National Avian Influenza Surveillance Dossier

Australian Government
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EXECUTIVE SUMMARY

The Avian Influenza Surveillance Dossier is Australia's first comprehensive document to collate, for strategic and analytic purposes, all available information about Australia's poultry sectors, wild bird and domestic poultry surveillance, and poultry health management arrangements that relate to avian influenza and other diseases.

Representatives of all eight Australian states and territories, and from a range of industry sectors—including poultry and ratite industries, market sellers, bird fanciers, exhibitors, backyard poultry owners—contributed and provided valuable information and comments during compilation of the document. This multi-sector and cross-regional collaboration was, in itself, a significant achievement and highlights stakeholders' commitment to reducing the risk of avian influenza outbreaks in Australia.

The dossier presents a significant amount of information, not only on avian influenza (AI) surveillance activity, but also on the strength and integrity of Australia's poultry industry operations and Australia's national animal health systems and capabilities.

The range of information relevant to Australia's poultry health and management arrangements covered in the dossier includes:

- Australia's risk environment, including its geographical isolation and quarantine systems
- structure and dynamics of all Australian poultry industry sectors
- movements and trading patterns for poultry and poultry products, and the traceability of these movements
- available information on non-commercial poultry in Australia, including estimated numbers, locations and links with commercial poultry
- wild bird species and movement patterns, including migratory birds and risk areas
- history and epidemiology of previous detections of AI viruses in poultry in Australia, including information about responses
- existing passive surveillance activities in each poultry industry sector
- existing active surveillance activities, including activities undertaken for the purpose of detecting or excluding AI in commercial poultry, backyard poultry and wild birds
- information on Australia's animal health systems, including quarantine legislation and legislation related to domestic disease control, veterinary and laboratory capacity, and reporting systems.

A summary of this information is offered below, highlighting the most salient points.

Avian influenza (all subtypes) is a notifiable disease in all states and territories of Australia. Highly pathogenic avian influenza (HPAI) and low pathogenicity avian influenza (LPAI) subtypes H5 and H7 are included in Australia's Emergency Animal Disease Response Agreement (EADRA), and detection of these AI subtypes in domestic poultry or captive birds would trigger an emergency response as described in AUSVETPLAN.

Australia undertakes active and passive AI surveillance in wild birds to provide epidemiological information about circulating viruses and to identify changes in subtype prevalence in reservoir species. While no country can claim to be free of AI viruses in wild birds, the documented prevalence of NAI in Australian wild waterfowl is very low (compared with Europe or North America), with 0.2% of sampled wild water birds testing PCR positive for H5 or H7 AI viruses annually. Analysis of the isolates from past Australian outbreaks indicates that Australian H7 viruses are evolving in a separate lineage to Eurasian isolates and this suggests there have been relatively few introductions of AI viruses from non-endemic sources.

Australia is not in the flight path of migratory *Anseriformes* (ducks, geese and swans), which are the major natural reservoir hosts of AI viruses. While migratory *Charadriiformes* (shorebirds and waders) do migrate to Australia via Southeast Asia, the distance between Australia and its northern neighbours may preclude frequent introduction of AI viruses via this route.

It is unlikely that AI viruses would be introduced into Australian poultry through the importation of birds or avian products, because strict quarantine controls are maintained on the importation of live birds, fertile eggs and poultry products such as meat and eggs. Stringent border security minimises the risk of illegal entry of poultry products or live birds into Australia.

While geographic isolation and stringent quarantine systems contribute to Australia's strong animal health status, it is further maintained by well-organised and developed animal health systems, disease control legislation, veterinary and laboratory capacity, and emergency response plans. One of the strengths of the Australian animal health system lies in its ability to adhere to the fundamental quality principles recommended by the OIE (World Organisation for Animal Health) for the evaluation of Veterinary Services.

Australia's last outbreak of HPAI H7 virus was in 1997, and in the 12 years preceding 2010, no outbreaks have been reported in any Australian state. The previous outbreaks highlighted the need for increased biosecurity, and the issue was addressed by industry and government in the years that followed.

Poultry-raising in Australia is characterised by a number of features that reduce the risk of AI virus introduction and spread. The commercial poultry industries have documented biosecurity plans and have implemented procedures to minimise the risk of transmission of disease into farms. Very few commercial farms in Australia produce more than one type of poultry. Australia does not have the subsistence farming practices seen throughout much of Asia and Africa, and free range village poultry are not a feature of the Australian landscape. Less than 7% of the Australian population keep backyard flocks and those backyard flocks are mostly in urban areas with very low likelihood of access by wild waterfowl or exposure to untreated drinking water. In contrast to countries which have experienced widespread AI outbreaks, there is no established live poultry market system in Australia, and there are no continuously populated live poultry sales venues.

Throughout the poultry industry, the range of surveillance activities includes: production monitoring and documentation; disease investigations and exclusions; targeted testing and screening of flocks; ante-mortem and post-mortem flock inspections; disease reporting or notifications; disease control programs; export testing; records of laboratory investigations and biological specimen banks. Examination of disease investigation data suggests that the threshold trigger for laboratory testing for AI exclusion is very low, with AI testing being conducted on many occasions with only low levels of morbidity or mortality. AI exclusion testing has resulted in the detection of non-notifiable LP AIV in association with low levels of morbidity, illustrating the capacity of the Australian surveillance system to detect LP AIV in poultry species where clinical signs are a feature.

In summary, Australia remains vigilant and undertakes AI surveillance in wild birds, and commercial and non-commercial poultry flocks. In addition, commercial poultry industries have documented biosecurity plans and procedures to help prevent disease transmission onto and between farms. Australia also has well-organised and well-developed animal health systems, disease control legislation, veterinary and laboratory capacity and emergency response plans.

Overall, Australia’s advantages of geography, wild bird migration patterns, poultry industry structure, veterinary services, and lifestyle reduce the risks of introduction and spread of NAI viruses in domestic poultry. At the same time, the level of risk is actively reduced through targeted, science-based biosecurity, surveillance, and preparedness strategies.

ACRONYMS AND ABBREVIATIONS

AAHL	Australian Animal Health Laboratory
ABS	Australian Bureau of Statistics
ACMF	Australian Chicken Meat Federation
AECL	Australian Egg Corporation Limited
AEV	Avian Encephalomyelitis Virus
AGID	Agar gel immunodiffusion test
AHA	Animal Health Australia
AHC	Animal Health Committee
AI	Avian influenza
ANEMIS	Animal Emergency Management Information System
ANQAP	Australian National Quality Assurance Program
ANZSDP	Australian New Zealand Standard Diagnostic Procedures
APAV	Accreditation Program for Australian Veterinarians
AQIS	Australian Quarantine and Inspection Service
ARIOFSP	Australian Ratite Industry On-Farm Surveillance Plan
ATF	Australasian Turkey Federation
AUSVETPLAN	Australian Veterinary Emergency Plan
AVR	Australian Veterinary Reserve
AWHN	Australian Wildlife Health Network
BioSIRT	Biosecurity Surveillance Incident Response and Tracing
CCEAD	Consultative Committee on Emergency Animal Diseases
C-ELISA	Competitive Elisa [Also Known As The Solid-Phase Competition Elisa (SPC-Elisa)]
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	Chief Veterinary Officer
DAFF	Department of Agriculture, Fisheries and Forestry (Australian Government)
DPI	Department of Primary Industries (State)
EAD	Emergency Animal Disease
EADRA	Emergency Animal Disease Response Agreement
EADRP	Emergency Animal Disease Response Plan

ECA	Egg Corp Assured
EDS	Egg Drop Syndrome
EFA	Emu Farmers Association
ELISA	Enzyme Linked Immunosorbent Assay
EPA	Environmental Protection Agency/Authority
EU	European Union
eWHIS	Electronic Wildlife Health Information System
FAO	Food and Agriculture Organisation
FAV	Fowl Adenovirus Infection
FREPA	Free Range Egg and Poultry Association
FSANZ	Food Standards Australia & New Zealand
GGP, GP	Great-grandparent Flock, Grandparent Flock
GIS	Geographic Information System
H type	Haemagglutinin surface glycoprotein of avian influenza virus, divided into subtypes 1 to 16
H5N1	Notifiable avian influenza virus with haemagglutinin subtype 5 and neuraminidase subtype 1
HACCP	Hazard Analysis Critical Control Point
HI	Haemagglutination inhibition test for antibody to H antigen
HPAI	Highly pathogenic avian influenza
HPAI (H5/H7)	highly pathogenic avian influenza caused by virus subtypes H5 and H7
HPAI (not H5/H7)	Highly pathogenic avian influenza caused by virus subtypes other than H5 and H7
IP	Infected premises
IRA	Import risk analysis
LDCC	Local Disease Control Centre
LEADDR	Laboratories for Emergency Animal Disease Diagnosis and Response
LPNAI	Low pathogenicity notifiable avian influenza – low pathogenicity AI viruses of the H5 and H7 subtypes, notifiable to the World Organisation for Animal Health (OIE). In AUSVETPLAN, LPNAI is referred to as LPAI (H5/H7)
LPAI (not H5/H7)	Low pathogenicity avian influenza caused by virus subtypes other than H5 and H7
MD	Marek's Disease
MG	Mycoplasma gallisepticum

MS	Mycoplasma synoviae
N type	Neuraminidase surface glycoprotein of avian influenza virus, divided into subtypes 1 to 9
NAHIS	National Animal Health Information System
NAI	Notifiable avian influenza—an OIE definition that includes all HPAI viruses and any AI virus of H5 or H7 subtype.
NAIVE	National Avian Influenza Vaccine Expert (Group)
NAQS	Northern Australia Quarantine Strategy
NATA	National Association of Testing Authorities
NBC	National Biosecurity Committee
NCN	National Communication Network
ND	Newcastle Disease
NEPSS	National Enteric Pathogen Surveillance Scheme
NMG	National Management Group (for emergency animal disease)
NNDSS	National Notifiable Diseases Surveillance System
OH&S	Occupational Health and Safety
OIE	World Organisation for Animal Health (Office International des Epizooties)
PCR	Polymerase chain reaction
PIC	Property identification code
PIMC	Primary Industries Ministerial Council
PISC	Primary Industries Standing Committee
PPP	Primary Production and Processing
RIRDC	Rural Industries Research and Development Corporation of Australian Government
RRT	Rapid Response Team
RT-PCR	Reverse Transcriptase Polymerase Chain Reaction
SCAHLS	Sub-committee on Animal Health Laboratory Standards
SDCHQ	State Disease Control Headquarters
SE	*Salmonella* Enteritidis
SOP	Standard operating procedures
SPF	Specific pathogen free
SPS	Sanitary and phytosanitary

WHO	World Health Organization
WTO	World Trade Organization

AUSTRALIAN STATES & TERRITORIES

ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern Territory
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia

INTRODUCTION

The impact and epidemiology of avian influenza differ widely in different regions of the world. Variation in the opportunity for contact between poultry and wild birds, different biosecurity levels and production systems, and a multitude of other variables, all require each region to assess its own specific level of epidemiological risk and to devise prevention, detection and response strategies accordingly. That is to say, strategies should be devised to suit a country or region's specific situation, as assessed through rigorous epidemiological investigation and a consideration of the epidemiological context.

It is the aim of this document, then, to provide reliable and scientific data that explains the epidemiology of notifiable avian influenza (NAI) in Australia[1], and to provide sufficient contextual information for a reliable assessment of the disease risk to Australia. Additionally, the document will describe how risk factors are managed and indicate national capacity for this management. The description of all of these factors amounts to a description of Australia's specific level of epidemiological risk for NAI and also provides a rational basis for an acceptable level of confidence in claims made about the absence of NAI virus (NAIV) infection. It also provides a basis for adjusting and/or devising prevention, detection and response strategies tailored for the Australian context.

The dossier describes in eight chapters Australia's specific variables in relation to NAI— the risks that exist for Australia and how these are managed, and existing capacity for managing risks.

Chapter 1 provides basic background information about Australia, such as geopolitical and governance systems, relevant for familiarising readers with the Australian context. The first chapter also seeks to provide sufficient background information necessary for understanding the jurisdictional responsibilities outlined in Chapters 2 and 3.

Chapter 2 explains in detail the organisation of Australia's animal health system, permitting the reader to gain an understanding of the depth and breadth of the system, as well as identifying relevant legislation underpinning the animal disease control system. Laboratory services, veterinary services capacity, and surveillance programs are also described to permit an evaluation of Australia's overall animal disease prevention, detection and response capacity.

In Chapter 3, general emergency management and preparedness systems, as well as those specifically related to avian influenza, are described. It is evident that Australia has well-resourced, extensively trialled and comprehensive plans and policies in place which are also aligned with international guidelines and recommendations.

Chapter 4 provides a picture of the Australian poultry industry sectors, in terms of structure, dynamics, operation and biosecurity practices. Industry sector size, location, interaction,

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[1] For the purpose of this document, 'notifiable avian influenza' (NAI) includes all highly pathogenic subtypes of AI virus, and any AI virus (whether highly pathogenic or not) of H5 and H7 subtypes. In AUSVETPLAN, NAI viruses are referred to as highly pathogenic avian influenza (HPAI) or low pathogenicity AI (H5/H7). Detection of any strain of AI virus remains notifiable in Australia, and the policy for dealing with detection of AI virus is outlined in AUSVETPLAN.

integration, regulation, product movement, and husbandry and management policy and practices are all detailed in order to provide sufficient information for an assessment of HPAI risk.

The history and epidemiology of AI detections in Australian domestic poultry is then presented in Chapter 5. This chapter is of particular significance in forming an assessment of the risk of future HPAI infection in Australia. In each case where avian influenza viruses have been detected in domestic poultry in Australia, infection was quickly identified, spread minimised and the disease eradicated. Furthermore, the chapter details how epidemiological investigation and analysis of the five HPAI outbreaks have contributed to the understanding of HPAI in the Australian context and to the development of biosecurity awareness activities involving all poultry industry sectors. This has further contributed to the reduced risk of recurrence of HPAI in Australia.

In the second part of the dossier, attention is focused specifically on avian influenza surveillance activities in Australia, for both wild and domestic poultry. Chapter 6 describes the various formal national surveillance and reporting systems in Australia, as well as other reporting mechanisms, with relevance to the identification of avian influenza.

Chapter 7 describes both the likelihood of introduction to Australia of exotic (especially highly pathogenic) strains of the AI virus through wild bird movements, as well as the methods and results of wild bird surveillance undertaken. Lastly, Chapter 8 describes surveillance of domestic poultry undertaken in Australia, including a description of methods and results.

These eight chapters provide, in combination, a comprehensive picture of the specific epidemiological context for NAI in Australia, including Australia’s risk management strategies and capacity.

PART 1 THE AUSTRALIAN CONTEXT

CHAPTER 1 BACKGROUND INFORMATION

1.1 General information on Australia

This chapter considers the characteristics that make Australia's epidemiological context unique, outlining Australia's geography, climate, government system, and other relevant information.

Geography and climate

Australia is the world's largest island with a land area of about 7.69 million square kilometres divided into six states and two mainland territories.

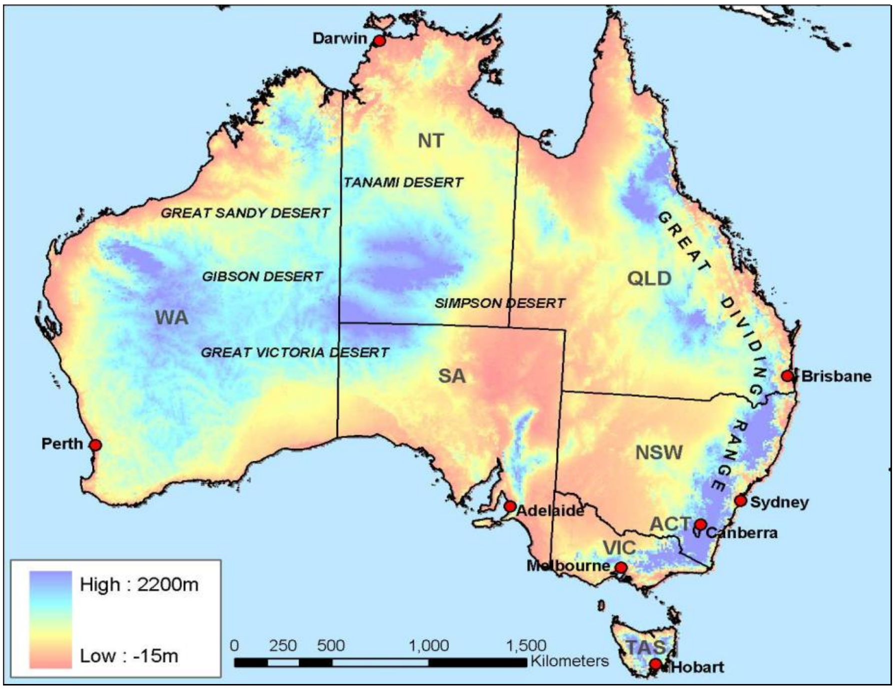

Figure 1.1 Geopolitical regions of Australia

The states and territories are shown above in Figure 1.1. Each state or territory has its own elected government, legislative powers and administrative systems (see Section 1.3).

Rainfall

With the exception of Antarctica, Australia is the world's driest continent with 80% of the country having a median annual rainfall of less than 600 millimetres while 50% of the continent has a median annual rainfall of less than 300 millimetres. The rainfall pattern is strongly seasonal with predominantly winter rainfall in the south and summer rainfall in the north.

Temperature

Average annual air temperatures range from 28° C along the Kimberley coast in the extreme north of Western Australia to 4° C in the alpine areas of south-eastern Australia. July is the month with the lowest average temperature in all parts of the continent. The months with the highest average temperature are January or February in the south and November and December in the north. Periods with a number of successive days having temperatures higher than 40° C are relatively common in summer over parts of Australia. The frequency increases inland.

