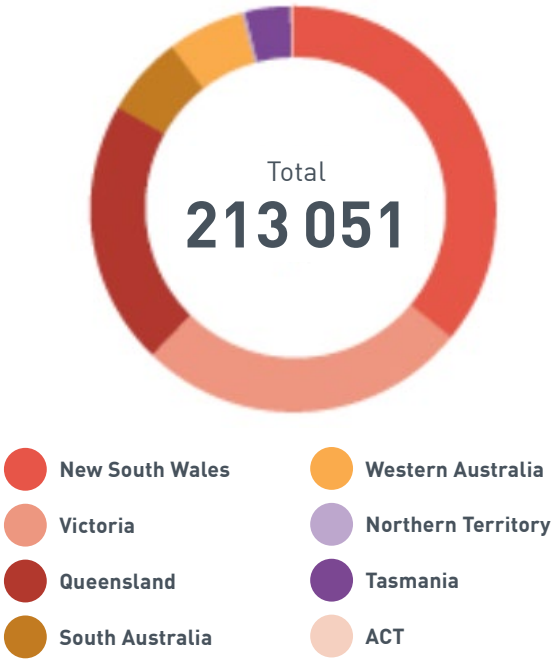


Figure 6.1 Total number and jurisdiction breakdown of property identification codes accredited in the LPA program, 2018

119 www.mla.com.au/meat-safety-and-traceability/red-meat-integrity-system/about-the-livestock-production-assurance-program

6.2.9 National Feedlot Accreditation Scheme

The National Feedlot Accreditation Scheme (NFAS)[120,121] is the Australian cattle feedlot industry's QA scheme and is the cornerstone of eligibility for beef to be described as 'grain-fed' within prescribed industry standards. The program encompasses QA elements for animal health and welfare, environmental management, food safety and product integrity. With about 400 accredited feedlots in Australia, the program ensures the integrity of the grain-fed beef sector. A key requirement of NFAS that all feedlots are audited annually promotes the independent verification of practices within a feedlot and ensures that consumers can maintain confidence in the way grain-fed beef is produced.

NFAS is underpinned with industry integrity systems which include biosecurity planning, livestock traceability and food safety. These fundamental principles promote the Australian feedlot sector as a responsible and ethical producer of protein, further strengthening the confidence consumers have in Australian produce.

The Australian Lot Feeders' Association reports that, since the review of NFAS and the implementation of the updated program standards, audits conducted in 2018 have revealed minimal non-conformance with the new standards. This rate of adoption and strong compliance reflect the feedlots sector's capacity to meet the changing expectations of the community.

6.2.10 Other quality assurance programs

FeedSafe

The Stock Feed Manufacturers' Council of Australia operates FeedSafe®[122] as the QA accreditation program for the Australian stockfeed industry. The central aspects of FeedSafe® are HACCP and the Code of Good Manufacturing Practices, and it encompasses elements for food safety, workplace health and safety, risk assessment, treatment and handling of materials, training, traceability and product recall. FeedSafe® was developed in consultation with the state and territory governments via their Chief Veterinary Officers, and was endorsed by the then Standing Council on Primary Industries.

There are currently more than 110 stock feed manufacturers in Australia which are subject to independent annual audits. The auditors are required to have Exemplar Global accreditation in food safety.

FeedSafe®-accredited manufacturers produce more than 13 million tonnes of feed, which is more than 90% of the manufactured feed sold in Australia. These manufacturers feed all aquaculture animals and about 99% of poultry; 90% of pigs; 55% of dairy cows; and 10% of grazing cattle, sheep and goats in Australia. They play an integral role in the production of Australian food-producing livestock.

Rendering standards and accreditation

The *Australian standard for the hygienic rendering of animal products* (AS 5008:2007)[123] provides the framework for producing safe rendered products in Australia. It prescribes minimum requirements for:

- implementing QA and HACCP principles
- hygienic construction of rendering plants
- hygienic rendering operations, microbiological testing and validation of heat treatments
- product tracing and recall
- labelling requirements that are consistent with state and territory legislation on labelling stockfeed, with a statement relating to restricted animal material.

Each state and territory requires rendering plants to comply with the standard. Compliance is verified by regular audits by, or on behalf of, state and territory food authorities, or by independent auditors. The independent auditors also audit rendering plants against the Australian Renderers Association Code of Practice and importing country requirements. They report their findings to both the Australian Renderers Association and the Department of Agriculture and Water Resources, who use these audits to consider approving rendering plants for export listing to qualified countries. The Department of Agriculture and Water Resources is notified of all critical non-compliances affecting applicable export operations. In some states and territories, the auditors also report results of audits, or compliance

120 www.ausmeat.com.au/services/list/livestock/nfas

121 www.feedlots.com.au/industry/nfas

122 www.sfmca.com.au/feedsafe/about_feedsafe

123 www.publish.csiro.au/book/5666

with product labelling requirements, to the relevant state or territory authorities.

Pet Food Adverse Event System of Tracking

The Pet Food Adverse Event System of Tracking (PetFAST)[124] is a voluntary joint initiative of the Australian Veterinary Association and the Pet Food Industry Association of Australia. It is designed to track health problems in dogs and cats that are suspected of being associated with eating pet foods, treats or pet meats.

The system enables veterinarians to report suspected pet food adverse events, and where there is a trend or cluster identified, action can be initiated to investigate the cause. PetFAST was launched in January 2012.

Seafood standards

Australia's seafood comes from a combination of wild-capture and aquaculture sources. All producers and manufacturers consider public and consumer confidence in seafood safety to be of paramount importance.

Australia has national, state and territory food safety standards, legislation and regulations that cover the seafood supply chain from production through to processing under the requirements of the FSANZ Code (Standard 4.2.1 *Primary production and processing standard for seafood*). Under this Standard, a seafood business must identify potential seafood safety hazards and implement controls that are commensurate with the risk.

This Standard represents the minimum food safety and QA standard that an Australian seafood business must meet. Many of the larger seafood industry sectors have developed their own QA programs, based on HACCP principles and good manufacturing practices that are tailored to their individual operations. For example, the Australian Shellfish Quality Assurance Program is a government–industry cooperative program designed to assure the food safety of shellfish managed in accordance with operational guidelines.

The Fisheries Research and Development Corporation was accredited in October 2013 by the Accreditation Board for Standards Development Organisations to develop Australian standards for the seafood industry. The Corporation manages the ongoing maintenance and development of the *Australian fish names standard* (AS 5300),[125] which specifies the nationally agreed standard names for all fish species in Australia.

All individual seafood businesses are legally required to have a documented food recall plan in case a product has to be recalled. Similarly, all food safety agencies have well developed emergency response strategies in place and regularly trial them. The strategies involve:

- stopping any further distribution and sale of unsafe food
- retrieving the potentially unsafe food
- informing the public and the relevant authorities about the problem.

There are many voluntary standards and certification schemes that can apply to the seafood industry. Some are domestically or internationally recognised independent QA or sustainability schemes, including (but not limited to):

- Aquaculture Stewardship Council
- Australian Sustainable Barramundi
- Australian Sustainable Prawns
- Best Aquaculture Practice
- BRC Global Standards
- Freshcare
- Friends of the Sea
- GlobalGAP
- ISO 22000 and Food Safety System Certification (FSSC) 22000
- Marine Stewardship Council
- Safe Quality Food Code
- Sedex
- World Wide Fund for Nature.

Others are retailer specific food safety and QA schemes, including but not limited to:

- Coles Quality Assurance
- Costco Quality Assurance Program
- Woolworths Quality Assurance Standard.

124 www.ava.com.au/petfast

125 seafoodstandards.com.au/fish-names/Pages/default.aspx

6.3 Biosecurity programs

6.3.1 Farm Biosecurity campaign

Farm Biosecurity is a national awareness and engagement program that provides information to livestock producers and related service providers about on-farm biosecurity and prevention of animal diseases and plant pests. The program is a joint initiative of AHA and PHA. It encourages producers to identify risks to their livestock and plant products, and to minimise these risks by incorporating on-farm biosecurity measures into their everyday operations.

Farm Biosecurity uses several channels to increase awareness of the six biosecurity essentials for good on-farm biosecurity. These channels include traditional and digital media, a range of educational materials and direct stakeholder engagement. The program promotes use of the Emergency Animal Disease Watch Hotline[126] and the Exotic Plant Pest Hotline[127] to report unusual signs of diseases or pests.

In 2018, several key activities took place, all of which were designed to build on producers' awareness about on-farm biosecurity:

- Research was commissioned to build an understanding of how consultants (i.e. veterinarians, agronomists and agents etc.) viewed and promoted on-farm biosecurity. This followed a significant number of producers in the 2017 survey indicating that their consultants were a primary information source on pests and diseases and often helped with monitoring for threats. This research will inform efforts in coming years to ensure that farm consultants are equipped with information, tools and resources.
- A follow-up survey of mixed grains and livestock producers indicated a greater awareness and uptake of on-farm biosecurity measures compared to the same group of producers in the 2017 survey. This signals success for several industry initiatives which promoted on-farm biosecurity and highlighted flow-on effects for enterprises producing more than one commodity.
- AHA and PHA once again partnered with the Department of Agriculture and Water Resources to sponsor a Farm Biosecurity Producer of the Year category at the 2018 Australian Biosecurity Awards. The 2018 winners provided valuable case studies on the importance of on-farm practices before, during and after an emergency biosecurity response.
- Farm Biosecurity had an enhanced presence at a range of industry and community events, working to build awareness and uptake of on-farm practices through direct engagement with producers.
- A subscriber drive saw the e-newsletter readership grow by nearly 30% over the course of the year, extending the reach and effectiveness of this communication channel.

6.3.2 One Biosecurity program

One Biosecurity[128] is a web-based platform developed by Biosecurity SA in collaboration with the livestock industry which allows producers to assess their biosecurity practices, develop an enterprise biosecurity profile and share it with interested parties. The program's philosophy is aimed at raising the general level of biosecurity practice in the livestock industry to minimum industry standards, while recognising those who have good practices through a scoring system.

A core component of the program is a biosecurity questionnaire with built-in educational tools allowing producers to assess and record their enterprise biosecurity practices. This is for the producer to determine if there are any gaps and to work towards achieving or maintaining their most appropriate level of biosecurity. The other core component of the program is a disease risk assessment based on farm practices which facilitate risk-based trading of livestock. It also offers the participant pathways for improvement and risk management of specific diseases of interest.

The One Biosecurity application offers producers the option to share information on existing assurance programs they implement, routine animal health management practices such as treatments, vaccinations and parasite control, and upload documents such as certificates or laboratory

126 Emergency Animal Disease Watch Hotline: 1800 675 888

127 Exotic Plant Pest Hotline: 1800 084 881

128 onebiosecurity.pir.sa.gov.au

testing results to support premium disease status. The program is underpinned by a verification process, and data can be extracted from the program, both of which enable animal health staff to identify areas of focus for mentorship activities.

The program was designed to meet the growing demand for information about on-farm biosecurity practices which is often the weakest in the 'farm to fork' information chain. It brings about a greater level of transparency to livestock trade and insight into biosecurity risk management. The portal is mobile friendly, allowing producers to ascertain the biosecurity credentials of a seller on location at the saleyard; for example.

The livestock industry recognises the obligation that producers must contribute to shared biosecurity responsibility. One Biosecurity provides sufficient and precise guidelines on how to contribute to the overall state biosecurity as well as how to measure success. Without a credible method of reporting on biosecurity obligations, there is a risk of wasted or ill directed effort and jeopardising premium market access in an environment where the requirements for evidence of claims is increasing.

The One Biosecurity program being implemented in South Australia provides a solid basis for certification and risk management. The approach provides knowledge of farm level biosecurity practices using auditable online systems and is likely to become the new standard for export certification to meet consumer demands and the minimum level of assurance demanded by importing countries.

6.3.3 Sheep Producers Australia

Sheep Producers Australia (SPA)[129] promotes biosecurity practices that assist in preventing the spread of infectious disease and invasive pests or weeds between farms as well as protecting Australia from diseases and weeds that occur overseas. This involves producers having a biosecurity plan for their farm, and meeting their obligations for traceability to allow the rapid containment of disease outbreaks should they occur.

Key biosecurity initiatives undertaken by SPA in 2018 include:

- finalisation of the National Sheep Industry Biosecurity Strategy (2018–2023), in conjunction with WoolProducers Australia, to benefit sheep producers and wool growers
- review with WoolProducers Australia of the National Ovine Johne's Disease Management Plan, managed by AHA
- support for the roll-out of the Livestock Data Link to provide feedback from the National Sheep Health Monitoring Project directly to growers.

6.3.4 WoolProducers Australia

Australian wool is sourced by export markets for its high quality and because of Australia's disease-free status for many livestock diseases that cause significant losses in other countries. WoolProducers Australia[130] aims to strengthen existing biosecurity practices that protect Australia from the entry of pests, weeds, invasive species and diseases, which is necessary for ongoing export market access for wool.

Key biosecurity initiatives undertaken by WoolProducers in 2017–18 include:

- three wool industry stakeholders recruited to attend foot-and-mouth disease real-time training in Nepal in November 2017 and March 2018
- a further two Consultative Committee on Emergency Animal Disease representatives were trained on behalf of the wool industry
- broadening the relationships across the supply chain with the goal of increasing awareness of EADs, with a project to involve agents and wool brokers through an online training platform launched in November 2018
- participation in the Sheep Health Project and National Sheep Health Monitoring Project
- reviews of the National Ovine Johne's Disease Management Plan and SheepMAP, managed by AHA
- Sheep Health Declaration review
- contributing to the roll-out of results from the Sheepcatcher II exercise through participation in the Sheep Traceability Working Group.

129 www.sheepproducers.com.au

130 www.woolproducers.com.au

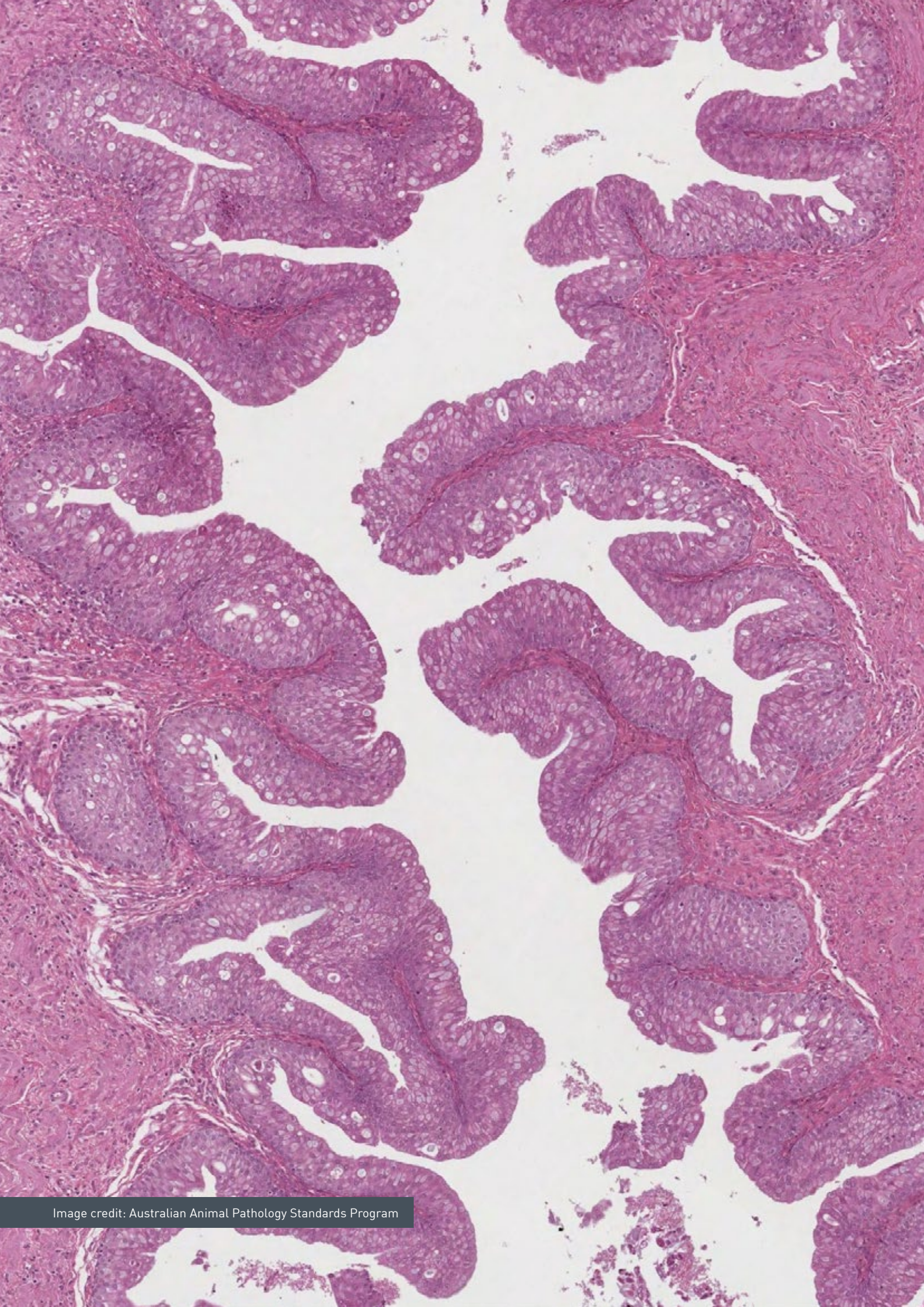


Image credit: Australian Animal Pathology Standards Program

7

ANIMAL HEALTH LABORATORIES

Australia's animal health laboratories are an integral part of the national animal health system and play a crucial role in disease preparedness and response.

They are operated by state and territory governments, CSIRO, universities and the private sector. These laboratories undertake surveillance, diagnostic testing, quality assurance (QA) and/or research for endemic and emergency animal diseases (EADs), including for exotic and zoonotic diseases. These functions support domestic and international trade for animals and animal products, and help safeguard animal and public health in Australia.

This chapter describes the national animal health laboratory network including its key functions and programs.

7.1 Structures and responsibilities

7.1.1 Government laboratory networks

There are eight government animal health laboratories in Australia. CSIRO's Australian Animal Health Laboratory (AAHL) in Geelong, Victoria is the national animal health laboratory. There are also animal health laboratories in all six states and the Northern Territory. All government laboratories play a key role in testing for EADs to support disease surveillance and response, biosecurity policy and domestic and international trade for animals and animal products and are part of the National Laboratory Task Group (NLTG) (see below). Several of these laboratories also have a national leadership or coordination role in QA, training and research relating to laboratory preparedness and response.

National Laboratory Task Group

The NLTG[131] provides technical, scientific and policy support to the Animal Health Committee (AHC) in terrestrial animal health laboratory diagnostics and related matters. It consists of members from the Department of Agriculture and Water Resources, AAHL, all Australian state and territory government laboratories and the New Zealand Ministry for Primary Industries. With AHC's approval, NLTG started a process to extend its membership to Australia's university and private veterinary laboratories for further streamlining and enhancing the laboratory network capacity in relevant areas. Animal Health Australia (AHA) is an observer. The Department of Agriculture and Water Resources provides secretariat support to NLTG.

NLTG provides national leadership and coordination in diagnostic capability and capacity, involving a range of essential laboratory functions for EADs. These functions include QA, standard procedures, test development and evaluation, and training initiatives, which are discussed below. NLTG also plays a key role in communicating matters of national interest about animal health diagnostic laboratories to government and non-government stakeholders. It maintains current data and information on its key activities and relevant national laboratory policies, procedures and resources through its website.[132]

In 2018, NLTG continued to engage stakeholders for *ad hoc* laboratory functions and issues. In support of AHC and Australia's Intergovernmental Agreement on Biosecurity framework, NLTG developed the *National animal health diagnostics business plan for 2018–2020* with three priority areas for further development or enhancement: laboratory data management, test validation and skills training. NLTG also embarked on a coordinating role in the animal health laboratory aspect of antimicrobial resistance as recommended by the National Antimicrobial Resistance Strategic and Technical Advisory Group in 2018. Through a planning workshop with relevant technical experts in September 2018, NLTG identified an initial approach to addressing national consistency in laboratory testing for antimicrobial resistance, which includes the formation of a technical working group and will be further developed for implementation, in collaboration with the Public Health Laboratory Network.

Laboratories for Emergency Animal Disease Diagnosis and Response network

The Laboratories for Emergency Animal Disease Diagnosis and Response (LEADDR) network reports to AHC and consists of members from the Department of Agriculture and Water Resources, AAHL and state and territory government laboratories. The network is coordinated by AAHL and aims to standardise or harmonise screening performance for targeted EADs of terrestrial and aquatic animals in all member laboratories. This ensures a nationally coordinated approach and maximises the availability of national resources to meet demands for large-scale testing in an EAD outbreak.

LEADDR commenced in 2009 and its QA programs now cover nine targeted terrestrial and aquatic animal diseases, including avian influenza, Newcastle disease, bluetongue, foot-and-mouth disease, classical swine fever, Hendra virus, white spot syndrome virus, ostreid herpesvirus 1 microvariants and megalocytivirus. These QA

131 The National Laboratory Task Group was established in 2016 after the cessation of the Subcommittee on Animal Health Laboratory Standards

132 www.agriculture.gov.au/animal/health/laboratories

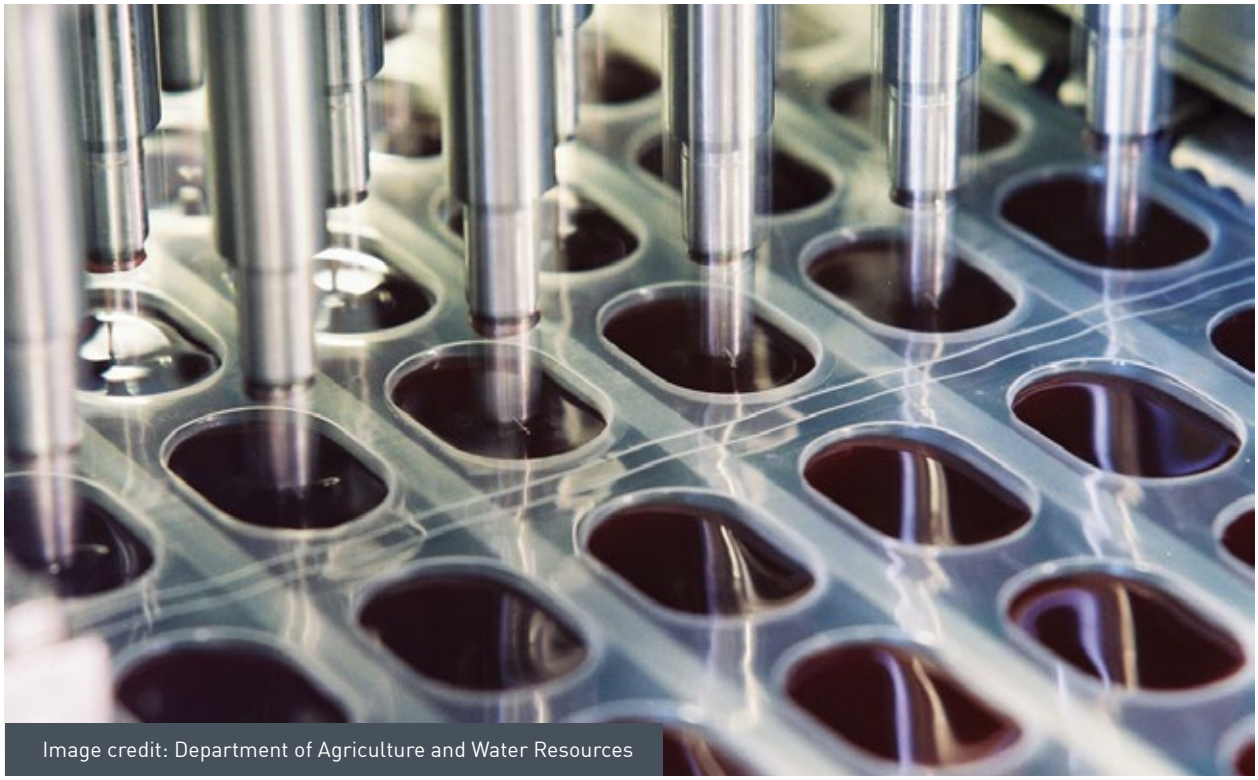


Image credit: Department of Agriculture and Water Resources

programs include standard testing procedures and network quality controls for each test and proficiency testing (PT) activities in some cases.

To strengthen Australia's preparedness for, and response to, major disease emergencies, the LEADDR members work closely with each other through monthly teleconferences and annual face-to-face meetings. To ensure Australia's access to specific expertise or materials that are not immediately available in Australia, the LEADDR laboratories also maintain strong working relationships with various overseas animal health laboratories. The LEADDR laboratories work closely with public health laboratories, as required, for zoonoses and other veterinary public health issues.

In 2018, funding through the **Agricultural Competitiveness White Paper** was provided to LEADDR to update national animal influenza testing capability. A new screening test for influenza A virus antibodies that can work on samples from multiple animal species was validated with a plan to roll it out to the network laboratories for use. Next-generation sequencing is a powerful genomic tool for agent detection and characterisation. With previous funding through the **Agricultural Competitiveness White Paper**, LEADDR successfully developed national implementation guidelines for the use of diagnostic next-generation sequencing for EADs. The guidelines are expected to be made available online in 2019 after completion of further stakeholder consultation.

7.1.2 Non-government laboratories

Universities

There are seven universities that have veterinary schools in Australia. They are Charles Sturt University (New South Wales), James Cook University (Queensland), Murdoch University (Western Australia), University of Adelaide (South Australia), University of Melbourne (Victoria), University of Queensland (Queensland) and University of Sydney (New South Wales). Although veterinary schools operate as independent entities, they are important to the national animal health system.

Each veterinary school has its own diagnostic laboratory and experts to support their diagnostic, teaching and research activities. The experts cover a broad range of animal health laboratory specialties, including pathology, molecular biology, virology, bacteriology, mycology, parasitology and immunology. Collectively, they represent the major national repository of veterinary-trained laboratory diagnosticians.

While veterinary schools generally have a diagnostic and research focus on endemic animal health

matters, some of their experts have involvement in specific EAD-related activities through consultancies and research collaboration. Some of the veterinary schools provide laboratory screening services for specific national animal disease surveillance programs. Several university veterinary laboratory diagnosticians provide expert advice or training to government and industry on EADs or other major animal health issues independently or through relevant national or sub-national committees, including NLTG and AHC.

A number of other universities also play a role in the national animal health system through a broad spectrum of works, some of which are relevant to laboratory diagnostics. These works are usually pertinent to research and development as well as provision of scientific advice. They are described in other relevant sections, including Section 8.8.

Private and industry-based laboratories

In Australia, private veterinary laboratories also provide animal health testing and diagnostic services. The government of South Australia has outsourced government veterinary diagnostic services to the private sector through contract. Private laboratories that have appropriate QA programs and government approval may offer official testing services, including those for international trade purposes. Some private laboratories also provide training opportunities for veterinarians to pursue specialist diagnostician qualifications, especially in pathology.

Industry-owned veterinary testing laboratories can be found in some vertically integrated companies, especially in the intensive livestock industries. These provide diagnostic services for the companies and their contractors.

7.1.3 International coordination

Australia's World Organisation for Animal Health (OIE) National Focal Point for Veterinary Laboratories, based in the Department of Agriculture and Water Resources, supports Australia's OIE Delegate on various regional and international laboratory issues, including laboratory capacity building for disease emergencies and preparation of comments on all relevant OIE laboratory standards and guidelines.

7.2 Quality assurance

7.2.1 Laboratory standards and accreditation

AAHL and all state and territory government animal health laboratories are accredited against ISO/IEC 17025:2017 by the National Association of Testing Authorities (NATA)[133] to perform a range of animal health testing services, including those for trade and public health purposes. Many of the major private or industry-based animal health laboratories in Australia are also accredited by NATA for their relevant scope of testing services. Two universities involved in EAD testing activities have maintained their NATA accreditation status for specific testing purposes. Maintaining NATA accreditation for the relevant class of test is obligatory for all government and non-government laboratories to participate in official EAD testing. NATA is a member of the International Laboratory Accreditation Cooperation.

7.2.2 Standard diagnostic procedures

For official EAD testing purposes, Australian laboratories generally adhere to the procedures recommended by the OIE aquatic and terrestrial diagnostic manuals. In 2018, diagnostic experts from AAHL and some of the government and university laboratories contributed to the development or revision of various chapters in the OIE manuals.

Australian and New Zealand laboratories collaborated to produce and maintain a comprehensive series of Australian and New Zealand Standard Diagnostic Procedures (ANZSDPs)[134] for major aquatic and terrestrial EADs. The series aims to standardise testing procedures to ensure testing consistency between laboratories and facilitate PT programs in Australia and New Zealand. They also reflect specific needs for regulatory or disease-management purposes in Australia or New Zealand when corresponding chapters of the OIE diagnostic manual and other international standard procedures do not meet

133 www.nata.com.au/nata

134 www.agriculture.gov.au/animal/health/laboratories/procedures/anzsdp

these requirements. The coordination of ANZSDP activities has been undertaken by NLTG under AHC. In 2018, several ANZSDPs underwent revision.

7.2.3 New test evaluation

NLTG has a role to evaluate new or modified testing methods before approval by AHC, through a peer-review process. Once approved by AHC, testing methods are included in the relevant ANZSDP. NLTG has published a new test-evaluation policy, requirements and process, including specific test-validation templates, to facilitate applications.

7.2.4 Proficiency testing

PT is an effective external QA practice commonly used by Australian laboratories to demonstrate their relevant testing competency, especially for accreditation purposes.

The Australian National Quality Assurance Program (ANQAP)[135] is managed by the Victorian Department of Economic Development, Jobs, Transport and Resources through a fee-for-service system. It is an international PT provider accredited by NATA to the ISO/IEC 17043:2010 standards. ANQAP provides a number of PT programs to support continuous improvement of individual Australian laboratories in EAD testing performance, including some LEADDR tests. These programs cover serology, virology, bacteriology and molecular diagnostics (mainly polymerase chain reaction testing). Most of its PT programs are used by participating laboratories that perform veterinary tests associated with quarantine, export health certification and disease control programs. About 26 animal health laboratories in Australia, New Zealand, Asia, Europe, Africa and North America participate in various ANQAP PT programs.

AAHL, which is also accredited by NATA to the ISO/IEC 17043:2010 standards, is another major PT provider in Australia and the region. AAHL supports the LEADDR PT programs for targeted EADs, mainly in serology and molecular diagnostics.

The Australian Animal Pathology Standards Program (AAPSP) is a national joint initiative under the management of AHA with support from governments, industry and professional organisations. It aims to improve QA in veterinary pathology by developing and delivering PT programs, a registry of national digital reference materials, and continuing professional development programs. State and territory government and private laboratories participate in a quarterly histopathology PT program, which was launched in 2006.

In addition, some animal health laboratories are involved in international PT programs run by independent private companies, especially concerning conventional microbiological methods.

7.2.5 Laboratory diagnostician training

In Australia, universities, government and private diagnostic services and professional bodies or networks play a major role in providing scientific and technical training opportunities to laboratory diagnosticians. Some of their training activities may support individuals to gain recognisable laboratory specialist recognitions, especially through professional bodies such as the Australian and New Zealand College of Veterinary Scientists and overseas equivalents.

In 2018, the Australian Association of Veterinary Laboratory Diagnosticians, the Australian Society for Veterinary Pathology, the Australian Society for Microbiology and AAPSP continued to provide regular training programs. In the AAPSP Digital Slide Archive (which represents cases of endemic and exotic diseases in a wide range of terrestrial and aquatic animal species), the migration of thousands of histopathological slides and gross images to a new online platform for training purposes was commenced. AAPSP continued to provide online training and educational materials to its members, with a series of roadshows on veterinary forensic pathology conducted across the country. The Australian Society for Veterinary Pathology conducted its annual conference in Sydney with a focus on wildlife reproductive pathology in population health and conservation. The Australian Association of Veterinary Laboratory Diagnosticians held a two-day scientific meeting in Melbourne covering a broad range of contemporary topics relevant to EADs, including the international spread of African swine fever, and advanced diagnostic technologies.

135 www.anqap.com

Image credit: CSIRO AAHL

In addition, some of the jurisdictional laboratories continued to conduct and/or participate in interactive pathology case studies via the internet and make relevant materials available online for training purposes.

7.3 Reference centres

7.3.1 Reference laboratories

Reference laboratories provide a range of functions important to their respective EAD preparedness and responses in Australia. In addition to performing confirmatory diagnosis and in-depth investigation, they play a national leadership or coordinating role in test development and transfer, production or supply of reference materials, expert scientific training and advice and other essential QA functions.