Agricultural land use

In spite of Australia's harsh environment, agriculture is the most extensive form of land use. At 30 June 2006, the estimated total area of agricultural activity in Australia was 442.8 million hectares, representing about 58% of the total land area.

The most extensive land use in Australia is livestock grazing in arid and semi-arid regions and covers 430 million hectares or 56% of Australia. At 30 June 2006, 5% of Australia's agricultural land was under crops, with a further 5% under sown pastures and grasses. This maintains the trend that has seen about 10% of Australia's agricultural land under cultivation each year since the 1980s. Until this time, the area of land cropped or sown to pastures and grasses had been expanding rapidly.

1.2 Australia's system of government

Australia is a constitutional democracy based on a federal division of powers with three levels of government: federal, state or territory, and local government. The basic features of the Australian system of government include: the constitutional basis of government; the Australian (federal) Government; the Australian Public Service; and state and territory and local government.

Constitution

The Australian Constitution defines the responsibilities of the federal government, which include foreign relations, trade, defence and immigration. State and territory governments are responsible for all matters not assigned to the Australian Government, and they too adhere to the principles of responsible government. Each state also has its own constitution.

Australian Government

Commonwealth legislative power is vested in the Parliament of Australia, comprising the House of Representatives and the Senate.[2] Having a federal system means that the powers of the Parliament of Australia are limited to areas of national importance. Among the powers granted to the Australian Government by the constitution are trade and commerce, taxation, postal services, foreign relations, defence, immigration, naturalisation and quarantine.

2 The term 'Commonwealth' refers to the legal entity established by the Australian Constitution. 'Australian Government' is used to refer to the federal government.

Australian Public Service

The Australian Public Service provides policy advice to the Australian Government and facilitates the delivery of programs to the community. The Australian Public Service is part of the broader public sector, which includes parliamentary staff, statutory authorities, a separate public service for each of the states and territories, and local government employees. As at November 2006 some 1 692 300 persons, or approximately 16% of the entire Australian workforce, worked in the public sector.

State and Territory governments

Each state is governed by a ministry headed by a premier. The state cabinet, chaired by the premier, is the centre of political and administrative power in each state. The extent of state legislative powers is defined by the Australian and state constitutions, and includes education, police, public health, public transport, agriculture, roads and overseeing local government.

The Australian Capital Territory and the Northern Territory are self-governing entities with powers almost matching those of the original states, including an elected House of Assembly.

Local government

Each state, and the Northern Territory, has a number of local government areas, known variously as cities, towns, municipalities, boroughs, shires or districts. The generic local body is the council. Most councillors and aldermen are elected by local residents, though councils may be dismissed by state governments.

1.3 Australia's epidemiological context

As an island continent with no shared land borders, Australia has a significant advantage over most other countries in its ability to control border movements. Animals can only be moved into Australia by sea or air, and only through controlled and inspected entry points.

This is an important distinction, as legal and illegal transboundary trade in poultry and poultry products across the land borders of infected and at-risk countries are now acknowledged as likely sources of spread of HPAI viruses in other regions (Martin et al., 2009). Furthermore, continental nations have land borders that are inevitably open to the movement of some pests and diseases through means other than trade.

In addition to its geographic isolation, Australia has stringent quarantine measures in keeping with the SPS measures prescribed by the WTO. In 2008, the report of the independent Quarantine and Biosecurity Review Panel compared the biosecurity approaches of a number of Australian trading partners and noted differences typically reflecting differing 'endemic pest and disease status, the extent of land borders with neighbouring countries, and capability levels' (Beale et al., 2008: 220). This, in turn, determined the relative emphasis trading partners placed on border controls or the capacity to identify and respond to pest and disease outbreaks quickly.

In contrast to other developed island nations such as the United Kingdom, Australia lacks a history of large trading volumes and people movements predating the development of biosecurity protocols. This, along with an absence of land borders, has created a favourable endemic pest and disease status in Australia and resulted in a (relatively) stronger emphasis on border control and the capacity to identify and respond to pest and disease outbreaks quickly. In other words, Australia is a country with a relatively short history of exposure to exotic pests and diseases, and has a history of successful eradication of incursions. Environmental protection is also an important factor, as Australia's plants and animals evolved in relative isolation and are thus highly vulnerable to exotic pests and diseases. Australians place a high value on the country's unique environment and biodiversity, and this is another reason why emphasis is placed on border and disease control systems.

The legal importation of live pigeons and hatching eggs of chickens, turkeys and ducks is permitted, but only through government controlled or regulated quarantine facilities. The importation of fresh poultry products into Australia is also subject to strict quarantine requirements. More details are provided in Chapter 2: Australia's Animal Health Systems.

Australia also has the advantage of not being on the flight pathways for migrating *Anseriformes*. *Anseriformes*, and in particular the waterfowl family *Anatidae*, are recognised to be a major wild bird reservoir of AI viruses. *Anatidae* have been implicated in the spread of subtype H5N1 highly pathogenic AI (HPAI) by wild birds within Asia and to Europe and Africa. While extensive international field studies have not yet determined whether wild birds spread the H5N1 HPAI virus over long distances during their annual migrations, it is generally acknowledged that the migration of water birds presents a serious risk for widespread dissemination of viruses. Current information suggests that infected birds may move short distances carrying H5N1 (Martin et al., 2009). The risk of introduction of AI viruses by migratory wild birds is discussed in more detail in Chapter 7.

1.4 Australia's level of agricultural development and living standards

AI viruses, including HPAI H5N1, have become endemic in some village farming and marketing systems in Asia. Australia, however, does not have the subsistence farming practices seen throughout much of Asia and Africa. Likewise, free ranging village poultry are not a feature of the Australian landscape, thus reducing the likelihood of virus persistence in the Australian environment. The number of small household poultry flocks has reduced in Australia with growing urbanisation, although there is a slight reversal of this trend with an increase in rural residential living as a lifestyle choice. Nevertheless, the majority of the poultry industry, as well as backyard chickens, are located in urban areas or in proximity to urban areas.

As in most countries, the location of poultry farms in Australia is limited by planning laws enforced by local government authorities. Internationally, the level of traceability for poultry varies, depending on country development and legislation, and the level of industry integration. In Australia, however, concerns about food safety have resulted in national and state regulatory requirements for commercial farms to be identified, and farm-to-fork traceability requirements. Minimum standards of best practice for commercial poultry are also enforced. More details are provided on this in Chapter 4.

As a technologically developed country, Australia has been able to develop technologies in the areas of remote sensing, GIS, modelling and diagnostics to continually improve its programs against transboundary animal diseases. Furthermore, digital information capture, storage and transmission have a major bearing on the use of informatics and epidemiology. Thus, Australia has a clear surveillance advantage over many countries, with its extensive broadband infrastructure and widespread connectivity, in conjunction with a (largely) technology- and computer-literate workforce.

Australia also has a high standard of general education and this is reflected in the intensive animal industry which is either directly or indirectly managed or serviced by trained personnel. Australia is a world leader in agricultural research, including animal health, and it has one of the highest per capita ratios of trained veterinarians in the world.

The following chapter describes the animal health system in Australia.

CHAPTER 2 ANIMAL HEALTH SYSTEMS IN AUSTRALIA

Australia has a strong and comprehensive animal health system which supports a high standard of animal health and welfare. In line with the principles of quality veterinary service set out in the OIE *Terrestrial Animal Health Code*, the Australian animal health system demonstrates—through its legislation, financial resources and effective organisation—a strong capacity for ‘control of the establishment and application of animal health measures, and of international veterinary certification activities’ (OIE, 2009). Australian legislation also ‘define(s) and document the responsibilities and structure of the organisations in charge of the animal identification system, control of animal movements, animal disease control and reporting systems, epidemiological surveillance and communication of epidemiological information’ (ibid.). Thus, the Australian animal health system meets OIE standards for veterinary services.

Australia’s biosecurity system is also robust. Over the years there have been a number of reviews of Australia’s biosecurity system—an indicator of that system’s importance—the most recent documented in *One Biosecurity: a working partnership*. The review concluded that while improvements could be made, Australia operated a good biosecurity system, one that was ‘often the envy of other countries given its comprehensiveness, transparency, and scientific rigour’ (Beale et al., 2008: xv). Importantly, these reviews have stressed a policy of shared responsibility for Australia’s quarantine and biosecurity system between the government, business and the Australian community.

Part of Australia’s epidemiological context, then, is that of a country with a strong and stable animal health system which compares well internationally. The system is maintained through cooperative partnerships between the Australian Government, the state and territory governments, livestock industries, private veterinary practitioners and research organisations. Each of these partners is a major contributor to the national animal health system. Details about each component of Australia’s animal health system (including governance) are presented in this chapter, along with a description of legislation and resources underpinning the system. For further details about the components of Australia’s animal health system and the current status of animal health in Australia, readers are directed to the annual report *Animal Health in Australia*.

2.1 Organisation of 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 advice and coordination of national government policy and, in some circumstances, financial assistance for national animal disease control programs.

A national committee structure (as outlined in Section 2.1.3) is used to govern and coordinate national animal health and biosecurity issues that involve all levels of government and industry.

2.1.1 Australian Government

The animal health responsibilities of the Australian Government are delivered through the Animal Division of Biosecurity Services Group (BSG) within the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF). Within the Animal Division are:

- the Office of the Chief Veterinary Officer
- Animal Health Programs
- Animal Biosecurity
- Animal Quarantine and Export Operations
- Biological Quarantine Operations and Marine Pests.

The Food Division of BSG is responsible for food safety and product integrity. It delivers this service through its Exports Standards, Food Exports, Residues and Food Safety, and Export Reform branches.

In addition, the Trade and Market Access Division of DAFF provides policy and strategic support for DAFF's international activities.

An external government agency, the Commonwealth Scientific and Industry Research Organisation (CSIRO) provides diagnostic services, emergency disease support and independent scientific advice, and also operates the Australian Animal Health Laboratory (see Section 2.3).

Within DAFF's Animal Division, the Office of the Australian Chief Veterinary Officer (OCVO) is responsible for providing: national leadership and strategic direction on priority national animal health policy issues; international disease information gathering; high-level epidemiological research, analysis and expertise; and an international reference point on animal health. It also manages Australia's commitments to the OIE and other international agencies involved with animal health. Further information on the OCVO is available on the DAFF web site.[3]

DAFF's Animal Health Programs branch represents the department on national animal health programs. It also coordinates national animal surveillance and laboratory strategies, livestock disease prevention and preparedness activities, and emergency disease planning, training and awareness programs. The branch supports animal and human health, biodiversity and trade through its collaboration with human health and environment authorities, and the management of programs in wildlife health, aquatic health and veterinary public health.

Biosecurity Australia

To protect Australia's animal and plant health status, Biosecurity Australia provides science-based quarantine assessments and policy advice. Animal Biosecurity carries out import risk analyses and policy reviews relating to the importation of live animals, animal reproductive material and animal products. It also provides technical advice for negotiations on access to

3 http://www.daff.gov.au

international markets and contributes to the development of international quarantine standards.

Australian Quarantine and Inspection Service (AQIS)

The Australian Quarantine and Inspection Service (AQIS) includes the following branches: Animal Quarantine and Export Operations, Biological Quarantine Operations and Marine Pests, Export Standards, Food Exports, Residues and Food Safety, and Export Reform. AQIS is responsible for delivering quarantine and export field services and also for issuing export certification for live animals, animal reproductive material and animal products.

The Animal Quarantine and Export Operations branch is responsible for managing the importation of live animals and animal genetic material in order to minimise the risk of entry of exotic animal pests and diseases into Australia. The branch is also responsible for maintaining market access for live animals and animal genetic material by certifying that Australian exports meet importing country requirements.

The Biological Quarantine Operations and Invasive Marine Species branch is responsible for national systems for marine pests, international agreements on ballast water and biofouling, and associated border and post-border issues. The branch is also responsible for import permits for biological materials.

Commonwealth Scientific and Industry Research Organisation (CSIRO)

CSIRO undertakes animal health research and operates the Australian Animal Health Laboratory (AAHL). The laboratory is a national facility for animal disease diagnosis and research and also develops and tests vaccines, carries out training, and maintains the National Animal Serum Bank (used for retrospective studies on diseases). Additionally, it serves as a regional and national reference laboratory (see Section 2.3). Further information on CSIRO and AAHL is available at the CSIRO web site.[4]

2.1.2 State and territory government animal health services

Australian state and territory veterinary services have legislative responsibility for animal health services within their respective borders. Details of state legislation are provided in Appendix 3.

State services administer relevant legislation and regulations involved with livestock identification and movement (within and between states and territories), disease surveillance, diagnosis, reporting and control of notifiable diseases, chemical residues, and other programs. An animal health administrative unit headed by the state or territory chief veterinary officer (CVO) carries out these tasks. Details of the current CVOs are provided in Appendix 1.

Each state and territory is divided into veterinary regions or divisions that are under the control of a government veterinary officer. Further details on state/territory veterinary services are given in Section 2.4.2. Details of regional and district veterinary offices are provided in Appendix 2.

Although the Australian Government is responsible for formulating policy and has ultimate responsibility for quarantine under the Australian Constitution, the states and territories may act as agents of the Commonwealth in the delivery of quarantine and export certification

4 http://www.csiro.gov.au

services. Under the AQIS-accredited export program, private veterinarians are accredited to provide important export certification services in relation to live animals. The Australian Accreditation Program for Veterinarians is a national program designed to integrate private veterinary practitioners into the national animal health system. Both programs are run by Animal Health Australia (AHA). Further information is available at the AHA web site.[5]

The states and territories also have government animal health laboratories that diagnose and investigate disease outbreaks and undertake applied research.

2.1.3 National governance and coordination arrangements

Primary Industries Ministerial Council

The Primary Industries Ministerial Council (PIMC) consists of Australian, state and territory, and New Zealand government ministers responsible for agriculture, food, fibre, forestry, fisheries and aquaculture industries and production, and rural adjustment policy. It is the peak government forum for consultation, coordination and—where appropriate—integration of action by governments on primary industries issues.

The PIMC is supported by a permanent committee, the Primary Industries Standing Committee (PISC).

Primary Industries Standing Committee

PISC comprises the chief executive officers of the relevant Australian, state and territory, and New Zealand government agencies responsible for agriculture, food, fibre, forestry, fisheries and aquaculture industries and production, and rural adjustment policy. The main objectives of the PISC are to support the PIMC in the achievement of its objectives and to develop cooperative and coordinated approaches to matters of concern to the PIMC.

PIMC and PISC (with its subsidiary committees) shape the overall policies for animal health services in Australia. This framework ensures that veterinary services are efficiently and effectively coordinated at the national level.

National Biosecurity Committee

On 1 July 2008 the National Biosecurity Committee (NBC) was established as an advisory committee to PISC and PIMC. The NBC provides strategic leadership in managing the national approach to emerging and ongoing biosecurity policy issues across jurisdictions and sectors. All agricultural biosecurity issues, including animal and plant biosecurity issues, are scrutinised by the NBC prior to submission to PISC and PIMC.

Animal Health Committee

The Animal Health Committee (AHC) provides strategic scientific and policy advice on animal biosecurity matters to government through NBC, PISC and PIMC.[6] Through driving strategic policy development, operational strategies and standards for government, AHC prioritises and coordinates national animal health, domestic quarantine and veterinary public health activities. In 2009, the scope of AHC's work was extended to include responsibility for aquatic animal health issues.

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5 http://www.animalhealthaustralia.com.au/interest-areas$/veterinarians.cfm
6 http://www.daff.gov.au/animal-plant-health/animal/committees/ahc

AHC membership includes the national, state and territory CVOs and representatives from CSIRO, Biosecurity Australia and New Zealand. AHA and AQIS are observers.

Three subcommittees provide advice to AHC on specific technical and policy issues. These are the Subcommittee on Animal Health Laboratory Standards, Subcommittee on Emergency Animal Diseases and Subcommittee on Aquatic Animal Health. Specialist ad hoc working groups are formed to advise AHC on technical or policy issues as they arise.

Emergency Animal Disease National Management Group

The Emergency Animal Disease National Management Group comprises the chief executive officers of state and territory and Australian Government departments of agriculture (or equivalents), as well as industry representatives. The National Management Group (NMG) is a high-level body responsible for decision making on policy and resource allocation during emergency animal disease responses. Further detail on Australia’s emergency animal disease response arrangements are provided in Chapter 3.

Consultative Committee on Emergency Animal Diseases (CCEAD)

CCEAD is the coordinating committee that provides a technical link between the Australian Government, states, territories and industry for decision making during animal health emergencies. CCEAD coordinates and makes decisions about the national technical response to emergency animal disease incidents of animal health, public health or trade significance. Where applicable, CCEAD advises NMG on funding mechanisms for responses, particularly if they relate to the Emergency Animal Disease Response Agreement. CCEAD is chaired by the Australian CVO and its membership includes state and territory CVOs, and representatives from AQIS, Biosecurity Australia, AAHL and industry bodies.

Animal Health Australia (AHA)

AHA is a national partnership of governments and stakeholders, comprising member representatives from the Australian Government, state and territory governments, livestock industries and other national animal health stakeholders. AHA is a not-for-profit public company limited by guarantee and funded primarily by member subscriptions. Through the partnership, collaborative programs on animal disease surveillance, emergency animal disease preparedness, market access, animal welfare, livestock productivity, and national biosecurity are initiated and managed. The funding provided by members is used to coordinate national animal health policy and programs that contribute to an integrated national animal health system. Few countries have combined public and private animal health funds (FAO, 2009: 87).

More information on AHA and its programs is available on the AHA web site.[7]

2.2 Disease control legislation

The OIE notes the essential role that veterinary legislation serves in enabling veterinary authorities to carry out key functions such as surveillance, early detection and control of animal diseases and zoonoses, animal production food safety and certification of animals and animal products for export.[8] The OIE also provides a set of guidelines for veterinary

7 http://www.animalhealthaustralia.com.au/

8 http://www.oie.int/eng/oie/organisation/en_vet_leg.htm?e1d2

legislation. Australian veterinary legislation fulfils all of the general and technical recommendations made by these guidelines and is described in greater detail in this section.

In Australia, legislation at both federal and state level helps underpin Australia's animal disease status and so both are described here. The legislation confers regulatory and associated investigative and prosecution powers.

2.2.1 Commonwealth legislation — animal health

Under the Australian Constitution, the Australian Government is responsible for quarantine and international animal health matters including disease reporting, export certification and trade negotiation. The relevant legislation is the *Quarantine Act*, the *Export Control Act* and these acts' subordinate legislation.

The *Quarantine Act 1908* regulates imports on the basis of quarantine risk. This act provides powers for quarantine officers to deal with quarantine matters, sets out the legal basis for controlling the importation of goods, animals and plants and also determines the offences for breaches of the act. The legislative base includes:

- *Quarantine Act 1908* (amended by various quarantine amendment acts, the most recent being the *Quarantine Amendment Act 2002*, and administered by AQIS and Biosecurity Australia for DAFF and the Australian Government Department of Health and Ageing)
- *Quarantine Proclamation 1998*
- *Quarantine (Cocos Islands) Proclamation 2004*
- *Quarantine Regulations 2000* and *Quarantine Regulations 2002*
- The legislative instrument *Notice of Declaration of a Special Quarantine Zone* under section 5A of *Quarantine Act 1908*
- *Quarantine Service Fees Determinations 2005.*

The legislation is complemented by the *Customs (Prohibited Imports) Regulations 1956* and the *Customs Regulations 1926*, both made under the *Customs Act 1901* and administered by the Australian Customs Service within the Justice and Customs/Attorney General portfolios.

The recent review of Australia's biosecurity and quarantine arrangements (*One Biosecurity: A working partnership*) also provided the imprimatur for the development of new legislation to further strengthen the Commonwealth's legislative authority.

<u>*Commonwealth legislation for imported foods*</u>

The relevant legislation is the *Imported Food Control Act 1992*, which regulates the inspection of imported foods. The legislative base comprises:

- *Imported Food Control Act 1992* (administered by AQIS and Foods Standards Australia New Zealand)
- *Imported Food Control Regulations 1993*
- *Imported Food Control Order 2001.*

The legislation is complemented by the operation of the *Food Standards Australia New Zealand Act 1991* and a code within this act, the Australian and New Zealand Food Standards Code. The code is administered jointly by Food Standards Australia New Zealand (FSANZ) (a statutory authority) and state and territory departments of health. AQIS is responsible for administering the *Imported Food Control Act 1992* and related legislation.

2.2.2 Quarantine policy in the international trading environment

Control of disease in imported livestock and products

As a member of the World Trade Organization (WTO), Australia ensures that its import policies and procedures are in line with its international obligations under the *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement). This agreement governs the imposition of measures that affect international trade and that have as their objective the protection of human, animal and plant life and health.

Control of disease in exported livestock and products

AQIS and Biosecurity Australia facilitate the export of agricultural products (including live animals, reproductive material and animal products) by ensuring that Australian export controls and importing countries' requirements are met. They are also responsible for seeing that approved animal welfare practices are used. Further information on Biosecurity Australia's activities can be found on the DAFF web site.[9]

Quarantine conditions for the importation of live poultry, hatching eggs and fresh poultry meat

Live poultry other than pigeons may not be imported into Australia. Individual pet birds may be imported from New Zealand but commercial consignments are not permitted. Conditions for the importation of pet birds from New Zealand can be found on the DAFF web site.[10]

Live pigeons may be imported into a high biosecurity quarantine facility following pre-import testing of birds for various disease agents, including avian influenza (AI) and Newcastle disease (ND). The pigeons then undergo further health inspections and testing for disease agents before release from quarantine in Australia. Conditions for the importation of live pigeons are available at the DAFF web site.[11]

Hatching eggs of chickens, turkeys and ducks may be imported into high biosecurity post-arrival quarantine facilities from approved countries, providing these countries are free of HPAI at the time of preparation of the consignment.[12] Import conditions for fertile eggs require testing of the parent flock for various disease agents, including AI and ND. The hatchlings, and sentinel specific pathogen free (SPF) chickens in contact with them, then undergo further testing for disease agents before release from quarantine in Australia. The AQIS ICON web site, a searchable database, provides detailed importation requirements for fertile eggs and other poultry products.[13]

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9 http://www.daff.gov.au/ba
10 http://www.daff.gov.au/aqis/import/live-animals
11 http://www.daff.gov.au/aqis/import/live-animals
12 Approved countries include the United States, Canada, the United Kingdom, New Zealand, Germany, France, the Netherlands and Ireland.
13 http://www.daff.gov.au/aqis/import/icon-icd

Live poultry imports into Australia are not permitted (except in the case of fertile eggs). The importation of fertile chicken, duck and turkey eggs is permitted from approved HPAI-free countries. Fertile eggs may be imported from countries where vaccination for ND is practised. However, this is subject to pre-export isolation and testing of the breeder flock, and post-arrival quarantine and testing of the hatchlings.

An import risk analysis (IRA) for the importation of chicken meat was recently finalised and published on the DAFF web site.[14] The IRA recommends quarantine controls for management of risk associated with AI, ND, and a number of other pathogens.

Border control operations

AQIS provides quarantine inspection for international passengers, cargo, mail, animals, plants, and animal and plant products arriving in Australia. They also inspect and certify a range of agricultural products exported from Australia. AQIS' import and export inspection and certification is essential to maintain Australia's favourable animal, plant and human health status and access to export markets. Quarantine controls at Australia's borders also minimise the risk of exotic pests and diseases to protect Australia's agriculture industries and environment. Further information on Australia’s border operations can be found on the AQIS web site.

2.2.3 State and territory legislation — animal health

State and territory services administer relevant acts and regulations involved with: livestock identification and movement (within and between states and territories), disease surveillance, diagnosis, reporting and control of notifiable diseases, chemical residues and other programs. The relevant state and territory legislation are the various stock diseases acts (or their equivalents) and the emergency diseases acts, which list reportable and/or quarantinable diseases. These acts provide the necessary authority for veterinarians and stock inspectors to enforce the legislation. Specific state and territory legislation is shown in Appendix 3 together with a short summary of the issues covered.

The *Mutual Recognition Act 1992* requires that interstate movement controls must not result in unnecessary restrictions to interstate trade. However, it allows for the imposition of such restrictions through state legislation where it can be shown that need exists; for example, to protect a state’s animal health status.

Control of disease in domestic poultry

Detection of AI virus in poultry is nationally notifiable. (See the National Notifiable Animal Disease list in Appendix 4). This required notification for AI across Australia is supported by state and territory legislative instruments shown in Appendix 5. Each state and territory government legislation requires the:

- investigation of suspected clinical cases
- notification of suspected cases of AI
- prohibition of vaccination and treatment
- compliance with any operational procedures.

14 http://www.daff.gov.au/ba/ira/final-animal/chicken-meat

The reporting of sick birds or mortalities is mandatory where there is a suspicion of, or need for a differential diagnostic excluding, an emergency animal disease such as AI. A veterinarian attending an animal and suspecting an exotic or notifiable disease is required by law to report the incident to the local or state authority, usually the state department of agriculture. The time period for notification is outlined in the legislation of each state and territory.

2.3 Animal health laboratories services

Worldwide, of the current 167 Member Countries of the OIE, 120 countries (almost 72%) are developing countries with variable scientific capacity or access to scientific expertise within their national laboratories. The majority of OIE Reference Laboratories and Collaborating Centres and expertise are situated in the remaining 47 Member Countries, part of the developed world (OIE, 2009). The map below (Funes, 2009) shows the world distribution of these laboratories.

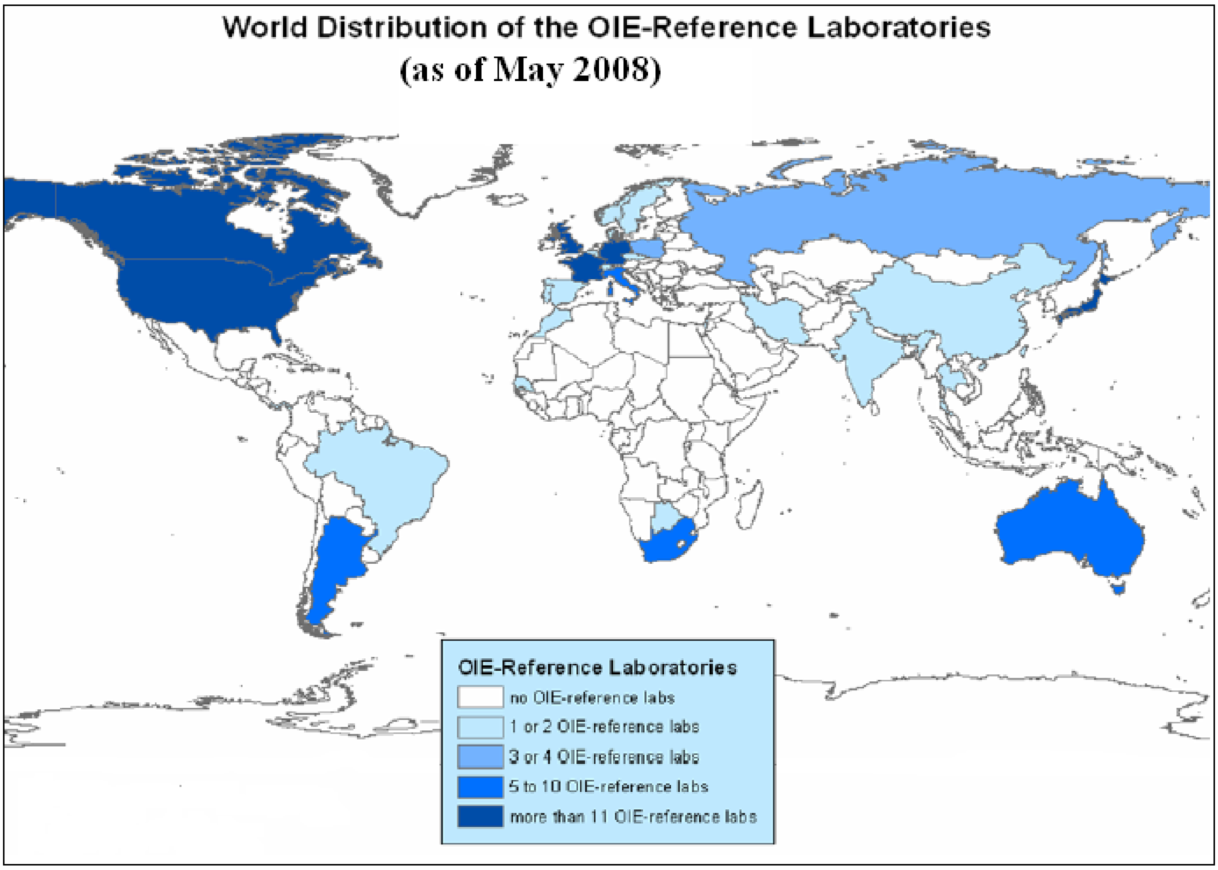

Figure 2.3 World Distribution of OIE Reference Laboratories (Source: Funes, 2009)

Australian Animal Health Laboratory

CSIRO and DAFF co-fund CSIRO's Australian Animal Health Laboratory (AAHL), a national centre for excellence in disease diagnosis, research and policy advice in animal health. The laboratory is an emergency animal disease diagnostic and research facility and also provides training in emergency animal disease (EAD) recognition and diagnosis for Australian and overseas animal health field and laboratory staff. Within its high biocontainment facility, AAHL contains modern facilities that can house a range of animal species up to physical containment 4 (PC4), the highest level available. AAHL is a designated OIE reference laboratory for AI, ND, bluetongue disease, Hendra and Nipah virus diseases, epizootic haematopoietic necrosis virus and yellowhead disease. AAHL is the national reference laboratory for these diseases as well as brucellosis and rabies.

AAHL is also:

- an OIE Collaborating Centre for New and Emerging Diseases
- an OIE Collaborating Centre for Laboratory Capacity Building
- a World Health Organisation (WHO) Collaborating Centre for Severe Acute Respiratory Syndrome (SARS).

In addition, AAHL provides a service to other countries in the region (e.g. the outbreak of Nipah virus in Malaysia). As part of CSIRO Livestock Industries, AAHL also has some responsibility for endemic diseases of national significance.

State and territory laboratories

State and territory government veterinary laboratories provide a wide range of diagnostic services and are involved in various research activities. In addition, some laboratories provide an informal national service for specific pathogens because of their particular expertise. For example, the Animal Research Institute in Queensland is recognised for its expertise in respiratory pathogens of intensively managed livestock, while the Elizabeth Macarthur Agricultural Institute in New South Wales has particular expertise in pestiviruses.

The following veterinary laboratories provide AI diagnosis:

- Australian Animal Health Laboratory (AAHL), Geelong, Victoria
- Biosecurity Sciences Laboratory, Yeerongpilly, Queensland
- Animal Disease Surveillance Laboratory, Toowoomba, Queensland
- Elizabeth Macarthur Agriculture Institute, Menangle, NSW
- Animal Health Laboratories, Perth, Western Australia
- Berrimah Veterinary Laboratories, Northern Territory
- Mt Pleasant Laboratory, Tasmania
- Victorian Department of Primary Industries, Veterinary Diagnostic Services, Attwood, Victoria.

State and national veterinary laboratories offer diagnostic testing at a number of sites. The table below provides the number of sites and tests available for AI in each state and territory as of 2008.

Table 2.1 Diagnostic laboratories offering tests for avian influenza

TEST	NSW	NT	QLD	SA	TAS	VIC*	WA
AGID						2	1

ELISA	1	1	1		1	2	1
HI	1		1			2	1
Isolation						2[a]	
PCR	1	1	1		1	2	1

*includes AAHL
a) In the Attwood laboratory, isolation of LPAI viruses, but not HPAI or LPAI (H5/H7)

In addition to government animal health laboratories, there are veterinary diagnostic laboratories associated with the veterinary schools. Specialist laboratories provide services to livestock industries in the areas of residue and microbiological testing of meat and other products.

Private and industry laboratories

There are many private and industry laboratories in Australia. Although private veterinary laboratories provide services mainly for companion animals, they also provide a range of services to animal industries. Several private veterinary laboratories provide diagnostic services for avian species, including laboratories associated with avian consultancy firms and commercial poultry companies. A number of these laboratories are accredited with the National Association of Testing Authorities (NATA) and participate in quality assurance programs as described below. Details of the laboratories can be obtained from the NATA web site.[15]

Standards and accreditation

Australia's government animal health laboratories are normally required to be accredited to international standards for performing diagnostic tests, especially those that are trade-related. NATA is the major provider of laboratory accreditation in Australia. NATA accreditation provides a way of assuring the ongoing competence of laboratories to perform a specific range of diagnostic testing in line with international standards.

NATA signed a revised memorandum of understanding with the Australian government in 2008, confirming that NATA is:

- Australia's authority for laboratory accreditation
- the compliance monitoring authority for OECD Principles of Good Laboratory Practice
- the designated authority for the European Union Mutual Recognition Agreement and APEC Mutual Recognition agreements.

NATA publishes an internet directory of its accredited laboratories which is updated daily and includes laboratory contact details and information on their testing capabilities.

Sub-committee on Animal Health Laboratory Standards

The Sub-committee on Animal Health Laboratory Standards (SCAHLS) acts as a forum for national coordination on laboratory issues such as: quality assurance, new test development,

15 http://www.nata.asn.au

standard diagnostic procedures, EAD preparedness, developing and maintaining a system of reference laboratories, organising and promoting training opportunities, technical advice relating to diagnostic testing, and contributing to the National Animal Health Information System (NAHIS) database.[16] SCAHLS reports to the AHC.

SCAHLS maintains a comprehensive series of Australian and New Zealand Standard Diagnostic Procedures (ANZSDPs) and publishes revisions and new titles as required, as recommended by the OIE. SCAHLS membership includes:

- the state and territory animal health laboratories
- the AAHL
- private animal health laboratories
- the OCVO
- Animal Biosecurity
- AHA
- each university veterinary school laboratory
- NATA
- Australian Veterinary Deans Committee
- the Ministry of Agriculture and Fisheries, New Zealand.

Quality Assurance

As part of its role in contributing to quality assurance, SCAHLS facilitates inter-laboratory proficiency testing through the Australian National Quality Assurance Program (ANQAP) based at the Department of Primary Industries in Attwood, Victoria.[17] The ANQAP conducts annual quality assurance testing for veterinary diagnostic procedures in Australia and New Zealand. The main focus of the program is to provide proficiency testing for veterinary tests associated with disease control programs, quarantine and export certification. Over 30 government and private veterinary laboratories in Australia, New Zealand, Asia, Africa, Europe and North America participate in the program, which is funded by the participating laboratories.

2.4 Veterinary capacity, infrastructure and organisation

Australia has well-developed veterinary legislation in each state and territory, with clear definitions of what constitutes a veterinarian and an act of veterinary service. Each state and territory has a statutory body for examining, certifying, registering and disciplining those providing animal health care services in that jurisdiction.

16 http://www.scahls.org.au/index.htm
17 http://www.anqap.com

In terms of veterinary services, an international comparison shows that Australia has an adequate number of veterinarians to support its animal health requirements (Umali et al., 1994).

As of 2009, Australia had 9961 professionally qualified veterinarians. About 81% are engaged in private practice, 6% are government employed and the remainder are employed by other organisations, mainly laboratories, universities and industry. These veterinarians are assisted by about 1000 animal health technicians.

The veterinary infrastructure in Australia comprises Australian and state and territory government veterinary services, public institutions (including CSIRO and universities involved in veterinary research and training), private veterinary institutions and practitioners that provide clinical and laboratory services. Table 2.2 shows the numbers and categories of veterinarians and other animal health personnel in Australia.