AAHL is a national and OIE-designated reference laboratory for bluetongue, avian influenza, Newcastle disease, Hendra and Nipah virus diseases, yellowhead disease, infection with abalone herpesvirus, epizootic haematopoietic necrosis (with the University of Sydney) and infection with ranavirus (with the University of Sydney). AAHL also serves as a national reference laboratory for rabies and brucellosis.

AgriBio, Centre for AgriBioscience, Victoria, is a designated national reference laboratory for Johne's disease (with the University of Melbourne) and anthrax. At the international level, the Elizabeth Macarthur Agricultural Institute, which is under the auspices of the New South Wales Department of Primary Industries, has continued to serve as an OIE reference laboratory for bovine viral diarrhoea. Queensland Health's Forensic and Scientific Services laboratory is an OIE reference laboratory for leptospirosis.

7.3.2 Collaborating centres

International reference or collaborating centres provide specific expert services to support the management of animal health issues, including, in some cases, capacity building.

AAHL has continued to serve as an OIE Collaborating Centre for New and Emerging Diseases and for Laboratory Capacity Building and Diagnostic Test Validation Science in the Asia–Pacific Region (with University of Melbourne and Massey University in New Zealand). AAHL is also a designated Food and Agriculture Organization of the United Nations reference centre for animal influenza and Newcastle disease and for laboratory biological risk management.

7.4 Biosafety and biosecurity

7.4.1 Standards and practice

Biosafety and biosecurity practice for the storage and handling of materials containing infectious microorganisms in laboratory facilities in Australia is generally based on relevant standards and guidelines developed by international and/or national bodies (e.g. ISO/IEC, Standards Australia and the World Health Organization). The Australia/New Zealand Standard (AS/NZS) 2243.3 is a national standard for the control and containment of microorganisms, good laboratory practices, work health and safety of laboratory personnel and design of biocontainment facilities. It supports the development of regulatory requirements and certification guidelines.

Many EAD agents are exotic to Australia, so to handle their causative agents for research or diagnostic purposes, laboratories must meet the minimum relevant regulatory requirements for Approved Arrangements under the *Biosecurity Act 2015* (Cwlth). Laboratories certified as an Approved Arrangement by the Department of Agriculture and Water Resources are subjected to regular and *ad hoc* audits. These laboratories also need to comply with relevant jurisdictional regulations and policies.

Laboratories that handle living modified organisms and security-sensitive biological agents must be certified by the Office of the Gene Technology Regulator and the Security-Sensitive Biological Agents Regulatory Scheme, respectively. Both these facilities are under the portfolio of the Australian Government Department of Health.

AHC, especially through support from NLTG and LEADDR, provides national leadership for strengthening biosafety and biosecurity practice in animal health laboratories in Australia. All government animal health laboratories have standard operating procedures for biosafety and biosecurity, including decontamination plans, in place.

7.4.2 Biocontainment facilities

AAHL is one of only six high-containment animal research centres in the world. It has facilities up to physical containment (PC) level 4 (i.e. the maximum level) suitable for both laboratory testing and animal studies for EADs that could threaten Australia's animal industries and public health. All state and territory government laboratories have certified PC2-level or PC3-level facilities adequate for their EAD testing purposes. Elizabeth Macarthur Agricultural Institute in New South Wales also has a PC3-level animal facility suitable for investigational study.

7.5 Networked response to disease emergencies

In the event of an EAD outbreak, a Laboratory Subcommittee – Consultative Committee on Emergency Animal Disease (LSC-CCEAD) may be formed to provide networked laboratory advisory and technical support to CCEAD (see Section 4.1) or Aquatic CCEAD (see Section 5.3.1). LSC-CCEAD consists of relevant experts from the LEADDR network and, as required, from other laboratories.

The AUSVETPLAN *Management manual – laboratory preparedness*[136] details the roles of LSC-CCEAD during an EAD response and assists LEADDR and other testing laboratories in all jurisdictions to prepare for a disease emergency. Under direction from the LSC-CCEAD, the LEADDR Coordinator (or delegate) will maintain the coordination of available laboratory resources for sample testing and, if necessary, laboratory supplies, to ensure the effective use of laboratory resources for surge capacity and biosecurity of testing laboratories.

Laboratories approved by CCEAD to conduct EAD testing and diagnosis should have relevant standard operating procedures, QA programs and an appropriate scope of testing accredited by NATA. They should also document their preparedness as an EAD Contingency Plan and test their plans regularly.

136 www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents

Image credit: Emily Onizawa

8

RESEARCH AND DEVELOPMENT

CSIRO, the Cooperative Research Centres (CRCs), Australia's universities and industry-based research and development corporations all have active research programs in animal health and welfare.

8.1 National Animal Biosecurity Research, Development and Extension Strategy

The National Primary Industries Research, Development and Extension (RD&E) Framework aims to promote greater collaboration and continuous improvement in the investment spent on primary industries RD&E resources nationally. The Framework is being implemented through 14 sectoral and seven cross-sectoral strategies, with one of the cross-sectoral strategies addressing animal biosecurity.

Biosecurity RD&E plays an important role in underpinning the productivity, growth, competitiveness and sustainability of Australia's livestock industries and their access to markets. The National Animal Biosecurity Research, Development and Extension Strategy (NABRDES) was refreshed with this in mind, and was subsequently endorsed in August 2018 with the vision of 'world-leading cross-sectoral biosecurity RD&E through collaboration and efficient use of resources, further improving Australia's high animal health status, productivity and ongoing market access'.

Implementation of NABRDES will be overseen by a cross-sectoral implementation committee, which is responsible for driving NABRDES outcomes through a priority framework (Figure 8.1).

For example:

- researching gaps in surveillance (tactical priority) could be used to inform development of national standards (priority area) for surveillance
- development of automation within traceability (tactical priority) could lead to new technology outcomes (priority area) that strengthen Australia's national system
- extension of targeted information on training and education (tactical priority) could contribute to futureproofing biosecurity (priority area).

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8.2 National Primary Industries Animal Welfare Research, Development and Extension Strategy

The National Primary Industries Animal Welfare Research, Development and Extension (NAWRDE) Strategy encourages greater national co-investment and collaboration to improve the efficient use of RD&E resources in animal welfare.

NAWRDE is overseen by a steering committee that guides the development of the strategy and cross-sectoral research projects. The steering committee comprises 26 major funding partners and providers of animal welfare research relating to the Australian farm sector, including representatives from the New South Wales, Queensland, South Australian, Victorian and Western Australian state governments.

A major new project commissioned in 2018 will develop a mechanism to monitor public attitudes to livestock industries and livestock welfare.

The 8th Forum of the National Primary Industries Animal Welfare Strategy was held at the University of Melbourne on 7 November 2018, with over 100 attendees. Speakers included representatives from AgResearch, Animal Welfare Science Centre (University of Melbourne), Australian Eggs Limited, CSIRO, NAWRDE, Rivalea, University of New England (UNE) and Zoos Victoria. Their presentations can be accessed using the following link: 1drv.ms/f/s!Ahfgzp5-1gOPg-k22DZuEI4ooxLDmw.

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8.3 CSIRO Australian Animal Health Laboratory and CSIRO Health and Biosecurity

CSIRO's Australian Animal Health Laboratory (AAHL) facility is a vital part of Australia's biosecurity infrastructure, helping to protect multi-billion dollar livestock and aquaculture industries and the general public from emerging infectious disease threats and to ensure the competitiveness of our agriculture and trade. AAHL works closely with veterinary and human health agencies globally. CSIRO's expertise extends across the disease and science spectrum, from pathogenesis and epidemiology to virus characterisation and test development.

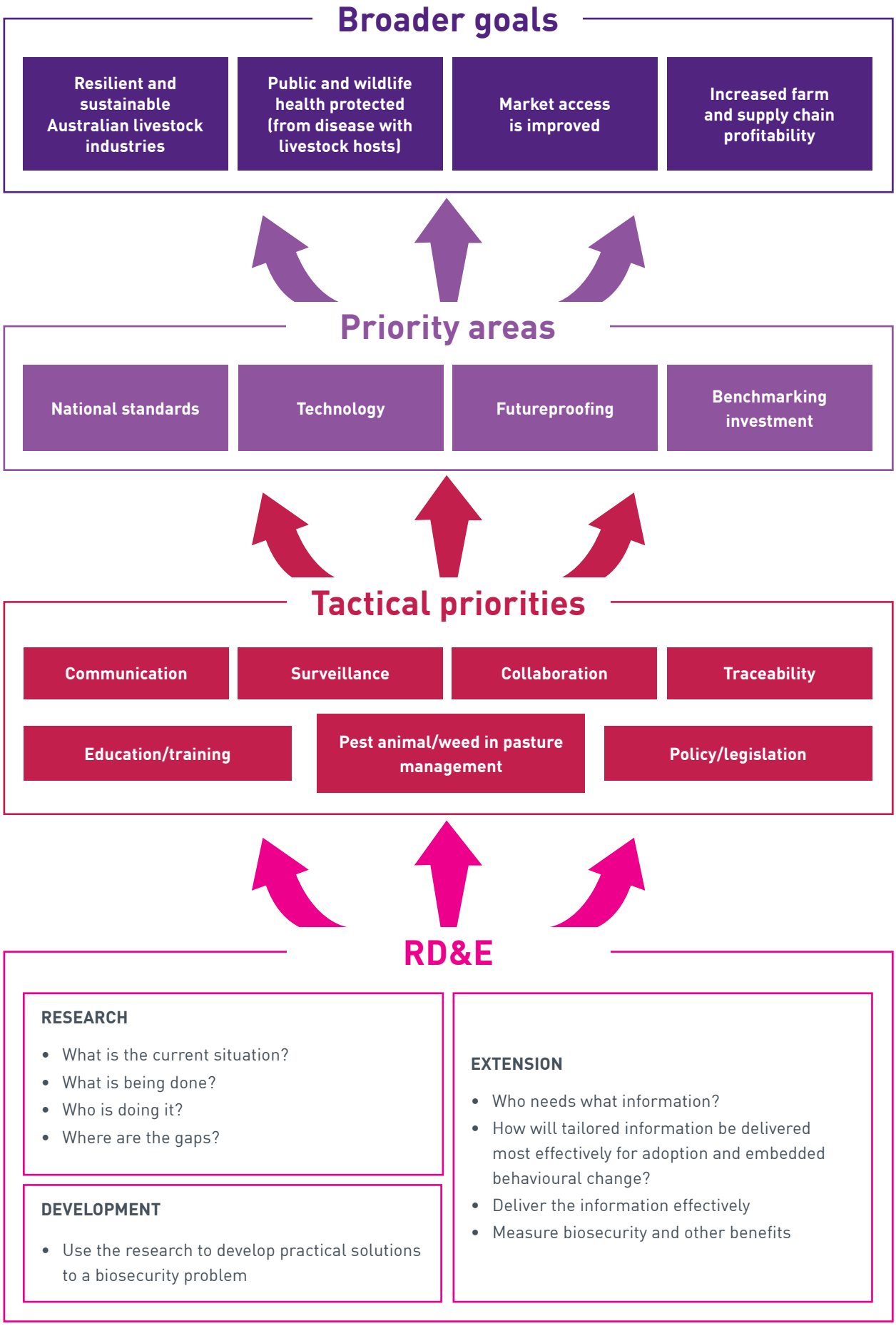

Figure 8.1 Priority framework for the National Animal Biosecurity Research, Development and Extension Strategy

As a national facility operating to benefit the nation, AAHL's responsibilities to industry and government stakeholders include:

- disease detection and epidemiology outbreak
- conducting research to understand and help manage new and emerging infectious diseases that affect both animals and people
- providing policy advice and training on disease diagnosis, management and mitigation.

AAHL plays an integral role in investigating exotic and emergency disease incidents not only in Australia but also globally, with a strong commitment in the Asia–Pacific region.

An outbreak of African swine fever (ASF) in domestic and wild pigs in China occurred in 2018, resulting in significant concerns about the spread of ASF to other countries in the Southeast Asian region. With no vaccine available to control this disease, it remains vitally important to monitor global movements of the virus and to educate animal health workers in Australia to be on the lookout for unusual disease signs. In addition, our scientists are working closely with at-risk countries to ensure they are ready to detect and respond to an incursion of ASF.

AAHL's work in supporting other countries to control and eradicate infectious animal diseases such as ASF not only reduces disease risk to the countries themselves, but also assists the preparedness of Australian biosecurity through improved threat assessment. To support these activities, AAHL serves as a centre of expertise for many diseases, on which further information is provided in Section 7.3.

The AAHL facility is also utilised by the CSIRO Health and Biosecurity (H&B) division. Research teams under H&B aim to tackle major challenges in health and biosecurity on a national and international scale. Examples of research themes that fall under H&B include the management of invasive species and diseases, protection of animal and human health, and biosecurity risk and preparedness.

Led by researchers from H&B, progress continued on the Foot-and-Mouth Disease (FMD) Ready Project, 'Improved surveillance, preparedness and return to trade for emergency animal disease (EAD) incursions using FMD as a model'.[137] The H&B team confirmed that Australia's FMD vaccine bank will provide sufficient protection against internationally circulating FMD strains. Building of the SPREAD[138] application is also under way, to eventually enable prediction of FMD virus spread between farms by wind.

AAHL receives funding from CSIRO, the Australian Government Department of Agriculture and Water Resources, National Research Infrastructure for Australia and external funding bodies.

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8.4 Elizabeth Macarthur Agricultural Institute

Elizabeth Macarthur Agricultural Institute is the New South Wales state laboratory for the diagnosis of diseases and pests of production animals, economic plants and, in some cases, the environment. It specialises in animal and plant pathology, microbiology, virology, serology, parasitology and molecular genetics of animals and pathogens to enable diagnosis and research. Key highlights from 2018 activities are outlined below.

Molecular genetics

Inherited diseases in livestock can affect animal welfare, production efficiency and profitability. Nine emerging inherited diseases in cattle and sheep were investigated. High density genotyping, whole genome sequencing and candidate gene sequencing were employed to identify implicated genes and mutations responsible for each disease and to develop diagnostic tests. Sequencing technologies are enhancing disease epidemiology to help understand the structure and evolution of pathogens and genes associated with disease events in terrestrial and aquatic animals and plants.

137 The FMD Ready Project is governed by a committee with partners from CSIRO, Meat & Livestock Australia, the Australian Government Department of Agriculture and Water Resources, Animal Health Australia and Charles Sturt University.

138 SPREAD is an application designed to assist in the management of highly infectious animal diseases, such as FMD. It facilitates identification of how causative pathogens might be spreading from farm-to-farm.

Virology

A real-time polymerase chain reaction (PCR) was developed to detect caprine arthritis–encephalitis virus in milk and blood of goats, and enzyme-linked immunosorbent assays (ELISAs) now exist for the detection of antibodies in milk. Multiplex real-time PCR assays were developed to directly detect bluetongue virus serotypes in the blood of infected animals; these are being used for bluetongue surveillance nationally. A vaccine is being developed to protect rabbits from recently discovered strains of rabbit haemorrhagic disease virus. Defined genetic lines of Pacific oysters are being screened to determine resistance to infection with oyster herpesvirus 1 to allow the selection of resistant breeding stock. A novel nidovirus was the cause of an outbreak of disease in 2015 in an endangered population of freshwater snapping turtles, and follow-up studies are being conducted. New assays are being evaluated for the typing of bovine herpesvirus 1 (infectious bovine rhinotracheitis virus) and bovine viral diarrhoea viruses to confirm Australia's status of freedom from highly pathogenic strains of these viruses. A new real-time PCR assay has been developed for the rapid detection of encephalomyocarditis virus.

Microbiology and parasitology

A real-time PCR for tick fever was used to investigate outbreaks of this disease in New South Wales. Work is ongoing on development of a quantitative PCR (qPCR) for *Tritrichomonas foetus*. Genomic and epidemiological investigations on *Theileria orientalis* identified that the disease-causing strain of this organism (Ikeda) is likely a different species to the benign strains. Field evaluation of insecticides for ectoparasites of sheep (blowflies and lice) will establish protection periods for major active ingredients in all available products. The development of a new Q fever vaccine for humans is expected to have flow-on benefits for animal vaccine development. A new Q fever ELISA test for use in alpacas is being validated. *Chlamydia psittaci* was identified as a cause of abortion in equines, with horse-to-human transmission identified. Evaluation of diagnostics for ovine brucellosis and footrot in sheep is being undertaken. Research for pigs is also under way into the effects of heat stress on immune parameters, epidemiology, diagnostic and control strategies for enteric and respiratory diseases, and alternatives to antibiotics for the control of enteric disease. Work is ongoing on bovine respiratory disease, Johne's disease and venereal campylobacteriosis, and a new diagnostic test for *Mycoplasma bovis* has been developed.

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8.5 Centre of Excellence for Biosecurity Risk Analysis

The Centre of Excellence for Biosecurity Risk Analysis (CEBRA) undertakes problem-based research into various aspects of biosecurity risk analysis on behalf of the Australian Government Department of Agriculture and Water Resources and the New Zealand Ministry for Primary Industries. CEBRA invests considerable effort in projects for animal biosecurity. Our current animal disease project is described below.

Budgeting and optimisation of resources for animal disease surveillance

Australia relies heavily on animal health surveillance both to protect the health and productivity of its livestock and to support trade and market access. There is growing recognition by Australia's national and jurisdictional governments and agricultural industries that Australia needs to strengthen its surveillance arrangements to be able to mitigate biosecurity threats while continuing to facilitate and enhance trade. Resources for surveillance are finite and therefore need to be allocated optimally. The Intergovernmental Agreement on Biosecurity promotes a risk-based approach to biosecurity; that is, it prioritises allocation of resources to the areas of greatest return. This project aims to provide a mechanism to enable rational, consistent and optimal allocation of national resources for terrestrial animal disease surveillance.

The completion of the first year of this project in 2018 provided the model context and framework for allocating resources for surveillance across six

important animal diseases: equine influenza; FMD; highly pathogenic avian influenza (AI); bluetongue; and classical swine fever as well as ASF. The area of study is currently Victoria, with a plan to extend this nationwide. The next steps of the project to be initiated in 2019 will centre on calibrating parameter values in the model, and formally determining how resources for surveillance should best be allocated across the threats.

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8.6 Cooperative Research Centres

8.6.1 Cooperative Research Centre for High Integrity Australian Pork

The Cooperative Research Centre for High Integrity Australian Pork (Pork CRC) will complete its activities on 30 June 2019. Pork CRC has invested in improving animal health and promoting the more judicious use of antibiotics through Program 2 (Herd Health Management) of its research portfolio. Program 2 has three subprograms (SPs):

- SP 1: diagnostic and health monitoring systems to control disease. Pork CRC researchers have developed new diagnostics and antimicrobial sensitivity profiles for most enteric and respiratory pathogens. These include *Escherichia coli*, *Lawsonia intracellularis*, *Brachyspira hyodysenteriae* isolates, *Mycoplasma hyopneumoniae*, *Actinobacillus pleuropneumoniae* and *Streptococcus suis*. In 2018, qPCRs were developed for *L. intracellularis* and *Brachyspira* spp. Both are being commercialised.
- SP 2: new pig genotypes and genetic technologies to enhance immune competence and disease resilience and robustness in Australian pig genetics. In 2018, traits were established for robustness and pre-weaning survival.
- SP 3: integrated alternative health strategies and technologies to reduce reliance on antibiotics. Pork CRC invested in the development of novel vaccines for *A. pleuropneumoniae*, *B. hyodysenteriae* and *S. suis*. In 2018, a live vaccine for *B. hyodysenteriae* was tested against European and American serotypes in the United States. Alternative strategies and technologies have also been developed for reducing the impact of disease on animal health and performance. These include anti-inflammatory agents, alternatives to antibiotics for weaner pigs and a range of dietary strategies and technologies. More recently, Pork CRC scientists investigated the effects of neomycin sulphate, zinc oxide and Detach® (recently registered by the Australian Pesticides and Veterinary Medicines Authority) on the gut microbiome and antimicrobial resistance (AMR). Detach® prevented scouring but had no impact on AMR, nor did it disrupt the gut microbiome. The antibiotic increased AMR and disrupted the gut microbiome, but these effects were short-lived after withdrawal.

Pork CRC also invested in animal welfare research through Program 1 (Reduced Confinement of Sows and Piglets). Research conducted as part of this program included examining ways in which the welfare and performance of sows housed in groups during gestation could be improved, and innovations in farrowing and lactation systems.

Pork CRC research projects funded between 2011 and 2018 are detailed on the Pork CRC website.

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8.6.2 Sheep Cooperative Research Centre

The Sheep CRC will complete its activities on 30 June 2019. Sheep CRC's research programs have endeavoured to transform the Australian sheep industry through the use of cutting-edge research to enhance sheep wellbeing, introduce value-based trading of sheep meat and deliver affordable technologies for DNA-based genetic improvement. Programs are:

- Program 1: Enhanced Sheep Wellbeing and Productivity
- Program 2: Quality-based Sheep Meat Value Chains
- Program 3: Faster Affordable Genetic Gain.

Image credit: Department of Agriculture and Water Resources

Key achievements from 2018 included the following:

- Dual energy x-ray absorptiometry technology for estimating lean meat yield was delivered by the Sheep CRC Meat Science Program through collaboration with Meat & Livestock Australia (MLA), JBS Australia, Scott Technology, Murdoch University, UNE and the South Australian Research and Development Institute.
- Predictive accuracy of genomic technologies was improved, positioning the industry to provide highly accurate genomic predictions and breeding values.
- The ASKBILL web-based software program was completed and commercially launched. Its development involved the Bureau of Meteorology, UNE, and Sheep CRC's participating organisations. The ASKBILL application aims to significantly improve pasture, production and welfare management by enabling producers to set management plans based on forecasts of pasture availability, animal performance and disease risks, allowing producers to proactively manage risks before flock wellbeing and productivity are compromised.

With the winding down of Sheep CRC, its products and intellectual property are to be transitioned to MLA, with the possible exception of ASKBILL and other web-based applications, which are expected to be maintained and further developed by UNE. Arrangements have also been negotiated wherein students of the postgraduate program who expect to complete their studies after Sheep CRC's closure will continue to be supported by Murdoch University.

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8.7 Research and development corporations

8.7.1 Australian Eggs Limited

Australian Eggs Limited is a member-owned, not-for-profit company providing marketing and research and development (R&D) services to benefit Australian egg farmers. The organisation is funded through statutory levies collected under the *Egg Industry Service Provision Act 2002* (Cwlth) and from Australian government funds for the purposes of approved R&D.

The egg industry has experienced incursions of EADs, with devastating consequences for

egg producers through production losses and weakening of consumer confidence. Minimising and overcoming disease outbreaks while managing adverse public opinion are essential to ensure industry sustainability. Addressing such issues includes ensuring effective levels of on-farm biosecurity, developing the industry's understanding of disease characteristics, having a significant input into the health and welfare of hens, and developing readily available vaccines.

Australian Eggs Limited invests directly with universities and CSIRO in projects and activities that affect not only the overall health of the laying flock, but also biosecurity and the welfare of the bird. Projects that have been completed in 2018 include:

- using feed additives to help reduce reliance on antimicrobials
- developing an Antimicrobial Stewardship framework so that efficacy of antimicrobial agents for use in the poultry industry is preserved by ensuring that birds remain healthy and do not require antimicrobial treatment. This framework provides that, when treatment is necessary, effectiveness is maximised while adverse effects of resistance are minimised.

Ongoing projects include:

- ensuring effective levels of on-farm biosecurity by understanding the barriers to effective engagement of medium-sized producers and through the provision of biosecurity manuals and posters
- developing vaccines for emerging diseases such as spotty liver caused by *Campylobacter hepaticus*
- continuing to supply up-to-date RD&E for food safety messaging on *Salmonella* management throughout the supply chain
- understanding the gut health of hens to provide a more holistic approach to keeping hens healthy
- conducting mock EAD outbreak exercises to better prepare the industry.

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8.7.2 Australian Pork Limited

The pork industry assists in maintaining high welfare standards through the implementation of research recommendations that address the needs of animals and are in keeping with the expectations of the community. Australian Pork Limited (APL) has invested over $2.2 million in welfare research alone to be at the forefront of innovative welfare science.

Key outcomes from 2018 and projects in APL's welfare R&D program include:

Tail biting

Research has found that the tail biting victim trait is heritable. Breed differences were also observed in one population of the study, providing further evidence for genetic influences on victims of tail biting. The study demonstrated how incorporating medication records for tail biting into electronic databases can assist in selecting for pig genotypes with a reduced risk of becoming a victim of tail biting. Producers are also encouraged to evaluate the micro-climate of individual pens within sheds in order to reduce the incidence of tail biting for specific pens.

Heat stress and seasonal infertility

Further research is examining the role of the genetic component (i.e. the genotype and its origin, e.g. European) in the susceptibility of a breeding sow to heat stress and seasonal infertility. In Australia, summer can be one of the most challenging times of the year for pig care. The combination of heat and increased day length creates environmental conditions that can cause seasonal infertility, which results in higher rates of reproductive failure and compromised animal welfare. Furthermore, any thermal stress on a pregnant animal can negatively affect her offspring in utero and can result in consequences throughout the animals' lives. Research into heat stress in utero and during growing and finishing, as well as ways to identify, prevent and alleviate heat stress in pigs, is under way.

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8.7.3 Australian Wool Innovation Limited

The mission of Australian Wool Innovation Limited (AWI) is to invest in R&D, marketing and promotion to enhance the profitability, international competitiveness and sustainability of the Australian wool industry, and to increase the demand and market access for Australian wool.

Improved sheep health and welfare form part of the current *AWI Strategic plan 2016/17 to 2018/19*.

In 2018, AWI investments in R&D included:

- provision of pain relief for surgical husbandry procedures
- internal and external parasite management in sheep, including genetics of blowfly parasitism, development of fly genome clustered regularly interspaced short palindromic repeats (CRISPR) technology, monitoring for resistance to blowfly and lice control chemicals, development of new chemicals and nanotechnology for sheep blowfly control, a new method for conducting faecal egg counts, and best-practice management of blowflies, worms and lice (ParaBoss)
- EAD preparedness, including review and revision of the AUSVETPLAN documents relating to wool, development of an EAD-preparedness training program and tools for the wool industry, evaluation of a prototype wool bale decontamination unit for use in an EAD outbreak, and investigation into tracking the temperature and humidity of wool bales along the supply chain
- genome-wide association study for breech flystrike resistance and update of rates of genetic gain in reducing breech flystrike
- improving fetal, lamb, weaner and ewe survival through feed supplementation and managing lambing paddock environment
- development of remote sensor hardware and signatures for normal and abnormal behaviour
- rabbit bio-control with rabbit haemorrhagic disease virus, and remote imaging and recognition of predators for alerts to land managers
- multivalent footrot vaccine development.

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8.7.4 Dairy Australia Limited

Dairy Australia Limited is the dairy industry's service company, and is committed to supporting improvements in animal health and welfare on Australian dairy farms. Dairy Australia Limited invests in RD&E projects to provide information and training for dairy farmers and their advisers that address national animal health and welfare priorities identified by the dairy industry organisations and wider consultative forums. In 2018, Dairy Australia Limited focused on several key animal health issues.

Mastitis

Mastitis, the most important production disease of dairy cows, is addressed through Dairy Australia Limited's flagship Countdown program. Extension activities include:

- the Countdown milk quality adviser training course, completed by 18 milk quality advisers in 2018
- over 30 Cups On Cups Off courses were run across Australia, training farmers in milking practices aimed at preventing mastitis.

Reproduction

InCalf is Dairy Australia Limited's reproductive program, and extension activities assist farmers to manage their mating without reliance on calving induction, which the industry is working towards phasing out. These include:

- Repro Right adviser training course
- In Charge workshops
- Heifers On Target discussion groups
- Heat Detective discussion groups
- Transition Cow Management workshops.

Production and fitness

Datagene, based at DairyBio, is applying genetic technologies and data analysis to improve the selection of animals that have superior production and fitness under Australian conditions.

A dairy farm biosecurity online tool was developed by Dairy Australia Limited, in conjunction with Agriculture Victoria, to be launched in 2019.

Other extension activities which aim to improve dairy cow health and welfare include:

- Healthy Hooves workshops to train farmers in prevention, detection and management of lameness
- Rearing Healthy Calves workshops
- Cool Cows extension (updated in 2018) to provide farmers and their advisers with up-to-date resources to support heat stress mitigation strategies; additionally, international expert Dr Geoffrey Dahl (funded by Dairy Australia Limited) to deliver a national roadshow to present the most recent research on heat stress
- Humane Euthanasia of Livestock courses delivered in all dairy regions, and additional courses provided to areas most affected by the current feed shortage
- *Australian animal welfare standards and guidelines for cattle* to build farmer awareness and adoption through media articles, webinars, discussion groups and workshops.

Research projects that addressed dairy cow health and welfare and were funded (or co-funded) by Dairy Australia Limited include:

- novel approaches to control the current threat of liver fluke in Victorian dairy herds
- creating a dairy beef supply chain to increase the value and volume of beef and veal products
- automatic lameness detection for dairy cows.

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8.7.5 Live Export Program

The Livestock Export Program (LEP) is a collaborative program between the Australian Livestock Export Corporation (LiveCorp) and MLA. The LEP RD&E program focuses on three key areas:

- improving animal health and welfare outcomes across the supply chain
- improving supply chain efficiency and regulatory performance
- enhancing market access conditions for existing and new markets.

Priorities for the LEP RD&E program in 2018 included the development and validation of scientifically rigorous indicators of animal welfare through the supply chain and the establishment of a four-year research partnership with UNE. This research partnership will streamline research in live export priority areas such as onboard stocking densities, bedding, air quality and ammonia emissions.

Inanition research and *Salmonella* vaccine development

LEP RD&E has shown that inanition and salmonellosis are the most common causes of mortality in exported sheep. A key outcome for the RD&E program in 2018 was the completion of a long-term project, *Strategies to reduce inanition in sheep*. Best-practice guidelines were developed from trials conducted in export feedlots to examine various feeding regimes to assist adaptation of sheep to feedlots and shipping rations. Development also continued on a novel *Salmonella* vaccine with the University of Sydney, which is anticipated to be available in 2021.

Additional highlights for 2018

Black organ disease (or acquired visceral melanosis) describes the melanin-affected livers, kidneys or lungs of sheep and goats. It is not an animal health or food safety issue but is significant for the livestock export industry because it can cause the unnecessary condemnation of offal and carcasses when sheep are slaughtered, particularly in the Middle East. In 2013, a review was initiated to provide an authoritative reference document evidencing that it is not an animal health or food safety issue. This project concluded in 2018.

Other research projects finalised in 2018 included:

- manual of designs for the handling and slaughter of cattle, sheep and goats
- manual for best-practice quarantine and biosecurity in pre-export facilities
- Exporter Supply Chain Assurance System (ESCAS) factsheets for meat quality, food safety and hygiene – communication tools for livestock exported under ESCAS.

Image credit: Animal Health Australia

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LiveCorp website: www.livecorp.com.au/research-development/about-r-d

8.7.6 Meat & Livestock Australia

Animal health and welfare research conducted by MLA aims to improve the profitability and sustainability of the beef cattle, sheep and goat industries. Biosecurity at enterprise, regional and national levels underpins health-related research to improve disease detection/diagnosis, treatment and prevention. Animal welfare research seeks better objective measurement of relevant physiological and behavioural parameters, and improvement or replacement of aversive husbandry practices. Achievements in 2018 are detailed below.

Understanding *Biserrula* photosensitisation

Biserrula pelecinus is a fodder legume known to cause photosensitivity. Research identified this photosensitivity to be primary (i.e. not secondary to liver damage) and its risk to be reduced in dried plant material. The photodynamic compounds have been identified.

Detoxifying fluoroacetate

The cost of sodium monofluoroacetate poisoning from plants is $45 million per year. Research completed in 2018 found that naturally occurring rumen microflora can detoxify sodium monofluoroacetate, and their growth and detoxifying ability can be stimulated with feed supplements. Further research is required to demonstrate this under field conditions.

Toward a new footrot vaccine

The final 26 of 89 recombinant antigens from cloned *Dichelobacter nodosus* genes were tested against a natural sheep footrot challenge. A few promising candidates were identified that offer the possibility of a cross-reactive vaccine.

Worm egg counts made easy

A proof-of-concept study demonstrated the feasibility of performing crush-side Worm Egg Counts (WECs) using image recognition software in a handheld device (smartphone) without the need for internet connectivity. This study hopes to improve the adoption of WECs as a decision support tool for anthelmintic treatment.

Lignocaine residues

Pain relief medication for aversive husbandry procedures will increase in the short to medium term. A lignocaine tissue residue depletion study in sheep will enable better-informed recommendations with regard to withholding periods.