Table 2.2 Number of veterinarians and other animal health personnel in Australia (Animal Health Australia, 2009)

VETERINARIANS		AUXILIARY PERSONNEL	
Government	642	Stock inspectors, meat inspectors, etc	872
CSIRO, universities, laboratories	544		
Private practitioners	8078		
Other veterinarians	697		
Subtotal	9961	Subtotal	872
TOTAL			10 833

2.4.1 Veterinary education, registration and representation

Within Australia there are six universities currently providing various five or six year courses in veterinary science. These are as follows:

- The University of Sydney
- The University of Queensland
- The University of Melbourne
- Murdoch University
- Charles Sturt University
- James Cook University

The University of Adelaide also currently provides a pre-veterinary science course and intends to provide a three year postgraduate award in Veterinary Science beginning in 2011.

In 2007, the intake of veterinary students in Australian universities was 614 and Australian veterinary schools continue to attract high quality students. Retention rates are close to 97%. Training in the recognition and diagnosis of livestock diseases is an important part of veterinary education in Australia.

In addition to veterinary education, courses in agriculture, animal care, poultry production, meat processing (abattoirs), veterinary nursing and animal technology are provided by universities, technical colleges, high schools and colleges. More than 11 000 students were enrolled in such courses in 2006 to 2007 (Department of Education, Science and Training, 2006; Department of Education, Science and Training, 2007).

The Accreditation Program for Australian Veterinarians (APAV) is a national program designed to integrate private veterinary practitioners into the national animal health system thus supporting the international standing of Australia's animal health service capability. APAV accreditation allows private veterinarians to expand their services through providing approval for their participation in government-sponsored market assurance programs such as the Australian Veterinary Reserve and AQIS Accreditation of Veterinarians for Livestock Export. Before veterinarians are accredited they must complete a training course in these fundamental areas. Further details are available at the AQIS web site.[18]

Professional veterinary associations and membership groups also exist in Australia, including the Australian College of Veterinary Scientists, veterinary registration boards and the Australian Veterinary Association.

2.4.2 State and territory veterinary services

State and territory government departments employ veterinarians in various capacities. Services provided include applied research and the investigation and diagnosis of livestock disease outbreaks. These require close links with livestock producers, industry organisations, private veterinarians, veterinary laboratories, livestock transport and marketing agents, and other stakeholders. An animal health unit, headed by the state or territory CVO, maintains these links.

Within the state and territory jurisdictions, regional veterinary officers supervise the local veterinary officers and inspectors of livestock administering the relevant legislation. The responsibilities of regional veterinary officers include:

- investigating and managing reports of livestock disease, including emergency animal diseases
- monitoring and ensuring compliance with animal identification systems
- investigating reports of chemical contamination of livestock, and implementing response plans to protect consumers from chemical residues
- maintaining producer awareness of best practice in local livestock management systems
- investigating complaints about the welfare of livestock

18 http://www.daff.gov.au/aqis/export/live-animals/livestock/vet

- monitoring the health of feral animals and native wildlife (to detect any incursion of new diseases of significance or exotic diseases)
- educating livestock producers, industry organisations and service providers (transport and marketing) about their legislative obligations, relevant biosecurity and market assurance programs, and technological developments.

State departments employ specialist poultry veterinarians who maintain close links with poultry industry veterinarians, private practitioners and poultry producers on poultry health issues. The activities of state government poultry veterinarians include field and laboratory investigations of poultry disease events, scrutiny of poultry submissions to state government veterinary laboratories, and provision of advice to both commercial poultry enterprises and non-commercial poultry keepers.

2.4.3 Private veterinary services

Private veterinarians play an essential role in rural communities, and in the animal disease preparedness programs developed for Australia's livestock industries. Private veterinarians also work in animal health consultancy and in various other capacities for Australia's animal industries. Additionally they are involved in government, tertiary institutions and private sector diagnostic and research laboratories.

All veterinary practitioners have an important role to play in the early detection and appropriate investigation of possible emergency diseases. Competency in recognising and diagnosing livestock diseases is an important part of veterinary education in Australia and a prerequisite for being registered as a veterinary surgeon.

Poultry industry veterinarians

Veterinarians working in the poultry industry are employed by state government (see Section 2.4.2) or by industry. Industry veterinarians may work either on an independent basis, as company employees, or as associates of the pharmaceutical and biological industries. Industry and government veterinarians are influential in determining health programs and biosecurity policies for producers. Individual government veterinarians or poultry specialists also provide technical services and advice to poultry producers and backyard flocks in a number of states.

The larger integrated companies in the chicken meat and layer and turkey sectors either employ staff veterinarians or contract consultant veterinarians. Medium and small producers commonly use either industry, consultant or government veterinarians on an ad hoc basis.

Producers in the duck industry also rely on consultant veterinarians. However, ducks are relatively healthy birds and do not require the same level of vaccination and monitoring of flock immunity as chickens.

Some ratite, turkey, and game bird producers have in-house veterinarians or use consultant specialist poultry veterinarians.

2.5 National disease surveillance programs

Australia participates in a number of global surveillance systems that exist to monitor animal diseases as part of cross-border and regional animal health surveillance programmes. These include the Global Early Warning System (GLEWS), operated by FAO, OIE and WHO, as well as global and regional networks of laboratories and epidemiologists – for example, the

OIE/FAO Network of Expertise on Animal Influenza (OFFLU) and regional laboratory and epidemiology networks in Africa and Asia (FAO, 2009: 87).

A number of national surveillance programs are also undertaken which are aimed at addressing specific disease risks, meeting trade requirements, providing early warning of potential disease issues, and gathering information on endemic diseases of interest or concern.

Australia also provides development support to increase the surveillance capacity of developing countries.

These activities are described below.

2.5.1 Animal disease surveillance

National Animal Health Surveillance Strategy

In 2007, the PISC endorsed the National Animal Health Surveillance Strategy (NAHSS). This strategy incorporates the surveillance requirements for demonstrating Australia's animal health status while also prioritising areas where there may be impacts on human health (e.g. zoonotic diseases), food safety, animal welfare, the environment, productivity and market access. PISC concurrently recommended the formation of a NAHSS Expert Surveillance Group by Animal Health Australia. This expert group would identify cost-effective changes in emphasis that would enable Australia's surveillance system to better meet future national surveillance needs.

Northern Australia Quarantine Strategy (NAQS)

NAQS provides early warning of exotic pest and disease incursions through an ongoing assessment of quarantine risks in northern Australia. The program is managed by the OCVO and operates across a coastal strip (with inland high-risk areas) stretching from Cairns (in the east) to Broome (in the west). The program area also includes the Torres Strait Islands, East Timor, Indonesia and Papua New Guinea.

The core activity of NAQS is monitoring and surveillance of animals for target list diseases, both onshore and offshore. The onshore program includes regular surveys of feral animals and livestock, and sentinel herd testing and insect vector trapping for a target list of diseases.

In neighbouring countries, Australia undertakes a range of capacity building activities that potentially reduce the risk of exotic animal disease incursions into Australia. NAQS manages a range of projects to strengthen biosecurity and mitigate risks associated with highly pathogenic AI. These projects are funded by the Australian Agency for International Development (AusAID) and take place in Indonesia, Papua New Guinea and East Timor. The focus of projects has been on enhancing quarantine, surveillance and diagnostic capacity in these countries.

National Wildlife Disease Surveillance

The Australian Wildlife Health Network (AWHN) is a not-for-profit organisation comprising a network of organisations and people across Australia. It is an initiative of the Australian Government (DAFF) and is managed under the Wildlife Exotic Disease Preparedness Program.[19] The network's aim is to promote and facilitate collaborative investigation and

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19 http://www.daff.gov.au/animal-plant-health/emergency/wedpp

management of wildlife health across Australia in order to support public and livestock health, biodiversity and trade. The network is based at Taronga Zoo in Sydney, New South Wales and is managed by a national coordinator and a management committee. AWHN is jointly hosted by the Taronga Conservation Society Australia and Industry & Investment NSW. The network maintains an interactive web site and a database for network members known as eWHIS (electronic Wildlife Health Information System). [20]

AWHN is coordinating the national surveillance program for AI in wild birds. Investigation of wild-bird mortality events is a crucial component of wildlife disease surveillance. Results of active surveillance, mortality investigations and exclusion testing for AI in wild birds are described in Chapter 7.

Through a national wildlife event investigation team (WEIT)[21], AHA, industry and AHC have made funding available for significant wildlife health investigations in Australia. This ensures that wildlife disease events of potential threat to biodiversity, public health, or national livestock productivity and trade are thoroughly investigated. Primary investigations involve assessing and defining the risks of wildlife diseases and identifying potential consequences for the public, livestock and/or wildlife. Subsequent investigations are subject to appropriate cost-sharing between relevant agencies.

National Significant Disease Investigation Program

The National Significant Disease Investigation (SDI) Program has been established from livestock industry and government subscriptions in order to boost Australia's capacity for the early detection of disease. It works by recruiting greater participation by private veterinary practitioners and subsidising the cost of their disease investigations. Where financial limitations to investigation exist, the National SDI Program subsidises livestock disease investigations by veterinary practitioners. In return, the practitioner provides a case report of the investigation. Significant diseases are broadly defined as those that may impact trade, regional or national productivity or public health, and may include clinical signs such as high morbidity, mortality or rapid rate of spread. Where there is genuine suspicion of a notifiable animal disease, it is the practitioner's legal responsibility to notify their state or territory animal health authority.

Summary case data is collated centrally in the National Animal Health Information System. This data allows future analysis of disease trends and assists the promotion of general surveillance capacity in Australia. Further information on this program can be found on the Animal Health Australia web site.[22]

Australian Veterinary Practitioner Surveillance Network

The Australian Veterinary Practitioners Surveillance Network (AVPSN) is a web-based system designed to collect information about on-farm investigations by nongovernment veterinarians. A small group of practitioners tested a pilot scheme of the AVPSN in 2004 to 2005, and the network has since been expanding with the progressive addition of new practices. The AVPSN collates information that adds to, and complements, information provided by existing surveillance activities.

20 http://www.wildlifehealth.org.au/AWHN/home.aspx
21 http://www.animalhealthaustralia.com.au/programs/adsp/weit.cfm
22 http://www.animalhealthaustralia.com.au/programs/adsp/sdi.cfm

Importantly, the system provides quantitative evidence of the amount of passive surveillance undertaken by Australia's network of veterinary practitioners across geographic regions and production systems. The database is managed by DAFF.

National Animal Health Information System Program

The National Animal Health Information System (NAHIS) Program collates data from a wide range of government and non-government programs in order to provide an overview of animal health, disease surveillance and disease control. Data is summarised in the NAHIS database, and routinely reported in the newsletter *Animal Health Surveillance Quarterly* together with veterinary investigation case reports.[23] The data is also used by the Australian Government in reports to the OIE, the Food and Agriculture Organization of the United Nations, and the World Health Organization. Current disease surveillance reports and publications are available on the NAHIS page of the Animal Health Australia web site.[24]

2.5.2 Relevant public health surveillance programs

National Notifiable Diseases Surveillance System (NNDSS)

The Communicable Diseases Network Australia (CDNA) is a network that monitors the incidence of an agreed list of human communicable diseases through notifications to state and territory health authorities (see Chapter 6). Data are updated regularly on the NNDSS web site and published in Communicable Diseases Intelligence.[25]

23 http://www.animalhealthaustralia.com.au/publications/reports.cfm
24 http://www.animalhealthaustralia.com.au/nahis/
25 http://www.health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-cdi-cdiintro.htm

CHAPTER 3 EMERGENCY MANAGEMENT AND PREPAREDNESS

The OIE and FAO recognise contingency planning and other preparedness programmes for animal disease emergencies as essential to mounting early effective action in the face of an emergency, and that emergency planning and management are core functions and capabilities of national animal health systems. Further, the OIE *Guidelines on Veterinary Legislation* state, under Section 7.3, that national veterinary legislation should address ‘emergency measures in accordance with established contingency plans’ and that ‘contingency plans should be developed for certain diseases’.[26]

The FAO *Manual on the Preparation of National Animal Disease Emergency Preparedness Plans* identifies the two fundamental components of animal disease emergency preparedness planning as ‘capabilities for early warning, and early reaction to disease epidemics and other animal health emergencies’ (Geering et al., 1999).[27]

The development of these capabilities requires:

- advance preparation of both generic and disease-specific written contingency plans and operating procedures, and testing of plans and training of staff
- the development of capabilities at national, provincial and local veterinary headquarters, including field and laboratory services
- development of mechanisms to involve other necessary government and private sector services and farming communities in the emergency response
- development of the capacity to apply all the necessary resources to counter the disease or other animal health emergency in the most efficient way (including equipment, personnel and finances)
- advance establishment of the appropriate legal and administrative structures to deal with an emergency (ibid.).

This chapter describes in detail Australia’s fulfilment of these requirements.

3.1 Managing animal health emergencies

Australia has comprehensive, tested strategies in place to manage an Australia-wide coordinated response to an incursion of an emergency animal disease.

Australian national animal health policy is aligned with that of the OIE in its belief that the cost of strengthening veterinary services (for better surveillance, early warning systems and management of epizootics) is negligible compared with that of economic losses resulting from the introduction of infectious animal diseases and zoonoses.

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26 http://www.oie.int/eng/oie/organisation/en_vet_leg.htm?e1d2
27 http://www.fao.org/docrep/004/X2096E/X2096E00.htm#TOC

In Australia, the states and territories have primary responsibility for emergency animal disease preparedness and response within their jurisdictions. However, the Australian Government makes a significant contribution to national and international programs through quarantine, biosecurity, maintenance of the Australian Animal Health Laboratory (AAHL), and by coordinating national response activities. All governments manage emergency animal disease contingency plans and provide scientific and technical expertise on emergency disease issues.

Thiermann (2004: 704) discussing the role of national veterinary services in managing emerging diseases, notes the importance (for successful management) of ‘interaction with, and full participation of, the private sector in the implementation of joint programmes and service’. The FAO *Manual On The Preparation Of National Animal Disease Emergency Preparedness Plans* further supports this principle and notes that government authorities should have the support of all interested parties to embed emergency preparedness as a core and well-resourced component of the country’s veterinary services.

Accordingly, livestock producers and affiliated industries play an essential role in emergency preparedness in Australia. They provide frontline surveillance, reduce risks through on-farm biosecurity measures, and take on a partnership role during an emergency animal disease response (see Section 3.2). They are also responsible for developing industry contingency plans to mitigate commercial disruption and loss resulting from emergency animal disease incidents.

3.1.1 Emergency Animal Disease Response Agreement

Certainty of funding arrangements is critical to the success of managing emergency disease responses. In 2001, a landmark agreement between the Australian Government, the state and territory governments, and the livestock industry representative bodies was ratified to ensure a rapid and efficient national response to outbreaks of emergency animal diseases.

This agreement, the Emergency Animal Disease Response Agreement (EADRA), provides a framework for:

- managing emergency animal diseases responses that are led by government agencies, but which ensure effective industry participation
- equitable sharing of funding responsibilities within defined limits.

Under the EADRA, governments and affected industries share a proportion of the eligible costs of disease containment and/or eradication. The major provisions of the agreement include:

- coverage of 63 emergency animal diseases[28]
- allocation of each emergency disease into one of four categories (each category determines the proportion of cost-sharing obligations to be borne by the government and industries)

28 AI is listed three times–HPAI subtypes H5 and H7; HPAI other subtypes; and LPAI subtypes H5 and H7

- an approved emergency animal disease response plan for each disease, identifying key strategies and operational activities
- the establishment of a high-level NMG to oversee policy and resource allocation issues during a response
- a predetermined expenditure limit for responses that will act as a trigger for review of a response program
- provision for progressive reimbursements by parties to the lead response agency
- a commitment by all parties to the principle of effective biosecurity, and to the implementation of industry biosecurity plans
- defining standards for accounting, auditing and training response personnel
- provision for initial underwriting by the Australian Government of an industry's share of response costs (with a pre-agreed repayment mechanism) where the industry is unable to meet its financial commitment immediately.

One of the most significant outcomes of the EADRA is the formal inclusion of livestock industries in decision making about outbreak management and response. Livestock industry signatories to the EADRA are also required to prepare and promote a plan to improve on-farm biosecurity arrangements through contractual arrangements and by encouraging individual producers to adopt appropriate biosecurity measures. The government parties have prepared statements outlining their biosecurity policies and programs, including feral animal, public health and environmental policies.

3.1.2 Emergency Animal Disease Preparedness Program

The Emergency Animal Disease Preparedness Program is managed by Animal Health Australia (AHA). The program is funded through an arrangement involving the Australian Government, state and territory governments, and livestock industry organisations. It provides a coordinated strategy embracing all aspects of emergency animal disease preparedness. The program has led to improvement in the early recognition of emergency animal diseases, further minimised the risks of establishment and spread, and enabled rapid and effective responses.

Some elements of the Emergency Animal Disease Preparedness Program are described further below.

Australian Veterinary Emergency Plan

Australia is a world leader in terms of published national disease contingency plans. Australia has more specific national disease contingency plans for terrestrial and aquatic diseases than any other OIE member country. [29] The FAO's *Manual On The Preparation Of National Animal Disease Emergency Preparedness Plans* uses Australia's AUSVETPLAN as a model and reference for the creation of technical and specific disease contingency plans.

29 http://www.oie.int/eng/info/en_plan_prepaurgence.htm?e1d5

AUSVETPLAN is the national Australian plan for responding in a consistent manner to an outbreak, or suspected outbreak, of an emergency animal disease in Australia.

Developed and agreed on by the Australian Government and state and territory governments in consultation with industry, the plan ensures that a prompt, efficient and effective response can be implemented without delay.

AUSVETPLAN comprises a series of technical response plans that describe the proposed Australian approach to an emergency disease incursion. Each plan provides a comprehensive package of agreed documentation that sets out the roles, responsibilities, coordination arrangements, financial arrangements (where applicable), policies (based on detailed technical information) and procedures that will be followed by all agencies in managing any emergency animal disease response. More details on the specific organisational arrangements that operate at state and local level in response to an emergency disease outbreak are provided in Section 3.3. AUSVETPLAN is available on AHA's web site.[30]

National Emergency Animal Disease Training Program

Australia conducts comprehensive and regular training activities, as recommended by the FAO manual on emergency preparedness, to ensure the nation's ability to detect and respond appropriately to emergency animal disease outbreaks.

Australia's National Emergency Animal Disease Training Program was developed to provide ongoing, proactive education and training to producers, veterinarians, government staff and other stakeholders in the Australian livestock industries. The training program is coordinated by AHA and aims to:

- ensure all personnel who take part in an emergency animal disease response are competent to perform their role (including government officers, livestock industry members, veterinary practitioners and emergency workers)

- develop a national team of trained personnel who are competent to perform their duties in any jurisdiction, and can be rapidly deployed to ensure a timely response to an incursion.

Emergency disease awareness

A major part of Australia's emergency animal disease preparedness program is improving awareness and understanding of emergency disease issues. A number of programs are conducted nationally, and within each jurisdiction and industry, and are aimed at a broad range of target audiences. Two examples of national awareness programs are:

1. **Improving emergency animal disease awareness of livestock producers**

The AHA Farm Biosecurity campaign[31] (formerly known as the Protect Australian Livestock Campaign) aims to maintain livestock producers' awareness of the importance of emergency animal diseases. The campaign encourages livestock producers to use biosecurity measures as everyday practice in reducing the risks of EADs and other diseases. The campaign promotes an Emergency Disease Watch Hotline. This toll-free telephone number[32] connects callers to a

30 http://www.animalhealthaustralia.com.au/programs/eadp/ausvetplan_home.cfm
31 www.farmbiosecurity.com.au
32 1800 675 888

relevant state or territory officer so the caller can report concerns about potential emergency animal disease incidents.

2. Veterinary practitioner awareness program

The veterinary practitioner awareness program includes: training of veterinary practitioners for the Australian Veterinary Reserve (AVR) program[33]; the Accreditation Program for Australian Veterinarians (APAV); courses on EAD awareness and reporting arrangements; and provision of technical reference materials to assist in diagnosis. Exotic animal disease bulletins are published each year in the *Australian Veterinary Journal* published by the Australian Veterinary Association. DAFF also prepares a quarterly *EAD Newsletter* for distribution by the jurisdictions to veterinary surgeons. The purpose of these publications is to maintain EAD awareness among veterinary practitioners and to encourage them to include EADs in differential diagnosis.

3.1.3 Resourcing of responses

As reflected in its *National Animal Health Strategic Framework*, Australia is committed to resourcing its animal health system to enable the management of identified national risks and opportunities.[34] Version 4 of the framework identified emergency animal disease preparedness and response capability as an ongoing priority.

Thus, in 2009 there were over 9900 veterinarians in Australia plus 872 auxiliary or para-veterinary personnel. Of the total number of veterinarians, 642 were employed in the government sector, with the Australian Government the largest single employer of veterinarians in Australia.

At the government level, state and territory focus is now turning to the development of a ‘first response capability’ in which government emergency response personnel have the competencies to participate in responses to a range of animal, plant and other emergencies.

The Rapid Response Team (RRT) comprises government animal disease and emergency management experts who can be deployed to fill key positions in an emergency animal disease control centre within 24 hours, anywhere in Australia. RRT members are encouraged to participate in a range of training and professional development activities each year. These include induction for new members; professional development workshops and an annual RRT exercise held in conjunction with a jurisdiction.

Through the AVR, approximately 100 non-government veterinarians have undergone training to enable them to work in government emergency animal disease programs. The Accreditation Program for Australian Veterinarians (APAV) accredits non-government veterinarians who undertake the training program for involvement in government and industry animal disease control programs.

To make more efficient use of communication resources during emergency responses, the Primary Industries National Communications Network (NCN) was established to coordinate web information, call centre arrangements and advertising. It draws on local, state and national agencies during an agricultural emergency and in 2008 around 250 communications

33 Canada also has a Veterinary Reserve program.

34 http://www.animalhealthaustralia.com.au/corporate/strategic-direction.cfm

professionals had undergone training to ensure an adequate pool of staff for major national responses.

3.1.4 Animal Emergency Management Information System

A vital component of effective crisis management is the mapping and tracing of livestock in affected regions. Powerful software packages are required for this task in order to deal with the enormous volumes of data in multiple fields generated (Kroschewskie, 2006: 219). A number of countries and regions have now developed their own animal emergency management information systems.

In Australia, BioSIRT is the web-based software application developed to enable better management of information and resources during emergency responses to animal or plant diseases, pests and incursions.[35] The BioSIRT program is supported and funded by states and territories and the Australian Government. Once fully operational, BioSIRT will replace ANEMIS (the Animal Emergency Management Information System) in most states.

The first version of BioSIRT has been released and is being trialled by jurisdictions in routine surveillance activities and emergency response exercises. The plan is that jurisdictions will use BioSIRT for managing both emergency incidents and routine activities. The application should enable rapid transfer between jurisdictions of information such as disease detection and location. This will facilitate a coordinated response and ensure national consistency in the recording and reporting of diseases.

3.2 Management of an emergency disease at state/territory and local level

Consistent with Australia's constitutional arrangements, the chief veterinary officer (CVOs) in the state or territory in which an outbreak occurs is responsible for drafting the EAD response plan, implementing disease control measures (in accordance with relevant legislation), and for making ongoing decisions on follow-up disease control measures (in consultation with the CCEAD and the NMG). States and territories are also responsible for establishing emergency operations centres such as the state disease control headquarters (SDCHQ) and local disease control centres (LDCC). These arrangements are similar to the 'command structure' recommended by the FAO's *Manual On The Preparation Of National Animal Disease Emergency Preparedness Plans*.

3.3 Disease outbreak simulations/exercises

The FAO's *Manual On The Preparation Of National Animal Disease Emergency Preparedness Plans* notes the value of simulation exercises in testing and refining contingency plans and in training staff.

The OIE also lists national disease outbreak simulation exercises as these are reported by countries.[36] Australia has already undertaken a number of national simulation exercises to test its emergency framework of preparedness, response and recovery against a significant animal disease outbreak. Some of those related to pandemic or avian influenza are described below.

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35 Biosecurity Surveillance Incident Response and Tracing
36 http://www.oie.int/eng/info/en_simulation_2009.htm?e1d5

Exercise Eleusis 05

This exercise was undertaken to evaluate national capability to manage an outbreak of AI. The exercise tested the integration of national emergency arrangements between industry, agricultural agencies and health agencies at state and territory and Australian Government levels. The exercise demonstrated that collaboration between lead agencies, all jurisdictions and industry was essential for a successful response. It highlighted the importance of national strategies for animal and human health, including those for surveillance, occupational health and safety, and animal welfare.

Exercise Cumpston 06

This exercise was undertaken to test Australia's preparedness for responding to a new virus strain of human pandemic influenza with its widespread human-to-human transmission.

Exercise Lester & Exercise Hippolytus

These exercises were undertaken to evaluate the surge capacity of a diagnostic laboratory system in response to an emergency animal disease outbreak. The information gained was then used to enhance the preparedness of Australia's animal health laboratories.

Other recent simulations have tested Australia's livestock identification schemes, our response to foot and mouth disease outbreak, and the response to an aquatic disease outbreak. The states and territories also conduct regular simulation exercises on a local basis for training regional staff.

3.4 Preparedness activities for avian influenza

Australia has an advantage in terms of AI preparedness due to past experience and the strength of its veterinary services. The foundations of Australia's strong animal health system are its strong laboratory network and diagnostic capability; robust legislative framework; and effective mechanisms for implementing biosecurity measures, controlling livestock movements, and funding compensation (as part of emergency response agreements). In addition to these existing structural advantages, the Australian Government has also implemented targeted prevention, preparedness and response strategies for AI.

3.4.1 Australian Government Avian influenza Program

In 2006, the Australian Government committed $45 million (to be spent over three years) in additional funding to build Australia's prevention, preparedness and response capacity for AI. An additional $15 million was provided to continue this important work throughout 2009 and 2010. The program includes:

- additional quarantine staff and equipment at airports and seaports to enhance border security and the ability to detect high-risk items such as poultry and poultry products
- surveillance programs aimed at early detection of the AI virus in Australia's far north and neighbouring countries
- enhanced national surveillance for poultry and wild birds
- strengthening of national diagnostic capabilities and systems
- development of vaccination strategies and options for contingency supply arrangements

- disease modelling and risk factor research to provide better understanding of the risks to Australia
- contributions to capacity building initiatives in the South East Asia and Pacific region to address the disease at source in birds and reduce associated risks to Australia
- targeted public communications and awareness raising activities.

3.4.2 Specific preparedness activities related to AI

Biosecurity

Recognising the role of biosecurity in the prevention and control of AI, the Australian Government is collaborating with the poultry industry and state counterparts to enhance Australia's national approach to biosecurity, and to develop a national system for biosecurity in domestic poultry industries. A national poultry farm biosecurity manual for all poultry industry sectors was released in June 2009. The manual provides a minimum standard upon which sector-specific manuals can be based. Sector-specific manuals will then be developed to provide more detailed guidance and additional requirements reflecting the characteristics of each industry sector. In addition to the biosecurity manual, 2009 also saw the publication of a manual describing the need to provide safe water, and methods for sanitising poultry farm water. Both manuals are available on the DAFF web site. [37]

Vaccines

A National Avian Influenza Vaccination Expert Group (the NAIVE group) has been established to consider issues associated with vaccination during an AI outbreak. The roles of NAIVE are to:

- provide advice on vaccination during a response to NAI
- consider vaccine developments prior to, during and subsequent to any NAI outbreak
- continue to refine the policy guide for NAI vaccination
- provide advice to AHC and CCEAD as advances in vaccine technology become known
- undertake scenario planning exercises and participate in any exercises developing and refining the process for rapid decision-making about the use of vaccination (based on agreed national policy).

Wild bird surveillance

Australia undertakes a nationally coordinated AI surveillance program in wild birds. This important program provides a better understanding of the AI viruses circulating in wild birds in Australia, contributes to better decision-making and understanding of risk factors, and provides a critical early warning system. Detailed information on Australia's wild bird surveillance is provided in Chapter 7.

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37 Available at: www.daff.gov.au/birds

Domestic poultry surveillance

In 2007 the Avian Influenza Surveillance Taskforce — comprising representatives from the Australian Government and two state governments, all commercial poultry industry sectors and Animal Health Australia — was formed to progress national issues relating to AI surveillance in Australia. This document forms part of the work of the taskforce.

Epidemiology and disease modelling

A key component of the Australian Government's AI Program is important epidemiology and modelling research that enables (in conjunction with other programs) Australia's early detection and rapid response to a potential outbreak of HPAI in commercial poultry. Two simulation models have been developed to study the transmission of HPAI in the commercial poultry industries, both between individual birds in poultry flocks and between poultry farms and regions in Australia. These models will continue to be tested, enhanced, and used to inform decision-making as required. Regions and poultry farms at risk of AI introduction from migratory and resident wild bird populations have also been identified (East et al., 2000a; 2000b).

Global developments and International capacity building

The Australian Government contributes significantly to animal health capacity building activities, with a particular focus on the South East Asian region. Through the AI Program, the Australian Government has provided technical advice and expertise on the design and implementation of regional programs. These programs address the threat of HPAI at source in birds and contribute to surveillance activities undertaken by our near-neighbours. The AI program also worked closely with APEC member economies to develop the 'Avian Influenza Toolkit', which is a web-based resource developed to assist countries strengthen their arrangements for better response to the threat of avian influenza and other emerging infectious diseases. The Toolkit collates the product of substantial global activity on AI preparedness and management into a comprehensive and easily accessible resource that can be used by everyone who needs it. This has become a well-utilised and valuable global resource in the fight against HPAI. The AI toolkit can be accessed at: www.aitoolkit.org

The AI Program team also maintains a close watching brief on the global AI situation and continuously monitors events to inform decision-making about the threat status to Australia. This threat status is reviewed on a regular basis.

Communications

The Australian Government's AI Program has conducted an extensive education and awareness campaign targeting the potentially higher-risk group of small-flock poultry owners and hobby farmers. The campaign undertook market research and distributed materials containing key biosecurity messages. Results have included the establishment of new networks with feed supply stores, bird club associations and farmers' market organisers.

Diagnostic capabilities

The Australian Government works closely with AAHL under the AI Program. The program aims to develop and consolidate the national quality-assured diagnostic capability for AI, and collaborates with all state and territory veterinary laboratories to develop appropriate tests and national diagnostic standards (including a sustainable proficiency testing system). The Laboratories for Emergency Animal Disease Diagnosis and Response (LEADDR) initiative aims to develop a national network of coordinated laboratories that assist each other with large-scale testing during a disease outbreak. This initiative will extend AI diagnostic screening capacity to state laboratories and consequently improve overall laboratory capability and capacity.

3.4.3 Overview of Australian policy for avian influenza

In Australia, detection of any AI subtype in poultry, cage birds or zoo birds (or any other animal) is nationally notifiable. Australia's preferred approach to an outbreak of HPAI or LPAI (H5 or H7)—or NAI by the OIE definition—is to achieve freedom without vaccination. Notwithstanding, there are situations where vaccination may be considered, particularly if disease spread cannot be rapidly controlled by stamping out and other measures. The overall policy for responding to detection of AI viruses is outlined in *AUSVETPLAN, Edition 3*, available on the AHA web site.

Policy requires the CCEAD to determine whether an infection in poultry, cage or zoo birds is caused by a virus that meets the definition of highly pathogenic AI (HPAI) and is, in its view, eradicable. This advice must then be endorsed by the NMG. The policy is to then eradicate the disease in the shortest possible period, while limiting the risk of human infection and minimising economic impact by implementing the following strategies:

- stamping out by destruction of all birds on infected premises (IPs) where there is clinical disease or evidence of active infection with HPAI virus, and the sanitary disposal of destroyed birds and contaminated avian products to remove the source of infection

- possible pre-emptive slaughter of birds on other premises, depending on information derived from tracing, surveillance and study of the disease's behaviour

- quarantine and movement controls on birds, avian products and associated items in declared areas to prevent spread of infection (a national standstill is not necessary for containment of AI)

- decontamination of facilities, products and associated items to eliminate the virus on IPs and to prevent spread in declared areas

- tracing and surveillance to determine the source and extent of infection, and to establish proof of freedom from the disease

- enhanced biosecurity at poultry establishments and premises holding cage or zoo birds

- zoning and compartmentalisation to define infected and disease-free areas

- a public awareness campaign to communicate risk and promote cooperation from industry, zoos, cage bird owners and the community.

Under EADRA, HPAI (H5/H7) is a Category 2 emergency animal disease (EAD) and HPAI (not H5/H7) is a Category 3 EAD. Category 2 EADs are those for which costs will be shared 80% by government and 20% by industry while Category 3 EADs are those for which costs will be shared 50% by government and 50% by industry.

<u>*Overall policy for avian influenza classified as LPAI (H5/H7) (LPNAI) in poultry*</u>

Low pathogenic notifiable avian influenza (LPNAI) is a Category 3 EAD under EADRA for cost sharing purposes. When CCEAD determines that an infection is caused by an AI virus that meets the definition of LPAI (H5/H7), the policy is to control and eradicate the disease while limiting spread and potential for mutation to HPAI. A combination of strategies are used, including:

- tracing and surveillance to determine the source and extent of infection and to establish proof of freedom from the disease, followed by

either

- stamping out either as for HPAI (if distribution of infection is limited in the poultry industry and humane destruction of infected flocks is manageable) or, by modified stamping out using process slaughter if processing capacity is available

or

- vaccination and a modified approach to eradication, if the infection is likely to spread or has spread out of control

and

- quarantine and movement controls on poultry, poultry products and associated items in known IPs to prevent spread of infection
- decontamination of facilities, products and associated items to eliminate the virus on IPs
- enhanced biosecurity at poultry establishments and premises holding cage or zoo birds in the vicinity
- zoning and compartmentalisation to define infected and disease-free areas
- a public awareness campaign to communicate risk and promote cooperation from industry and the community, and to protect public health.

Overall policy for avian influenza classified as LPAI (H5/H7) in cage or zoo birds

Because of the potentially serious consequences of the spread of these strains of AI, LPAI (H5/H7) in cage or zoo birds is a Category 3 EAD. When CCEAD determines that an infection in cage or zoo birds is caused by such a virus, an assessment of the risks to animal and public health will be carried out. The assessment will take into account: the species of bird involved; the clinical status of birds; and the proximity of birds to commercial poultry and other significant bird establishments and populations, and to public amenity areas. The policy is to limit the spread of the infection and its potential for mutation to HPAI, and the response will depend upon the assessed risk. A combination of strategies may be employed, including tracing and surveillance, quarantine and movement controls, stamping out in accordance with the risk assessment, enhanced biosecurity, and a public awareness campaign.

Overall policy for avian influenza infections classified as LPAI (not H5/H7) in poultry, or in cage or zoo birds

AI caused by a strain of virus that is neither HPAI nor LPAI subtype H5 or H7, and which is producing mild or no clinical disease, is not considered an immediate threat to Australia’s domestic or zoo birds, or public health. Such AI virus strains are classified as LPAI (not

H5/H7) and their detection in Australia would not be treated as an emergency disease outbreak.

When the CVO determines that an infection is caused by such a virus, an assessment of risks to animal and public health will be carried out. Again, the assessment will take into account: the virus subtype; the species of bird involved; the clinical status of birds; and the proximity of birds to commercial or other significant bird establishments and populations, and to public amenity areas. No action will be required unless the risk assessment indicates an unacceptable threat to animal or public health. When a response is necessary, it may include tracing and surveillance to determine the spread of infection, enhanced biosecurity, and an industry-arranged control program.