Making castration less painful

The NumNuts® device was developed to administer a lignocaine injection at the time of applying an Elastrator® ring to lambs (during castration and tail docking) as a means of pain relief.

Euthanasia alternative

An intravenous injection of saturated magnesium sulphate following sedation with xylazine was demonstrated to cause humane death, and to greatly reduce the risk of secondary poisoning of carnivorous animals. This development offers an alternative to traditional methods of euthanasia such as firearms and barbiturates.

Upskilling stockpeople

The MLA research team presented the scientific basis for the development and use of cognitive–behavioural training of staff to reduce handling stress in sheep, and its value to industry stakeholders, as supported by recent and previous research.

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8.7.7 AgriFutures Australia

AgriFutures Australia works to grow the long-term prosperity of Australian rural industries. This is achieved by collaborating with industry and government and by investing in R&D, which contributes to the productivity, profitability and sustainability of these industries. The four areas of AgriFutures Australia's research investment are:

- people and leadership
- national challenges and opportunities
- growing profitability
- emerging industries.

Most AgriFutures Australia projects relating to animal health fall within the following RD&E programs:

- chicken meat
- honey bee and pollination
- thoroughbred horses
- small, levied industries such as kangaroo, deer, ratite
- emerging animal industries.

Some of the key initiatives and achievements of AgriFutures Australia from 2018 are:

- the launch of a pilot agriculture-focused entrepreneurial program aimed at secondary school students
- the launch of evokeAG, an international agrifood technology event
- collaboration with APL, Murdoch University and various biotechnology companies in the AgriFutures Chicken Meat Program, which will look to develop an inexpensive and accurate system for objectively defining AMR risks at the farm level.

Further details on programs conducted in 2018 can be accessed via the respective project reports and the *AgriFutures Australia 2017–18 annual report*, available on the AgriFutures Australia website.

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8.8 University research programs

8.8.1 Charles Sturt University

Charles Sturt University (CSU) has an ongoing commitment to rural Australia and its livestock industries as well as an international focus. The School of Animal and Veterinary Sciences has Australian partners and collaborators through its research centres, as well as international partners, for example in China, Fiji, India, Indonesia, Pakistan and Papua New Guinea. These links allow the School to offer a wide range of PhD training opportunities to domestic and international students.

The Graham Centre for Agricultural Innovation is one of CSU's four research centres and is an alliance between CSU and the New South Wales Department of Primary Industries. The Graham Centre aims to strengthen the capacity of these organisations to undertake industry-relevant R&D, and focuses on delivering solutions for crop and livestock systems across value chains.

Academic staff at the School of Animal and Veterinary Sciences have research interests in animal health in a range of species and disciplines, and many are active members of the Graham Centre. Research within the School focuses on five research clusters:

- epidemiology, public health and biosecurity
- animal health and disease diagnosis
- farming systems
- translational and clinical sciences
- learning and education.

The school offers research training, with an emphasis on sustainable livestock production systems, theriogenology, equine medicine and surgery, and wildlife health. It has developed novel approaches to curriculum delivery to ensure that graduates benefit from leading-edge pedagogy and uses research to inform further development of its educational programs.

The National Life Sciences Hub on the CSU Wagga Wagga campus provides world-class research laboratory facilities and a site for interaction and collaboration between researchers from various on-campus schools and external research organisations.

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8.8.2 Deakin University

Animal health and biological research at Deakin University spans multiple research programs that are predominantly within the School of Life and Environmental Sciences (LES). Within LES, the Centre for Integrative Ecology (CIE) investigates how changing environments affect animal health and populations. LES also has expertise in infectious diseases. The CIE, the Deakin Aquaculture Futures facility and the Faculty of Health collaborate with regional and national organisations to meet numerous regional, national and global challenges. Their research makes a significant contribution to science, industry and environmental management. Deakin University's diverse research programs are funded by the Australian Government and industry, and programs to note from 2018 include:

- disease surveillance for AI and Newcastle disease in water birds and psittacosis in parrots
- avian circovirus infection, prevalence, and vaccine development for a range of Australian parrot species
- beak and feather disease virus – Deakin University has identified large differences between subspecies in the prevalence and intensity of infection, along with a role for host heterozygosity and genotype rarity in predicting viral load and infection probability; loci involved with resistance and tolerance are now being explored
- the susceptibility, transmission and treatment of amphibian chytrid fungus in the Baw Baw frog (*Philoria frosti*) under laboratory conditions – preliminary findings confirm a high susceptibility to chytridiomycosis infection transmitted through multiple modes, suggesting a high responsiveness of infected Baw Baw frogs to conventional treatments
- transmissible tumour disease in the Tasmanian devil
- poultry welfare and health
- development of sustainable diets to improve productivity and profitability of aquaculture
- effect of climate change on temperature and its impacts on aquaculture production
- environmental monitoring and habitat assessment (aquatic and terrestrial)
- using diverse tracking technologies to understand animal behaviour
- conservation and population genetics to examine population connectivity (meta-populations), relatedness of species, identification of cryptic species and development of non-destructive monitoring techniques (i.e. eDNA methodology).

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8.8.3 James Cook University

At James Cook University (JCU), the Discipline of Veterinary Sciences within the College of Public Health, Medical and Veterinary Sciences aims to provide global leadership to improve animal and human health in the tropics, using a multi-disciplinary team of researchers. Particular strengths exist in five established areas: veterinary tropical diseases and food biosecurity; animal production; fertility in adverse environments; tropical rangeland ecosystems; and aquatic animal health and disease. The Discipline of Veterinary Sciences is actively involved in high-quality research in these areas, and is rated above world standard by the Australian Research Council, with a consistent Excellence in Research for Australia (ERA) rating of 4 out of 5 (above world standard).

One Health approaches are followed while helping to understand and improve the interdependent health and quality of life of wildlife, animals and humans in northern Australia and in nearby tropical regions. Current work involves seeking to improve the production of pastures and livestock in northern Australia, reducing methane emissions by livestock, wildlife health surveillance and investigating small mammal population declines. Other relevant areas of investigation, with an emphasis on the tropics, include:

- targeted syndromic animal health surveillance in Pacific Island and African countries
- tropical diseases of horses and in particular arboviruses and flaviviruses
- chytridiomycosis of amphibians
- investigating the potential and nutritional value of by-products from the horticulture industry as alternative feed for livestock, particularly during drought
- investigating genetic and nutritional determinants of meat quality in sheep
- improved cattle artificial breeding outcomes
- ecology and management of livestock parasites
- health, welfare and behaviour of companion animals
- legumes to enhance livestock production within tropical pasture-based grazing systems.

The JCU Discipline of Veterinary Sciences has been instrumental in establishing a regional food biosecurity network between Australia and selected Pacific Island countries. Research into trade networks and disease hotspots has shown where surveillance and biosecurity can be most cost-effective.

Key achievements of the JCU Veterinary Science Program in 2018 include its high scores in student experience, graduate satisfaction and graduate employment as reflected within the Quality Indicators for Learning and Teaching 2016–17 survey, and its attainment of a full Australasian Veterinary Boards Council accreditation without any deficiencies.

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8.8.4 La Trobe University

La Trobe University (LTU) has a strong Animal Science discipline, with a long history of agriculture research and teaching, primarily within a systems perspective. The university has a current ERA ranking of 5 (well above world standard) in the agricultural and veterinary sciences.

The newly established Centre for Livestock interactions with Pathogens (CLiP) at LTU, located within AgriBio, Centre for AgriBioscience, Victoria, brings together a range of scientists across departments at LTU together with scientists from the Victorian Government Department of Economic Development, Jobs, Transport and Resources and from a variety of other universities, to address critical diseases of Australian livestock. In particular, research at LTU focuses upon serious endemic diseases of Australian livestock such as roundworms, liver fluke and footrot. Our aims are to improve our understanding of host–pathogen interactions and to use this understanding to develop sustainable methods of disease control.

LTU is particularly keen to improve diagnostic tests and existing methods of disease control. LTU's diagnostic tests go beyond the presence or absence of pathogens, and include both DNA-based and immunological tests. Examples include:

- development and implementation of a pen-side test for the detection of virulent versus avirulent footrot

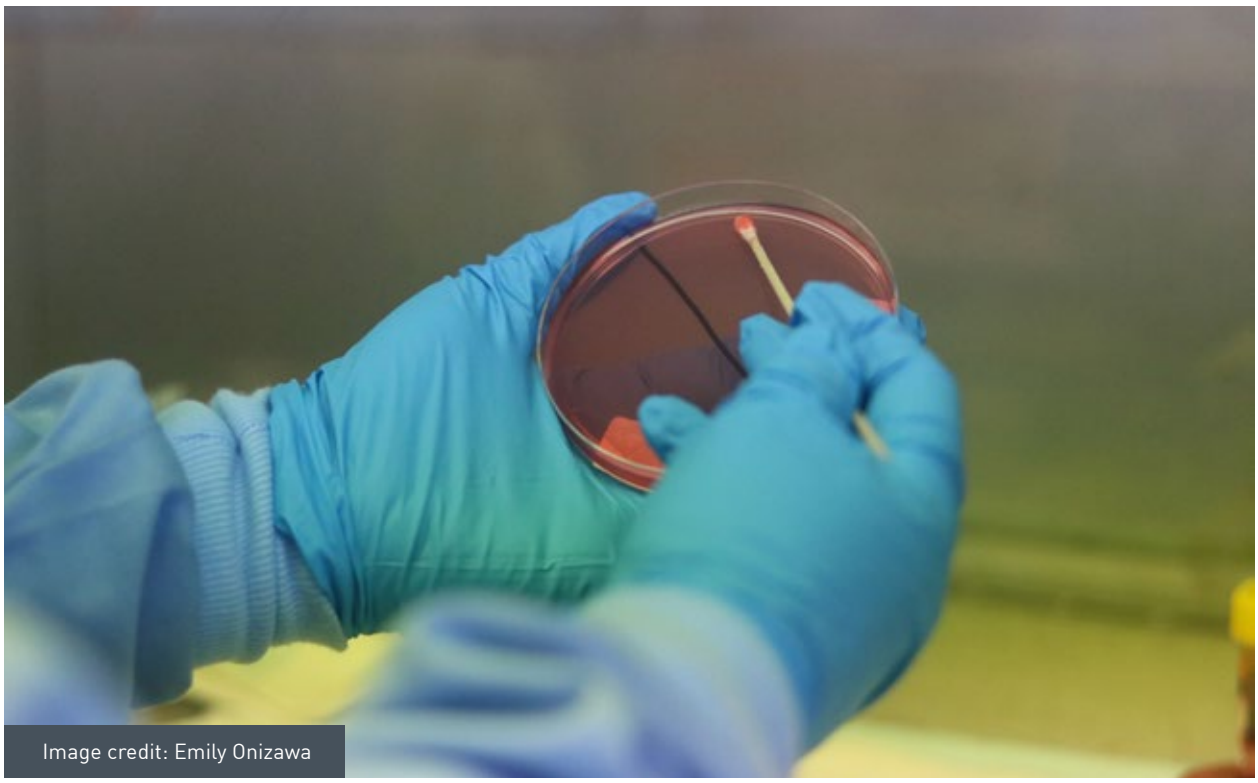

Image credit: Emily Onizawa

- detection of fluke metacercariae on pasture by quantitative PCR for the first time
- development of an immunological assay such as salivary IgA tests to identify disease-resistant and susceptible sheep.

These diagnostic tests detect virulent pathogens and parasites in the environment as well as resistant and resilient hosts. Methods are also being developed to remotely assess feeding behaviour of cattle and how this changes when animals are infected.

Research on improving methods of pathogen and parasite control includes integrated approaches such as selective breeding and the use of genetically resistant stock, as well as developing vaccines against rotavirus infections of pigeons and liver fluke infections of cattle.

CLiP research strengths include:

- animal and veterinary biosciences
- managing gastrointestinal nematode infections in ruminants
- new approaches to vaccination and assessing novel adjuvants
- genomics and genetics of parasitic worms
- biosecurity surveillance
- field-based diagnostics
- molecular parasitology and virology
- integrated parasite management.

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8.8.5 Murdoch University

The School of Veterinary Medicine at Murdoch University conducts One Health research into emerging, recurrent and zoonotic diseases, vector-borne diseases and anti-parasitic drugs. Additionally, a $3.2 million high-throughput laboratory for research into AMR came online in 2018. International studies are conducted on the epidemiology and economics of FMD, control of rabies, the burdens of brucellosis and toxoplasmosis in small ruminants, and transmission dynamics and control of AI and swine influenza.

The School oversees a clinical research laboratory dedicated to performing studies into animal and human health. Research topics include mechanisms, diagnosis and treatment of shock, coagulation disorders, sepsis and acute kidney injury in canine experimental and clinical models,

and cardiopulmonary diseases of horses. Through collaboration with the Royal Perth Hospital, there is extensive and ongoing research into biomechanics of orthopaedic disease and surgical repair, as well as studies of gait analysis working with sports medicine researchers. These themes generate outputs relevant to both animal and human health.

Within the theme of animal production, health and welfare, the School maintains research programs on animal behaviour, pain management, development of animal welfare assessment tools, nutrition for production, export animal management, improved pathogen detection and vaccine development. Food safety and public health research includes management of zoonotic diseases, livestock and watershed management, and studies into microbial contamination of meat products. Production animal systems research includes reproductive and maternal efficiency, metabolic diseases and sustainable sheep parasite management. Meat, milk and fibre studies include nutrition and disease interactions, and meat quality.

Biology and behavioural ecology of native, feral and invasive animals, health and diseases of wildlife, and population management research ranges from projects as diverse as reptilian virology, infectious diseases of microbats and gastrointestinal parasites of orangutans to the effects of habitat destruction on native cockatoos and the population genetics of under-studied microbat species.

The School also conducts research into fish and marine wildlife health, responses of aquatic organisms to habitat and climate change, sustainability of fisheries, identification and responses to biosecurity threats, interdisciplinary marine systems research, responses to climate change, management of marine and coastal ecosystems and sustainable marine tourism.

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Annual Research Report, Murdoch University School of Veterinary Science: www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-research

8.8.6 University of Adelaide

The School of Animal and Veterinary Sciences at the University of Adelaide undertakes a wide range of research activities in animal production and health, in addition to its work in the allied One Health arena. The School provides an outstanding environment for research, with high-quality laboratory and animal housing infrastructure. The goal is to produce industry-relevant outcomes that also address state government priorities relating to the livestock industries.

The School has a broad range of research under way on animal welfare, behaviour, production and health, and animal–human interactions across domestic, livestock and wildlife species.

The Australian Centre for Antimicrobial Resistance Ecology (ACARE) bolsters research in the newly emerging area of AMR in animals. Through industry collaboration, ACARE scientists are developing new antimicrobial therapies particularly targeted at complex infections arising at wound sites.

The Davies Research Centre at the University of Adelaide encourages a multi-disciplinary research approach that strives for sustainability of the red meat industry by optimising animal welfare, efficiency and product quality among ruminants. Projects focusing on animal health include:

- development of a point-of-care test for early parasite detection and disease diagnosis
- leading a value chain strategy to reduce endemic diseases through vaccine development and improved management
- understanding the molecular genetics of resistance and susceptibility to disease.

In 2018, the School's research remit was delivered through five departments:

- Animal and Veterinary Bioscience
- Pathobiology, Infectious Diseases and Public Health
- Livestock Production and Health
- Companion Animal Health
- Equine Health and Performance.

The research profile of the School was recognised during the 2015 ERA evaluation insofar as the

School received a ranking of 5 (well above world standard) in the field of veterinary science.

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8.8.7 University of Melbourne

The Faculty of Veterinary and Agricultural Sciences at the University of Melbourne has research strengths in the diagnosis, prevention and control of infectious disease; morphology and cell biology; animal biotechnology; animal production systems and reproduction; and clinical studies. The Animal Welfare Science Centre, jointly based at the University of Melbourne, is in partnership with the OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis. The faculty has particular interests in:

- AMR stewardship
- new vaccines and approaches to control and diagnostic methods for infectious diseases
- genomics and genetics of viruses, prokaryotes, protists and parasitic worms
- the roles of the extracellular matrix in bone and joint pathology, and the role of protease-activated receptors in musculoskeletal development and inflammatory disease
- risk factors for, and mitigation against, catastrophic bone injury in horses
- understanding and manipulation of the plant, animal and soil microbiome
- new approaches to vaccination and assessing novel adjuvants
- animal models of human disease, including asthma and gastrointestinal disorders
- dietary and other means to mitigate against heat stress in farm animals
- manipulation of the site of digestion of starch and protein to reduce disease risk and improve productivity in ruminants
- improving farm profitability and reducing production risk
- assessment and improvement of production animal behaviour and welfare
- epidemiology of mastitis in sheep and cattle
- pharmacology of vasoactive agents and the pathophysiology of laminitis
- wildlife disease surveillance
- the role of livestock industries in improving health and resilience in developing economies.

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8.8.8 University of New England

UNE is located in a region with strong sheep and beef grazing and feedlot production systems as well as poultry and horses. The Animal Science discipline at UNE is strong, with a long history of animal-health-related research and teaching, primarily within a systems perspective. The university has a current ERA ranking of 5 (well above world standard) in the agricultural and veterinary sciences. The Animal Science discipline is located within the School of Environmental and Rural Science, and has approximately 50 staff, with major research strengths in the areas of livestock genetics, ruminant and monogastric nutrition, ruminant carbon emission abatement, international livestock development, animal product science and animal health and welfare. The group has nearby access to an extensive range of excellent facilities for intensive and grazing animal research. Interaction with industry and agencies such as the nearby CSIRO F.D. McMaster Laboratory is a hallmark, and the group has hosted multiple CRCs in the beef, sheep and poultry industries.

Animal health and welfare are recognised as key components of integrated animal production systems, and are also seen as issues that constrain production and limit efficiency and sustainability of livestock production. UNE has increased investment in this area with the recent appointment of several post-doctoral fellows and new staff. Key current areas of research include:

- disease modelling (epidemiology, economics, decision support)
- genetics of disease resistance and interactions with environment
- economics of disease and disease control
- managing gastrointestinal nematode infections in ruminants
- managing gastrointestinal disease in intensive and free-range poultry

- managing viral disease in poultry
- animal behaviour and welfare in a range of livestock production systems.

UNE's strong multi-disciplinary research approach, especially in its use of intensive measurement and data in experimentation and management of agricultural systems, provides better understanding and decision support for improving productivity, animal health and environmental outcomes.

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8.8.9 University of Queensland

Staff at the University of Queensland (UQ) conduct research into the health and welfare of livestock, companion animal and wildlife species. The research is produced from UQ's School of Veterinary Science, School of Agriculture and Food Sciences and the Queensland Alliance for Agriculture and Food Innovation, and involves both the Gatton and St Lucia campuses.

Research accomplishments in 2018 cover diverse topics spanning a range of animal species and disciplines. Notable achievements include the first Australian study to report on risk factors associated with seropositivity to *Mycoplasma bovis* in feedlot cattle. Several studies reported on measurable sperm attributes and their influence on *Bos indicus* cattle reproduction. UQ researchers also published work on the effects of simulated ship motion and ammonia concentration on sheep behaviour and physiology.

In equine research, achievements include research into improved anaesthesia methods, insulin dysregulation, serum bone biomarkers in mares and foals, and mechanisms of laminitis pathogenesis. In other companion animals, UQ researchers reported on the evolution of canine parvovirus subtypes in Australia. In addition, molecular epidemiological studies are being conducted on the spread of ectoparasites between pets and wildlife. UQ researchers also reported on minimally invasive procedures in dogs, and on molecular markers in canine prostatic and brain cancers.

In the wildlife field, notable achievements include the first production of stem cells from a marsupial (Tasmanian devil) and a monotreme (platypus). These stem cells provide a valuable biological resource and offer insights into pluripotency throughout evolution. UQ staff research also revealed the molecular epidemiology and pathology of spirorchiid parasite infection in sea turtles, aspects of the reproductive biology of wombats and koalas, and the behavioural responses of migrating humpback whales to seismic airgun noise.

In animal welfare research, achievements include chicken and cattle studies that will potentially lead to improved measures for assessing welfare, and studies on the influences and interventions that can produce improved outcomes for cats and dogs entering shelters. Achievements internationally in this field include identification of the main impediments to improvements in animal welfare in China, and publications on welfare impacts in Indian cow shelters.

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8.8.10 University of the Sunshine Coast

The University of the Sunshine Coast (USC) is a regional university with strong ties to animal and wildlife research and conservation. With campuses distributed from the Fraser Coast to Moreton Bay, USC is ranked one of the top 150 young universities in the world by the *Times higher education* Young University Rankings, and has a current ERA ranking of 5 (well above world standard) in zoology and 4 (above world standard) in agricultural and veterinary sciences.

USC brings together researchers with a passion to understand what determines the health of animals, what forces shaped their evolution, how their actions and behaviours create key functions in ecosystems, and how best to conserve animal diversity and habitats.

USC has established strength in wildlife research programs, including research focused on koalas and kangaroos. Marine and coastal ecology is an emerging strength, with world-leading researchers in deep-sea biology, marine climate change ecology and the environmental impacts of human

activities on coastal ecosystems. Using One Health approaches, USC research also includes projects on health and welfare of livestock, zoonoses and wildlife species.

A highlight of 2018 was when USC researchers were major partners in the sequencing and analysis of the koala genome, which was released in *Nature genetics*.

Areas of study include expertise in:

- livestock and wildlife chlamydial infection and transmission
- zoonoses and One Health
- infectious diseases and vaccine development in koalas
- relationships between form, function and ecology among living and extinct animals
- deep-sea ecology
- marine conservation and habitat restoration
- impacts of global change on marine ecosystems
- evolutionary processes in nature using genetic and behavioural data
- diversity of the world's animal clades.

USC maintains a network of industry, national and international collaborators.

Contact: Professor Peter Timms
Email: ptimms@usc.edu.au
Website: www.usc.edu.au/research-and-innovation/animal-and-marine-ecology

8.8.11 University of Sydney

The University of Sydney School of Veterinary Science fosters interdisciplinary work in a broad variety of disciplines with over 30 sub-themes. The School's partners include rural development corporations, industry organisations and national and international government agriculture departments. These partnerships aim to advance the reproduction, nutrition, genetics and health of Australia's livestock and enhance Australia's competitive trading status. Following are highlights from the production animal and One Health research themes (more information on the School's companion animal and wildlife health and conservation research can be found on the University of Sydney School of Veterinary Science website).

Production animal – production outcomes, health and welfare

In 2018, the School of Veterinary Science:

- improved understanding of the mechanisms of disease, and generated diagnostic reagents, markers, management and control solutions, to sustain the national competitive capacity, welfare, biosecurity and food safety in food-producing animals across the red and white meat industries and aquaculture
- developed quality-assured diagnostic testing for Johne's disease and advanced our understanding of its epidemiological control
- further advanced the prevention of ovine footrot by developing and validating diagnostic tests and control programs and commercialising patented recombinant customised vaccines
- improved detection and management of disease caused by fish and oyster viruses, leading to the development of a National Association of Testing Authorities-accredited laboratory to monitor and investigate local and transboundary diseases
- continued mitigation of international animal diseases and securing of Australian borders against endemic and emerging transboundary diseases including ASF, AI and rabies
- further developed cryopreservation methods in assisted reproductive technologies and fertility measures across a broad range of current (pig, sheep, horse) and potential (rabbit, camel) production or performance species
- developed real-time, sensor-based monitoring of animals and data management for on-farm application to improve welfare standards in International and Australian livestock by assessing and ameliorating pain, monitoring behaviour and production parameters around feeding changes, and improving welfare during routine husbandry procedures
- determined common causes of beef cattle mortality in northern Australia
- characterised the epidemiology, diagnosis, disease impact and/or control measures of *Therileria* spp. in cattle, liver fluke in sheep and *Lawsonia intracellularis* in pigs
- worked directly with dairy farmers locally and nationally (Dairy Australia Limited) to determine the major production barrier implications of

mycoplasma mastitis in dairy cattle, and to develop biosecurity procedures to control and prevent infection in Australian dairy production systems

- incorporated recommendations for on-farm biosecurity to control transboundary diseases, and in particular AI risk, into poultry industry biosecurity guidelines nationally
- documented the extent of pig movements and associated risks for classical swine fever spread, leading to collaboration with the governments of Indonesia and Timor-Leste on classical swine fever research and control
- advanced understanding of the impact of poultry nutrition, welfare, housing and infectious diseases on the growth, health and welfare of poultry.

One Health

In 2018, the School of Veterinary Science:

- investigated knowledge, attitudes and practices of veterinary personnel and animal breeders to Q fever and its vaccine
- engaged with commercial producers of current and future antimicrobial agents, veterinary professional organisations, other prescribing professions (doctors, dentists) and government departments to determine the extent of AMR in clinical infections in production and companion animals (including horses); explored barriers and enablers to sensible antimicrobial prescribing; and provided strategies for clinical management in horses and small companion animals
- investigated epidemiology, diagnosis and treatment of potentially communicable infectious agents such as the parasites *Giardia* and *Cryptosporidium*, newly discovered or previously known fungal species causing sporotrichosis and aspergillosis, and viruses such as AI and rabies, within a One Health framework
- connected human and animal health and welfare in Aboriginal communities in remote areas of New South Wales, the Northern Territory and Queensland, exploring topics of modelling for rabies incursion, sharing of multi-drug-resistant pathogens and the cultural importance of dogs in Aboriginal communities.

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Image credit: Animal Health Australia

Image credit: Animal Health Australia

9

TRADE

This chapter summarises import and export-related activities of the Department of Agriculture and Water Resources.

The export of live animals, reproductive material and animal products from Australia must meet the health requirements of importing countries. The Department of Agriculture and Water Resources administers export of a range of prescribed goods under the *Export Control Act 1982* (Cwlth). Similarly, entry of animals and animal products into Australia is administered by the Department of Agriculture and Water Resources under the *Biosecurity Act 2015* (Cwlth), to protect the ongoing health and viability of Australia's livestock, wildlife, agriculture and other enterprises.

Agreements between trading partners encourage trade while recognising that countries need to protect themselves from the risk of spread of pests and diseases. In 2018, Australia negotiated animal health requirements for the export of live animals to 36 countries. Through its expanded overseas network of agriculture counsellors and locally engaged staff, the Department of Agriculture and Water Resources also pursued international market access in important and emerging markets. Free trade agreements with key trading partners, including China, will reduce tariffs over time and increase certainty of access to markets for Australian exporters. A new multilateral agreement, the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (TPP-11), entered into force (came into effect) on 30 December 2018 for the six countries, including Australia, that have finalised their ratification process.

9.1 Trade-related areas of the Department of Agriculture and Water Resources

Several areas in the Department of Agriculture and Water Resources are responsible for import and export-related activities.

Trade in animals and animal products is facilitated by the following:

- Office of the Chief Veterinary Officer (CVO)
- Biosecurity Animal Division
- Biosecurity Plant Division
- Exports Division
- Live Animal Exports Division
- Trade and Market Access Division
- Biosecurity Policy and Implementation Division
- Compliance Division
- Biosecurity Operations Veterinary and Export Meat Services Group (VEMS)
- Department of Agriculture and Water Resources' overseas agricultural counsellor network.

The Australian CVO provides oversight of Australia's animal health status and policy.

The Biosecurity Animal, Biosecurity Plant, Exports, and Live Animal Exports divisions support technical market access for agricultural products including food, animal and plant by-products, live animals and plants, and reproductive material.

The Trade and Market Access Division (TMAD) is responsible for improving international market access for Australian portfolio industries through bilateral, plurilateral, regional and multilateral engagement. TMAD works collaboratively with industry and government to develop new export regulation and better coordinate market access activities.

The Biosecurity Animal, Biosecurity Plant, Compliance, and Biosecurity Policy and Implementation divisions ensure that imports into Australia pose minimal risk, from the perspective of animal and plant health and food safety.

9.2 International standards

Australia has been a member of the World Trade Organization (WTO) since 1995 and is a signatory to the Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement). The SPS Agreement encourages WTO members to harmonise all sanitary and phytosanitary (SPS) measures while recognising the necessity for members to protect themselves from the risk of spread of pests and diseases.

The following organisations produce guidelines, international standards and recommendations on which WTO members are encouraged to base their SPS measures:

- International Plant Protection Convention
- World Organisation for Animal Health (OIE)
- Codex Alimentarius Commission.

Australia works to ensure that international standards are based on current scientific principles and that SPS measures are not used to unnecessarily restrict trade.

9.3 Free trade agreements

Free trade agreements (FTAs) provide a range of benefits to Australian agriculture, including new market opportunities, increased price competitiveness and a more level playing field with competitors that already have FTAs. FTAs promote stronger trade and commercial ties between participating countries, and open up opportunities for Australian exporters and investors to expand their businesses into key markets. They are particularly beneficial when they aim to remove barriers in highly protected markets or gain a foothold in potential or expanding markets.

The Australian Government supports the negotiation of comprehensive FTAs that are consistent with the WTO rules and guidelines, and which complement and reinforce the multilateral trading system.

The Department of Agriculture and Water Resources works with the Department of Foreign Affairs and Trade to secure FTAs that have commercially meaningful outcomes for Australia's primary producers. Along with continued improvements in trading rules under existing FTAs, such as the China–Australia Free Trade Agreement (ChAFTA), in 2018 the Australian Government signed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (TPP-11), which came into force on 30 December 2018. The government has also recently concluded the Australia-Hong Kong FTA which will provide ongoing certainty for zero tariff access to the Hong Kong market.

9.3.1 Trans-Pacific Partnership

TPP-11 is a multilateral FTA between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. It entered into force on 30 December 2018 for the six countries, including Australia, that have finalised their ratification processes.

Australian agricultural products exported to TPP countries were worth about $12.6 billion in 2017–18, representing 23.6% of Australia's total exports of these products. Australia has secured numerous positive outcomes for agricultural products, including (but not limited to):

- a reduction of Japan's beef tariffs to 9% within 15 years from when the TPP-11 agreement entered into force; Australian fresh, chilled and frozen beef exports to Japan were valued at $2.1 billion in 2017–18
- the elimination of all remaining tariffs on Australian raw wool exports to TPP-11 countries from entry into force; wool exports to TPP-11 countries were valued at around $51.4 million in 2017–18
- significant market access improvements and new quotas for Australian dairy products in Japan, Canada and Mexico; around 32% of Australia's dairy products, valued at $1.1 billion, were exported to TPP-11 countries in 2017–18.

The ratification of TPP-11 has enabled Australia to continue to stand for open trade and investment and defend the rules-based approach in the region. The Australian Government welcomes interest from economies that also share this vision and are considering joining the TPP-11.

9.3.2 Indonesia–Australia Comprehensive Economic Partnership Agreement

On 31 August 2018, Australia and Indonesia announced the substantive conclusion of negotiations on the Indonesia–Australia Comprehensive Economic Partnership Agreement (IA-CEPA).

Building on the benefits of the Association of Southeast Asian Nations–Australia–New Zealand Free Trade Agreement, IA-CEPA will provide certainty of access to Indonesian markets for Australian exporters.

IA-CEPA will deepen the economic cooperation with one of Australia's most important agricultural trade partners, with two-way agriculture, fisheries and forestry trade worth $3.6 billion in 2017–18.

Over 99% of Australian goods exported to Indonesia, including beef, sheepmeat and dairy, will enter duty free or under significantly improved and preferential arrangements.

IA-CEPA will also provide improved access into Australia's largest live cattle market, with duty-free access for 575 000 head of live male cattle per year, growing at 4% per year to 700 000 head.

The Australian Government is now working with Indonesia to sign the agreement, which will then allow both sides to follow their respective domestic treaty-making processes to bring IA-CEPA into force.

9.3.3 China–Australia Free Trade Agreement

China is Australia's top market for agricultural, food and fisheries commodities, worth $13.6 billion in 2017–18. ChAFTA came into force on 20 December 2015. ChAFTA has provided Australian exporters with significant tariff advantages over major competitors.

The agreement eliminates tariffs on a range of key agricultural and fisheries products, mostly within four to eight years. Tariffs of up to 25% on beef, sheepmeat, hides and skins, and tariffs on dairy products will be eliminated within four to 11 years after entry into force (by 2019 to 2024), and tariffs on seafood will be eliminated by 2019.

Australia received an exclusive duty-free country-specific quota of 30 000 tonnes of clean wool (approximately 43 000 tonnes of greasy wool) from 1 January 2016. This volume will grow by 5% each year to 44 324 tonnes clean (approximately 63 500 tonnes greasy) by 2024, all at duty-free rates.

Since ChAFTA entered into force, there have been four tariff cuts, which are supporting strong export growth. A fifth cut commences on 1 January 2019.

9.4 Overseas agricultural counsellor network

Through its overseas network of agriculture counsellors and locally engaged staff, the Department of Agriculture and Water Resources pursues international market access in important and emerging markets. The Department of Agriculture and Water Resources' overseas officers are key contact points between the department and Australia's major agricultural trading partners and international organisations.

Overseas officers work to remove distortions to international trade; progress and resolve market access issues for industry; facilitate targeted technical assistance and agricultural cooperation in support of portfolio interests; and influence the development of international standards for agricultural products and industries.

In May 2018, the Australian Government announced an expansion to the Department of Agriculture and Water Resources' overseas network with six new agriculture counsellors and the continuation of five counsellors originally funded through the 2016 **Agricultural Competitiveness White Paper**. This takes the total agricultural diplomatic network to 22 counsellors located across Asia, Europe, the Middle East and North and South America.

The expanded counsellor network enhances the Department of Agriculture and Water Resources' capacity to advance agricultural trade and market access priorities. The network supports the commercial priorities of agricultural export industries and works to establish a framework for future market access for Australia's agricultural products, both in-market and in other markets where Australia competes.

9.5 Exports

Australia has a strong reputation as a reliable source of high-quality agricultural exports. The Department of Agriculture and Water Resources is responsible for regulatory oversight of the export of certain 'prescribed' products that are listed in the *Export Control Act 1982* (Cwlth). These prescribed goods include milk and milk products, eggs and egg products, fish and fish products, fresh fruit and vegetables, grains and seeds, hay and straw, live animals, meat and meat products, organic produce, plants and plant products, frozen raw meat (used for animal food), raw animal materials (used for pharmaceuticals) and animal by-products (such as skins and hides).

9.5.1 Managing Australian exports

Export certification for edible animal products and animal by-products

The Department of Agriculture and Water Resources regulates the export of edible animal products and animal by-products by:

- registering businesses involved in the production and export of edible animal and plant products

Image credit: Animal Health Australia

- licensing meat exporters
- requiring all export-registered establishments (including seafood vessels) involved in preparation, handling and storage of dairy, egg, fish and meat products destined for human consumption to have an 'approved arrangement'
- auditing and verification of the performance of establishments against their Approved Arrangements
- issuing export certification only to products that have met the relevant Australian production standards and importing country requirements.

Approved arrangements are documented procedures and processes specific to each export establishment that enable them to demonstrate their ability to meet the relevant Australian production standards for all commodities they export. The approved arrangement ensures the safety of the product by basing processes and procedures on hazard analysis and critical control point (HACCP) principles, and must also document how the establishment will meet relevant importing country requirements.

Australia's food and animal by-product export establishments may be subject to audit by trading partners. Several audits are hosted each year.

Export certification and inspection services for live animals and reproductive material

The Department of Agriculture and Water Resources regulates and issues export certification and documentation for a wide range of live animals (including livestock, companion animals and zoo animals) and reproductive material exported from Australia.

Live animals

The Tracking Animal Certification for Export (TRACE) system manages the application and approval processes for consignments of all live animals exported from Australia.

The Department of Agriculture and Water Resources regulates the export of live animal exports by the following assessment, inspection and certification procedures:

- issuance of livestock export licences and regular auditing of livestock export licence holders
- registration approval and regular auditing of premises used for the pre-export assembly, preparation and isolation of livestock intended for export
- accreditation of veterinarians for the preparation and inspection of livestock for export

- inspection of livestock by veterinarians from the Department of Agriculture and Water Resources to confirm fitness for travel, in accordance with the *Australian standards for the export of livestock*, and the importing country's animal health requirements
- verification that exporters have complied with Australian legislation and importing country animal health requirements in the preparation of the animals
- issuance of animal health certification and export permits to accompany live animal consignments
- monitoring and reporting on activities in approved export programs for the purpose of ensuring the health and welfare of livestock during export voyages leaving Australia by sea.

Reproductive material

The Department of Agriculture and Water Resources regulates the export of reproductive material by the following assessment, inspection and certification procedures:

- All reproductive material for export must be prepared in accordance with the OIE *Terrestrial animal health code*.
- All establishments that collect genetic material for export are regularly audited by official veterinarians to confirm compliance.
- Embryo collection teams must be supervised by an officially approved veterinarian. Approval is issued to practitioners who demonstrate technical competence and understand the requirements of OIE standards.
- Official health certification is issued confirming that exported material complies with the importing country requirements. This includes certifying that exported material complies with additional requirements by importing countries above the OIE minimum standard where justified, according to OIE standards.

9.5.2 Negotiating market access for animal commodities

The Department of Agriculture and Water Resources negotiates with trading partners to maintain and improve market access, and to open new markets for edible animal products and animal by-products. This includes responding to challenges associated with trade disruptions such as changes to food safety and animal health requirements, and animal or public health status. In addition to bilateral negotiations with trading partners, the Department of Agriculture and Water Resources participates in multilateral international forums, such as Codex, to promote science-based international standards that support Australia's agricultural exports.

The Department of Agriculture and Water Resources hosts visits by competent authorities of trading partners, who regularly audit Australia's export systems. These delegations assess Australia's animal health and food safety systems in order to maintain or expand export access for a wide range of Australian commodities. Successful audits and inspections hosted by Australia in 2018 include system and commodity audits conducted by delegations from Egypt, Indonesia and the United States.

9.5.3 Negotiating market access for live animals and reproductive material

The Department of Agriculture and Water Resources has negotiated animal health requirements for the export of live animals (such as livestock, horses and bees) and their genetic material (such as bovine semen and embryos, and day-old chicks and hatching eggs) to 36 countries.

This included improving and maintaining existing market access, and gaining new market access, by responding to changes in animal health status and negotiating health certificates with trading partners to facilitate the export of live animals and their genetic material.

New market access achieved through negotiations with trading partners includes bee semen to Italy, queen bees to the Philippines, breeder sheep and goats to Russia and Indonesia, and camelids to Canada.

The Department of Agriculture and Water Resources also hosts trading-partner delegations to audit Australia's export and processing facilities, such as ruminant germplasm-collection centres.

9.5.4 Residue monitoring

Australian animal and plant industries participate in residue-monitoring programs that assess whether existing controls on the use of pesticides and veterinary medicines are appropriate, and determine the levels of these chemicals and environmental contaminants in exported and domestically consumed commodities.

The programs are risk-based and are designed to identify and monitor chemical inputs into Australian agricultural production systems. Results from monitoring programs are assessed against relevant Australian and importing country standards. When non-compliance is found, a traceback investigation is undertaken by the relevant state or territory authority to identify and resolve the source of the non-compliance. Regulatory action may then be taken. The results of monitoring programs provide confidence for Australian consumers and overseas markets that Australian agricultural products meet domestic and international requirements. Peak industry councils are consulted to ensure monitoring programs address trading-partner requirements as well as Australian standards.

The National Residue Survey (NRS), within the Department of Agriculture and Water Resources, undertakes residue-monitoring programs for the cattle, sheep, goat and pig industries, and for buffalo, camels, deer, donkeys, game deer, horses, kangaroos, poultry, ratites (ostriches and emus), wild boar, honey, eggs and aquaculture and wild-caught seafood. Results of NRS monitoring programs are available on the Department of Agriculture and Water Resources website.[139] In 2018, a total of 9729 samples were collected from animal food products and analysed for a range of pesticides, veterinary drug residues and environmental contaminants. The results showed a high degree of compliance with Australian standards and help to demonstrate compliance with international market requirements.

The National Association of Testing Authorities accredits laboratories involved in residue monitoring. For programs managed by the NRS, laboratories undergo proficiency testing before being contracted and throughout the contractual period.

The Australian Milk Residue Analysis survey provides a national, independent monitoring program for residues of agricultural and veterinary chemicals, and environmental contaminants in cow's milk. Dairy Food Safety Victoria coordinates the survey on behalf of the Australian dairy industry. The survey plays an important role in the Australian dairy industry by gathering and compiling information on the chemical residue status of Australian milk. In doing so, it assesses the effectiveness of the control measures in place for the use of chemicals in the dairy industry to ensure food safety outcomes.

9.5.5 Agricultural export regulation review

As a part of a wider initiative to strengthen agricultural exports and market access, the Department of Agriculture and Water Resources is improving the current agricultural export legislative framework. In 2015, a review of existing legislation found there was scope to make improvements to enable Australia to better support exporters, farmers and other primary producers in a changing trade environment.

Improvements to the export legislative framework will make it easier to understand, administer and use, and to safeguard Australia's reputation as a reliable, high-quality source of exports. Changes will mean farmers and exporters are supported by contemporary, responsive and efficient legislation.

The new framework will maintain existing regulatory oversight and achieve current regulatory outcomes, while removing duplication and making export provisions consistent across commodities, where possible. There will be no change to Australia's commitment to meet the requirements of importing countries.

Public consultation was undertaken on an exposure draft of the *Export Control Bill 2017* (Cwlth) during 2017. The Bill was introduced into the Australian Parliament in December 2017 and is currently before the Senate. The Export Control Rules, which are legislative instruments that will support the Bill, are currently being drafted. Consultation on the draft rules for meat products began in November 2018. Consultation on other commodities will be undertaken as draft rules

139 www.agriculture.gov.au/ag-farm-food/food/nrs/nrs-results-publications

are developed. The 60-day consultation on the complete set of rules is anticipated to occur in late 2019.

The improved legislative framework for Australian agricultural exports is anticipated to commence in 2020.

9.6 Imports

Importation of animals and animal products into Australia is regulated by the Department of Agriculture and Water Resources under the *Biosecurity Act 2015* (Cwlth) and its subordinate legislation, and by the Australian Government Department of the Environment and Energy under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and its subordinate legislation.

As part of the strengthening biosecurity surveillance and analysis component of the **Agricultural Competitiveness White Paper**,[140] the Department of Agriculture and Water Resources began an operational review of all animal and biological import conditions on the Biosecurity Import Conditions (BICON) database in mid-2016, which will continue through to mid-2019. The import conditions review will ensure that import conditions effectively manage biosecurity risk while being a minimum burden to all those involved.[141]

9.6.1 Post-entry quarantine facility

Phase 1 construction of the Mickleham post-entry quarantine facility included capacity for post-entry quarantine for imported cats, dogs, plants, horses and bees. Phase 2 construction was finalised at the end of 2017, with delivery of a purpose-built facility for camelid and ruminant imports, additional capacity for cats and dogs and the completion of the high-containment avian compound.

Throughout 2018, the avian compound has undergone testing to ensure it is ready to accept imported stock, including live pigeons and fertile poultry eggs. On the commencement of avian operations at Mickleham, currently scheduled to take place in 2019, the current avian facilities in Spotswood, Victoria and Torrens Island, South Australia will be decommissioned.

The state-of-the-art single site enables greater efficiencies in operations and consolidation of staff expertise, and will better meet Australia's post-entry quarantine needs into the future.

9.6.2 Biosecurity import risk analyses

The Department of Agriculture and Water Resources undertakes a range of risk analyses in response to market access requests from other countries, or proposals from Australian importers to import new animals, plants and/or other goods into Australia.

These analyses may be regulated under the *Biosecurity Act 2015* (Cwlth), or may be undertaken as a risk review by the Department of Agriculture and Water Resources.

Biosecurity Import Risk Analyses (BIRAs) are legislated in the *Biosecurity Act 2015* (Cwlth) and subordinate legislation. BIRAs are undertaken by the Department of Agriculture and Water Resources to assess the level of biosecurity risk that may be associated with the importation of a good, and identify appropriate ways to manage these risks to achieve the appropriate level of protection (ALOP) for Australia. Australia's ALOP is expressed as providing a high level of SPS protection aimed at reducing risk to a very low level, but not to zero.

The term 'biosecurity risk' refers to the likelihood of a disease or pest entering, establishing or spreading in Australian territory, and the potential for the disease or pest to cause harm to human, animal or plant health, the environment, or economic or community activities.

BIRAs are consistent with Australian Government policy, the obligations of the WTO SPS Agreement, and the standards developed by the OIE and the International Plant Protection Convention (see Section 9.2).

The *Biosecurity import risk analysis guidelines 2016* provide further information on how the risk-analysis

140 www.agriculture.gov.au/biosecurity/agwhitepaper-bio-surveillance-analysis#growing-scientific-capability

141 www.agriculture.gov.au/import/online-services/bicon/review-import-conditions

process is conducted and are available on the Department of Agriculture and Water Resources website.[142]

9.6.3 Biosecurity risk reviews and competent authority evaluations

As part of strengthening the biosecurity surveillance and analysis component of the **Agricultural Competitiveness White Paper**,[143] the Department of Agriculture and Water Resources has been able to increase resources and streamline the risk-analysis process. This has facilitated the progression or commencement of a number of long-standing policy reviews.

The Department of Agriculture and Water Resources made progress on the following reviews for animal biosecurity in 2018:

- The import risk review for psittacine birds (household pet and aviary) which commenced in May 2016 continued throughout 2018. The scope of the review was updated in October 2018 to consider commercial imports in addition to non-commercial and zoo birds. A draft report is anticipated for comment in early 2019.
- A risk review of prawns and prawn products from all countries[144] commenced in May 2017. In March 2018, submissions were invited on specific issues with Australia's current prawn import policy. Submissions closed in July 2018 and are being considered in developing the draft report.
- In May 2018, stakeholders were consulted on new import conditions for breaded, battered and crumbed prawns for human consumption pending the completion of the prawn and prawn products review. New import conditions were implemented at the end of September 2018.
- The review of biosecurity risks associated with importing cooked duck meat from Thailand, which commenced in June 2017, continued throughout 2018. A draft report is anticipated for comment in early 2019.
- Comments were invited from stakeholders in June 2017 on high-pressure processing as an equivalent risk-management measure for the importation of chicken meat. Comments received have been assessed and the Department of Agriculture and Water Resources is consulting with members of the Scientific Advisory Group in their capacity as independent experts. The findings and recommendations of the Department of Agriculture and Water Resources are expected to be released for further stakeholder comment following review of the draft document by members of the Scientific Advisory Group.
- In October 2018, comments were invited on proposed changes to import conditions for salmonid products exported from approved countries. Comments closed in December 2018 and are being considered before any changes to existing policy occur.

For some commodities, the Department of Agriculture and Water Resources evaluates the animal disease status of trading partners and potential trading partners, and the competency of their veterinary and aquatic animal health authorities. The evaluations are typically comprehensive desk assessments, and may be followed by on-site (in-country) verification visits. To gain access to Australian markets, the competent authorities of trading partners must demonstrate their ability to manage biosecurity risks in their country and to comply with Australia's import requirements for the commodities that they want to export to Australia.

In 2018, the competent authority assessment program of the Department of Agriculture and Water Resources included evaluations of salmon and a compartment[145] assessment for avian influenza. The Department of Agriculture and Water Resources undertook familiarisation visits to trading partner countries to increase its understanding of the pre-border controls in place to manage biosecurity risks for prawns exported to Australia. A familiarisation visit was also made to Hong Kong to strengthen relationships and to

142 www.agriculture.gov.au/biosecurity/risk-analysis/guidelines

143 www.agriculture.gov.au/biosecurity/agwhitepaper-bio-surveillance-analysis#growing-scientific-capability

144 www.agriculture.gov.au/biosecurity/risk-analysis/animal/prawns-products-human-consumption

145 A compartment, as defined by the OIE, is an animal subpopulation contained in one or more establishments under a common biosecurity management system with a distinct disease-specific animal health status, for which required surveillance, control and biosecurity measures have been applied for the purposes of international trade.

Image credit: Department of Agriculture and Water Resources

discuss Australia's suspension of horse exports from Hong Kong to Australia.

9.6.4 Imports of biological products, live animals and reproductive material

The Department of Agriculture and Water Resources regulates the import of biological goods, live animals and reproductive material into Australian territory, under the *Biosecurity Act 2015* (Cwlth).

Biological goods that may be imported include products derived from animals and microbes, such as food, human and animal therapeutics, laboratory materials, animal feed and veterinary vaccines. Such goods may not be imported into Australia unless they meet specified conditions. Guidelines to help importers determine which documentation is needed to assess the biosecurity risk of genetic recombination and re-assortment of imported veterinary vaccines were released in July 2018.[146]

Import conditions are available on the BICON database.[147] BICON houses the Australian Government's biosecurity import conditions for more than 20 000 plants, animals, minerals and biological products.

Live animals and animal products that may be imported include dogs (pet, military and assistance), cats, horses, ruminants, fertile eggs, birds, zoo animals, laboratory animals, aquatic animals, bees and reproductive material.

The Department of Agriculture and Water Resources works across the biosecurity continuum to manage biosecurity risks from imported live animals and biological goods by:

- developing import conditions to mitigate the biosecurity risks to an acceptable level
- auditing overseas facilities to verify the integrity of:
    - manufacturers' systems for sourcing raw materials, processing, preventing contamination and tracing products, or
    - arrangements for preparing and quarantining live animals prior to export
- assessing information provided with import applications to decide whether the biosecurity risk can be reduced to an acceptable level through:
    - manufacturing processes, or
    - testing and treatment regimens, or

146 www.agriculture.gov.au/biosecurity/risk-analysis/animal/assess-genetic-recombination-imported-vet-vaccines

147 www.bicon.agriculture.gov.au/BiconWeb4.0

    - restrictions on what the goods may be used for after import
- liaising with international competent authorities
- granting import permits, if the relevant conditions can be met.

Import permits may be suspended, revoked or amended if biosecurity risks change, for example, if there is an exotic disease outbreak in a country from which goods are sourced, processed and/or approved for export to Australia.

In 2018, the Department of Agriculture and Water Resources granted approximately 8431 import permits for biological goods and 7347 for live animals.

During 2018, the Department of Agriculture and Water Resources continued to work closely with stakeholders on biosecurity regulation and related issues, and helped importers and users of imported goods comply with Australia's biosecurity requirements.

The Department of Agriculture and Water Resources consults with stakeholders to share information and seek industry advice and opinions on the design of effective biosecurity systems and risk management. These stakeholders include national governments and international agencies, importers, industries, community interest groups, producers, processors, consumers and users of imported goods, research and development organisations, and travellers. Consultative forums include the Biological Consultative Group (BCG) and the Horse Industry Consultative Committee (HICC).

The BCG includes representatives from the pet food industry, veterinary medicine manufacturers and distributors, government bodies, universities, food importers and other peak bodies. The BCG provides the Department of Agriculture and Water Resources and industry with a forum for consultation on departmental policy and industry initiatives affecting importers of biological goods with the goal of ensuring effective biosecurity outcomes are delivered without unnecessary impediments to trade. In 2018, the group met in April and November.

The HICC includes representatives from horse shipping agents, breeding and racing authorities, the Australian Veterinary Association and other peak bodies within the equine industry. The HICC provides the Department of Agriculture and Water Resources and industry with a consultative forum that ensures the biosecurity risks associated with imported horses are managed effectively without unnecessary impediments to trade, racing and equestrian sport. In 2018, the committee met once, in May.

Image credit: iStock

10

ANIMAL WELFARE

Australia has a collaborative approach to managing animal welfare. Australia's three tiers of government work with industry, non-government animal welfare organisations and private veterinarians to oversee and improve the welfare of animals.

Legislative responsibility for animal welfare within Australia rests primarily with state and territory governments. All states and territories have legislation related to animal welfare and are responsible for ensuring animal welfare within their borders. In many jurisdictions, non-government organisations are authorised to enforce animal welfare, and local governments play a role in the welfare of companion animals. The Australian Government has responsibility for animal welfare relating to trade and international agreements. All groups work together with industry to drive continuous improvement in animal welfare.

10.1 Jurisdictional updates

10.1.1 Australian Government

In 2018, the Australian Government continued to:

- undertake verification activities to ensure that Australian export abattoirs meet applicable animal welfare standards and report identified non-compliance to state and territory governments
- issue export certification for live animals (including commercial livestock species, companion and assistance animals, greyhounds and horses) to meet importing country requirements; this includes ensuring that an animal is fit to travel
- participate in international animal welfare matters by engaging at the global, regional and country levels
- work with state and territory governments to support the development and maintenance of nationally consistent animal welfare arrangements, such as *Australian animal welfare standards and guidelines* (Section 10.3)
- provide matching funding for eligible research and development funding by livestock research and development corporations, including funding for animal welfare research completed as part of the National Primary Industries Animal Welfare Research, Development and Extension (RD&E) Strategy (see Section 8.2)
- maintain awareness of consumer trends and global developments to prepare for and respond to animal welfare concerns that may affect agriculture and international trade.

The Australian Government administers a regulatory framework to ensure that animals in the live export trade are handled and slaughtered in accordance with animal welfare standards set by the World Organisation for Animal Health (OIE) and *Australian Standards for the Export of Livestock* (*ASEL*). The government is in the final stages of a review of ASEL to ensure that standards for livestock exported by sea are fit for purpose and align with contemporary animal health and welfare research. The review will then consider the ASEL for livestock exported by air. The standards represent the basic animal health and welfare requirements the government expects industry to meet in order to export livestock for slaughter.

In April 2018, the government supported the recommendations of an independent review conducted by veterinarian Dr Michael McCarthy into live sheep exports to the Middle East in the northern summer.

Dr McCarthy's recommendations led to a number of changes to the trade's regulation to improve animal welfare outcomes for livestock exported from Australia. These changes include:

- a requirement that all vessels carrying sheep to the Middle East during the northern hemisphere summer will be equipped with automated watering systems and have ventilation systems independently audited
- an increase in space allocation for sheep
- placement of independent observers on livestock export voyages by sea from Australia, with observers reporting directly to the regulator.

Independent observers check the welfare and care of onboard animals and take photographs and notes to provide regular updates to the regulator on livestock vessel conditions, enabling issues that may affect the welfare of animals to be dealt with as they arise.

Following Dr McCarthy's recommendations relating to heat stress, a technical reference panel comprising experts in animal welfare, heat stress and animal science was appointed to provide advice on heat stress risk assessment. The panel has assisted with the development of findings and proposals on heat stress risk assessment for consideration by the Department of Agriculture and Water Resources.

In October 2018, the independent *Review of the Regulatory Capability and Culture of the Department of Agriculture and Water Resources in the Regulation of Live Animal Exports* was released. One of its recommendations which was accepted by the government was to appoint an external, independent Inspector General of Live Animal Exports to oversee the Department of Agriculture and Water Resources' regulation of live exports and report to the public and the Minister.

The Department of Agriculture and Water Resources has appointed a Principal Regulatory Officer to improve its regulatory practice, compliance and culture. The Department of Agriculture and Water Resources has also established an Animal Welfare Branch, which will work with researchers to implement animal welfare indicators as part of the export compliance systems.

In its 2017–18 Budget, the Australian Government announced legislative and non-legislative measures to ban the testing of cosmetics on animals. The ban will be implemented by:

- working with states and territories to incorporate a testing ban following amendment of the National Health and Medical Research Council's *Australian code for the care and use of animals for scientific purposes*
- development of a voluntary industry code of practice on the sale of cosmetic products by the cosmetics industry, in consultation with key animal welfare stakeholders
- legislating a national ban on using new animal test data to support the introduction of chemicals intended exclusively for use as cosmetic ingredients.

The national ban will be implemented through the *Industrial Chemicals Bill 2017* (Cwlth), as part of broader reforms. The Bill passed the House of Representatives on 17 October 2017 and is currently before the Senate. Other components of the ban will be finalised after the Bill is passed.

10.1.2 Australian Capital Territory

In 2018, the Australian Capital Territory (ACT) Government delivered a number of actions under the *Animal welfare and management strategy 2017–2022*. The aim of the Strategy is to ensure the ACT Government delivers a consistent and consolidated approach to promoting improved outcomes for animal welfare.

One of the key objectives under the Strategy is that the ACT has contemporary animal welfare laws. In meeting this objective, the ACT Government has undertaken a comprehensive review of the *Animal Welfare Act 1992* (ACT), in consultation with the Animal Welfare Advisory Committee (AWAC) ACT and the Royal Society for the Prevention of Cruelty to Animals (RSPCA ACT). The review has culminated in the drafting of the *Animal Welfare Legislation Amendment Bill 2019* (ACT).

As at 30 April 2018, the racing and trialling of greyhounds was banned in the Australian Capital Territory. In support of the ban, a *Code of practice for keeping and breeding racing greyhounds in the ACT* was drafted and implemented in consultation with AWAC.

During 2018, AWAC ACT recommended that *Australian animal welfare standards and guidelines for sheep* be implemented as a code of practice under the *Animal Welfare Act 1992* (ACT). AWAC also reviewed *Australian animal welfare standards and guidelines for cattle*, but is yet to submit recommendations regarding implementation. AWAC continues to progress draft codes of practice for the welfare of wildlife, small mammals and reptiles as well as review current codes of practice for the welfare of dogs, cats and horses.

The ACT Government continues to build strong working relationships with animal welfare organisations in the ACT to ensure animals are managed and cared for in a way that is consistent with best practice and aligns with community expectations.

10.1.3 New South Wales

In New South Wales, the Department of Primary Industries (DPI) is responsible for ensuring that the policy and legislative frameworks in the state support good animal welfare outcomes. The DPI released its *Animal welfare action plan* in May 2018. The Plan aims to deliver an animal welfare system that is focused on outcomes and reflects evolving animal welfare science and community expectations.

In 2018, the New South Wales Government amended the *Companion Animals Act 1998* (NSW) and *Prevention of Cruelty to Animals Act 1979* (NSW). The changes improve identification to allow better traceability of cats and dogs, promote responsible pet ownership and enable more effective enforcement action to be taken.

The *Australian animal welfare standards and guidelines* for cattle and for sheep, and a guide for welfare assessment, *Welfare scoring nutritionally deprived beef cattle, dairy cattle and their crosses, sheep and horses*, have been prescribed as

guidelines under the *Prevention of Cruelty to Animals Act 1979* (NSW). This means they can be used as evidence in proceedings under the Act or Regulation.

A revised guideline has been published by New South Wales DPI and the Animal Research Review Panel on *Collaborative research between accredited animal research establishments*. The guideline aims to ensure that animal care and use is properly approved and monitored during all phases of a collaborative research project, and now includes a template collaborative research agreement. Guidelines are also being developed to support research organisations in rehoming animals used in research. In addition, from January 2019, research organisations will be required to report on what happens to domestic dogs and cats used in research once a project is complete. These data will be collected and published annually.

The Greyhound Welfare and Integrity Commission commenced operation in New South Wales to regulate the greyhound racing industry, target wrongdoing and enforce animal welfare standards.

Drought has had a significant impact on livestock production in New South Wales during 2018. The New South Wales Government is providing subsidies and support for eligible producers impacted by drought, and online resources have been developed to guide decision making in times of drought and to explain everyone's role in protecting animal welfare. Stock Welfare Panels are operating to facilitate livestock welfare outcomes. The New South Wales DPI convenes Stock Welfare Panels to address escalating livestock welfare cases where enforcement agency and Local Land Services directions have not been followed. New South Wales DPI has the power to issue warnings and order seizure and disposal of stock.

10.1.4 Northern Territory

Animal welfare is regulated by the Northern Territory Department of Primary Industry and Resources, and the governing and subordinate legislation is implemented by the Animal Welfare Branch, which responds to reports of cruelty, neglect and abandonment. In partnership with key stakeholders, the Animal Welfare Branch uses a range of approaches including training and education to better inform the community of their responsibilities under the *Animal Welfare Act 1999* (NT) and Regulations as amended in 2017. Codes of practice are adopted under the *Animal Welfare Act 1999* (NT) by the Minister on the recommendation of the Northern Territory AWAC.

A new *Animal Protection Act 2018* (NT) was passed by the Legislative Assembly in October 2018 and is currently awaiting assent before adoption into law. The new legislation brings stronger, more effective animal welfare protection measures in the Northern Territory, including increased penalties.

In the Northern Territory, relevant standards in the *Australian animal welfare standards and guidelines* are adopted under the *Livestock Act 2008* (NT). Adoption of standards for cattle, sheep, and livestock at saleyards and depots is currently being progressed through a comprehensive review of the current Act to align with the current implementation of the welfare standards for land transport of livestock. The standards are enforced by Livestock Biosecurity Officers, including by the use of infringement notices.

Animal welfare emergency plans to deal with natural disasters such as cyclones and flooding are maintained by the Northern Territory Department of Primary Industry and Resources. Under such plans, an animal welfare coordination centre will be set up in an emergency to safeguard animal welfare.

10.1.5 Queensland

The *Animal Care and Protection Act 2001* (Qld.) is Queensland's animal welfare legislation, providing good welfare outcomes and protection for all animals in Queensland.

On 1 October 2018, the compulsory Code of Practice for Breeding of Dogs commenced, requiring all breeders to meet legislated standards. A communication plan has ensured breeders are aware of the new laws and can make necessary adjustments to their breeding practices.

Mandatory dog breeder registration in Queensland continues to receive strong support from breeders and the community. As at 22 November 2018, over 21 000 dog breeders had registered since the new laws commenced on 26 May 2017.

Australian animal welfare standards and guidelines for cattle, sheep and saleyards are being adopted

Image credit: Shutterstock

as compulsory requirements to support improved animal welfare outcomes in those species.

Queensland is developing *Animal welfare standards and guidelines for animals at rodeos* to provide greater welfare assurance for rodeo animals.

The *Exhibited Animals Act 2015* (Qld.) continues to be implemented across the industry. Animal welfare is a key exhibition risk that must be managed through the development of management plans identifying the exhibition risks for each species. Guidelines and supporting information are available to assist applicants with submitting management plans. Enforcement of standards supports world-class wildlife experiences for tourists and the community in Queensland.

Queensland continues to register all users of animals for scientific purposes, including for research and teaching. This practice is governed by the *Australian code for the care and use of animals for scientific purposes*. In Queensland, compliance with this Code is mandatory, safeguarding the welfare of all animals used for scientific purposes.

10.1.6 South Australia

In South Australia, all animals must be treated in accordance with the *Animal Welfare Act 1985* (SA) and the *Animal Welfare Regulations 2012* (SA).

South Australia is working to improve the welfare credentials of its livestock industry. The new One Biosecurity program, through which producers create online profiles of their farming enterprises to showcase their animal health credentials, requires producers to declare knowledge and on-farm implementation of the relevant animal welfare codes of practice and *Australian animal welfare standards and guidelines*. South Australia has also been heavily involved in the development of the *Australian animal welfare standards and guidelines for poultry*.

The *South Australian response plan for oiled wildlife* has been revised to incorporate regional plans detailing specific issues on each section of coastline and the resources available to respond if the need occurs.

10.1.7 Tasmania

Biosecurity Tasmania is the Tasmanian Government division responsible for animal welfare. Biosecurity Tasmania administers the *Animal Welfare Act 1993* (Tas.), which provides for the regulation of animal welfare for all live, non-human vertebrates under all circumstances, including use in research and teaching. AWAC Tasmania provides advice to the relevant Minister on animal welfare policy matters, including legislative change.

Tasmania has been actively involved in the development of new *Australian animal welfare standards and guidelines for poultry*, including having a representative on the writing group.

Tasmania has continued to refine the working arrangements between RSPCA Tasmania and Biosecurity Tasmania. RSPCA Tasmania is the first point of contact for animal welfare complaints, which are dealt with according to species and situation. Biosecurity Tasmania leads investigations relating to commercial livestock, while RSPCA takes the lead on pets and horses. Biosecurity Tasmania and RSPCA Animal Welfare Officers also conduct routine unannounced inspections of intensive farms. There have been a number of significant animal welfare cases progressing toward and through prosecution in 2018.

10.1.8 Victoria

The Victorian Government released Victoria's first *Animal welfare action plan* on 2 January 2018. The Plan sets the direction for animal welfare in Victoria, a key action is the review and modernisation of the *Prevention of Cruelty to Animals Act 1986* (Vic.).

In 2018, Animal Welfare Victoria (AWV) was formed within the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) to bring together responsibility for domestic animal (pet) and animal welfare policy, legislation, licensing and audit, and grant and education programs, to support animal welfare in Victoria. DEDJTR renegotiated and renewed its memorandum of understanding with RSPCA Victoria, setting out operational arrangements and responsibilities for the enforcement of animal welfare legislation between the two organisations.

Victoria commenced reforms to dog breeding (puppy farm) and pet shop industries with large-scale legislative change on 10 April and 1 July 2018. These reforms, together with $500 000 Animal Welfare Fund grant funding offered in 2018, aim to improve welfare standards for companion animals across Victoria.

The *Code of practice for the keeping of racing greyhounds* was released on 23 April 2018, following extensive stakeholder consultation. The code prioritises animal welfare while providing flexibility to greyhound industry participants. Following a detailed, evidence-based review of greyhound muzzling requirements in Victoria, the Minister for Agriculture announced that from 1 January 2019, non-racing greyhounds will no longer require a muzzle in public.