These LPAI (not H5/H7) subtype viruses are not categorised under EADRA for cost-sharing arrangements. Nevertheless, increased tracing and surveillance as well as an awareness campaign may be undertaken in certain cases.

CHAPTER 4 THE AUSTRALIAN POULTRY INDUSTRY

This chapter provides an overview of the structures, operations and biosecurity practices of the Australian poultry industries.

The Australian poultry industry is made up of the following sectors:

- chicken meat (including free-range)
- chicken layers (including free-range)
- ducks
- turkeys
- ratites (emus and ostriches)
- game birds (this category includes quail, pigeons/squabs raised for meat production, pheasants, partridge and guinea fowl)
- ‘niche’ poultry industries (small and mixed poultry enterprises, sale of started pullets to small producers, home and hobby farmers, growing of meat chickens to organic specifications and live bird sales)
- Specific Pathogen Free (SPF) eggs and chickens.

Consistent with the OIE definition of poultry, pigeons for racing and exhibition have not been included in this description of the Australian poultry industry.

Within each sector, particularly the chicken meat and egg industries, there may be further segmentation into the following:

- genetic breeding stock, including great-grandparent (GGP), grandparent (GP), and parent flocks
- hatcheries
- housed and free range meat chicken grow-out and layer flocks.

An overview of each industry sector is provided below.

4.1 Industry sectors - Overview

4.1.1 Chicken meat industry

The Australian chicken meat industry is predominantly vertically integrated. Around 70% of meat chickens are produced by two large vertically integrated companies and the remaining 30% are produced by smaller vertically integrated companies and small processors. Growers contracted to processing companies produce the majority of meat chickens. More detail on the structure of the Australian chicken meat industry can be found on the web site of the Australian Chicken Meat Federation (ACMF).[38]

Modern Australian meat chicken farms grow approximately 50 000 birds per shed and 300 000 birds on each farm. Some older units may have 20 000 birds per shed or up to 60 000 birds on one farm.

In Australia, chicken meat is produced for the domestic market. Supermarkets are the main buyers, followed by butchers, fast food chains and pet food companies. In 2006 to 2007, the consumption of chicken meat in Australia was estimated to be roughly 809 000 tonnes, the equivalent to 454 million birds (Australian Chicken Meat Federation).

Only about 3% of chicken meat is exported. Exports are primarily to Oceania and Asia with occasional sales of excess portions to various other countries. There is also limited export to Asia of intestines and feet, as well as offal to be used as livestock feed.

In 2008 there were an estimated 6.5 to 7 million adult breeder birds in the Australian chicken meat industry (meat GGPs, GPs and parents). Meat parent breeder farms are usually maintained as single age units with sheds containing between 7000 and 10 000 birds, and farms with 20 000 to 40 000 parent breeders. The large integrated companies have their own genetic breeding stock which other growers also rely on. Elite breeder facilities (GGPs and GPs) are increasingly being used for the supply of parent breeders overseas, particularly in Asia.

Free range production of chicken meat is increasing with around six to seven percent of chicken meat production now free range. The bulk of this production is supplied by growers contracted to the large integrated companies. The organic specialist market comprises about 20% to 30% of free range production. The distribution of the chicken meat industry in Australia can be seen in Figure 4.1. GGP facilities are located in New South Wales, South Australia and Victoria. GP flocks are usually located near GGP flocks, and hatcheries are generally located near chicken meat farms. Farms in the chicken meat industry tend to be clustered due to the importance of close proximity to processing plants and feed mills.

38 http://www.chicken.org.au/

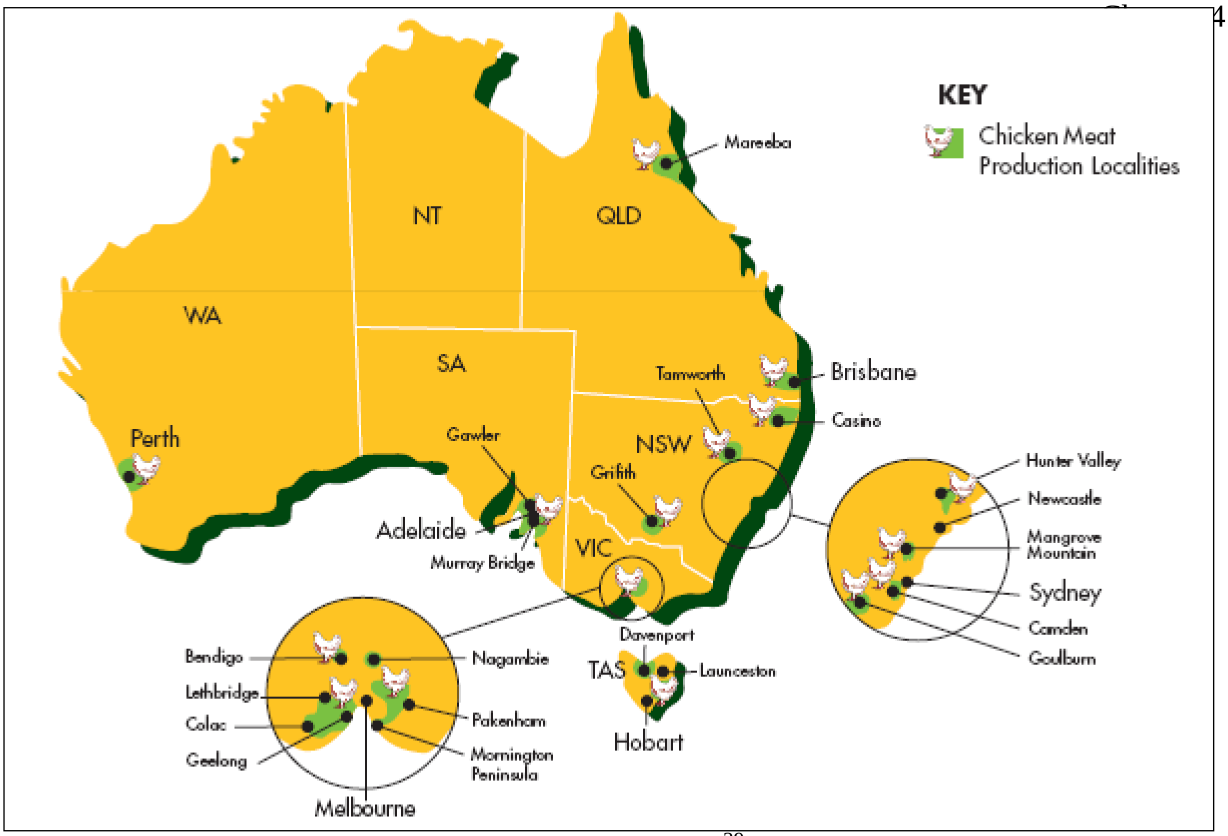

Figure 4.1 Major chicken meat production areas in Australia[39]

4.1.2 The chicken layer industry

In June 2009, there were approximately 20 million commercial layers in Australia, including 14.7 million laying hens and about five million pullets reared to laying age (Australian Egg Corporation Ltd.). Egg production is estimated at 334 million dozen eggs.

Approximately 85% of Australian-produced eggs are sold domestically through grocery and retail chains, and wholesale to the food service sector. The remaining are processed into liquid, frozen and dried egg products for use in the food service and processed food sectors.

In Australia, layers housed under free range or barn systems of management comprise approximately 32% of the market share.

In 2008, 172 metric tonnes of shell eggs and 246 metric tonnes of egg pulp were exported. This figure has increased substantially from late 2004, with rising Australian exports to Singapore due to the temporary presence of HPAI in Malaysia. Shell eggs are mainly exported to Singapore, while egg pulp (and some shell eggs) are mainly exported to the United States, Pacific Islands, Brunei, Hong Kong and New Zealand (Australian Egg Corporation Ltd).

There are seven major egg marketing groups in Australia and these employ a range of business models in terms of integration of production, grading, packing and marketing. The national industry has progressively evolved since deregulation of production and marketing in the 1980s, and the larger integrators now control a major proportion of the industry through ownership or lease of farms, or contracting supply from independent farmers.

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39 Source: www.chicken.org.au

The figure below shows the distribution of Australian egg layer farms.

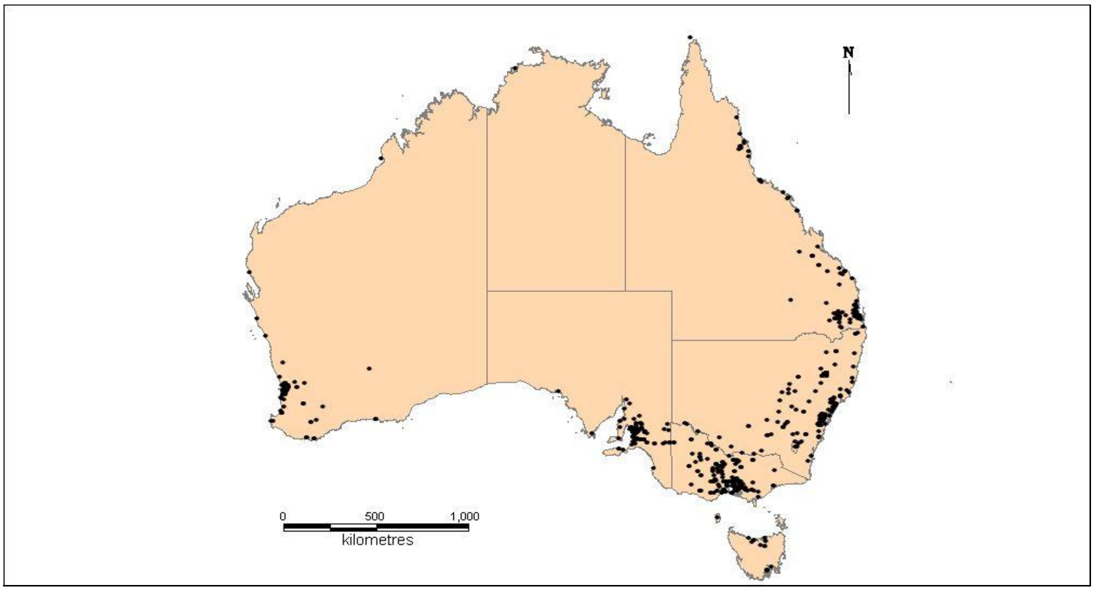

Figure 4.2 Distribution of chicken layer farms (Provided by Iain East, DAFF)

4.1.3 Duck industry

There are two major duck producers in Australia, both are vertically integrated and, between them, produce 95% of duck meat sold in Australia. Both duck meat and eggs are produced but egg production is relatively small.

In terms of world duck meat production, Australia ranked 24th among duck-producing countries with 9600 metric tons produced in 2006.[40] It is estimated that 5.4 million ducks were slaughtered in Australia for human consumption during 2006 to 2007.

Most Australian duck farms house 50 000 ducks or less, but a small number of farms are larger.

Of Australia's two major duck producers, one is located in western Victoria and the other in the Sydney basin of NSW. One commercial producer of Muscovy ducks is situated in southeast Queensland and distributes ducks to farms in New South Wales and Victoria.

A small number of independent producers supply speciality restaurants. Australia exports duck eggs and meat to Southeast Asia, the Pacific Islands and the Middle East.

40 http://www.agr.gc.ca/volaille/prindd3_eng.htm

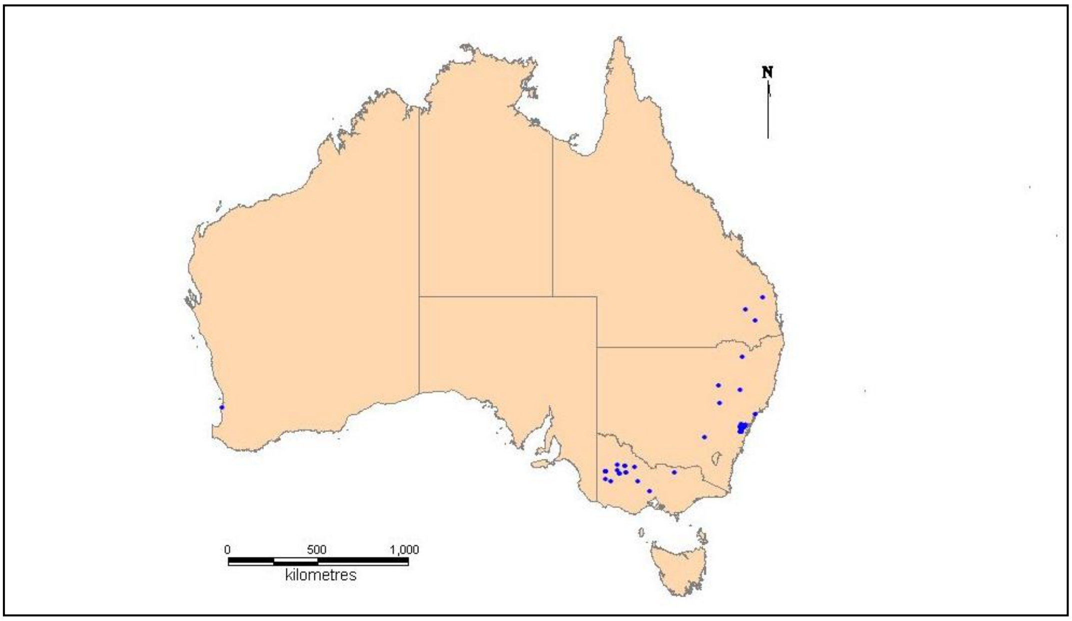

Figure 4.3 Distribution of duck farms (Provided by Iain East, DAFF)

4.1.4 Turkey industry

In 2008, turkey stocks in Australia were estimated at approximately 3.9 million birds. In 2009, this figure was expected to increase to approximately 4.2 million production birds. The current trend of more commercial contract growers running larger farms means that turkey production is growing in Australia. This is consistent with the world growth in turkey production of 115.4% from 1986 to 2006.[41] There is no commercial turkey table egg industry in Australia.

Vertically integrated companies account for around 85% of turkey meat production in Australia. Turkey farm sizes vary, with up to 32 000 birds on one site. The majority of product from the Australia turkey industry is consumed by the domestic market. Only small markets exist for the export of fertile turkey eggs to Taiwan and poults to Asia.

It is estimated that current breeder stocks are approximately 1200 GPs and 4500 parents.

Since 2005, small increases in the number of free range and organic birds have occurred. This increase is consistent with the estimated four to six percent increase in the total number of turkeys slaughtered yearly.

41 http://www.agr.gc.ca/poultry/prindt2_eng.htm

The Australian turkey industry has largely developed around processing plants and is located away from areas with high poultry density. Four main areas of turkey growing are Beresfield and Bargo in New South Wales, McLaren Vale in South Australia, and St Arnaud in Victoria.

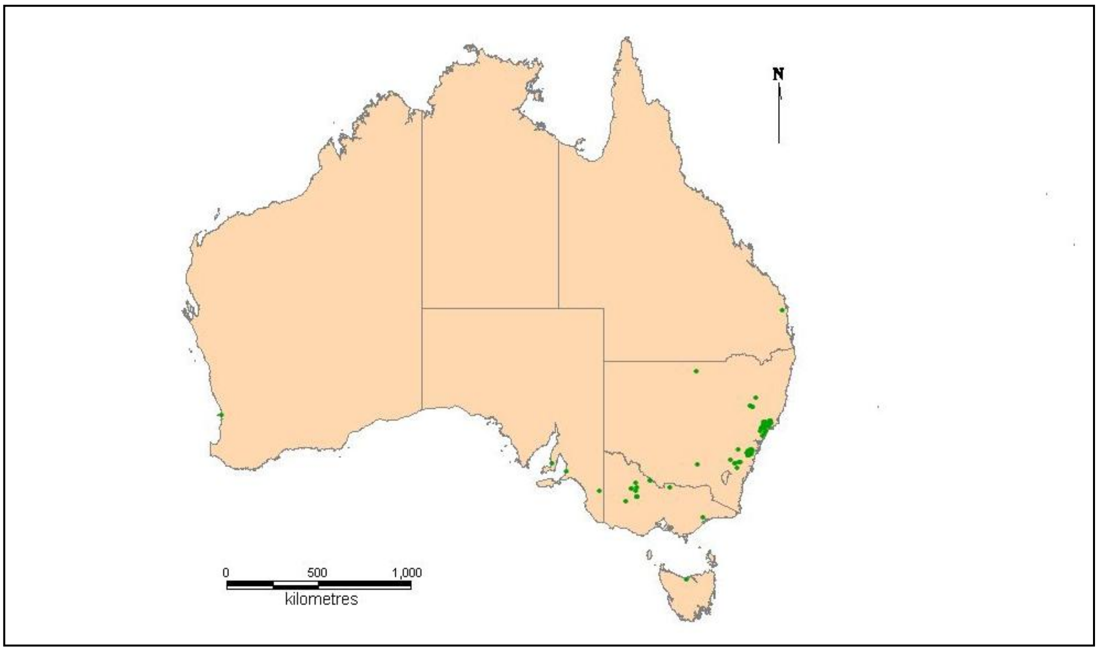

Figure 4.4 Distribution of turkey farms (Provided by Iain East, DAFF)

4.1.5 Ratite industries

Ostrich and emu are raised in Australia, Belgium, Botswana, Canada, Chile, China, France, Holland, Israel, Korea, Namibia, New Zealand, Poland, South Africa, the United Kingdom, the United States and Zimbabwe.[42] In international terms, Australia's ratite industry is comparatively small.

<u>*Emus*</u>

In 2005, there were 144 known emu producers in Australia according to state licensing figures. However, registration is only required every five years and there is likely to have been a reduction in numbers due to drought and closure of some processing plants.

Emu oil is the most valuable commodity produced by the emu industry. Emu oil is registered with the Therapeutic Goods Administration and can be listed as an active ingredient in cosmetic products and over the counter remedies in Australia. Oil is also exported to the European Union and Asia. Some producers market their oil from the farm gate or on the internet. Meat, leather and eggs for carving are also sold. The meat is largely sold for consumption on the domestic market and only a small percentage is exported to Europe. Data from the Ratite Slaughter Levy indicates that 5344 emus were slaughtered in processing plants in Australia in 2007 to 2008 (DAFF, 2009).