AWV produced *Establishing a rehoming program for animals used in research and teaching* as guidelines for licence holders, researchers, teachers and Animal Ethics Committees considering rehoming animals after the conclusion of research or teaching projects. The *Prevention of Cruelty to Animals Regulations 2008* (Vic.) were amended in October 2018 to allow the limited use of electronic collars on livestock in research. This change allows research to be conducted to evaluate animal welfare outcomes from new technologies that use electronic collars to create a virtual fence for livestock.

10.1.9 Western Australia

Animal welfare is a priority of the Western Australian Government. The community expects producers and exporters of livestock to respect minimum national animal welfare standards, and many farmers support this concept. In November 2018, to shift focus from the prohibition of cruelty towards the setting of minimum animal welfare requirements and to modernise its legislation, the Western Australian Parliament passed a Bill to amend the *Animal Welfare Act 2002* (WA).

The *Animal Welfare Act 2002* (WA) was amended to provide for regulations giving effect to the *Australian animal welfare standards and guidelines for livestock* that have been endorsed by agriculture ministers nationally. It is anticipated that regulations will be developed in early 2019 to give legislative effect to the *Australian animal welfare standards and guidelines for land transport of livestock* and the *Australian animal welfare standards and guidelines for saleyards and depots*, with the standards and guidelines for cattle and sheep to follow. A comprehensive review of the *Animal Welfare Act 2002* (WA) will commence in 2019.

The Department of Primary Industries and Regional Development (DPIRD) is currently developing Western Australian standards and guidelines for the health and welfare of dogs. These are intended to set minimum requirements for all dogs kept in the

state, with additional requirements for commercial dog businesses such as commercial breeders, pet shops and boarding kennels. The introduction of these standards is a key pillar of the state government's Stop Puppy Farming initiative.

In March 2018, the State Emergency Management Committee (SEMC) formally assigned the role for coordinating animal welfare in emergencies to DPIRD, consistent with State Emergency Management Policy. In consultation with stakeholders, DPIRD drafted a State Support Plan. The Plan outlines state-level arrangements for coordinating animal welfare in emergencies, as well as any local arrangements, and sets out how these support the role of the owner or carer of an animal. The Plan applies to all managed hazards that require an emergency response, with the exception of animal and plant biosecurity emergencies, for which separate arrangements apply. The next step is to develop a DPIRD Operational Plan for Animal Welfare in Emergencies.

10.2 Industry updates

10.2.1 Alpaca

Australian Alpaca Association

The Australian Alpaca Association (AAA), being the peak industry body and premier membership organisation for the Australian alpaca industry, manages the alpaca stud register for the Australian alpaca industry. With about 200 000 registered alpacas and a national herd close to 400 000, the industry is now well established as part of the Australian agricultural scene. The industry has transitioned from its initial base of breeding stud and show stock to enterprises ranging from hobby farmers to large-scale commercial breeders producing breeding stock, fibre and, increasingly, meat.

Recent research related to alpaca welfare

A study co-funded by AAA and AgriFutures Australia and conducted at the University of Melbourne was completed in mid-2018.

The study aimed to determine the prevalence of gastrointestinal nematodes of alpacas in various climatic zones in Australia using traditional methods and the latest molecular diagnostic methods. Field efficacy studies were also undertaken to determine the status of anthelmintic resistance in gastrointestinal nematodes as well as the dosage rates required to achieve control of gastrointestinal nematodes in alpacas.

10.2.2 Cattle

Australian Dairy Industry Council

The Australian Dairy Industry Council (ADIC) is the peak body representing dairy farmers and dairy processors, with membership made up of Australian Dairy Farmers and the Australian Dairy Products Federation. The industry is also supported by Dairy Australia Limited, the industry service body, providing support services across the dairy supply chain.

Through the Australian Dairy Industry Sustainability Framework,[148] the Dairy Promise – to provide nutritious food for a healthier world – commits the industry to 'strive for health, welfare and best care for all our animals throughout their lives'. This is one of four commitments underpinning the Dairy Promise.

Animal health and welfare goals for 2020 are set out in the Framework:

- all of industry complying with legislated animal welfare standards
- all of industry adopting relevant recommended industry practices, including:
    - reducing use of routine calving induction
    - discontinuing tail docking
    - disbudding calves prior to two months of age, with pain relief
    - having a lameness strategy in place
    - having cooling facilities to keep cows cool during heat
    - feeding bobby calves within six hours before transport.

Key actions to support these commitments include:

- investing in RD&E programs that address disease, illness and welfare

148 www.dairyaustralia.com.au/DairyAustralia/About-Dairy-Australia/About-the-industry/Sustainability

- helping industry identify, prioritise and respond positively to key welfare issues
- supporting farmers to adopt recommended animal welfare practices
- building confidence in animal husbandry practices and welfare outcomes.

The dairy industry monitors and publicly reports progress on these commitments. To gather data on animal health and welfare performance, the industry has conducted an animal husbandry survey every two to three years since 2005. Significant improvements are evident in the longitudinal data. The next survey will be conducted in 2019.

Of note is the industry's commitment to phase out calving induction. To meet this goal, the industry has progressively reduced herd calving induction limits (from 15% in 2016 to 8% in 2019) to drive voluntary practice change, and Dairy Australia Limited has delivered programs to assist farmers to meet these targets.

As part of the Framework, ADIC is currently developing a new mechanism to monitor animal health and welfare practices on all dairy farms. This will provide further evidence to support industry-agreed goals and targets. The industry is transitioning from 2020 goals and targets to 2030 goals and targets, and will continue to report on progress towards them.

Australian Lot Feeders' Association

The Australian Lot Feeders' Association (ALFA) is the peak industry council for the grain-fed cattle industry. The core attribute of the Australian cattle feedlot industry is its quality assurance systems, including the National Feedlot Accreditation Scheme (NFAS).[149,150]

Promoting sound animal health and welfare practices throughout the livestock industry remains a key focus for the feedlot industry, in line with key imperatives highlighted in the Meat Industry Strategic Plan (MISP).[151]

ALFA delivers on the imperatives highlighted in MISP through the continuous maintenance of comprehensive training programs and through research and development specifically aimed at improving animal welfare in feedlots.

The review of NFAS conducted throughout 2014–2015 made a series of recommendations that highlighted areas of program improvement that would ensure continuous advancement of industry standards. Since the adoption of the new NFAS standards in March 2018, 308 audits have been conducted, with excellent compliance demonstrated by industry participants.

ALFA has continued to deliver its nationally accredited Animal Welfare Officer training across the country, which has seen an additional 123 feedlot and industry personnel trained throughout 2018. Investing in the capability and capacity of those working in the industry ensures that the workforce has the necessary knowledge and skills to continually monitor and assess animal welfare indicators specific to the feedlot environment. ALFA will continue to deliver specific Animal Health and Welfare Workshops in 2019, along with workshops focusing on heat load and antimicrobial stewardship, helping to build the industry's capability and capacity in the important space of animal health and welfare.

Cattle Council of Australia

Australia's cattle producers, particularly in the northern regions, rely heavily on the livestock export trade for much – if not all – of their livelihoods. Over a million cattle are exported to more than 20 countries annually, with a farmgate return estimated at more than 500 million dollars.

The trade has come under increasing pressure from opponents, who want it stopped on animal welfare grounds.

In response, the Cattle Council of Australia has been working tirelessly with Australian Government authorities and relevant livestock sectors to ensure that export standards are appropriate and regularly reviewed, and that compliance with the standards is uncompromising.

This has resulted in Australia being recognised as having the most advanced livestock export standards in the world. In one form or another, the standards cover livestock from pre-embarkation to slaughter in their destination country.

149 www.feedlots.com.au/industry/nfas

150 www.ausmeat.com.au/services/list/livestock/nfas

151 rmac.com.au/wp-content/uploads/2016/12/MISP-2020-doc.pdf

Image credit: Animal Health Australia

The Australian Government and industry continue to strive for improvements, with the next major review scheduled for late 2018.

Part of the standards for livestock export relates to pregnancy testing, the aim being to avoid the loading of any in-calf cattle that are not destined for breeding.

Along with livestock exporting and lot feeding sectors, Cattle Council of Australia has recognised a gap in the rules governing pregnancy testing of Australian cattle intended for export or lot feeding. This gap principally involves pregnancy testing done by lay (i.e. non-veterinary) operators who provide a commercial service to cattle producers.

The peak councils of the three sectors (grass-fed, grain-fed and live export) are working with a consultant commissioned by Meat & Livestock Australia (MLA) to develop a national standard for pregnancy testing of cattle in Australia. It is anticipated that this national standard will strongly reference the veterinary profession's PregCheck® program, with the expectation that any lay operator wishing to become accredited will be using a national standard closely aligned with that used by veterinarians.

On a separate issue, Cattle Council of Australia has overseen the development of a scheme for accrediting lay spayers of cattle using the dropped ovary technique (DOT); the scheme is now fully developed and ready for national implementation in time for the spaying (northern dry) season of 2019.

Consistent with the *Australian animal welfare standards and guidelines for cattle*, spaying of any cattle in Australia will need to be done by or under the direct supervision of a veterinarian or an accredited lay spayer. This scheme, which has been successfully trialled by four existing lay operators, will accommodate 'recognition of prior learning' and allow spayers in remote areas to conduct the course via tele-link or video, saving them from having to travel many hundreds of kilometres.

It is possible that the Unit of Competency for Lay Spayers of Cattle Using the DOT could be used as the platform for the proposed national standard for pregnancy testing.

10.2.3 Goat

Goat Industry Council of Australia

The Goat Industry Council of Australia (GICA) works with government and industry bodies, producers and other peak industry councils to develop collective goat industry policy for all breeds.

Welfare of livestock is important during all stages of goat production from birth to slaughter, and affects productivity, profitability and sustainability of the goat and broader livestock industries. Good animal welfare practices are an integral part of a property management plan.

GICA and Animal Health Australia (AHA) have developed the *Australian industry welfare standards and guidelines for goats*. These industry standards and guidelines apply to all goat farming enterprises in Australia, from extensive rangelands to intensively managed systems and individually owned goats. The industry standards and guidelines are a voluntary tool that facilitates industry uptake of best-practice animal welfare, improves production and maintains market access.

In addition, GICA oversees the investment of industry levies in animal welfare research conducted by MLA, to provide tools and knowledge to help producers improve the wellbeing of their goats and address issues of community concern.

10.2.4 Horse

Equestrian Australia Limited

Equestrian Australia (EA) is the peak governing body for equestrian sports in Australia, encompassing eight riding disciplines in each state from introductory to Olympic and Paralympic-level.

Horse welfare is paramount, and 'For the love of the horse'[152] is a core value in the organisation's management and care of horses. EA's vision and six key priorities in the Equestrian Australia Strategic Plan 2017–2020 are each connected to this core value.

As well as adhering to the *Fédération Equestre Internationale code of conduct for the welfare of the horse,*[153] EA aspires to ensure the welfare of every horse, and has implemented several initiatives over the past year, including:

- the Making Eventing Safer program, a $250 000 investment in research and development to reduce the risk of injury to riders and horses
- a National Safety Officer to review existing safety and risk-management practices and policies and to recommend and implement safety initiatives to improve horse welfare and standards
- roll-out of frangible devices for cross-country courses at all EA events
- a 'think tank' for Australia's top course designers, to help ensure cross-country courses meet world safety standards for prevention of horse falls
- making policies and procedures accessible on the horse welfare section of the EA website.

Harness Racing Australia

Harness Racing Australia (HRA) is the peak body for the regulation of harness racing in Australia as well as keeper of the Standardbred Studbook (the registry for breed information).

In 2018, the first microchipping of standardbred foals occurred. Microchips have been introduced to replace alpha angle freezebrands over a three-year transition period as the unique, unalterable means for the identification of horses, supporting the primary identifier of parental verification via DNA hair testing. Despite some initial opposition, the roll-out was a success and the industry is now preparing to microchip the second crop of foals. Supporting the microchip project is a tailor-made database program designed to increase traceability and integrity within the harness racing industry.

The development of additional information technology portals for use by industry participants was also a feature of HRA's 2018 welfare work. Paperwork will be replaced with online, real-time updates to aid traceability of standardbreds that have retired from racing. In addition, the introduction of a new ratings-based handicapping system will also have welfare benefits, giving horses a longer, more productive racing career.

In September 2018, the latest phase of whip-use moderation began. The rules of harness racing have been constantly modified since 2010, with the latest amendments making Australian harness racing among the most strictly regulated in the world. The latest amendments restrict drivers to a forward-facing flicking motion only, with no shoulder rotation.

152 www.equestrian.org.au/lovehorse

153 inside.fei.org/system/files/Code_of_Conduct_Welfare_Horse_1Jan2013.pdf

HRA's major welfare project for 2018 was a Retraining the Standardbred Project headed 'There Is No Finish Line'. For this project, a retired standardbred horse named Savesomtimetodream was retrained to a saddle career, with the HRA Health and Welfare Coordinator overseeing the program. Several step-by-step instructional videos documented the horse's training progress from paddock to major equestrian events, such as Equitana. Some publications provided support for the Project, which also attracted attention via the www.thereisnofinishline.com.au website and related social media platforms.

Racing Australia

Racing Australia is the peak national body formed by, and representing, the principal racing authorities in each state and territory. Among other responsibilities, Racing Australia is responsible for administering the Australian Rules of Racing, which include rules for equine welfare.

Recent reforms have strengthened ownership transparency and traceability, ensuring that the location of thoroughbred horses from birth to retirement is known to authorities, thus enabling improved monitoring of the health and welfare of horses.

Equine welfare is of paramount importance to the thoroughbred industry, and Racing Australia's traceability reforms were a world first. They are now being adopted in other international racing jurisdictions, including the United Kingdom.

In April 2018, Racing Australia launched its Equine Genetics Research Centre (EGRC). The EGRC is located at Scone in New South Wales, the largest thoroughbred breeding area in Australia.

The EGRC performs parentage verification and DNA profiling for the Australian Stud Book and about 30 other horse breed associations. EGRC also initially offers DNA testing for 11 genetic diseases and 18 other phenotypic traits.

The addition of an equine geneticist to the Racing Australia team as the EGRC's inaugural director also ensures that EGRC has the capability to undertake research into genetic disorders in horses.

Racing Australia funds additional research into thoroughbreds in two ways:

- directly through the Racing Australia Research and Development Fund, which makes financial support available to research projects aimed at improving the health, welfare or performance of thoroughbred horses
- indirectly through the AgriFutures' Thoroughbred Horses fund where, in addition to collecting the levy on behalf of breeders, Racing Australia also contributes an additional $150 000 annually.

10.2.5 Kangaroo

Kangaroo Industries Association of Australia

The kangaroo industry progressed several initiatives during 2018 to ensure the continued improvement of existing standards for the humane treatment of kangaroos.

Four species of kangaroo have been identified by the Australian Government as requiring harvesting for ecological and land management reasons. None is a threatened species.

The Australian Government has responsibility for permitting the export of kangaroo products. Commercial harvesting of kangaroos is conducted under state management plans, which include annual harvest quotas based on regular population monitoring.

This year, AgriFutures Australia began leading a review of the *National code of practice for the humane shooting of kangaroos and wallabies for commercial purposes.*[154] This review involves representatives from the Australian Veterinary Association, RSPCA, industry and relevant government agencies. The current Code was originally published in November 2008.

A key issue for the industry during 2018 was the impact of drought in several parts of the country. Kangaroo populations typically come under stress during drought, and kangaroos compete with grazing stock for precious feed. Both the New South Wales and Queensland governments have lifted the levels of non-commercial culling of kangaroos.

154 www.environment.gov.au/system/files/resources/8ae26c87-fb7c-4ddc-b5df-02039cf1483e/files/code-conduct-commercial.pdf

Image credit: Shutterstock

Industry has expressed concern about the potential for reduced oversight of culling activities and diminished ability of commercial harvesters to ensure animal welfare.

Kangaroo Industries Association of Australia increased its communications regarding industry checks and balances during 2018. This increase included the production of fact sheets and policy papers on topics such as tracing kangaroo products from paddock to plate. Today, every harvested kangaroo for export or domestic commercial sale can be individually traced through state-based tagging and reporting systems.

During the year, the kangaroo industry held consultations with a range of stakeholders about key issues facing the sustainable and humane treatment of kangaroos, with outcomes to be actioned over the coming year.

10.2.6 Pig

Australian Pork Limited

Australian Pork Limited (APL) is the national representative body for Australian pork producers. APL is a producer-owned, not-for-profit company combining marketing, export development, research and innovation and policy development to assist in securing a profitable and sustainable future for the Australian pork industry.

The Australian pork industry employs more than 36 000 people in Australia, and contributes approximately $5.2 billion in gross domestic product to the Australian economy.

The industry places great emphasis on the welfare of pigs, with animal welfare policies and initiatives underpinned by strong investment in animal welfare research and development. Animal welfare is a key module in the Australian Pork Industry Quality Assurance Program (APIQ✓®). The APIQ✓® program covers more than 89% of Australian commercial sows in production. Each year, producers accredited by APIQ✓® are independently audited against all the APIQ✓® standards and performance indicators, including those in the animal welfare module.

During the 2017–18 financial year, a good example of the Australian pork industry's commitment to continuous improvement in animal welfare was the decision to phase out gestation stalls. In 2010, the Australian pork industry agreed to voluntarily phase out gestation stalls by 2017, from five days after mating until one week before sows are due to farrow. Today, four out of five sows are loose-housed in accordance with the voluntary decision undertaken by industry in 2010.

Ahead of the 2019 review of the *Model code of practice for the welfare of animals: pigs,*[155] APL has commissioned an animal welfare science review (*Review of the scientific literature and the international pig welfare codes and standards to underpin the future standards and guidelines for pigs*[156]). This review will be the primary input into the Code review, and is due to be completed and published before the end of 2018.

10.2.7 Poultry

Australian Chicken Meat Federation

The Australian Chicken Meat Federation (ACMF) is the industry's peak body representing all elements of the chicken meat industry at the national level, including growers and processors. The ACMF represents the industry in matters such as international trade, quarantine, animal health, biosecurity, food standards, environmental issues, food safety and animal welfare. The ACMF also has an important role in providing information to consumers and the public more broadly about the Australian chicken industry, its products and how it operates.

Animal welfare is a priority for the chicken industry and therefore a priority area for the ACMF. The ACMF actively promotes member awareness of and compliance with both regulated and voluntary welfare standards (including *Model codes of practice for the welfare of animals*) as well as non-regulated guidelines. The ACMF has also been actively promoting activities aimed at ensuring standards are monitored and met in high-risk areas of welfare, for example by promoting the use of closed-circuit television surveillance of live-animal handling areas at processing plants to ensure the humane treatment of the birds at all times – a recommendation that has been voluntarily adopted by all ACMF affiliated members.

Up to 70% of chickens produced in Australia today are grown on farms that are accredited under the RSPCA Approved Farming Scheme. RSPCA staff assess compliance with scheme standards, and the ACMF has actively engaged with the RSPCA over the past year in the review of these standards.

Most chickens farmed with access to an outside range area are accredited under the Free Range Egg and Poultry Australia (FREPA) program. Compliance with FREPA standards is independently assessed, and approximately 20% of chickens in Australia are accredited under this program.

Chicken meat processing companies are also required to meet, and be assessed against, the welfare standards of their major customers, such as the major supermarket chains and quick service restaurants.

Over the past two years, the ACMF has actively engaged with governments and other stakeholders in the development of new poultry welfare standards and guidelines. The ACMF strongly supports the principle of animal welfare standards being uniformly adopted into Australian laws. The ACMF has been working with its members to ensure that they understand the implications of this development and in particular what their responsibilities will be once the new standards are implemented.

The chicken industry maintains that good welfare means more than simply ensuring flocks are kept healthy. Chickens need to be kept in an environment where they are comfortable, protected from injury, pain and predation, fed optimally and able to express important social and other behaviours appropriate to their age. It is also important that they are cared for by experienced stockpeople who understand their needs and behaviours.

The viability of the industry depends on good welfare outcomes being achieved.

Australian Duck Meat Association

The Australian Duck Meat Association (ADMA) was formed by the industry in 2008 as a representative body for the duck industry, providing policy advice and support to the industry in matters pertaining to biosecurity and animal welfare as well as future research and development activities.

155 www.publish.csiro.au/ebook/download/pdf/5698

156 www.animalwelfarestandards.net.au/files/2019/01/APL-Project-2017-2217-review-of-pig-welfare.pdf

Key achievements in duck welfare by ADMA in 2018 include:

- The *Farmed bird welfare science review*[157] conducted by Britain's University of Bristol in 2017 was reviewed systematically in 2018 to compare important duck welfare issues to analysis undertaken during the recent standards and guidelines production process. Both reviews identified issues relating to surface water and behavioural repertoire, crusty eyes and nostrils and bill trimming, but the review undertaken by the Standards and Guidelines Stakeholder Advisory Group also identified duck handling during depopulation as an important issue.
- Following recommendations made in the proposed standards and guidelines, the industry has begun adopting an alternative technology (misting) for wet preening of ducks. This provides a mechanism to improve ducks' behavioural repertoire without compromising health outcomes and egg hygiene.
- The industry has developed auditable animal welfare standards for all steps in the industrial duck meat production process, and many companies integrate the standards into their in-house quality assurance (QA) systems.
- QA monitoring for plumage, eye and nostril condition are being adopted to ensure that wet preening and litter management are effective in eliminating related welfare issues from commercial production.
- ADMA has been involved in compiling data on plumage condition and eye and nostril crusting to support the next analysis of these issues, and plans a systematic research and development project to report on them.

Australian Eggs Limited

Australian Eggs Limited is the industry services body for the egg industry, providing RD&E and marketing services for the benefit of Australian egg farmers and other stakeholders. Australian Eggs Limited works with its members to promote continuous improvement in all aspects of egg farming. All known Australian egg farms are serviced by Australian Eggs Limited, irrespective of size, location or farming system.

Animal welfare is a key focus of the Strategic Plan 2017–21, as egg farmers recognise that good hen welfare is critical to running an efficient and sustainable egg industry. In response to growing community interest, Australian Eggs Limited has broadened its research program to concepts that go beyond the physical condition of hens. The aim is to drive ongoing improvement by contributing to a more productive debate around animal welfare issues and by exploring new ways to measure welfare outcomes.

Key achievements in hen welfare in 2018 include the following:

- CSIRO published an Australian Eggs Limited-funded report that examined the attitudes of Australians towards the egg industry and underlying values that drive these attitudes. The response was overwhelmingly positive, with a statistically representative sample of 5500 Australians showing a high degree of trust in the industry. The report also highlighted that animal welfare continues to be an area of public concern.
- Five new research projects, focusing on providing on-farm solutions to welfare problems such as smothering and the impact of ultraviolet light on ranging behaviour in free range flocks, were funded in the animal welfare RD&E stream. Other projects have taken a more strategic view, and are investigating new technologies to assess welfare in hens, as well as understanding the current status of hen welfare science and the values-based elements arising from it, to determine future research priorities.
- Australian Eggs Limited has revitalised its on-farm extension program to farmers and businesses supporting the egg industry. This has included a workshop series rolled out nationally, the publication of over 25 new factsheets on best-practice management of hens and egg farming, and the publication of two new manuals including a new edition of the *Vaccination training manual*,[158] which has been updated to reflect current best practice to ensure good health and welfare outcomes for hens.
- A total of 19 farm workers completed their Certificate III in Poultry Production, with another

157 agriculture.vic.gov.au/__data/assets/pdf_file/0019/370126/Farmed-Bird-Welfare-Science-Review-Oct-2017.pdf

158 www.australianeggs.org.au/assets/australian-eggs/Uploads/VACCINATION-TRAINING-MANUAL.pdf

27 enrolled and finishing next year. Certificate III is the egg industry's flagship training program, and covers the full scope of egg farm operations from bird health and welfare to workplace safety.

- There was continued participation in the National Primary Industries Animal Welfare RD&E Framework, which aims to deliver better industry outcomes from animal welfare RD&E, and to provide a platform for identification and delivery of RD&E where there is common interest across sectors.

10.2.8 Sheep

Sheep Producers Australia

Sheep Producers Australia (SPA) is the peak industry organisation for sheep and lamb producers. SPA works to enhance the productivity, profitability and sustainability of the Australian sheep and lamb industry by representing all producers to industry decision-makers and stakeholders, with the goal of positioning the industry for future success.

A key activity of SPA is to achieve enhanced sheep welfare outcomes through the adoption of consistent, science-based practices. These activities work to improve wellbeing of animals within our care, build community support for the sheep industry as a whole and increase productivity outcomes.

SPA recognises that all stakeholders have a duty of care for the health and wellbeing of animals managed in the industry. There are several goals that underpin this commitment, and these are contained in the Sheep Industry Strategic Plan (SISP) 2015–2020. These goals include measurable improvements in sheep welfare across the supply chain, preparing plans for emergency disease outbreaks, meeting National Livestock Traceability Performance Standards, and reducing the cost of managing endemic diseases.

Key animal welfare initiatives undertaken by SPA in 2018 include:

- coordination of the lamb survival working group, which aims to reduce lamb mortalities through cross-industry RD&E and adoption of relevant on-farm husbandry practices
- continued support for the Sheep Health Project, enabling growers to improve on-farm management of biosecurity, health and welfare and improve preparedness for an emergency animal disease (EAD)
- advocacy for a science- and evidence-based solutions to live sheep export issues to ensure an outcome can be achieved that protects the welfare of animals while preserving the trade and the benefits the industry delivers to farmers, regional communities and those employed in the supply chain
- continued support for the National Wild Dog Action Plan.

WoolProducers Australia

WoolProducers Australia is the national peak industry body representing and promoting the needs of Australia's wool growers. Membership covers the industry's commercial, superfine and stud breeding sectors.

Animal health and welfare are key components of the work done on behalf of growers, supporting ongoing improvement alongside productivity and profitability. WoolProducers is the wool-growing member of AHA, and carries a significant responsibility for decision-making on behalf of the industry, including overseeing the wool industry health and welfare levy collected and administered by AHA.

Key initiatives undertaken by WoolProducers in 2017–18 include:

- liaising with wool-related post-farmgate organisations to ensure they are clear on language and roles and responsibilities of the EAD Response Agreement
- continuing negotiations regarding valuation and compensation, especially in regard to timing of compensation
- developing a Crisis Response Plan and joint Response Plan with the Sheep Meat industry
- interested growers attended 'Liaison – Livestock Industry' training held in May 2018 in Melbourne and in September 2018 in Adelaide
- raising awareness of key health, welfare and biosecurity issues through increased media presence.

Image credit: iStock

10.2.9 Other

Australian Live Exports Council

In 2018 in the live export area, television footage showing poor animal welfare practices occurring for sheep on ships to the Middle East caused much concern. Collective industry reforms need to be made to address these concerns and maintain the future of the trade.

The Livestock Export Program (LEP), a joint program between LiveCorp and MLA, has undertaken a large-scale project to determine methods of measuring and recording the welfare of livestock on ships. This includes the development of scientific animal welfare indicators and a fast-tracked, industry welfare data-collection project.

The LEP is also continuing its work on the industry Livestock Export Heat Stress Risk Assessment Model. The livestock export industry recently committed to the implementation of the Livestock Global Assurance Program[159] which will improve control, traceability and welfare within the supply chain. This R&D project began in 2012 and the program implementation is a significant step in strengthening regulatory compliance systems, animal welfare accountability and safeguards.

159 www.livecorp.com.au/research-development/reports/livestock-global-assurance-program

Australian Meat Industry Council

The Australian Meat Industry Council (AMIC) is the peak body representing Australia's cattle, sheep and goat processors, smallgoods manufacturers and meat retailers. The red meat processing sector has a responsibility to ensure that all livestock under its care are treated humanely and in as pain-free and stress-free an environment as practical.

AMIC proposes that animal welfare is of paramount importance to the red meat processing sector for a number of reasons including community acceptance of the industry, workplace health and safety, competitive advantage in export markets, and eating quality. Animal welfare is important from birth to slaughter, and industry systems reflect and help maintain the integrity of the Australian livestock industry.

AMIC remains engaged with state jurisdictions in the development of *Australian animal welfare standards and guidelines* for the welfare of livestock at processing establishments. While these standards and guidelines were envisaged to be completed in 2018, delays with finalisation of other standards have resulted in the process being put on hold by the Australian Animal Welfare Task Group.

AMIC developed *Industry animal welfare standards at livestock processing establishments: preparing meat*

for human consumption, which were incorporated into the Australian Livestock Processing Industry Animal Welfare Certification System in 2013 and are independently audited by AUSMEAT. The Industry Standards have had significant uptake since then, and in 2016 over 85% of Australian cattle, 65% of lambs, 48% of sheep and 58% of goats were processed in establishments accredited under this system.

The Industry Standards are in the process of being reviewed to ensure that they meet community and industry expectations of working towards best practice in animal welfare for livestock processing.

Zoo and Aquarium Association

The Zoo and Aquarium Association (ZAA) is the region's peak body for zoos and aquariums across Australia, New Zealand and Papua New Guinea. ZAA's animal welfare ethos is articulated in its *Animal welfare position statement* and is aligned with the *Australian animal welfare strategy*.[160] ZAA manages an Accreditation Program to validate and promote 'positive welfare' among its 90-plus members. All ZAA member organisations need to achieve and maintain accreditation on a three-year cycle. Significantly, the Accreditation Program aligns with the goals of the World Association of Zoos and Aquariums' *World zoo and aquarium animal welfare strategy*.

The Accreditation Program employs a contemporary understanding of animal welfare, utilising the Five Domains Model[161] for welfare assessment. The Program requires members to assess their animals and practices over three self-assessment components, with their findings externally sighted and reviewed. The primary assessment is focused on establishing the subjective experiences of the animal using the Five Domains Model in a format applicable to all animal care facilities. Other benchmarks include the areas of proactive care, alignment with natural living and the opportunity to engage in a full range of species-appropriate behaviours. These are integral elements of positive welfare, producing a quality of life well beyond that achieved by merely minimising negative welfare. Welfare knowledge among members continues to develop through ZAA support, with guided learning and resource development.

The ZAA Accreditation Program has been presented in international forums, and interest in the program has been received from other regional associations and animal care facilities, serving as a strong indicator of the robustness and standing of the program.

In May 2018, ZAA launched the latest improved Program, Accreditation 2020 (A2020). The strengthening of the welfare assessment framework includes evidence-based demonstration of welfare support, expanded briefing materials to improve program understanding and application, and refined practical application and assessment. With 268 individual species assessments across 31 member organisations completed in A2020's first year, the program will continue its roll-out, with members making a commitment to continuous improvement.

10.3 Australian animal welfare standards and guidelines

Australian animal welfare standards and guidelines for several different animal industries are being developed under the direction of the Animal Welfare Task Group (see Section 1.1.1). 'Standards' are minimum standards to be adopted in legislation in each state and territory to create consistent enforceable standards across jurisdictions. 'Guidelines' set out additional guidance. The guidelines can also be used by industry bodies to create QA or verification schemes that complement mandatory requirements. These standards and guidelines update and replace existing model codes for particular animal sectors.

In 2018, the Animal Welfare Task Group continued to oversee the development of the *Australian animal welfare standards and guidelines for poultry*. The *Australian animal welfare standards and guidelines* for livestock at saleyards and depots, were completed and are published at www.animalwelfarestandards.net.au.

160 www.zooaquarium.org.au/index.php/position-statements

161 Mellor DJ and Beausoleil NJ. Extending the 'Five Domains' model for animal welfare assessment to incorporate positive welfare states. *Animal Welfare* 2015; 24(3): 241–253.

10.3.1 *Australian animal welfare standards and guidelines for exhibited animals*

The *Australian animal welfare standards and guidelines for exhibited animals* create improved, nationally consistent rules for the care and management of animals kept for exhibition purposes at facilities such as zoos, fauna parks, wildlife parks, aquariums and museums with live animal exhibits.

The final draft standards and guidelines need to be endorsed by relevant state, territory and Australian ministers before they are ready for implementation.

10.3.2 *Australian animal welfare standards and guidelines – livestock at saleyards and depots*

The *Australian animal welfare standards and guidelines – livestock at saleyards and depots* were finalised in February 2018. The standards and guidelines aim to better inform all those involved in the saleyard process of their responsibilities along the supply chain. They manage animal welfare risks such as livestock handling, penning density, pre-sale inspection and fit-for-sale selection, humane management of any unfit animals, and water and feed requirements. The standards and guidelines apply to the main livestock species (cattle, sheep, pigs, goats and horses) and replace the existing *Model code of practice for the welfare of animals: animals at saleyards*.

10.3.3 *Australian animal welfare standards and guidelines for poultry*

The Animal Welfare Task Group continue to oversee the development of the *Australian animal welfare standards and guidelines for poultry*. Public consultation on the standards and guidelines for poultry concluded in February 2018, and the draft standards and guidelines are now being revised in response.

The draft standards and guidelines cover all aspects of the welfare of poultry reared or bred in captivity including layer chickens, broilers, ducks, turkeys, geese, pheasants, guinea fowl, ostriches, emus, partridge, quail and pigeons. The standards and guidelines are intended to update and replace existing model codes of practice for the welfare of poultry, including slaughter.

10.4 International animal welfare

10.4.1 World Organisation for Animal Health

Since May 2005, the World Assembly of the OIE, representing 182 member countries, has adopted 13 animal welfare chapters in the OIE *Terrestrial animal health code* and four animal welfare chapters in the OIE *Aquatic animal health code*. Animal welfare standards for pig production systems were adopted in 2018.

Australia supports OIE's development of scientifically based international animal welfare standards. These standards are not intended to strengthen non-tariff barriers to international trade through prescriptive animal welfare requirements. The Australian Government consults closely with livestock industries and non-government organisations when developing Australia's positions on issues being discussed in the OIE forum. In 2018, Australia also provided expert consultants for the *ad hoc* working groups established to develop animal welfare standards for pig production systems and animal welfare standards for killing methods for reptiles commercially processed for their skins, meat and other products.

OIE Collaborating Centres are appointed by the OIE as centres of expertise in a specific sphere of competence. The OIE Collaborating Centre for Animal Welfare Science and Bioethical Analysis is a partnership between:

- Animal Welfare Science and Bioethics Centre at Massey University (New Zealand)
- AgResearch (New Zealand)
- Animal Welfare Science Centre (University of Melbourne)
- Centre for Animal Welfare and Ethics (University of Queensland)
- CSIRO Animal, Food and Health Sciences (Armidale, New South Wales).

The OIE Collaborating Centre is not currently undertaking any joint projects, but it continues to meet regularly to discuss projects of common interest, particularly in the Asian region. Members of the Collaborating Centre attended and presented at the first OIE Animal Welfare Forum, Supporting Implementation of OIE Standards, in Paris in March 2018.

10.4.2 Regional Animal Welfare Strategy: Asia, the Far East and Oceania

The OIE Regional Animal Welfare Strategy (RAWS) Advisory Group works to encourage the implementation of OIE animal welfare standards within the region. Members of the RAWS Advisory Group are appointed by the Director-General of OIE. Australia is an active participant in the RAWS Advisory Group, with membership including the Australian OIE Focal Point for Animal Welfare, the President of the Australian Veterinary Association, two members from the OIE Collaborating Centre for Animal Welfare and Bioethical Analysis, industry representation through MLA and advocacy representation through World Animal Protection.

In 2018 the RAWS Advisory Group continued to review and implement aspects of the RAWS Action Plan, including projects led by New Zealand to map OIE animal welfare standards to legislation in the region and another reviewing animal welfare training in the region.

Image credit: Shutterstock

11

ONE HEALTH

The One Health concept acknowledges that human and animal health are interdependent and related to the ecosystems in which they coexist. Stated simply, the health of people is connected to the health of animals and the environment.

The goal of One Health is to encourage collaborative efforts of multiple disciplines, working locally, nationally, regionally and globally, to achieve the best health outcomes for people, animals and our environment. A One Health approach is critical for the growing global threat of antimicrobial resistance (AMR) and emerging zoonotic diseases (approximately 70% of all emerging human infectious diseases originate from animals).

The development of AMR threatens human and animal health. It is globally driven by antimicrobial misuse and overuse in humans and animals, and the subsequent spread of organisms resistant to antibiotics between humans and animals and the wider environment.

11.1 Antimicrobial resistance

11.1.1 Antimicrobial resistance prevention

AMR is a global risk that poses a serious and imminent threat to human and animal health. It cannot be addressed through unilateral action. A One Health approach and significant effort in human and animal health fields will be required to reverse the trend.

The profile of AMR continues to rise internationally. On 21 September 2016, the United Nations General Assembly (UNGA) declared a commitment to act on AMR. This is only the fourth time a health issue has been taken up by the UNGA.

Australia has a good record on AMR, from an animal health perspective, by having one of the most conservative approaches to the use of antimicrobial agents in agriculture in the world. In December 2015, the United Kingdom review on AMR showed Australia as the fifth-lowest user of antibiotics in agriculture among the countries examined. Australia has not registered colistin (a last-resort antibiotic for humans), carbapenems or any fourth-generation cephalosporins for animal use, and fluoroquinolones are not approved for use in food-producing animals (including horses). As a result, the risk of the development of AMR from agriculture in Australia is considered to be low, in contrast to most other countries in the world. The Australian Pesticides and Veterinary Medicines Authority (APVMA)[162] evaluates and registers antimicrobial agents for animal use in Australia. The evaluation process involves conducting a risk assessment, including for AMR. Consideration is given to whether antimicrobial agents destined for veterinary use are classified as being of critical importance in human medicine. To do this, the APVMA uses the Antibacterial Importance Ratings.[163] These ratings aim to inform regulators and users about the importance of antibacterial agents for treatment of infections and the seriousness of the consequences if resistance emerges or is amplified in humans and animals.

Almost all antimicrobial agents used in animals are Schedule 4 medicines, which means they are prescription-only medicines.

The Department of Agriculture and Water Resources, and through the Australian Chief Veterinary Officer (CVO), has a leadership role in the strategic management of AMR.

At a national level, the Department of Agriculture and Water Resources participates in the following groups:

- Antimicrobial Resistance Prevention and Containment Steering Group: brings together the Department of Health and the Department of Agriculture and Water Resources Executive Group, and includes the Australian Government Chief Medical Officer (CMO) and Australian CVO. This group provides governance and leadership on AMR issues, and oversees implementation and progress of the National AMR Strategy.
- Australian Strategic and Technical Advisory Group[164] on AMR (ASTAG): an expert group from the human health, animal health, agriculture and food sectors, is co-chaired by the Australian Government CMO and Australian CVO. This group provides technical, scientific and clinical advice to the steering group.
- AMR Surveillance Task Group: includes animal health industry participants. This group focuses on developing and implementing Australia's AMR surveillance program for food animals.
- Quadrilateral Animal Health AMR Network comprises AMR representatives from Australia, Canada, New Zealand and the United States (as the Chair), to share information about tackling AMR.
- Animal Sector Focus Group: this group was established to finalise the *Animal sector national antimicrobial resistance plan 2018*. The Plan aligns with and supports the National AMR Strategy, and provides an avenue for the animal sector to articulate its priorities for the second National AMR Strategy starting in 2020.

162 apvma.gov.au/node/1013

163 www.amr.gov.au/resources/importance-ratings-and-summary-antibacterial-uses-human-and-animal-health-australia

164 www.amr.gov.au/australias-response/objective-7-governance

Image credit: Shutterstock

The Department of Agriculture and Water Resources and the Department of Health launched a One Health AMR website[165] in late 2017. The two departments are now also preparing the next national AMR strategy with stakeholder input.

Antibiotic Awareness Week

As part of World Antibiotic Awareness Week on 12–18 November 2018,[166] the Department of Agriculture and Water Resources was involved in activities which included:

- the Australian CVO (and current President of the World Organisation for Animal Health World Assembly) opened the inaugural Australian Veterinary Antimicrobial Stewardship Conference
- promoted simple actions to take to reduce the threat of AMR through a jointly released communique by the Australian Government CMO and the Australian CVO
- a global Twitter chat on AMR.

11.1.2 Antimicrobial resistance surveillance activities

A roundtable meeting with industry and other stakeholders in December 2014 led to the establishment of an AMR Surveillance Task Group to develop a proof-of-concept model for AMR surveillance in food animals. The model includes a requirement to have the capability to make the transition into an ongoing, self-sustaining program for the various food animal industries. Three proof-of-concept AMR surveillance projects in the pig, chicken meat and layer chicken industries were completed in mid-2018. They showed good results relating to the current prevalence of resistance against specified antimicrobial agents in one or more indicator organisms. It was noted that there were some areas for improvement. As expected, no resistance to colistin was found in these surveys. Following an initial workshop to raise awareness of AMR, a pilot survey for AMR is progressing in the salmon industry. Further departmental discussions with other intensive animal industries are anticipated to develop AMR surveillance activities.

Australian Pork Limited is working with partners AgriFutures Australia, Murdoch University, the University of Adelaide, Tecan Australia, Thermo Fisher Scientific, Illumina and New South Wales

165 www.amr.gov.au

166 www.agriculture.gov.au/animal/health/amr/antibiotic-awareness-week

Department of Primary Industries to deliver the *High throughput technology for defining antimicrobial resistance status in pork and chicken* project, funded under the Australian Government's Rural Research and Development for Profit program. The project aims to use robotics that work extremely quickly, precisely and cost effectively to provide efficient, accurate and inexpensive methods to determine on-farm bacterial AMR.

11.1.3 Antimicrobial usage and stewardship

Australian livestock industry production is mostly extensive, and there is limited use of antimicrobial agents for growth promotion in intensive industries. There is increasing momentum nationally and internationally from consumers and the medical community to address the use of antimicrobial agents for non-therapeutic and non-prophylactic purposes in animals. Following two departmental workshops held in December 2017, about phasing out growth-promotion claims from currently registered antimicrobial agents important for human health, there are now no products important for human health with such claims. There were very few antimicrobial growth promotants being used before this voluntary action was undertaken.

An ASTAG working group updated the *Importance ratings and summary of antibacterial uses in human and animal health in Australia* (the *Antibacterial importance ratings*) in June 2018. The ratings will undergo a further review to consider other requirements.

In mid-November, the inaugural Australian Veterinary Antimicrobial Stewardship Conference 2018 successfully hosted more than 170 delegates from government, animal health industries, key national animal food industry organisations, universities and veterinary practitioners. The Australian CVO and the Australian Government CMO opened the conference, with the Australian Government CMO making a presentation on the AMR activities undertaken by human health professionals. The conference proceedings are available[167] and the presentations are to be released.

The Australian Chicken Meat Federation, Meat & Livestock Australia, Australian Pork Limited, and Australian Eggs Limited have formed the Intensive Animal Antimicrobial Stewardship working group, which is actively discussing antimicrobial stewardship (AMS) efforts in each industry. An agreed stewardship framework has been developed for all parties to use as a basis for AMS activities. Each member of the working group has contributed to a compendium report to capture the historical and current AMS efforts of Australian livestock industries. The compendium report was released in November 2018 and can be found on the Animal Health Australia website.[168] The Australian Government has also funded an AMS project with the Veterinary Schools of Australia and New Zealand to develop an online education package on effective AMS practices for clinical veterinarians. The package will be made nationally available to veterinarians once finalised.

11.2 Public health surveillance for zoonotic diseases

11.2.1 Regulations for zoonoses

The suspicion or confirmation of nationally notifiable zoonoses are required to be reported to the agricultural authorities or a veterinarian in the originating state or territory. The relevant health authorities are also notified by the state or territory government.

A memorandum of understanding exists between the Department of Health and the Department of Agriculture and Water Resources to work together in the management of regulatory functions that have a direct or indirect impact on human health. They include regulatory functions related to the import of food and animal products, and management of disease outbreaks and emergencies, including the management of emerging and zoonotic diseases. Other portfolio agencies that may be called on include the Office of the Gene Technology Regulator, Food

167 docs.wixstatic.com/ugd/52dc54_acfc1da0c01f4cd18145e6de5686be41.pdf

168 www.animalhealthaustralia.com.au/antimicrobial-stewardship-in-australian-livestock-industries

Standards Australia New Zealand and the APVMA. For example, the Department of Health and the Department of Agriculture and Water Resources have commenced work on a National Action Plan for Health Security to address the recommendations arising from Australia's Joint External Evaluation of the International Health Regulations (2005).

11.2.2 Anthrax and brucellosis

Potential zoonotic diseases endemic in animals in Australia include anthrax and swine brucellosis. Anthrax is subject to government controls, including quarantine, disposal of carcasses, and vaccination and tracing of at-risk animals and their products. Areas at risk of anthrax occurrence are well defined, with a low prevalence and sporadic occurrence (see Section 4.6.1). Swine brucellosis resulting from infection with *Brucella suis* causes sterility and abortion in sows, and orchitis in boars. Other livestock species may be infected but do not show clinical signs; however, orchitis and other clinical signs have been seen occasionally in antibody-positive pig-hunting dogs. In Australia, feral pigs are the usual source of infection for humans. For investigations of anthrax and brucellosis, see Table 11.1 and Appendix C1.

11.2.3 Q fever

Q fever is another zoonotic disease, caused by the bacterium *Coxiella burnetii*, which leads to human health notifications in Australia. It is found in most countries worldwide, although not present in New Zealand. The primary route of infection for humans is airborne, usually from inhaling infected particles from animal birth products, urine, faeces and contaminated dust, or from ingestion of unpasteurised milk. Human Q fever infections are most often associated with exposure to livestock (cattle, sheep and goats), although cases have been reported from exposure to wildlife (kangaroos) and household pets (dogs and cats). Q fever became a nationally notifiable disease of humans in Australia in 1991.

The Australian Government, through the Department of Health, supports industry to manage the risk of Q fever by subsidising the production of the Q-VAX® Q fever vaccine and skin test kit to support its ongoing availability on the open market. The Department of Health monitors national notification rates of human Q fever through the National Notifiable Diseases Surveillance System (see Section 11.2.5). The Communicable Diseases Network Australia (CDNA) (Section 11.2.4) has national guidelines to assist with the public health management of Q fever cases. The guidelines are available from the Department of Health website.[169] The Department of Agriculture and Water Resources also monitors Q fever from an animal health perspective to provide assistance to the Department of Health when required.

11.2.4 Communicable Diseases Network Australia

The CDNA[170] provides national leadership and coordination for the surveillance, prevention and control of communicable human diseases that pose a threat to public health. Its members include the Australian Government (including the Department of Agriculture and Water Resources), state and territory governments, and key non-government organisations concerned with communicable diseases. The CDNA provides advice to governments and other bodies on public health strategies to minimise the effect of communicable diseases, and oversees the development of nationally consistent public health guidelines for responses to outbreaks of communicable diseases. The CDNA reports to the Australian Health Ministers' Advisory Council through the Australian Health Protection Principal Committee.

11.2.5 National Notifiable Diseases Surveillance System

The National Notifiable Diseases Surveillance System (NNDSS) coordinates the national surveillance of more than 50 communicable diseases or disease groups that can infect people. Notifications of these diseases and disease groups are made to the state or territory health authority, under the provisions of the public health legislation in each jurisdiction. De-identified unit records of notifications are then supplied to the Australian Government Department of Health for collation, analysis and publication. Publication channels

169 www.health.gov.au/internet/main/publishing.nsf/Content/cdna-song-q-fever.htm

170 www.health.gov.au/cdna

Table 11.1 Notifications of selected zoonotic diseases in humans

	Number of notifications		
Zoonotic disease	**2017**	**2018**	**5-year mean (2014–2018)**
Anthrax	0	0	0
Barmah Forest virus infection	449	340	497.4
Brucellosis	19	27	20.0
Kunjin virus infection	6	0	1.6
Leptospirosis	146	144	115.2
Murray Valley encephalitis virus infection	0	1	0.6
Ornithosis	21	10	22.0
Q fever	475	475	517.2

include the NNDSS website[171] (updated daily) and the quarterly journal *Communicable diseases intelligence*,[172] an online, peer-reviewed journal that disseminates information on the epidemiology of communicable diseases in Australia, including surveillance, prevention and control.

Data on five important zoonoses are also presented in *Animal health surveillance quarterly*.[173]

Table 11.1 shows the number of notifications of selected zoonotic diseases in 2018 and compares these data with those for 2017 and the five-year mean.

11.2.6 National Enteric Pathogens Surveillance Scheme

The National Enteric Pathogens Surveillance Scheme collates, analyses and disseminates (on request) data on enteric pathogens isolated from humans, animals, food, water, the environment and other sources. The scheme is operated and maintained by the Microbiological Diagnostic Unit at the University of Melbourne.

Scientists, diagnostic and reference laboratories, clinicians and public health professionals generate and contribute data acquired from both human and non-human sources relating to pathogens such as *Salmonella* spp., pathogenic *Escherichia coli*, *Yersinia* spp. and *Campylobacter* spp.

Data for human notifiable enteric pathogens are also reported within the NNDSS, whose data show that, as in recent years, the most frequently notified foodborne infections in 2018 were campylobacteriosis (31 089 notifications) and salmonellosis (14 119 notifications).[174]

171 www.health.gov.au/internet/main/publishing.nsf/Content/cda-surveil-nndss-nndssintro.htm

172 www.health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-cdi-cdiintro.htm

173 www.animalhealthaustralia.com.au/our-publications/animal-health-surveillance-quarterly

174 www9.health.gov.au/cda/source/cda-index.cfm. Based on data extracted from the National Notifiable Diseases Surveillance System (NNDSS), 15 January 2019. Due to the dynamic nature of the NNDSS, data in this extract are subject to retrospective revision and may vary from data reported in published NNDSS reports and reports of notification data by states and territories.

Image credit: iStock

Image credit: Shutterstock

12

CONSUMER PROTECTION – FOOD

Food must be safe, whether it is imported, exported or traded domestically. The Australian Government, state and territory regulatory authorities, and the food industry work together to ensure the safety of food consumed in Australia or exported.

Food Standards Australia New Zealand (FSANZ),[175] the Australian Government Department of Agriculture and Water Resources,[176] the Australian Government Department of Health,[177] food regulators across state and territory government authorities,[178] and Animal Health Australia[179] all undertake activities to protect public health and safety. These activities include:

- developing nationally consistent food standards
- monitoring microbial pathogens, chemical residues and environmental contaminants in products
- implementing and managing systems that deliver hygienic food products to the marketplace
- monitoring and surveillance to identify, prevent and control outbreaks of foodborne illness.

175 www.foodstandards.gov.au
176 www.agriculture.gov.au
177 www.health.gov.au
178 foodregulation.gov.au
179 www.animalhealthaustralia.com.au

12.1 National arrangements and consultation

The Australian and New Zealand joint food regulation system is made up of laws, policies, standards and processes that ensure our food is safe to eat. The four key parts of the system are policy development, standards development, implementation and enforcement of standards, and responding to food incidents.

Policy which is agreed by the Australia and New Zealand Ministerial Forum on Food Regulation is taken into account by FSANZ when it develops food standards for the *Australia New Zealand Food Standards Code* (the Code). The forum is chaired by the Australian Assistant Minister for Health (or delegate) and consists of representatives from the Australian, state and territory, and New Zealand governments.

Australian food safety policies focus on a 'farm to fork' preventive approach, to ensure that risks to public health are managed at the most effective point in the food supply chain. This builds consumer confidence, safeguards international trade in food and improves levels of food safety.

12.2 Food standards

12.2.1 Australian and New Zealand standards

The food standards in the Code cover food additives, processing aids, novel foods, foods produced using gene technology, vitamins and minerals, irradiated foods, special purpose foods (such as infant formula), commodity standards and contaminants.

The standards include labelling requirements for both packaged and unpackaged foods, for example including specific mandatory warnings or advisory labels. Mandatory declarations of allergens apply to all packaged foods containing a defined list of substances as ingredients, food additives or processing aids.

The Code also contains Australian-only standards in Chapter 3 (Food safety standards) and Chapter 4 (Primary production and processing standards). Chapter 3 contains food safety standards that place obligations on all Australian food businesses to produce food that is safe and suitable to eat. The standards, which also contain health and hygiene obligations for food handlers, aim to lower the incidence of foodborne illness.

Chapter 4 of the Code contains primary production and processing standards for the primary production sector. These standards aim to strengthen food safety and traceability throughout the food supply chain, from paddock to plate. Standards are in place for seafood, meat and meat products (including game meat, ready-to-eat meat and poultry meat), dairy products (including raw milk dairy products), eggs and egg products, and seed sprouts.

12.2.2 International standards – Codex Alimentarius Commission

The international body for setting food standards, Codex Alimentarius Commission, was established by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO).

Codex develops internationally recognised food standards, guidelines, codes of practice and other recommendations relating to foods, food production and food safety. These aim to protect the health of consumers and ensure fair practices in international food trade.

Australia plays a strong leadership role in developing international evidence-based food standards through Codex and its subsidiary bodies. Australia also contributes to the work of Codex committees dealing with export inspection and certification, food additives and contaminants, animal feed, residues of veterinary drugs and pesticides, food hygiene, food labelling, nutrition and food for special dietary uses.

12.2.3 Scientifically based risk-analysis process

Changes in the food supply resulting from new technologies, expanding trade opportunities, ethnic diversity and changing diets mean that

government, industry and consumers must be vigilant to maintain food safety.

FSANZ uses an internationally accepted risk-analysis process to develop standards, and to assess, manage and communicate food-related health risks. This applies to monitoring and surveillance activities, assessing food technology practices and considering emerging food safety issues. Use of the risk-analysis process ensures effective regulatory decisions and encourages communication between all interested parties, including consumers.

The FSANZ risk-analysis process (Figure 12.1) includes:

- risk assessment: determining the likelihood and severity of hazards
- risk management: weighing and selecting management options of greatest net benefit to the community in a consultative decision-making process
- risk communication: ensuring that stakeholders are aware of, and understand, the risk being addressed and the control measures.

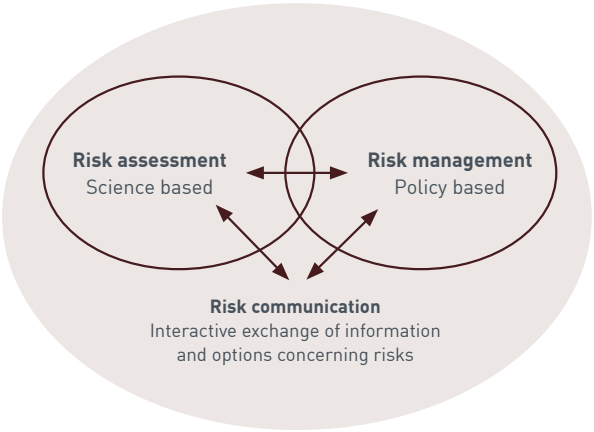


Figure 12.1 Risk-analysis process[180]

12.2.4 FSANZ applications and proposals

Any individual, business or organisation can apply to FSANZ to amend the Code. Applicants are legislatively obliged to provide certain information and data to support their application according to a published application handbook. FSANZ can also initiate action to amend the Code for public health and safety reasons by initiating a proposal to amend the Code.

12.3 Hazard limits in food

12.3.1 Microbiological limits

FSANZ periodically reviews the role of microbiological testing and the use of existing microbiological limits in food safety management. Internationally recognised principles, such as those of Codex, are used to review microbiological criteria and establish criteria for food safety and process hygiene.

Guidance is continually being developed and refined for applying microbiological criteria in the context of through-chain controls (i.e. food safety standards and primary production and processing standards already in the Code) to:

- support and verify effective application of controls
- provide information to food business operators about microbiological levels that should be achieved when best practices are applied
- help identify situations (products and processes) requiring investigative and/or control action.

12.3.2 Maximum residue limits

FSANZ and the Australian Pesticides and Veterinary Medicines Authority have shared responsibilities for establishing the maximum residue limits (MRLs) for agricultural and veterinary chemicals listed in Schedule 20 of the Code. This is an Australia-only standard.

MRLs are set using internationally recognised methodology, consistent with Codex guidelines, for specific combinations of chemicals and food commodities. This involves a rigorous risk assessment including case-by-case dietary exposure assessments (see Section 12.9). The process is methodical, streamlined and transparent, and includes public consultation. Domestic MRLs, including those arising from requests from stakeholders for food import purposes (import MRLs), are included in the Code only if the level of chemical residue in the food does not pose any health and safety risks to consumers.

180 www.foodstandards.gov.au/publications/riskanalysisfoodregulation/Pages/default.aspx

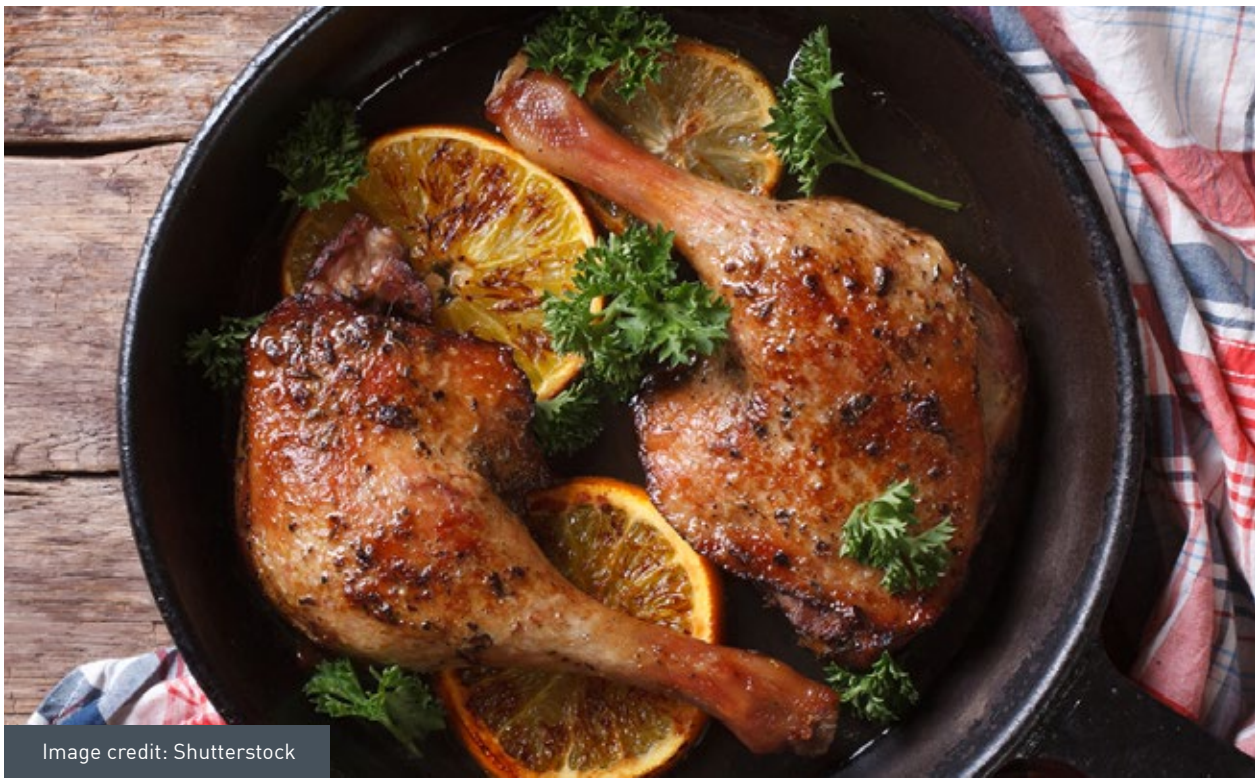


Image credit: Shutterstock

12.3.3 Contaminant levels

FSANZ sets maximum levels for specific metal and non-metal contaminants and natural toxicants in nominated foods. Despite the maximum levels outlined in Standard 1.4.1 of the Code, the principle of 'as low as reasonably achievable' applies to levels of contaminants in all foods. The levels set are based on international methodologies and best practice, such as those of the Joint FAO/WHO Expert Committee on Food Additives and the Codex Committee on Contaminants in Food, and are consistent with public health and safety requirements.

12.4 National response framework

The entire food regulatory system needs to be able to respond rapidly to food emergencies resulting from a variety of food safety risks.[181] A food incident is defined as 'any situation within the food supply chain where there is a risk or potential risk of illness or confirmed illness or injury associated with the consumption of a food or foods.' A national food incident is defined as 'a food incident that could, or is expected to, impact on multiple government jurisdictions…'.

A food incident can be identified in several ways, for example, food recalls; investigation of a multi-jurisdictional disease outbreak; and information provided directly from industry or the Australian, state, territory and local government agencies that are responsible for food safety.

It is vital that government and industry work together during an incident. The appropriate government and industry groups need to be alerted as early as possible to an emerging issue, so that necessary action can occur. This is critical to maintaining the confidence of consumers and trading partners, and reducing the flow-on effects on resources. One of the main ways that industry can be prepared for an incident is to have a recall plan that clearly defines roles and responsibilities, and ensures that businesses can respond quickly when necessary.

FSANZ maintains close contact with Australia's international partners, and is an active participant in the FAO/WHO International Food Safety Authorities Network (INFOSAN).[182]

181 foodregulation.gov.au/internet/fr/publishing.nsf/Content/incident-response

182 www.who.int/foodsafety/areas_work/infosan/en

Recent domestic and international food incidents have highlighted the importance of traceability. The complexity of supply chains makes the process of product tracking slow and inefficient in times of crisis. Chapter 3 and Chapter 4 of the Code specify requirements for food businesses to ensure that they can trace food that they receive and sell. These requirements are consistent with international (Codex) principles of being able to trace food products 'one step back' and 'one step forward' in the food supply chain.

When a national food incident occurs, action is coordinated through the Bi-National Food Safety Network, which comprises the Australian, state and territory, and New Zealand food enforcement agencies, and FSANZ.

Responses to food incidents are implemented under food laws and response plans or protocols in the states and territories, and the New Zealand Ministry for Primary Industries. In some cases, the National Food Incident Response Protocol will be triggered. The Protocol provides guidance on the response to national food incidents linked to microbiological, chemical, radiological, physical or unknown hazards. It provides a link between various government emergency response protocols.

12.5 Food recalls

A food recall removes food that may pose a health or safety risk from distribution, sale and consumption. FSANZ coordinates and monitors food recalls in Australia. Recalls occur as a result of consultation between state and territory governments and a sponsor (usually the food product's manufacturer or importer).

A food recall may occur because of a report or complaint from a manufacturer, wholesaler, retailer, government or consumer. It may also occur as a result of internal testing and auditing by a food business. Food recalls can be at the trade or consumer level. A food withdrawal, which is different from a food recall, removes food from the supply chain for reasons other than protection of public health and safety, for example, if the food is underweight compared to label information.

When a food safety issue is identified, food businesses must be able to quickly remove unsafe food from the marketplace to protect the health and safety of consumers. FSANZ helps food businesses to recall unsafe food in Australia by communicating recall information to state and territory government agencies and industry groups. Food businesses are responsible for ensuring that the public is notified of a recall.

In September 2018, a consumer-level food recall (see Figure 12.2) was initiated for fresh, whole-shell eggs available in small retailers across the Sydney basin.[183]

This recall was associated with an outbreak of salmonellosis in people, and was an outcome of the joint New South Wales Health and New South Wales Food Authority investigations.[184]

The New South Wales Department of Primary Industries issued a biosecurity direction on the farm to restrict movement of livestock, eggs, manure and disposables and order the disinfection and decontamination of equipment. This is consistent with the *Salmonella* Enteritidis Response Plan.[185]

Figure 12.2 Consumer-level food recall

183 www.foodauthority.nsw.gov.au/news/newsandmedia/departmental/2018-09-08-farm-recalls-eggs-investigation

184 www.health.nsw.gov.au/Infectious/alerts/Pages/enteritidis-eggs-2018.aspx

185 www.australianeggs.org.au/what-we-do/leading-research/salmonella-enteridis-response-plan

Salmonella Enteritidis is not endemic in Australian layer flocks (see Section 3.6.8).

12.6 Bovine spongiform encephalopathy control for beef imports

Bovine spongiform encephalopathy (BSE) is a transmissible and fatal neurodegenerative disease that affects cattle. Variant Creutzfeldt–Jakob disease, a rare and fatal human neurodegenerative condition, results from exposure to the BSE infective agent by consumption of beef or beef products that are contaminated with the infective agent. Since BSE was identified as a major risk to human health in 1996, Australia has had comprehensive arrangements in place to protect consumers from exposure to the BSE infective agent through contaminated food. Clause 12 of Standard 2.2.1 of the Code specifies that only bovine meat and meat products derived from animals free from BSE can be sold in Australia.

In 2009, the Australian Government announced a revised policy on BSE that established new requirements for imported beef and beef products. Under this policy, which was implemented in March 2010, countries wishing to export beef to Australia must apply to the Australian BSE Food Safety Assessment Committee for a country BSE food safety assessment. FSANZ completes the assessment, which includes, when necessary, an in-country inspection. An in-country inspection examines the effectiveness of BSE-preventive measures in the exporting country to ensure the safety of beef and beef products to be exported to Australia. In addition, the Department of Agriculture and Water Resources conducts biosecurity risk analysis for countries wishing to export fresh beef (chilled or frozen) to Australia and implements import certification requirements at the border.

Under the revised policy, FSANZ has completed BSE food safety assessments for Argentina, Brazil, Chile, Croatia, Japan, Latvia, Lithuania, Mexico, New Zealand, the Netherlands, Sweden, the United States and Vanuatu. The BSE risk status assigned to these countries, together with the full assessment reports, can be found on the FSANZ website.[186] Applicant countries that are assigned a Category 1 or Category 2 BSE food safety risk status are eligible to export certain beef products to Australia (e.g. heat-treated, shelf-stable beef and beef products). These countries are required to provide an annual update of BSE surveillance and BSE control information to FSANZ.