The distribution of commercially active emu farms is largely dependent on access to processing facilities. In 2009, only two processing facilities in Victoria were identified as

42 http://www.agr.gc.ca/poultry/prindrat_eng.htm

processing emus in Australia. The majority of commercial emu farms are located in Victoria, South Australia and New South Wales.

Ostriches

Between 2005 and 2009, the number of producers actively involved in the ostrich industry in Australia decreased. Current estimates indicate that there could be as few as six properties in Australia with commercial ostrich flocks. Only two or three of these are actively breeding birds.

Ostriches are farmed for meat and leather. The World Ostrich Association puts current world production of Ostrich meat at 12 000 to 15 000 metric tonnes per year and notes that the skin is the more valuable product. Around 60% of ostrich production is in South Africa and the remainder of world production is fragmented.[43]

The Ratite Slaughter Levy reported 4165 ostriches processed in Australia from 2007 to 2008 (DAFF, 2009). Most ostrich meat is currently exported to the United States, Canada and Japan. Previously, the majority was exported to Europe. Skins are mainly exported wet-salted to South Africa, Korea and Israel while some are tanned and sold domestically. There is a small market for the export of live chicks and fertile eggs. Australia is recognised internationally as a source of good genetic ostrich stock and this may see more producers enter this market in the near future. A potential market exists for the supply of hatching chicks to the European Union.

There are two slaughtering plants for ratites in Australia and both are located in the state of Victoria. Most farms with commercial flocks are located in Victoria or close to its border.

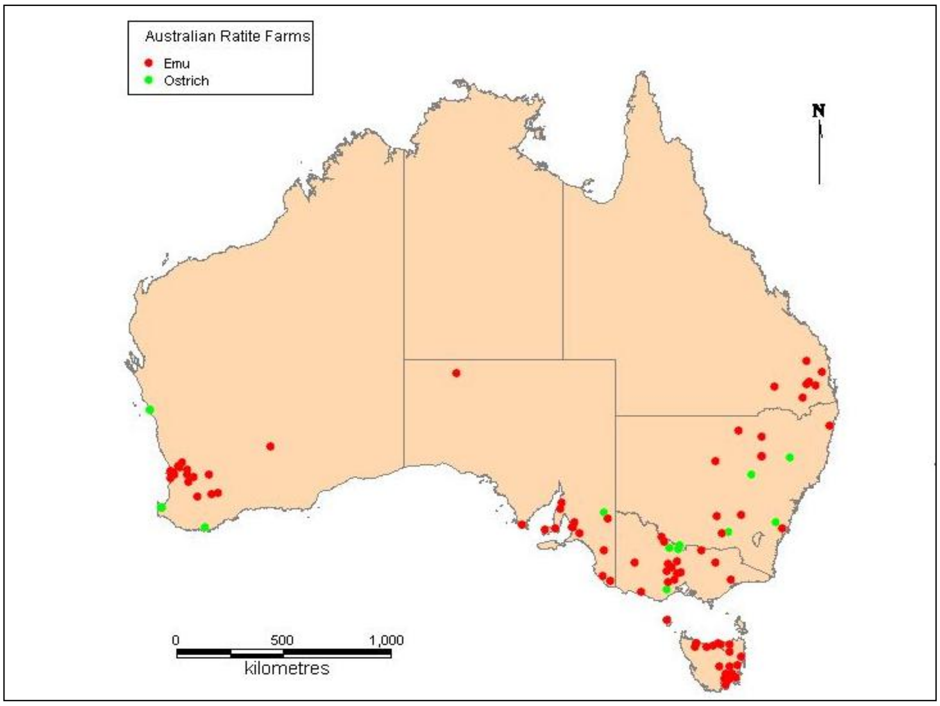

Figure 4.5 Distribution of ratite farms (provided by Iain East, DAFF)

43 http://www.world-ostrich.org/demand.htm

4.1.6 Game bird industry

The game bird industry comprises quail, squabs, pheasants, partridge and guinea fowl. Game bird properties are usually independently owned and operated with the exception of contract grower squab farms. There has been a reduction in the number of commercial game bird producers since 2003, at least partly because of rising feed prices during drought.

There are 32 known squab farms in Australia, 17 of which are in Victoria. Since the 1970s there has been a growing demand for squab pigeon within Australia's gourmet and Asian community markets. Approximately 420 000 squab are produced in Australia each year (M. Cowie, pers. comm. 2009).

Quail are farmed for both meat and eggs (including embryonated eggs) and most producers market both products. In 2003, the Rural Industries Research and Development Corporation (RIRDC) estimated the number of quail produced in Australia to be around 6.5 million birds per year. This figure has now decreased to approximately 4 million birds per annum (M. Cowie, pers .comm. 2009). There are eight known quail producers in Australia. Quail flocks range in size from 2000 birds to large integrators with an estimated 330 000 birds spread over four sites. In 2003, the largest producer, located in New South Wales, produced nearly 52 000 birds per week and accounted for approximately 75% of the 6.5 million quail processed in Australia.

Almost all quail products are sold on the domestic market. Only one producer exports quail products, and this export market only accounts for 5% of their sales. Some producers specialise in distributing to local clients while others send their products interstate (as well as supplying local customers).

Eight commercial producers in Australia are known to grow pheasant, partridge and guinea fowl for meat, while only one producer grows birds solely for feathers and pelts. One farm produces fertile eggs for sale to other producers. Approximately 90 000 pheasant, partridge, and guinea fowl are produced in Australia each year (M. Cowie, pers. comm. 2009).

The majority of game bird producers are found in New South Wales and Victoria. Some larger producers in the game bird industry are adopting a vertically integrated structure and have acquired their own processing facilities, hatchery, breeder farm and contract grower farms. In addition to specialised game bird producers, there are farms with game bird flocks not involved in full-time commercial farming. Most small farmers sell their product through larger producers or directly to small, independent processing plants that handle mixed avian species. Game bird farms are scattered widely and there is very little geographic clustering of farms.

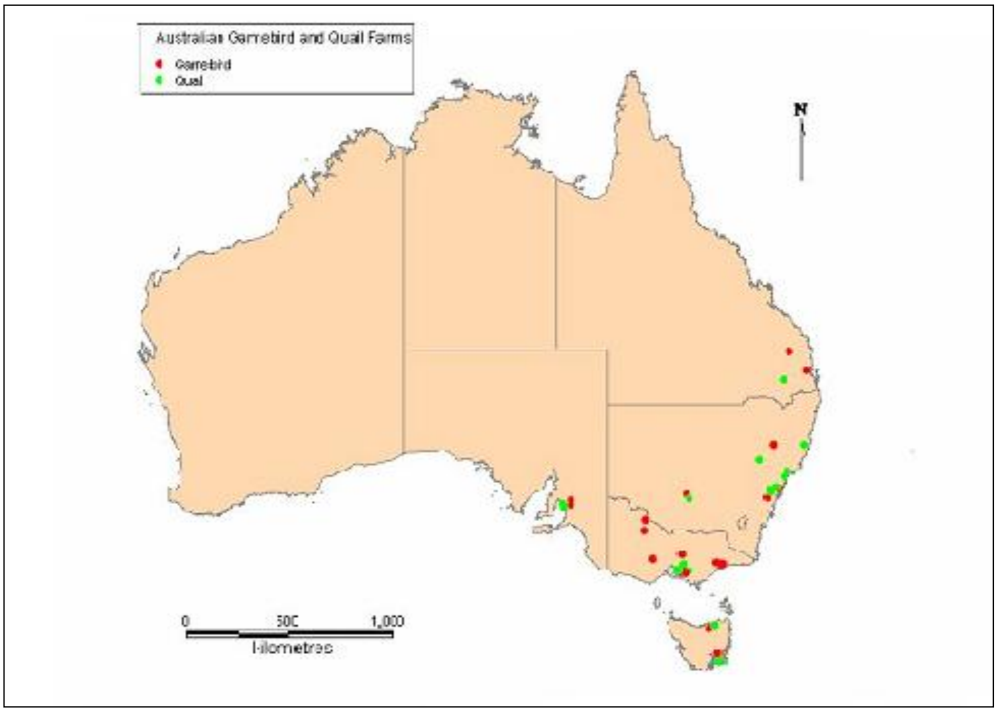

Figure 4.6 Distribution of game bird farms (Provided by Ian East, DAFF)

4.1.7 Niche sectors

The niche poultry sector in Australia includes live bird sales, backyard poultry and the producers and distributors of small numbers of poultry for the back yard layer industry. It also includes the production of specialist poultry products such as organic, yellow birds, cockerels, and alternative layer strains. The source of supply for such livestock varies. Large vertically integrated operators, medium-size independents and small operators with the capacity to breed and hatch poultry may all supply specialist poultry livestock. Some day-old male birds from the major layer hatcheries (which were previously culled and disposed of) are now purchased by growers who supply the Asian cockerel market.

Meat chicken companies also sell small numbers of day-old meat chickens to niche market operations producing organic chicken meat, poussins or yellow meat birds.

Sale of live birds

The marketing of live birds in traditional live bird markets, particularly at wet markets where livestock is slaughtered on site, is recognised as a high-risk event for HPAI transmission for a number of reasons, including mixing of species, lack of movement controls, and poor biosecurity and hygiene (Permin & Detmer, 2007).

There are no continuously populated live bird markets in Australia. Within the Australian commercial poultry industry, birds are moved directly from hatcheries to growers and then to processing plants for slaughter. Consequently, there is no established live bird market system. Instead, sales of relatively small numbers of poultry and aviary birds occur periodically at live bird sales venues. These venues include regional livestock sale yards, privately operated auctions or poultry club sales.

Live bird sales venues ('markets') are not well established in Australia and have declined in size with the growth of the large integrated poultry industries. The requirements for supplying backyard, small and medium-sized poultry producers are largely met by niche producers rather than live bird sales, and Australian sales are therefore small enterprises in comparison with those in the United States and Europe.

Neither the slaughter of birds, nor the sale of freshly slaughtered birds for human consumption, are permitted at Australian live bird sales venues.

A recent study commissioned by DAFF (University of Sydney, unpublished, 2009) identified 51 regular live bird sales[44] in Australia, with NSW holding the most sales (15). Most live bird sales were held at regular intervals (ranging from weekly to biannual events), with only ten sales held annually. Poultry club associations generally organised annual and biannual sales while more frequent sales were organised privately. In Australia, low numbers of birds (less than a 1000) are sold at live bird sales, and venues are depopulated between sales. The map below shows the location of the main live bird sales in Australia.

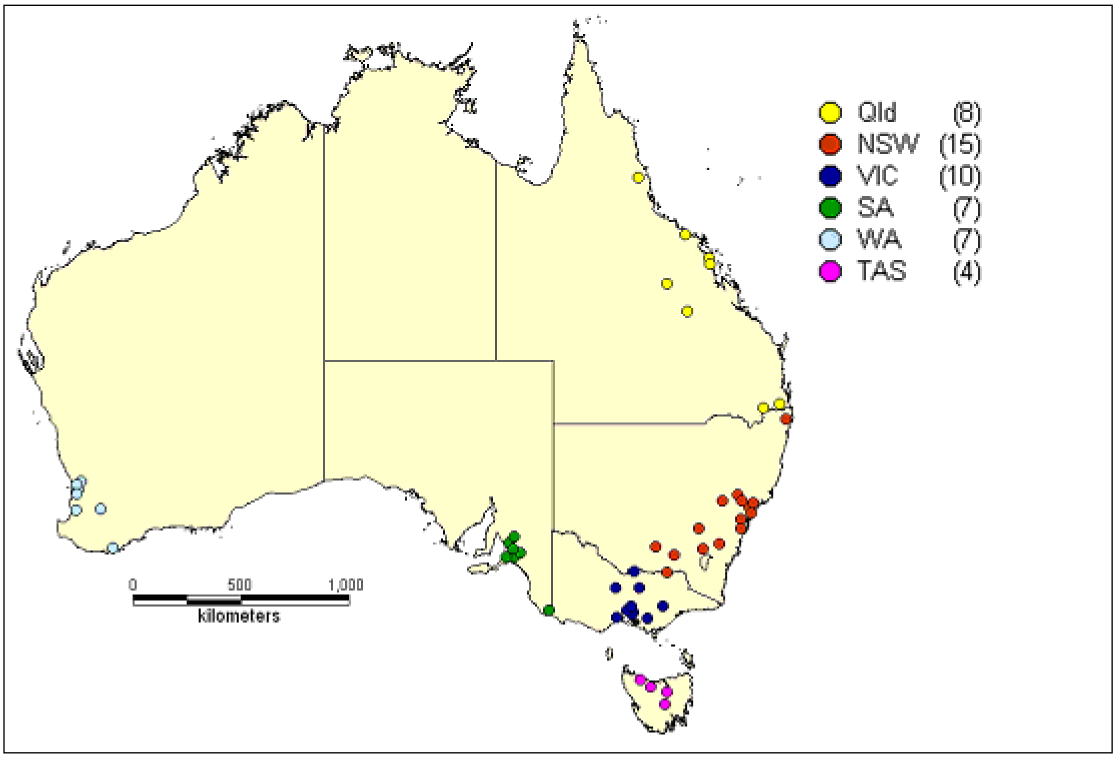

Figure 4.7 Location of main live bird sales venues (Hernandez-Jover, Schembri and Toribio, unpublished 2009)

Outside of the live bird sales venues, established bird associations have regular sales between breeders and to the public. Sales are between enthusiasts maintaining small breeding stocks of a poultry species or breed.

44 These sales do not include sales of birds to or from commercial poultry farms.

Case studies of three of the larger live bird sales venues found no significant links between the live bird sales venues and the commercial poultry industry. No shared personnel, vehicles or equipment were identified at the venues studied (unpublished data, 2009).

Backyard poultry

Internationally, the highest populations of backyard poultry are associated with traditional livestock production systems in developing countries.

The last census of backyard poultry ownership in Australia occurred in1992. The Australian Bureau of Statistics household survey established that 7% of households keep backyard poultry. It is estimated that the average flock size is between two and ten birds per flock. Not included in these figures are the 2000 pure breed 'fancy' flocks which average 50 multi-age breeder birds per flock for exhibition.

Based on the best information available, the size of the Australian backyard poultry flock is estimated at:

- between 100 000 and 200 000 owners of backyard poultry with a flock size of between two and ten laying hens, with an estimated population of around 1 million birds
- between 3000 and 5000 owners of small flocks (up to 500 birds) for meat and egg production.

There is little breeding in the backyard sector where most poultry are kept only to produce eggs for the owner's personal consumption and breeding is unnecessary. Breeding is also limited in urban areas where the keeping of roosters is restricted by local government (council) regulations. The majority of birds in backyard flocks come from specific pullet producers and through the sale of spent hens from commercial flocks. The number of chickens and other poultry species kept for the production of poultry meat for home consumption is very small and not significant as a proportion of total poultry meat production in Australia. Such activity is usually restricted to rural holdings where the keeping of roosters and larger species like turkeys and geese is not restricted.

Poultry Enthusiasts

In Australia, approximately 2000 poultry flocks are estimated to be owned by poultry enthusiasts who show and sell poultry of various special breeds (J. Finger, Bellsouth Ltd. Pty., pers. comm. 2009). Breeds in this category include traditional chickens, bantams, ducks, geese, quail, pigeons and turkeys. Flock sizes average around 50 birds with the total population estimated at 0.1 million birds.

There is little contact between the commercial poultry operations and backyard, enthusiast, small commercial and niche market poultry operations. The main opportunity for potential contact between sectors is through feed store operators and suppliers of other products.

4.1.9 The specific pathogen free egg (SPF) and chicken industry

In Australia there is only one SPF egg and chicken producer. Located in Victoria, the company produces SPF eggs which comply with the European Pharmacopoeia 5.2.2 standard. The company supplies eggs to: Australian poultry vaccine manufacturers; government and private testing laboratories; seasonal influenza master and working seed manufacture; private and government import quarantine stations (for hatching sentinel birds); institutional and commercial poultry researchers; horse and cattle semen producers; hospitals; and government agricultural departments.

SPF eggs are also exported to New Zealand, the United States, Europe, and South East Asia.

4.2 Biosecurity plans and practices

The 2008 joint FAO, WHO and OIE *Global Strategy for the Prevention of H5N1 Highly Pathogenic Avian Influenza* clearly identifies poultry biosecurity as an important prevention and control measure, and poor biosecurity as a risk factor, for H5N1.

The Australian commercial poultry industries operate to high levels of biosecurity, and recently, in partnership with the Australian government, developed an all-sector *National Farm Biosecurity Manual*.[45] Published in 2009, the manual was developed by the Avian Influenza Biosecurity Consultative Group (BCG). The BCG comprises representatives of the Australian and state and territory governments, Animal Health Australia, and all poultry industry sectors (chicken meat, egg layers, free range chicken industries, duck, turkey, game birds and ratites). The manual provides the minimum biosecurity standards to be applied in all poultry industry sectors, recognising that many companies and producers will implement higher standards than the minimum ones described. Additionally, many sectors have adapted the national plan to create sector-specific biosecurity plans.

A *National Water Biosecurity Manual for Poultry Production* was also published in 2009. This document explains the need for sanitising water supplied to commercial poultry and also provides a guide to common water sanitation methods. The manual was created in response to recognition of untreated surface water contaminated by waterfowl as a source of HPAI outbreaks in Australia and overseas.

4.2.1 Chicken Meat Industry

Nearly all chicken meat producers in Australia refer, in contracts and external communications, to the national biosecurity code produced by the ACMF. This national biosecurity code formed the basis for the development of the *National Farm Biosecurity Manual* mentioned above.