12.7 Imported food risk assessment

The Department of Agriculture and Water Resources inspects imported food to check that it meets Australian public health and safety requirements, and that it complies with the Code.

There are biosecurity restrictions on food such as meat, fruit, eggs, vegetables and dairy products from certain countries. Any foods that do not meet biosecurity requirements are not allowed into Australia.

FSANZ provides risk-assessment advice to the Department of Agriculture and Water Resources on the level of public health risk associated with imported food. The Department of Agriculture and Water Resources uses this risk advice to determine appropriate risk-management measures at the Australian border for imported food products.

FSANZ has completed a review of 'risk category' foods (i.e. medium-to-high risk, as listed in the Imported Food Control Order 2001), and is now focusing on other foods and hazards that potentially pose a medium-to-high risk to public health and safety. The completed risk advice is published on the FSANZ website.[187]

12.8 International engagement

Collaboration with international agencies involved in ensuring food safety is extremely important, given the global trade in food. FSANZ collaborates with many international scientific and regulatory

186 www.foodstandards.gov.au/industry/bse/bsestatus/Pages/default.aspx

187 www.foodstandards.gov.au/consumer/importedfoods/Pages/FSANZ-advice-on-imported-food.aspx

bodies to develop methods for data collection and analysis. Although food-related risks around the world may vary, sharing information, data and best practices on food regulatory science can promote consistent approaches to analysing risk.

The Asia–Pacific Economic Cooperation Food Safety Cooperation Forum (FSCF) seeks to build robust food safety systems in the Asia–Pacific region. The Forum, whose members represent food safety regulators, is co-chaired by Australia (through FSANZ) and China. During 2017 the FSCF held its biennial conference, and in 2017 and 2018 held several technical workshops.

Australian Government representatives, including from FSANZ and the Department of Agriculture and Water Resources, actively lead and participate in various Codex committees (see Section 12.2.2).

FSANZ also supports the work of WHO and the FAO by participating in expert committees and meetings. These include the Joint FAO/WHO Expert Committee on Food Additives and the Joint FAO/WHO Meeting on Pesticide Residues.

In addition, FSANZ collaborates extensively with other international risk-assessment and regulatory agencies through established networks such as the International Food Chemical Safety Liaison Group, the International Microbiological Food Safety Liaison Group, the Food Safety Regulatory Economics Working Group and the Social Sciences International Liaison Group, which comprise international experts in their given areas.

12.9 Dietary exposure assessment

Dietary exposure assessments are a key part of FSANZ's risk-assessment and risk-analysis process, which contributes to evidence-based decision making. A dietary exposure assessment estimates how much of a food chemical a population, or population subgroup, consumes. FSANZ uses internationally accepted dietary modelling techniques for the dietary exposure assessments. These assessments consider the potential exposure of the Australian and New Zealand populations to chemicals such as food additives, pesticide and veterinary chemical residues and other chemical contaminants, as well as nutrients, food ingredients and other substances that have a nutritional or health purpose.

Dietary exposure to (or intake of) food chemicals is estimated by combining the amount of food consumed with the concentration of the food chemical, and includes all foods that contain the chemical of interest. The estimated dietary exposure to a food chemical is compared with a known health-based guidance value to determine the potential level of risk to the population.

Health-based guidance values indicate the amount of the substance that can be consumed daily, weekly or monthly without adverse health effects. One example of a health-based guidance value is an acceptable daily intake, which is used for pesticides and veterinary drugs.

The food consumption data used for dietary exposure assessments are derived from the latest national nutrition surveys in Australia and New Zealand. The data contain information from individual records about specific foods and amounts consumed over either one or two days. Concentrations of food chemicals in both plant-based and animal-based products consumed in the diet are obtained from several sources. These may include analysis of foods through food surveys or monitoring programs, food manufacturers' levels of use of food additives, agricultural trials, and/or maximum levels established in the Code.

Estimated dietary exposures and information about the main dietary sources of food chemicals provide essential information for standards setting, and enable targeted planning for food survey and monitoring programs to better ensure consumer health and safety. In some instances, FSANZ may provide consumer advice on the consumption of certain foods due to the presence of chemicals, for example, certain fish species which may contain high levels of mercury.

12.10 Monitoring safety of the food supply

The Australian Government and state and territory food safety authorities routinely audit, inspect and monitor the food supply to ensure its safety for

consumers. Good hygienic practices and food safety systems, based on the principles of hazard analysis and critical control points (HACCP), are used to ensure that meat, dairy, seafood, eggs and the products derived from these commodities are safe for human consumption.

Premises used for processing and storing these types of foods for export must be registered with the Department of Agriculture and Water Resources. FSANZ and Australian and New Zealand government agencies continuously monitor the food supply to ensure that it is safe, and that foods comply with standards for microbiological contaminants, pesticide residues and chemical contamination. FSANZ monitors nutrients in the Australian food supply, compiling the results in databases that are available to the public through the FSANZ website.

FSANZ also collects food surveillance data, including the results of general compliance testing and more targeted surveys conducted by public health units in jurisdictions across Australia and New Zealand. Australia's most comprehensive assessment of consumers' dietary exposure to pesticide residues, contaminants and other substances is the Australian Total Diet Study (formerly the Australian Market Basket Survey). This study is conducted at regular intervals, every two to three years, to monitor the national food supply to ensure that existing food regulatory measures adequately protect consumer health and safety.

FSANZ may also undertake food analytical surveys as part of its work on the Code, for example, when it develops food additive standards or in response to emerging issues and national food incidents.

Other Australian food regulatory agencies undertake regular monitoring activities that may inform FSANZ's process for setting standards. For example, under the National Residue Survey, the Department of Agriculture and Water Resources tests food for export for residues of agricultural and veterinary chemicals and environmental contaminants.

12.11 Foodborne disease surveillance

12.11.1 OzFoodNet

OzFoodNet[188] was established to improve the national surveillance of foodborne disease. This collaborative network of epidemiologists, microbiologists and food safety specialists conducts applied research into foodborne disease and methods for improving surveillance. Reports from OzFoodNet are provided fortnightly to the Communicable Diseases Network Australia (CDNA)[189] (see Section 11.2.4) and are published in *Communicable diseases intelligence*, a quarterly publication of the Department of Health.

OzFoodNet identifies outbreaks, and provides early warning, of foodborne illnesses in Australia. It ensures a consistent national response to such outbreaks, and reduces the number of incidents and spread of foodborne illness by prompt preventive action.

188 health.gov.au/internet/main/publishing.nsf/Content/cdna-ozfoodnet.htm

189 www.health.gov.au/cdna

Image credit: Shutterstock

Image credit: Department of Agriculture and Water Resources

13

REGIONAL ANIMAL HEALTH INITIATIVES

This chapter summarises Australia's main areas of international engagement in terrestrial animal health in the Asia–Pacific region and Africa.

Australia supports animal health surveillance, capacity building, and aid and research activities in neighbouring countries, the Asia–Pacific region and some parts of Africa. These activities occur in partnership with overseas government agencies, veterinary associations and private organisations. Animal health surveillance and capacity-building initiatives aim to provide early warning and increase preparedness for important animal pests and diseases, including zoonoses. Information on regional aquatic animal health initiatives is provided in Chapter 5.

Aid and research activities are primarily resourced through the Australian Government Department of Foreign Affairs and Trade (DFAT)[190] and the Australian Centre for International Agricultural Research (ACIAR)[191] and aim to improve livelihoods in partner countries.

190 dfat.gov.au/aid

191 aciar.gov.au

13.1 Pre-border surveillance and capacity building

13.1.1 Papua New Guinea and Timor-Leste

Australia assists its near neighbours Papua New Guinea (PNG) and Timor-Leste with field surveillance for significant animal diseases and capacity-building activities to support exotic animal disease awareness, preparedness and response.

The Australian Government Department of Agriculture and Water Resources undertakes these activities in partnership with the PNG National Agriculture Quarantine and Inspection Authority (NAQIA) and the Timor-Leste Ministry of Agriculture and Fisheries (MAF).

In 2018, collaborative animal health surveys took place in:

- West Sepik and Madang Provinces, PNG
- Cova Lima Municipality, Timor-Leste.

Survey participants developed skills in surveillance and communication via increased public awareness, thus improving animal health management in the region. They also increase the abilities of the PNG NAQIA and the Timor-Leste MAF to identify and respond to animal disease emergencies, thus helping to mitigate exotic animal disease threats to Australia.

The Department of Agriculture and Water Resources also funded the following activities through the **Agricultural Competiveness White Paper**:

- an animal health survey of south coast villages of the South Fly District, Western Province, PNG
- continued management of sentinel cattle herds in Timor-Leste and PNG to provide early warning for significant animal diseases
- a joint surveillance activity to support PNG NAQIA's response to the detection of pigs with antibodies to Aujeszky's disease
- training for data kit use in PNG and Timor-Leste to improve data collection and quality from surveillance activities
- biosecurity and surveillance knowledge training for animal health staff in PNG and Timor-Leste
- animal health surveys delivered independently by PNG NAQIA and Timor-Leste MAF
- laboratory testing to support animal disease investigations undertaken by PNG NAQIA in West Sepik and Madang Provinces, PNG
- environmental sampling of wild water birds in PNG for avian influenza surveillance.

These activities provide valuable intelligence about the presence, distribution and risk pathways of animal diseases that are important to neighbouring countries.

13.2 Overseas aid

The Indo-Pacific region includes recognised hotspots for emerging infectious diseases, 75% of which originate in animals. Many countries also have underdeveloped human and animal health systems, rendering the region vulnerable to rapidly spreading and dangerous emerging infectious diseases. A major disease outbreak would have severe health and economic implications for Australia and its neighbours and trading partners, potentially costing lives and disrupting regional trade, tourism and development. DFAT currently fund the Indo-Pacific Centre for Health Security[192] and the Live Animal Marketing and Production activity[193] which support relevant projects in partner countries (see websites for further details).

13.2.1 Partnering with the World Organisation for Animal Health

Australia is fortunate to be free from many serious diseases of livestock, and enjoys advantages in export markets because of this. Diseases such as foot-and-mouth disease, rabies and avian influenza, among others, are spreading in South East Asia, and pose a risk to the health and welfare of Australian animals and the community. Controlling diseases at their source is important to reduce the risks to Australian agriculture, and also has benefits to farmers in South East Asia.

192 indopacifichealthsecurity.dfat.gov.au

193 dfat.gov.au/geo/east-asia/development-assistance/Pages/health-assistance-south-east-asia-region.aspx

Following the conclusion of the Stop Transboundary Animal Diseases and Zoonoses Initiative in 2017, the Department of Agriculture and Water Resources commenced discussions on a project with the World Organisation for Animal Health (OIE) to improve the capacity of veterinary services in the South East Asian region to prevent, detect and control incursions of emergency animal diseases. It is expected that the Department of Agriculture and Water Resources will enter into a multi-year arrangement with OIE in early 2019.

13.2.2 Australia Indonesia Partnership for Emerging Infectious Diseases

The objective of the Australia Indonesia Partnership for Emerging Infectious Diseases (AIP-EID) animal health program was to strengthen the Indonesian government's veterinary services to prevent and control emerging infectious diseases (EIDs). Guided by the principles of partnership and sustainability, the AIP-EID program delivered outcomes of mutual benefit to Australia, Indonesia and the region. These outcomes supported animal health and biosecurity, public health, food security and economic development. The Program officially closed on 30 September 2018. The Program was funded by DFAT and implemented by the Australian Government Department of Agriculture and Water Resources in partnership with the Indonesian Ministry of Agriculture.

The AIP-EID animal health program was a sub-program of the wider Australia Indonesia Partnership for Emerging Infectious Diseases. AIP-EID had three components designed around three high-level goals:

- emergency preparedness and response: the Indonesian government now has stronger systems for preparation and rapid response to animal health and public health emergencies
- animal health information system: the Indonesian government animal health information system and public health surveillance systems are strengthened and used effectively
- core veterinary leadership and management: institutions and key individuals have improved their performance in leadership, management and evidence-based decision-making.

In the emergency preparedness and response component, AIP-EID has contributed to improved guidelines, procedures and funding mechanisms within the Ministry of Agriculture, which have been tested through simulation exercises involving whole-of-government collaboration.

The Integrated Animal Health Information System (iSIKHNAS), developed through AIP-EID during Phase 1, is now the main information system for monitoring animal health and production in Indonesia. In some districts, it has replaced manual reporting, beginning to support evidence-based policy development and advocacy, more effective veterinary service delivery, improved disease-control programs and better allocation of resources. The Ministry of Agriculture has acquired systems management and development skills for sustaining iSIKHNAS into the future.

In the core veterinary leadership and management component, the enhanced skills in evidence-based policy making, effective communication and program management gained through the Indonesian Veterinary Leadership course has continued to enable graduates from the government and academic sectors to achieve leadership positions. Course graduates have reported positive changes at individual, team and organisational levels.

13.3 International animal health research

13.3.1 ACIAR livestock systems program

ACIAR's livestock systems program supports research organisations in Australia and partner countries to use multi-disciplinary approaches to solve problems in animal production and health in the Asia–Pacific and African regions. Progress and final reports of projects are published on the ACIAR website[194] and via social media and other platforms.

194 www.aciar.gov.au

Image credit: Arthur Mostead

APPENDICES

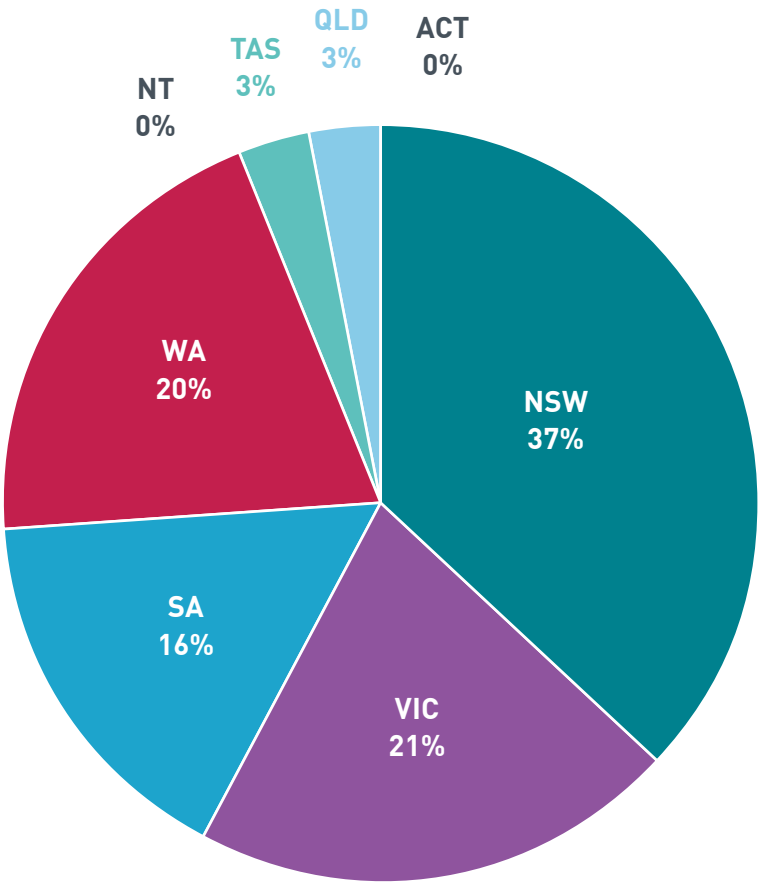
APPENDIX A
LIVESTOCK INDUSTRIES IN AUSTRALIA

Table A1 Sheep and cattle numbers by state, 2016–17

	Unit	Qld	NSW	Vic	SA	WA	Tas	NT	ACT	National
Sheep	'000 head	2108	26 929	15 203	11 506	14 222	2082	22	53	72 125
Beef cattle	'000 head	10 993	4992	1981	956	1993	461	2189	5	23 570
Dairy cattle	'000 head	151	295	1629	127	135	269	-	-	2606

Source: Australian Bureau of Statistics.

Figure A1 Sheep flock by state, 2016–17*



*2017-18 figures were not readily available at time of print and will be provided in the 2019 edition.

Figure A2 Beef cattle herd by state, 2016–17*

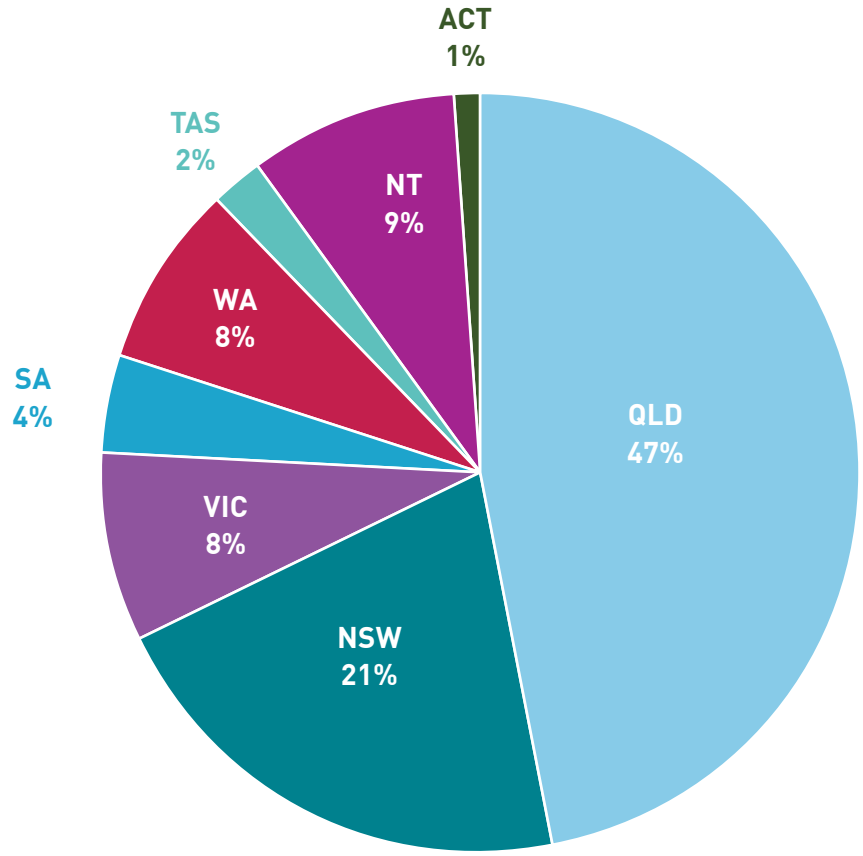
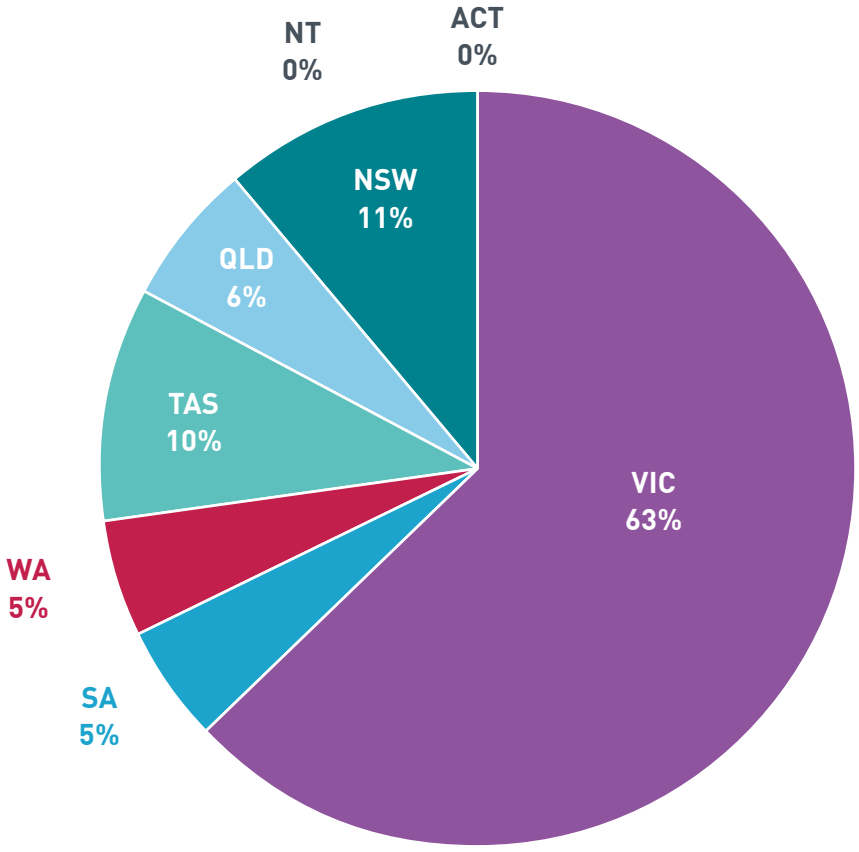


Figure A3 Dairy cattle herd by state, 2016–17*



*2017-18 figures were not readily available at time of print and will be provided in the 2019 edition.

Table A2 Australian livestock statistics

	Unit	2015–16	2016–17	2017–18[s]
Livestock numbers				
Sheep	'000 head	67 543	70 156	68 800
Beef cattle	'000 head	22 306	23 312	23 206
Dairy cattle	'000 head	2665	2600	2640
Total cattle	'000 head	24 971	25 912	25 846
Pigs	'000 head	2294	2381	2504
Livestock slaughterings				
Sheep	'000 head	8127	6553	8396
Lamb	'000 head	23 131	22 344	23 432
Cattle and calves	'000 head	8796	7423	7913
Pigs	'000 head	5000	5160	5378
Chickens	million	623	653	636
Goats	'000 head	2158	2087	1995
Meat produced[a]				
Mutton	kt (cw*)	196	163	204
Lamb	kt (cw)	516	506	531
Beef and veal	kt (cw)	2344	2069	2238
Pork	kt (cw)	378	397	417
Poultry	kt (cw)	1191	1230	1193
Goat meat	kt (cw)	33	33	29
Livestock products				
Wool[b]	kt (gr. eq.**)	404	414	422
Milk[c]	mL	9679	9015	9289
Eggs	million dozen	329	335	343
Meat exports				
Mutton	kt (sw***)	156	135	177
Lamb	kt (sw)	261	255	280
Beef and veal	kt (sw)	1196	991	1122
Pig meat	kt (sw)	28	31	35
Chicken meat	kt (sw)	27	35	37
Goat meat	kt (sw)	30	29	25
Kangaroo meat	kt (sw)	3	3	3
Camel meat	kt (sw)	1	1	1

cont.

	Unit	2015–16	2016–17	2017–18[s]
Live animal exports				
Sheep[d]	'000 head	1859	1851	1975
Feeder/slaughter cattle[e]	'000 head	1114	817	885
Breeder cattle[f]	'000 head	144	99	96
Goats	'000 head	81	30	19
Camels	head	273	584	2584
Buffalo	head	1838	3672	6166
Gross value of livestock production				
Sheep[g]	$m	535	678	853
Lamb[g]	$m	2477	2998	3265
Cattle and calves[g,h]	$m	11 536	10 783	9997
Pigs[g]	$m	1353	1355	1092
Poultry	$m	2748	2857	2672
Goats	$m	167	203	142
Cattle exported live[i]	$m	1551	1199	1268
Sheep exported live[d]	$m	228	233	259
Goats exported live	$m	10	5	5
Wool[b]	$m	2965	3397	4297
Milk[j]	$m	4282	3687	4273
Eggs	$m	783	808	823

*cw = carcase weight

**gr. eq. = greasy equivalent

***sw = shipped weight

a Includes carcase equivalent of canned meats.

b Includes shorn wool (includes crutching), dead and fellmongered wool, and wool exported on skins.

c Includes the whole milk equivalent of farm cream intake.

d Includes breeding stock.

e Includes buffalo.

f Includes dairy cattle and buffalo.

g Excludes skin and hide values.

h Includes dairy cattle slaughtered.

i Includes all bovine for feeder/slaughter, breeding and dairy purposes.

j Milk intake by factories and valued at the farm gate.

s ABARES estimate.

Source: Australian Bureau of Statistics.

Table A3 Australian fisheries production

	Unit	2014–15	2015–16	2016–17
Volume of fisheries production				
Tuna	kt	12	14	12
Salmonids[a]	kt	49	56	53
Other fish	kt	102	123	114
Prawns	kt	25	25	26
Rock lobster	kt	10	10	11
Crab	kt	5	5	5
Other crustaceans	kt	1	1	1
Abalone	kt	5	4	4
Scallop	kt	4	5	6
Oyster	kt	13	11	12
Squid	kt	2	2	2
Other molluscs	kt	5	5	6
Other nei*	kt	6	5	4
Total	**kt**	**239**	**266**	**255**
Value of fisheries production				
Tuna	$m	161	171	148
Salmonids[a]	$m	631	718	756
Other fish	$m	435	523	508
Prawns	$m	365	388	396
Rock lobster	$m	668	695	673
Crab	$m	55	53	57
Other crustaceans	$m	10	11	13
Abalone	$m	164	160	177
Scallop	$m	11	14	24
Oyster	$m	93	97	112
Squid	$m	12	13	15
Other molluscs	$m	97	107	103
Other nei*	$m	68	77	75
Total	**$m**	**2769**	**3026**	**3058**
Exports of fisheries production				
Edible – volume[b]	kt	43	62	51
Edible – value[b]	$m	1293	1418	1333
Non-edible – value	$m	147	123	103

a Includes salmon and trout production.

b Excludes live tonnage but includes live value.

*not elsewhere included

Sources: ABARES; Australian Fisheries Management Authority; Australian Bureau of Statistics; Department of Fisheries, Western Australia; Department of Primary Industries, New South Wales; Department of Primary Industries, Parks, Water and Environment, Tasmania; Fisheries Queensland, Department of Agriculture, Fisheries and Forestry; Fisheries Victoria, Department of Environment and Primary Industries; Northern Territory Department of Primary Industry and Fisheries; Primary Industries and Regions, South Australia; South Australian Research and Development Institute

Image credit: Shutterstock

Table A4 Australian aquaculture production[a]				
	Unit	2014–15	2015–16	2016–17
Volume				
Fish				
Salmonids[b]	kt	49	56	53
Tuna	kt	8	9	8
Silver perch	kt	0	0	0
Barramundi	kt	4	4	4
Other[c]	kt	2	3	3
Total	**kt**	**63**	**72**	**68**
Crustaceans				
Prawns	t	5282	4628	4624
Yabby	t	34	20	29
Marron	t	64	56	55
Redclaw	t	45	51	65
Total	**t**	**5426**	**4755**	**4774**
Molluscs				
Edible oyster	kt	11	11	12
Pearl oyster	kt	-	-	-
Abalone	kt	1	1	1
Blue mussel	kt	4	4	4
Total	**kt**	**15**	**16**	**17**
Production not included elsewhere[d]	**kt**	**6**	**5**	**4**
Total (all categories)	**kt**	**89**	**97**	**94**
Value				
Fish				
Salmonids[b]	$m	631	718	756
Tuna	$m	131	127	115
Silver perch	$m	4	5	4
Barramundi	$m	37	35	41
Other[c]	$m	26	41	38
Total	**$m**	**829**	**925**	**954**

cont.

	Unit	2014–15	2015–16	2016–17
Crustaceans				
Prawns	$m	86	86	86
Yabby	$m	1	1	1
Marron	$m	2	2	2
Redclaw	$m	1	1	2
Total	**$m**	**90**	**90**	**90**
Molluscs				
Edible oyster	$m	93	97	112
Pearl oyster	$m	68	78	70
Abalone	$m	29	29	34
Blue mussel	$m	12	11	12
Total	**$m**	**201**	**215**	**229**
Production not included elsewhere[d]	**$m**	**66**	**76**	**74**
Total (all categories)	**$m**	**1187**	**1307**	**1347**

a Excludes hatchery production, crocodiles, microalgae and aquarium worms.

b Includes salmon and trout production.

c Includes eel, other native fish and aquarium fish.

d Includes aquaculture production not elsewhere specified because of confidentiality restrictions. In Victoria, this includes warmwater finfish, ornamental fish, other shellfish, shrimps and aquatic worms.

Sources: ABARES; Australian Fisheries Management Authority; Department of Fisheries, Western Australia; Department of Primary Industries, New South Wales; Department of Primary Industries, Parks, Water and Environment, Tasmania; Fisheries Queensland, Department of Agriculture, Fisheries and Forestry; Fisheries Victoria, Department of Environment and Primary Industries; Northern Territory Department of Primary Industry and Fisheries; Primary Industries and Regions, South Australia; South Australian Research and Development Institute

APPENDIX B
KEY AUSTRALIAN ANIMAL HEALTH WEBSITES

Accreditation Program for Australian Veterinarians	www.animalhealthaustralia.com.au/training-centre/accreditation-program-for-australian-veterinarians-apav
AgriFutures Australia	www.agrifutures.com.au
Animal Health Australia	www.animalhealthaustralia.com.au
Animal Health Surveillance Quarterly	www.animalhealthaustralia.com.au/our-publications/animal-health-surveillance-quarterly
Animal Research Centre, University of the Sunshine Coast	www.usc.edu.au/research-and-innovation/animal-and-marine-ecology/the-animal-research-centre
AQUAPLAN	www.agriculture.gov.au/animal/aquatic/aquaplan
AQUAVETPLAN	www.agriculture.gov.au/animal/aquatic/aquavetplan
AUS-MEAT Limited	www.ausmeat.com.au
Australasian Veterinary Boards Council	www.avbc.asn.au
Australia's animal health laboratory network	www.agriculture.gov.au/animal/health/system/lab-network
Australian Alpaca Association	www.alpaca.asn.au
Australian and New Zealand College of Veterinary Scientists	www.anzcvs.org.au
Australian Centre for International Agricultural Research	www.aciar.gov.au
Australian Chicken Meat Federation	www.chicken.org.au
Australian Chief Veterinary Officer	www.agriculture.gov.au/animal/health/acvo
Australian Dairy Farmers	www.australiandairyfarmers.com.au
Australian Eggs Limited	www.australianeggs.org.au
Australian Food & Grocery Council	www.afgc.org.au
Australian Government Department of Agriculture and Water Resources	www.agriculture.gov.au
Australian Government Department of Foreign Affairs and Trade Overseas Aid Program (Australian Aid)	www.dfat.gov.au/aid
Australian Government Department of Health	www.health.gov.au
Australian Government Department of Home Affairs	www.homeaffairs.gov.au
Australian Government Indo-Pacific Centre for Health Security	www.indopacifichealthsecurity.dfat.gov.au
Australian Harness Racing	www.harness.org.au

Australian Honey Bee Industry Council	www.honeybee.org.au
Australian Horse Industry Council	www.horsecouncil.org.au
Australian Live Exporters' Council	www.auslivestockexport.com
Australian Lot Feeders' Association	www.feedlots.com.au
Australian Meat Industry Council	www.amic.org.au
Australian Meat Processor Corporation	www.ampc.com.au
Australian National Quality Assurance Program	www.anqap.com
Australian Pesticides and Veterinary Medicines Authority	www.apvma.gov.au
Australian Pork Limited	www.australianpork.com.au
Australian Q Fever Register	www.qfever.org
Australian Veterinary Association	www.ava.com.au
Australian Wool Innovation Limited	www.wool.com
AUSVETPLAN	www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents
BeeAware	www.beeaware.org.au
Biosecurity in Australia	www.agriculture.gov.au/biosecurity/australia
Biosecurity risk analysis	www.agriculture.gov.au/biosecurity/risk-analysis
Cattle Council of Australia	www.cattlecouncil.com.au
Centre of Excellence for Biosecurity Risk Analysis	www.cebra.unimelb.edu.au
Chief Environmental Biosecurity Officer	www.agriculture.gov.au/biosecurity/environmental/cebo
College of Public Health, Medical and Veterinary Sciences, James Cook University	https://www.jcu.edu.au/college-of-public-health-medical-and-veterinary-sciences
Cooperative Research Centre for High Integrity Australian Pork	www.porkcrc.com.au
Cooperative Research Centre for Sheep Industry Innovation	www.sheepcrc.org.au
CSIRO Australian Animal Health Laboratory	www.csiro.au/en/Research/Facilities/AAHL
Dairy Australia Limited	www.dairyaustralia.com.au
Deer Industry Association of Australia	www.deerfarming.com.au
Department of Agriculture and Fisheries, Queensland	www.daf.qld.gov.au
Department of Animal, Plant and Soil Sciences, La Trobe University	www.latrobe.edu.au/animal-plant-and-soil-sciences/about
Department of Jobs, Precincts and Regions	www.agriculture.vic.gov.au
Department of Primary Industries and Regional Development, Western Australia	www.dpird.wa.gov.au
Department of Primary Industries and Regions, South Australia	www.pir.sa.gov.au
Department of Primary Industries, New South Wales	www.dpi.nsw.gov.au

Department of Primary Industries, Parks, Water and Environment, Tasmania	www.dpipwe.tas.gov.au
Department of Primary Industry and Resources, Northern Territory	www.dpir.nt.gov.au
Elizabeth Macarthur Agricultural Institute	www.dpi.nsw.gov.au/about-us/science-and-research/centres/emai
Emergency Animal Disease Response Agreement	www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement
Equestrian Australia Limited	www.equestrian.org.au
Faculty of Veterinary and Agricultural Sciences, University of Melbourne	www.fvas.unimelb.edu.au
Farm Biosecurity	www.farmbiosecurity.com.au
Fisheries Research and Development Corporation	www.frdc.com.au
Food Standards Australia New Zealand	www.foodstandards.gov.au
Goat Industry Council of Australia	www.gica.com.au
Intergovernmental Agreement on Biosecurity	www.coag.gov.au/content/intergovernmental-agreement-biosecurity
Kangaroo Industries Association of Australia	www.kangarooindustry.com
LiveCorp	www.livecorp.com.au
Meat & Livestock Australia	www.mla.com.au
National Animal Health Information Program	www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/national-animal-health-information-system-nahip
National Arbovirus Monitoring Program	www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/national-arbovirus-monitoring-program
National Farmers' Federation	www.nff.org.au
National Notifiable Diseases Surveillance System	www.health.gov.au/internet/main/publishing.nsf/Content/cda-surveil-nndss-nndssintro.htm
National pest & disease outbreaks	www.outbreak.gov.au
National Primary Industries Animal Welfare Research, Development and Extension Strategy	www.npirdef.org
National Transmissible Spongiform Encephalopathies Surveillance Project	www.animalhealthaustralia.com.au/what-we-do/disease-surveillance/tse-freedom-assurance-program/surveillance-of-tses
Nationally Agreed Standard Operating Procedures	www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/nationally-agreed-standard-operating-procedures

Poultry Hub	www.poultryhub.org
Racing Australia	www.racingaustralia.horse
SAFEMEAT	www.safemeat.com.au
School of Animal & Veterinary Sciences, Charles Sturt University	www.csu.edu.au/vet
School of Animal and Veterinary Sciences, University of Adelaide	www.adelaide.edu.au/vetsci
School of Environment and Rural Science, University of New England	www.une.edu.au/about-une/faculty-of-science-agriculture-business-and-law/school-of-environmental-and-rural-science
School of Life and Environmental Sciences, Deakin University	www.deakin.edu.au/life-environmental-sciences
School of Veterinary and Life Sciences, Murdoch University	www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences
School of Veterinary Science, University of Queensland	www.veterinary-science.uq.edu.au
School of Veterinary Science, University of Sydney	www.sydney.edu.au/vetscience
Seafood Standards	www.seafoodstandards.com.au
Sheep Producers Australia	www.sheepproducers.com.au
Stock Feed Manufacturers' Council of Australia	www.sfmca.com.au
Wildlife Health Australia	www.wildlifehealthaustralia.com.au
WoolProducers Australia	www.woolproducers.com.au
Zoo and Aquarium Association	www.zooaquarium.org.au

APPENDIX C
INVESTIGATIONS OF CERTAIN EMERGENCY ANIMAL DISEASES AND NATIONALLY NOTIFIABLE ANIMAL DISEASES

Australia maintains a National List of Notifiable Animal Diseases of Terrestrial Animals. During 2018, investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases were recorded in the National Animal Health Information System (Section 2.2). Table C1 lists the laboratory-confirmed results of these disease investigations. 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. For additional information on some disease investigations, see Anthrax in New South Wales, Queensland and Victoria (Section 4.6.1), African swine fever (Section 4.5.1), Avian influenza (Section 4.5.2), Hendra virus in New South Wales (Section 4.6.2), and Transmissible Spongiform Encephalopathies Freedom Assurance Program (Section 3.4.4). Wildlife health surveillance activities are reported in Section 3.3.4.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
African swine fever	Pig	**National total**	**12**	**0**	**12**
		NSW	2	0	2
		Qld	1	0	1
		SA	1	0	1
		Tas.	1	0	1
		Vic.	2	0	2
		WA	5	0	5
Anaplasmosis in tick-free areas	Cattle	**National total**	**10**	**0**	**10**
		NSW	2	0	2
		WA	8	0	8
Anthrax	Alpaca	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
	Camelid	**National total**	**2**	**0**	**2**
		NSW	2	0	2

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Anthrax	Cattle	**National total**	**220**	**5**	**215**
		NSW	137	2	135
		Qld	23	3	20
		SA	3	0	3
		Tas.	1	0	1
		Vic.	48	0	48
		WA	8	0	8
	Goat	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Horse	**National total**	**4**	**0**	**4**
		NSW	1	0	1
		Qld	2	0	2
		Vic.	1	0	1
	Pig	**National total**	**4**	**0**	**4**
		NSW	3	0	3
		WA	1	0	1
	Sheep	**National total**	**147**	**14**	**133**
		NSW	57	1	56
		Vic.	86	13	73
		WA	4	0	4
Australian bat lyssavirus	Cattle	**National total**	**4**	**0**	**4**
		NSW	1	0	1
		Qld	2	0	2
		Tas.	1	0	1
	Dog	**National total**	**8**	**0**	**8**
		NT	3	0	3
		Qld	2	0	2
		Vic.	3	0	3
	Horse	**National total**	**23**	**0**	**23**
		NSW	1	0	1
		Qld	19	0	19
		Vic.	2	0	2
		WA	1	0	1
	Sheep	**National total**	**2**	**0**	**2**
		Vic.	1	0	1
		WA	1	0	1

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Avian influenza	Bird	**National total**	**367**	**4**	**363**
		ACT	1	0	1
		NSW	121	0	121
		NT	14	0	14
		Qld	50	2[a]	48
		SA	40	0	40
		Tas.	25	0	25
		Vic.	74	2[b]	72
		WA	42	0	42
Babesiosis in tick-free areas	Cattle	**National total**	**39**	**9**	**30**
		NSW	28	9	19
		WA	11	0	11
Bluetongue (clinical disease)[c]	Cattle	**National total**	**39**	**0**	**39**
		NSW	2	0	2
		SA	2	0	2
		Vic.	2	0	2
		WA	33	0	33
	Goat	**National total**	**2**	**0**	**2**
		Qld	2	0	2
	Sheep	**National total**	**29**	**0**	**29**
		NSW	8	0	8
		NT	1	0	1
		Qld	2	0	2
		SA	3	0	3
		Vic.	7	0	7
		WA	8	0	8
Bovine virus diarrhoea Type 2	Cattle	**National total**	**29**	**0**	**29**
		WA	29	0	29

cont.

a Two low-pathogenic strains of avian influenza were detected in a Queensland backyard poultry farm. One strain was determined by polymerase chain reaction (PCR) testing and virus isolation to be H1N2. The other strain was shown to be H1NX (no conventional reverse transcription-PCR products were able to be generated for NX sequencing).

b Two low-pathogenic strains of avian influenza were detected in Victorian backyard poultry farms. One strain was identified by virus isolation, PCR and gene sequencing as H4N6. The second strain could not be identified by PCR as H5 or H7; further subtyping could not be performed due to insufficient sample.

c For additional negative monitoring data, see the National Arbovirus Monitoring Program: animalhealthaustralia.com.au/what-we-do/disease-surveillance/national-arbovirus-monitoring-program.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Brucella abortus[d]	Cattle	**National total**	**576**	**0**	**576**
		NSW	10	0	10
		Qld	133	0	133
		SA	9	0	9
		Tas.	7	0	7
		Vic.	100	0	100
		WA	317	0	317
	Dog	**National total**	**1**	**0**	**1**
		NT	1	0	1
	Goat	**National total**	**7**	**0**	**7**
		NSW	1	0	1
		NT	1	0	1
		Qld	1	0	1
		Vic.	4	0	4
	Horse	**National total**	**2**	**0**	**2**
		NSW	1	0	1
		Vic.	1	0	1
	Pig	**National total**	**2**	**0**	**2**
		Vic.	2	0	2
	Sheep	**National total**	**33**	**0**	**33**
		Tas.	1	0	1
		Vic.	32	0	32
Brucella canis	Dog	**National total**	**5**	**0**	**5**
		NT	1	0	1
		SA	1	0	1
		Vic.	2	0	2
		WA	1	0	1

cont.

d Bovine brucellosis (caused by *Brucella abortus*) was eradicated from the Australian cattle herd in 1989 and is presently considered an exotic animal disease in Australia. Neither ovine nor caprine brucellosis (caused by *B. melitensis*) have ever been reported in Australian sheep or goats. Swine brucellosis (caused by *B. suis*) is confined to small areas of northern Australia where it occurs in feral pigs, with cases detected occasionally in dogs used to hunt feral pigs.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Brucella melitensis[d]	Dog	**National total**	**1**	**0**	**1**
		NT	1	0	1
	Goat	**National total**	**6**	**0**	**6**
		NT	1	0	1
		Vic.	4	0	4
		WA	1	0	1
	Horse	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
	Sheep	**National total**	**61**	**0**	**61**
		SA	3	0	3
		Vic.	31	0	31
		WA	27	0	27
Brucella suis[d]	Cattle	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Dog	**National total**	**415**	**82**	**333**
		NSW	274	55	219
		NT	3	0	3
		Qld	132	27	105
		Vic.	5	0	5
		WA	1	0	1
	Goat	**National total**	**1**	**0**	**1**
		NT	1	0	1
	Pig	**National total**	**11**	**1**	**10**
		NSW	8	1	7
		NT	1	0	1
		SA	1	0	1
		Vic.	1	0	1
Contagious agalactia	Goat	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Sheep	**National total**	**4**	**0**	**4**
		NSW	2	0	2
		Qld	1	0	1
		WA	1	0	1

cont.

d Bovine brucellosis (caused by *Brucella abortus*) was eradicated from the Australian cattle herd in 1989 and is presently considered an exotic animal disease in Australia. Neither ovine nor caprine brucellosis (caused by *B. melitensis*) have ever been reported in Australian sheep or goats. Swine brucellosis (caused by *B. suis*) is confined to small areas of northern Australia where it occurs in feral pigs, with cases detected occasionally in dogs used to hunt feral pigs.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Contagious caprine pleuropneumonia	Goat	**National total**	**1**	**0**	**1**
		Qld	1	0	1
Contagious equine metritis	Horse	**National total**	**6**	**0**	**6**
		WA	6	0	6
Dourine	Horse	**National total**	**2**	**0**	**2**
		WA	2	0	2
Duck virus hepatitis	Bird	**National total**	**3**	**0**	**3**
		NSW	1	0	1
		Qld	2	0	2
Encephalitides – tick-borne	Horse	**National total**	**1**	**0**	**1**
		WA	1	0	1
	Sheep	**National total**	**2**	**0**	**2**
		WA	2	0	2
Enzootic bovine leucosis	Cattle	**National total**	**2**	**0**	**2**
		WA	2	0	2
Equine encephalomyelitis (Eastern, Western and Venezuelan)	Horse	**National total**	**13**	**0**	**13**
		Vic.	1	0	1
		WA	12	0	12
Equine infectious anaemia	Horse	**National total**	**42**	**1**	**41**
		NSW	3	0	3
		NT	7	0	7
		Qld	21	1	20
		Vic.	5	0	5
		WA	6	0	6
Equine influenza	Horse	**National total**	**5**	**0**	**5**
		Qld	1	0	1
		Vic.	1	0	1
		WA	3	0	3
Equine piroplasmosis (*Babesia equi*, *B. caballi* and *Theileria equi*)	Horse	**National total**	**2**	**0**	**2**
		WA	2	0	2
Equine viral arteritis	Horse	**National total**	**9**	**0**	**9**
		NSW	4	0	4
		Vic.	1	0	1
		WA	4	0	4

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Foot-and-mouth disease	Camelid	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Cattle	**National total**	**52**	**0**	**52**
		NSW	11	0	11
		Qld	1	0	1
		SA	4	0	4
		Vic.	10	0	10
		WA	26	0	26
	Goat	**National total**	**2**	**0**	**2**
		NSW	2	0	2
	Pig	**National total**	**7**	**0**	**7**
		NSW	1	0	1
		SA	1	0	1
		Vic.	2	0	2
		WA	3	0	3
	Sheep	**National total**	**17**	**0**	**17**
		NSW	5	0	5
		SA	2	0	2
		Vic.	6	0	6
		WA	4	0	4
Haemorrhagic septicaemia	Cattle	**National total**	**6**	**0**	**6**
		NT	1	0	1
		WA	5	0	5
Infection of bees with *Melissococcus plutonius* (European foulbrood)	Bees	**National total**	**266**	**49**	**217**
		Qld	176	12	164
		SA	77	34	43
		Vic.	13	3	10
Infection of bees with *Paenibacillus larvae* (American foulbrood)	Bees	**National total**	**617**	**217**	**400**
		ACT	3	1	2
		NSW	62	15	47
		Qld	176	80	96
		SA	320	109	211
		Vic.	56	12	44

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Infection with African horse sickness virus	Horse	**National total**	**3**	**0**	**3**
		WA	3	0	3
Infection with Aujeszky's disease virus	Cattle	**National total**	**3**	**0**	**3**
		Tas.	1	0	1
		WA	2	0	2
	Dog	**National total**	**2**	**0**	**2**
		NT	2	0	2
	Pig	**National total**	**9**	**0**	**9**
		NSW	3	0	3
		NT	1	0	1
		Qld	1	0	1
		Vic.	3	0	3
		WA	1	0	1
	Sheep	**National total**	**4**	**0**	**4**
		Tas.	1	0	1
		WA	3	0	3
Infection with Borna disease virus	Sheep	**National total**	**5**	**0**	**5**
		Tas.	1	0	1
		WA	4	0	4
Infection with Bungowannah virus (porcine myocarditis)	Pig	**National total**	**1**	**0**	**1**
		NSW	1	0	1
Infection with *Chlamydophila abortus* (enzootic abortion of ewes, ovine chlamydiosis)	Sheep	**National total**	**25**	**0**	**25**
		WA	25	0	25
Infection with classical swine fever virus	Pig	**National total**	**33**	**0**	**33**
		NSW	4	0	4
		Qld	1	0	1
		SA	5	0	5
		Tas.	1	0	1
		Vic.	2	0	2
		WA	20	0	20
Infection with duck herpesvirus 1 (duck viral enteritis/duck plague)	Bird	**National total**	**1**	**0**	**1**
		NSW	1	0	1

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Infection with equid herpesvirus-1 (EHV-1) (abortigenic and neurological strains)	Horse	**National total**	**264**	**9**	**255**
		NSW	148	4	144
		Qld	71	0	71
		SA	4	0	4
		Tas.	5	3	2
		Vic.	23	2	21
		WA	13	0	13
Infection with equine encephalosis virus	Horse	**National total**	**2**	**0**	**2**
		WA	2	0	2
Infection with Getah virus	Horse	**National total**	**7**	**0**	**7**
		WA	7	0	7
Infection with Hendra virus	Alpaca	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Camelid	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Cattle	**National total**	**2**	**0**	**2**
		NSW	1	0	1
		Tas.	1	0	1
	Dog	**National total**	**2**	**0**	**2**
		NSW	1	0	1
		Qld	1	0	1
	Donkey	**National total**	**3**	**0**	**3**
		NSW	1	0	1
		Qld	2	0	2
	Horse	**National total**	**836**	**1**	**835**
		NSW	204	1	203
		NT	9	0	9
		Qld	582	0	582
		SA	1	0	1
		Tas.	1	0	1
		Vic.	23	0	23
		WA	16	0	16
	Pig	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Infection with influenza A viruses in swine	Dog	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Pig	**National total**	**33**	**11**[e]	**22**
		NSW	3	1	2
		Qld	4	3	1
		Vic.	6	2	4
		WA	20	5	15
Infection with Jembrana disease virus	Cattle	**National total**	**1**	**0**	**1**
		WA	1	0	1
Infection with Menangle virus	Pig	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
Infection with *Mycobacterium avium* (avian tuberculosis)	Bird	**National total**	**2**	**2**	**0**
		Qld	1	1	0
		Tas	1	1	0
	Chicken	**National total**	**3**	**2**	**1**
		Qld	1	0	1
		Tas.	2	2	0
Infection with *Mycoplasma mycoides* subsp. *mycoides* SC (contagious bovine pleuropneumonia)	Cattle	**National total**	**12**	**0**	**12**
		NT	2	0	2
		WA	10	0	10
Infection with peste des petits ruminants virus	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Infection with porcine epidemic diarrhoea virus	Pig	**National total**	**5**	**0**	**5**
		NSW	1	0	1
		Vic.	3	0	3
		WA	1	0	1
Infection with rabies virus	Cat	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Dog	**National total**	**4**	**0**	**4**
		NT	3	0	3
		Vic.	1	0	1
	Horse	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
	Sheep	**National total**	**1**	**0**	**1**
		Vic.	1	0	1

cont.

e Sequencing from positive detections indicated the presence of the seasonal H1N1 virus strain known to currently circulate in both pigs and humans.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Infection with Rift Valley fever virus	Cattle	**National total**	**1**	**0**	**1**
		WA	1	0	1
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Infection with rinderpest virus	Cattle	**National total**	**1**	**0**	**1**
		WA	1	0	1
Infection with *Salmonella abortusequi*	Horse	**National total**	**10**	**0**	**10**
		NSW	1	0	1
		WA	9	0	9
Infection with *Salmonella* Enteritidis in poultry	Bird	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Chicken	**National total**	**2**	**0**	**2**
		NSW[f]	2	0	2
Infection with *Salmonella* Gallinarum (fowl typhoid)	Bird	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Chicken	**National total**	**5**	**0**	**5**
		NSW	1	0	1
		WA	4	0	4
Infection with swine vesicular disease virus	Pig	**National total**	**3**	**0**	**3**
		SA	1	0	1
		Vic.	1	0	1
		WA	1	0	1
Infection with Teschovirus A (porcine enteroviral encephalomyelitis)	Pig	**National total**	**3**	**0**	**3**
		Vic.	2	0	2
		WA	1	0	1
Infection with *Theileria parva* (East Coast fever) or *T. annulata* (Mediterranean theileriosis)	Cattle	**National total**	**15**	**0**	**15**
		NSW	1	0	1
		Qld	7	0	7
		SA	1	0	1
		WA	6	0	6

cont.

f Two seropositive *Salmonella* Group D detections were made. The environmental sample cultures for these investigations returned positive for *Salmonella* Enteritidis; however the animal sample culture was negative for *S.* Enteritidis.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Infection with vesicular stomatitis virus	Camelid	**National total**	**1**	**0**	**1**
		NSW	1	0	1
	Cattle	**National total**	**44**	**0**	**44**
		NSW	10	0	10
		Qld	1	0	1
		SA	4	0	4
		Vic.	10	0	10
		WA	19	0	19
	Goat	**National total**	**2**	**0**	**2**
		NSW	2	0	2
	Horse	**National total**	**3**	**0**	**3**
		WA	3	0	3
	Pig	**National total**	**6**	**0**	**6**
		NSW	1	0	1
		SA	1	0	1
		Vic.	2	0	2
		WA	2	0	2
	Sheep	**National total**	**15**	**0**	**15**
		NSW	5	0	5
		SA	2	0	2
		Vic.	6	0	6
		WA	2	0	2
Infectious bursal disease (very virulent and exotic antigenic variant forms)	Bird	**National total**	**1**	**0**	**1**
		NT	1	0	1
Infestation of bees with *Varroa destructor* or *V. jacobsoni* (varroosis)	Bees	**National total**	**3**	**0**	**3**
		Vic.	3	0	3
Japanese encephalitis	Horse	**National total**	**11**	**0**	**11**
		WA	11	0	11
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Leishmaniosis of any species	Dog	**National total**	**1**	**0**	**1**
		NSW	1	0	1

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Louping ill	Sheep	**National total**	**4**	**0**	**4**
		WA	4	0	4
Lumpy skin disease	Cattle	**National total**	**3**	**0**	**3**
		SA	1	0	1
		Vic.	1	0	1
		WA	1	0	1
Maedi–visna	Barbary Sheep	**National total**	**1**	**0**	**1**
		SA	1	0	1
	Sheep	**National total**	**7**	**0**	**7**
		Tas.	1	0	1
		Vic.	1	0	1
		WA	5	0	5
Malignant catarrhal fever – wildebeest-associated	Cattle	**National total**	**5**	**0**	**5**
		NSW	3	0	3
		WA	2	0	2
	Sheep	**National total**	**1**	**0**	**1**
		NSW	1	0	1
Newcastle disease	Bird	**National total**	**356**	**0**	**356**
		ACT	1	0	1
		NSW	128	0	128
		NT	14	0	14
		Qld	44	0	44
		SA	40	0	40
		Tas.	13	0	13
		Vic.	74	0	74
		WA	42	0	42

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Paratuberculosis (Johne's disease)	Alpaca	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Bison	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
	Camel	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Camelid	**National total**	**1**	**0**	**1**
		WA	1	0	1
	Cattle	**National total**	**170**	**32**	**138**
		NSW	26	0	26
		Qld	26	2	24
		Vic.	67	30	37
		WA	51	0	51
	Deer	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
	Goat	**National total**	**27**	**3**	**24**
		NSW	2	0	2
		Qld	5	0	5
		Vic.	19	3	16
		WA	1	0	1
	Sheep	**National total**	**52**	**35**	**17**
		NSW	3	0	3
		Vic.	36	30	6
		WA	13	5	8
Porcine reproductive and respiratory syndrome	Pig	**National total**	**16**	**0**	**16**
		NSW	1	0	1
		Qld	2	0	2
		SA	1	0	1
		Vic.	2	0	2
		WA	10	0	10
Post-weaning multi-systemic wasting syndrome	Pig	**National total**	**2**	**0**	**2**
		WA	2	0	2
Pullorum disease (*Salmonella* Pullorum)	Bird	**National total**	**1**	**0**	**1**
		Qld	1	0	1

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Pulmonary adenomatosis (jaagsiekte)	Sheep	**National total**	**1**	**0**	**1**
		Vic.	1	0	1
Salmonellosis (*S. abortusovis*)	Sheep	**National total**	**31**	**0**	**31**
		NSW	2	0	2
		Vic.	4	0	4
		WA	25	0	25
Screw-worm fly – New World (*Cochliomyia hominivorax*)	Cattle	**National total**	**2**	**0**	**2**
		Qld	1	0	1
		WA	1	0	1
	Dog	**National total**	**3**	**0**	**3**
		NT	2	0	2
		Qld	1	0	1
	Horse	**National total**	**2**	**0**	**2**
		Qld	2	0	2
	Primate	**National total**	**1**	**0**	**1**
		NT	1	0	1
	Sheep	**National total**	**4**	**0**	**4**
		NSW	1	0	1
		NT	1	0	1
		Qld	1	0	1
		Vic.	1	0	1
Screw-worm fly – Old World (*Chrysomya bezziana*)	Cattle	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Dog	**National total**	**3**	**0**	**3**
		NT	2	0	2
		Qld	1	0	1
	Horse	**National total**	**2**	**0**	**2**
		Qld	2	0	2
	Primate	**National total**	**1**	**0**	**1**
		NT	1	0	1
	Sheep	**National total**	**4**	**0**	**4**
		NSW	1	0	1
		NT	1	0	1
		Qld	1	0	1
		Vic.	1	0	1

cont.

Table C1 Investigations of suspect cases of certain emergency animal diseases and nationally notifiable animal diseases, 2018

Disease	Species	Jurisdiction	Number of investigations	Number positive	Number negative
Sheep pox and goat pox	Goat	**National total**	**1**	**0**	**1**
		Qld	1	0	1
	Sheep	**National total**	**1**	**0**	**1**
		WA	1	0	1
Surra (*Trypanosoma evansi*)	Cattle	**National total**	**6**	**0**	**6**
		NT	1	0	1
		WA	5	0	5
Transmissible gastroenteritis	Pig	**National total**	**4**	**0**	**4**
		NSW	1	0	1
		Vic.	2	0	2
		WA	1	0	1
Transmissible spongiform encephalopathies (bovine spongiform encephalopathy, chronic wasting disease of deer, feline spongiform encephalopathy, scrapie)	Cattle	**National total**	**521**	**0**	**521**
		NSW	179	0	179
		NT	22	0	22
		Qld	145	0	145
		SA	24	0	24
		Tas.	13	0	13
		Vic.	104	0	104
		WA	34	0	34
	Sheep	**National total**	**527**	**0**	**527**
		NSW	157	0	157
		Qld	36	0	36
		SA	46	0	46
		Tas.	8	0	8
		Vic.	107	0	107
		WA	173	0	173
Tuberculosis (*Mycobacterium bovis*)	Cattle	**National total**	**1**	**0**	**1**
		NT	1	0	1
West Nile virus infection – clinical	Horse	**National total**	**48**	**0**	**48**
		NSW	21	0	21
		SA	5	0	5
		Vic.	3	0	3
		WA	19	0	19
	Sheep	**National total**	**5**	**0**	**5**
		WA	5	0	5

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas. = Tasmania; Vic. = Victoria; WA = Western Australia

ACRONYMS AND ABBREVIATIONS

AAA	Australian Alpaca Association
AADIS	Australian Animal DISease
AAHL	Australian Animal Health Laboratory
AAPSP	Australian Animal Pathology Standards Program
ABLV	Australian bat lyssavirus
ACARE	Australian Centre for Antimicrobial Resistance Ecology
ACIAR	Australian Centre for International Agricultural Research
ACMF	Australian Chicken Meat Federation
ACT	Australian Capital Territory
ACV	Australian Cattle Veterinarians
ACVO	Australian Chief Veterinary Officer
ADIC	Australian Dairy Industry Council
ADMA	Australian Duck Meat Association
AGSOC	Agriculture Senior Officials' Committee
AHA	Animal Health Australia
AHBIC	Australian Honey Bee Industry Council
AHC	Animal Health Committee
AI	Avian influenza
AJASN	Australasian Joint Agencies Scanning Network
ALFA	Australian Lot Feeders' Association
ALIHS	Australian Livestock Industry Health Studies
ALOP	Appropriate level of protection
AMIC	Australian Meat Industry Council
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
ANQAP	Australian National Quality Assurance Program
ANZSDP	Australian and New Zealand Standard Diagnostic Procedures
APL	Australian Pork Limited
APVMA	Australian Pesticides and Veterinary Medicines Authority
ASEL	Australian Standards for the Export of Livestock
ASF	African swine fever

AVBC	Australasian Veterinary Boards Council
AWAC	Animal Welfare Advisory Committee
AWI	Australian Wool Innovation
AWV	Animal Welfare Victoria
BBO	Bee Biosecurity Officers
BCG	Biological Consultative Group
BICON	Biosecurity Import Conditions
BSE	Bovine spongiform encephalopathy
BTEC	Brucellosis and Tuberculosis Eradication Campaign
CAE	Caprine arthritis-encephalitis
CCEAD	Consultative Committee on Emergency Animal Diseases
CDNA	Communicable Diseases Network Australia
CEBO	Chief Environmental Biosecurity Officer
CEBRA	Centre of Excellence for Biosecurity Risk Analysis
CIE	Centre for Integrative Ecology
CLiP	Centre for Livestock interactions with Pathogens
CMO	Chief Medical Officer
CPD	Continuing Professional Development
CRC	Cooperative Research Centres
CRISPR	Clustered regularly interspaced short palindromic repeats
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSU	Charles Sturt University
CVO	Chief Veterinary Officer
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DFAT	Department of Foreign Affairs and Trade
DFTD	Devil facial tumour disease
DOT	Dropped ovary technique
DPI	Department of Primary Industries
DPIRD	Department of Primary Industries and Regional Development
EA	Equestrian Australia
EAD	Emergency animal disease
EADRA	Emergency Animal Disease Response Agreement
EADRP	Emergency Animal Disease Response Plan
EBL	Enzootic bovine leucosis
EGRC	Equine Genetics Research Centre
EI	Equine influenza
EID	Emerging infectious diseases
ELISA	Enzyme-linked immunosorbent assay

ERA	Excellence in Research for Australia
ESA	Egg Standards of Australia
ESCAS	Exporter Supply Chain Assurance System
FAO	Food and Agriculture Organisation
FMD	Foot-and-mouth disease
FRDC	Fisheries Research and Development Corporation
FREPA	Free Range Egg and Poultry Australia
FSANZ	Food Standards Australia New Zealand
FSCF	Food Safety Cooperation Forum
FTA	Free trade agreements
GICA	Goat Industry Council of Australia
HACCP	Hazard analysis and critical control points
HeV	Hendra virus
HICC	Horse Industry Consultative Committee
HPAI	Highly pathogenic avian influenza
HRA	Harness Racing Australia
IAHER	International Animal Health Emergency Reserve
IGAB	Intergovernmental Agreement on Biosecurity
IGB	Inspector-General of Biosecurity
INFOSAN	International Food Safety Authorities Network
JCU	James Cook University
JD	Johne's disease
JEV	Japanese encephalitis virus
LBN	Livestock Biosecurity Network
LEADDR	Laboratories for Emergency Animal Disease Diagnosis and Response
LEP	Livestock Export Program
LES	Life and Environmental Sciences
LPA	Livestock Production Assurance
LPAI	Low pathogenicity avian influenza
LTU	La Trobe University
MAF	Ministry of Agriculture and Fisheries
MISP	Meat Industry Strategic Plan
MLA	Meat & Livestock Australia
NABF	Northern Australia Biosecurity Framework
NABRDES	National Animal Biosecurity Research, Development and Extension Strategy
NAHIS	National Animal Health Information System
NAHSD	National Animal Health Surveillance and Diagnostics
NAHTRG	National Animal Health Training Reference Group

NAIWB	National Avian Influenza in Wild Birds
NAQIA	National Agriculture Quarantine and Inspection Authority
NAQS	Northern Australia Quarantine Strategy
NATA	National Association of Testing Authorities
NAWRDE	National Primary Industries Animal Welfare Research, Development and Extension
NBC	National Biosecurity Committee
NBCEN	National Biosecurity Communication and Engagement Network
NBPSP	National Bee Pest Surveillance Program
NBRT	National Biosecurity Response Team
ND	Newcastle disease
NFAS	National Feedlot Accreditation Scheme
NJDP	National Johne's Disease Project
NLIS	National Livestock Identification System
NLTG	National Laboratory Task Group
NMG	National management group
NNDMP	National Newcastle Disease Management Plan
NNDSS	National Notifiable Diseases Surveillance System
NRS	National Residue Survey
NSDIP	National Significant Disease Investigation Program
NSHMP	National Sheep Health Monitoring Project
NSW	New South Wales
NT	Northern Territory
NTSESP	National Transmissible Spongiform Encephalopathies Surveillance Project
NVD	National Vendor Declarations
NWS	New World screw-worm fly
OIE	World Organisation for Animal Health
OJD	Ovine Johne's disease
OWS	Old World screw-worm fly
PC	Physical containment
PCR	Polymerase chain reaction
PCR	Polymerase chain reaction
PHA	Plant Health Australia
PNG	Papua New Guinea
POMS	Pacific oyster mortality syndrome
PT	Proficiency testing
QA	Quality assurance
Qld	Queensland
R&D	Research and development

RAWS	Regional Animal Welfare Strategy
RD&E	Research, Development and Extension
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SA	South Australia
SCAAH	Sub-Committee on Aquatic Animal Health
SDI	Significant disease investigation
SE	*Salmonella* Enteritidis
SISP	Sheep Industry Strategic Plan
SP	*Salmonella* Pullorum
SPA	Sheep Producers Australia
SPS	Sanitary and phytosanitary
SWF	Screw-worm fly
SWFSPP	Screw-Worm Fly Surveillance and Preparedness Program
Tas.	Tasmania
TB	Tuberculosis
TMAD	Trade and Market Access Division
TPP	Trans-Pacific Partnership
TRACE	Tracking Animal Certification for Export
TSE	Transmissible spongiform encephalopathies
TSEFAP	Transmissible Spongiform Encephalopathies Freedom Assurance Program
UNE	University of New England
UNGA	United Nations General Assembly
UQ	University of Queensland
USC	University of the Sunshine Coast
Vic.	Victoria
VSAAC	Veterinary Schools Accreditation Advisory Committee
VSB	Veterinary statutory body
WA	Western Australia
WHA	Wildlife Health Australia
WHO	World Health Organization
WNS	White-nose syndrome
WTO	World Trade Organization
ZAA	Zoo and Aquarium Association

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