Through the representation of the ACMF, the Australian chicken meat industry is a member of AHA, and a signatory to the Emergency Animal Disease Response Agreement (EADRA). This obliges the industry to have an industry biosecurity plan and comply with and implement industry practices consistent with the National Animal Health Performance Standards. A key component of the Standard is a formal biosecurity plan and policy (*National Biosecurity Manual for Contract Chicken Meat Farming*) that is communicated to all chicken meat producers.

All Australian chicken meat companies have extensive in-house biosecurity policies and quality assurance programs based on Hazard Analysis and Critical Control Point (HACCP) principles. Compliance with these programs is assessed as very high. Most chicken meat breeder farms are maintained under highly biosecure conditions which include perimeter fences, shower-in facilities and mechanisms by which dead bird collection and deliveries can occur without the need for vehicles to enter farms. In large poultry operations, all-in/all-out

45 http://www.daff.gov.au/birds

management styles allow the simultaneous depopulation of facilities between flocks. This provides time for periodic clean-up and disinfection to take place, thus breaking the cycle of potential disease. For breeding flocks, all-in/all-out management is not practicable.

All chicken meat breeding farms maintain batch summary or production record sheets. These record sheets may be paper or electronic and are used to monitor production outcomes, environmental observations and bird treatments. This includes daily production, daily mortalities and culls, feed and water quantities, shed and ambient temperatures, feed deliveries and silo distribution, bird weights and any treatments such as vaccinations or medications. Both planned and performed activities (such as vaccinations and serological testing) are recorded. The farm manager can use the daily record sheets in conjunction with ongoing clinical observations on the farm to promptly identify any changes in flock performance. All records are forwarded weekly to farming administration for incorporation into company records.

All farm staff are trained to quickly identify any changes in flocks and to immediately investigate negative production changes. Meat chicken farming is a very competitive industry and where production and health parameters fall below established performance standards, contractors will quickly seek advice from company service personnel and veterinarians.

Free range meat chicken farms contracted to the large integrators operate under the integrator company's biosecurity guidelines. Independent free range poultry operators usually have small operations producing and processing 100 000 birds or less per year. These birds have access to outside ranges but all flocks are fed inside the housing facility.

All feed supplied to breeder and production meat chicken flocks is pelleted, heat treated and stored in enclosed silos at the mill. The feed is also transported in enclosed tankers to farms, and is stored in farm silos that exclude possible contamination by wild birds and vermin.

The pickup of meat chickens is undertaken by either the integrator or contract crews that work in close association with the processing company. Pickup crews are trained in standard biosecurity practices and contract crews tend to operate for one company in a particular region. Transport vehicles and crews may be either company or contactor owned and operated. Most pickups are made for the same company; however, pickups will occasionally be made for another company. When this occurs, the vehicles and live bird crates of the other company will be used. The use of automated machinery for meat chicken pick ups in Australia is increasing.

4.2.2 Chicken layer industry

The egg layer industry has a well established biosecurity plan within Egg Corp Assured (ECA). The ECA is a national egg quality assurance program established by the Australian Egg Corporation Limited (AECL) and audited by registered third party auditors. The program is a voluntary scheme but has been adopted by 75 % (at 1 March 2007) of egg industry registered flocks representing 58 % of registered egg businesses. The ECA program incorporates quality assurance standards for food safety, animal welfare, animal health, egg labelling, and biosecurity in the layer industry. Disease prevention is a significant part of this program.

Egg production flocks have biosecurity plans emphasising the need for barrier controls on the movement of objects that can act as fomites. Measures include the exclusion of the public and people from other farms, and changing clothes and footwear on entry. Surveys of the industry indicate there is a high level of adoption of biosecurity practices in the egg layer industry (East, 2007). Farms that are overseen by accrediting bodies are generally compliant with good industry practice.

Egg parent breeder farms are maintained under even more highly biosecure conditions. Measures include perimeter fences, shower-in facilities, and mechanisms enabling deliveries and dead bird collection without vehicle entry to farms.

The AECL is a member of AHA and a signatory to the EADRA. This imposes obligations on the industry to have an industry biosecurity plan and to comply with and implement industry practices consistent with the National Animal Health Performance Standards. To achieve this, the egg industry developed their formal biosecurity policy - the *Code of Practice for Biosecurity in the Egg Industry.*

The majority of free range eggs and chicken meat sold in Australia is produced by the large integrated companies. The companies manage this by adjusting their husbandry systems on properties also carrying intensively reared birds. Thus, the biosecurity plans and hygiene standards of these growers is the same as those described in the egg and chicken meat sections above. The Free Range Egg and Poultry Australia (FREPA)[46] association also requires that its free range chicken and egg producers meet the standards of its established biosecurity policy. FREPA members contracted to integrated companies are also bound under contract arrangements to abide by the biosecurity standards of the company.

Some layer companies in Australia also have individual farms accredited with the Agri-Food & Veterinary Authority (AVA) of Singapore.[47] This accreditation allows the export of table hen eggs from Australia to Singapore. A critical component of this scheme is that farms must belong to a government-endorsed *Salmonella* Enteritidis accreditation program which requires high standards of biosecurity practice.

4.2.3 Ducks

The major duck companies are vertically integrated and are active members of the Australian Duck Meat Association (ADMA). The ADMA has an industry-based biosecurity system and active audit process, and is an industry member of Animal Health Australia alongside the chicken meat and egg layer industries.

The major integrated duck companies and independent breeders have established and documented biosecurity plans. A high standard of biosecurity is maintained throughout all levels of duck production. Company-employed personnel undergo comprehensive training programs and are audited regularly to ensure that standards are maintained.

Meat ducks are reared in a similar way to meat chickens, with similar standards of biosecurity, operations and housing. One large integrator and one small independent duck breeding operation have established controlled-environment sheds for their elite stock. Housing for production stock is in naturally ventilated sheds.

Large duck producers purchase their feed from accredited independent commercial feed mills. Some smaller independent producers use commercial pelleted feed or commercial mash feed,

46 www.frepa.com.au
47 www.ava.gov.sg

the remainder use non-heat-treated home mix rations. The feed mills that produce duck feed tend to specialise, so one mill will usually produce feed for a large number of producers.

4.2.4 Turkeys

The Australian turkey industry is represented by the Australasian Turkey Federation (ATF), whose membership comprises all major independent turkey producers in Australia. While the all-sector *National Farm Biosecurity Manual* sets out minimum requirements for turkey growers, many industry members have their own more detailed plans.

There are two common types of commercial turkey farm in Australia. The first is the large, commercial contract grower, similar in operation to the commercial chicken meat contract grower. These contract growers receive technical advice from the integrator and adhere to the integrator's biosecurity codes. This type of grower is responsible for more than 85% of the turkey grown in Australia. The second type of grower is the smaller, independent integrated farm.

The turkey industry is structured into breeder flocks and production flocks. Two companies maintain commercial quantities of primary breeding stock in Australia. One company is owned and operated by a major chicken meat integrator which applies all the operational standards of their chicken industry operations (including biosecurity) to their turkey breeder division and meat turkey grow-outs. The other main company is a private family-owned company without a grow-out facility. It also operates under strict husbandry programs which include biosecurity measures. Turkey breeder flocks are housed in controlled-environment sheds, while most turkey grower flocks are housed in fan-assisted, naturally ventilated sheds.

GGP stock is maintained on separate sites to production stock. Turkey breeder sites are maintained under highly biosecure conditions which include perimeter fences, shower-in facilities, and mechanisms enabling deliveries and dead bird collection without vehicle entry to the farm.

There is only a small amount of free range turkey production in Australia. Those producers contracted to integrated companies are required to maintain the high biosecurity standards of the parent company.

Feed for meat turkeys and breeder flocks is almost entirely heat-treated pelleted feed supplied by independent or in-house quality assured mills.

4.2.5 Ratites

The Australian ratite industry has an audited on-farm surveillance plan which includes a whole-farm biosecurity plan. The Australian Ratite Industry On-Farm Surveillance Plan (ARIOFSP) allows the ratite industry to maintain access to export markets, specifically the European Union, with which it trades. In 2009, two of the eight commercial emu farms and over 90% of ostrich flocks were part of the ARIOFSP. The ARIOFSP provides a system of full traceability from product to farm and for all stock movements within Australia.

Each state has its own Emu Farmers Association (EFA), although not all emu farmers are members of these organisations. Each EFA is a state member organisation of the Emu Industry Federation of Australia (EIFA); a national body which has established industry policies on biosecurity.[48] Each EFA can nominate two councillors to sit on the EIFA committee. The national representative body for ostrich farmers is the Australian Ostrich Association.

Ostrich breeder birds are kept in paddocks and most breeder farms establish their own breeding program with stock from their farm. Birds from other properties can be brought in to add to the genetic pool. However, if a property is part of the ARIOFSP, birds can only be introduced from other farms also involved in the plan. Fifty percent of ostrich breeder properties in Australia have their production birds reared on another site.

Production or grow-out emu stock is raised on the same farm as the parent breeding flock. There is very low turnover of breeding stock on most emu farms because breeders often have a useful breeding life of ten years. Breeding stock are kept in paddocks. Ratite flocks, particularly ostrich flocks, are now commonly housed in closed-access sites to assist with European Union trade requirements for ratite products.

Most ratite feed is a home mix, but commercial pelleted rations may be fed to young birds.

4.2.6 Game birds

The Game Industry Council of Australia represents farmers and processors of game birds in Australia. Larger game bird producers generally have in-house programs involving production reports, biosecurity policies and husbandry practices.

Some larger game bird producers monitor for disease and biosecurity, as well as maintaining written production records (passive surveillance documents).

In the game bird industry, genetic and grow-out stock are housed on the same property (but in separate sheds or pens) as breeding stock. Replacement breeder birds are chosen from grow-out stock.

There are no commercial suppliers of squab breeding pairs in Australia and a closed breeding program for squabs is common. Squab farms are usually made up of multiple lofts containing breeding pairs with nest boxes and a covered or open flight area. Other pens on the farm will contain young birds and genetic breeding stock.

Quail breeding stock are usually housed in cages inside a shed with artificial lighting. Quail meat birds are usually reared on the ground in sheds.

Partridges, pheasants and guinea fowl are generally allowed to free range in netted pens or in large flight aviaries. Alternatively, they may be grown in open pens if their wings have been clipped. Most properties maintain closed flocks and rarely move live commercial stock onto or from their property. Pheasants, partridges and guinea fowl breeders are housed in naturally ventilated sheds or pens.

All quail farmers use commercially manufactured ration obtained from feed mills. Squab feed is usually whole grains and supplements purchased from local suppliers. Other commercial game bird farms purchase heat-treated commercially prepared rations and some supplementary grain is purchased locally.

48 www.emuindustry.asn.au

4.2.7 Live bird sales venues ('markets')

The *Global Strategy for the Prevention of H5N1 Highly Pathogenic Avian Influenza* identifies market activities as 'a serious risk of dissemination of HPAI' (FAO, 2008: 30). Risks at poorly controlled live bird markets include the development of infection cycles within markets (as markets are continuously populated), the transfer of virus via fomites (e.g. on cages and transport equipment) and virus spread through live bird movement from a market (ibid.).

There are no continuously populated live bird sales venues in Australia and birds cannot be slaughtered at sales venues. The interval between sales varies from weekly to twice a year. Between sales, venues are depopulated and the cages and surrounding areas cleaned. Arrangements for transport and containment of birds vary between live bird sales. Some venues supply cages for birds while others allow vendors to provide their own bird containers.

4.2.8 The SPF eggs and chicken industry

The one SPF facility in Australia has two production houses, a grow-out shed, and a hatchery for the continued production of fertile SPF eggs and chicks. All birds are raised and managed in positive pressure, high efficiency particulate air filtered housing. Housing is on fully slatted floors in the two production houses, or decked cage facilities in grow-out areas. The filters and positive air pressure system are tested and calibrated after each cleanout by an independent NATA[49] certified company.

The facility has a shower-into-shed policy and one-shed-per-day visit policy. A despatch cool room has been built on the farm boundary so that farm entry by contractors (such as transport vehicles) is unnecessary. Feed containers have also been placed on the farm boundary so that feed delivery trucks do not enter the farm. The commercial waste pick-up bin is located away from the entrance, buildings and staff car park.

SPF chickens are fed gamma sterilised feed which is double-bagged to prevent the potential entry of disease agents. There are no commercial populations of other avian species on the SPF property, nor within 20 kilometres of the site.

4.2.9 Other biosecurity issues

Multi-age farming

Disease control can be more difficult in multi-age flocks as multiple age birds on the same site provide a reservoir for disease organisms because the all-in, all-out principle is impracticable for multi-age flocks. The all-in, all-out farming practice is identified as an essential biosecurity control measure (WHO/FAO/OIE, 2006).

All meat chicken and around 85% of turkey grow-out farms in Australia are single-age sites. Some smaller turkey farm operators have multi-age farms.

The egg layer industry still has a large number of multi-age farms. Typically these layer farms will rear pullets on-site and have a number of birds of different age in production. This enables them to achieve a uniform supply of eggs to the market. With the emergence of several large integrators in the egg industry, there has been a progressive move to single-age farms with off-site rearing.

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49 National Association of Testing Authorities (www.nata.asn.au)

Duck, game bird (with the exception of quail producers) and ratite producers all operate as multi-age farms and, in some cases, have multi-age sheds.

Mixed species farming

The OIE *Terrestrial Animal Health Code* (2005) identifies ‘places where birds and poultry of different origins are mixed’ as high-risk groups. The raising of ducks and chickens together is particularly risky, as ducks act as a natural reservoir for AI virus (WHO/FAO/OIE, 2006).

The OIE *Terrestrial Animal Health Code* (2005) further recommends, in Section 6.4.1 ‘Hygiene and disease security procedures in poultry breeding flocks’, that poultry breeding enterprises should be single-species enterprises.

In Australia, chicken meat farms are nearly exclusively run as single species, all-in-all-out enterprises, and contract growers are not permitted to keep pet birds or other avian species. The integrated companies in the meat chicken, turkey and duck industries use in-house written or informal biosecurity plans that prohibit the keeping of other species on the premises. This practice is also enforced upon contracted growers.

Layer breeder companies and integrated commercial layer farms also closely adhere to the practice of maintaining only one species on farms. The majority of duck, turkey and ratite farms are also maintained on a one-species basis.

Some game bird operators still farm a variety of poultry species. However, this practice has decreased in recent years with the exit of many smaller commercial farmers from the industry. Quail are more likely to be farmed as a single species; however, some quail farms in Australia are known to have other species of poultry on the same property (e.g. chickens or ducks for home consumption). The other species found on game bird farms are usually chickens, ducks, pheasants, partridge, guinea fowl and pigeons. The presence of commercial populations of other species on the same property as squabs is uncommon, but there may be small populations of ornamental ducks, geese or laying hens kept for home meat and egg consumption. The helmeted guinea fowl (*Numidia meleagridis*) is often farmed along with pheasants and/or partridges. Some commercial game bird farms will have one or more of these species as well as other commercial bird species on their farm. However, while some game bird producers operate multiple species farms, they often also breed their own replacement birds.

The species most likely to be mixed on niche farm enterprises are chickens, ducks, turkeys, and quail. Sometimes there will be a small processing plant on site or in close association with the venture. This is to limit the need for live bird movements off these mixed species poultry sites. Some niche market farms purchase poultry (particularly ducks and chickens) from live bird markets, move these back to farms for further feeding, and then send them off for processing.

Processing plants

Most integrated chicken meat and layer companies use company processing plants. Some live sales customers purchase live grown meat birds to process in their own plants and then distribute to customers. In some states, this practice accounts for over 10% of all processed meat chickens.

Processing plants for ducks are generally specialist plants. The need to wax ducks after de-feathering limits the ability of plants to process other poultry species. Ducks are generally transported in crates but for short distances may be herded onto tray trucks or trailers for transport to the processing plant. The crates and transports for ducks are owned and operated by the processor. The large integrated companies no longer operate in both duck and chicken industries, so there is no sharing of equipment, transports or pick-up crews. Small processing plant operators usually receive birds in crates owned by the bird owner.

In the turkey industry, the processing plants of three integrated companies are dedicated to the processing of turkeys.

Three specialist transporters in the ratite industry deliver emus and ostriches to the processing plant in eastern Australia. For between-farm transport, the same three transporters move adult and 90-day-old birds. Each person in eastern Australia transporting birds also operates an emu or ostrich farm. For this reason, all transporters practise strict biosecurity to protect their own birds. In Western Australia, it is the processor who collects and delivers birds to the processing plant in that state.

Except in the case of one large integrator, it is uncommon for quail to be moved between properties. Most independent operators have a small processing plant on the farm and company transport is used for any movement of quail. Where game birds are to be processed at a facility away from the farm, the producer’s crates are used to transport birds. These are washed and sanitised before being brought back to the farm. The transport of squabs between properties is normally carried out using contractors.

Dead bird disposal

As with other shared service providers, shared dead bird pick-up crews creates a risk for disease spread by providing a point of contact between producers. Dead birds also need to be disposed of safely to avoid disease spread, otherwise dead birds may act as a reservoir of infection (FAO, 2007).

In the chicken meat industry, dead bird disposal can be performed by burial, composting, incineration, disposal at the local tip, or through contracted collection services. The use of dead bird disposal contractors is becoming more common due to local government controls on disposal. Collection vehicles do not enter the farm and integrators commonly instruct contractors on company biosecurity plans. The major disposal sites for dead birds are council tips and rendering plants.

Same species feeding of rendered poultry offal is extremely rare in the Australian chicken meat industry. Poultry offal that is rendered separately from other species generally finds a higher commercial value on the export market or goes to pet food manufacture. Rendering of offal combined with secondary heat treatment of pelletised rations makes AI transmission through feed a very low risk.

Spent layer hens have a lower commercial value than meat birds and there is an increasing requirement by local government authorities for producers to dispose of dead birds through commercial contractors. Most spent hens are disposed of through chicken meat processing plants, small specialist processing plants for spent hens, or through a turkey processing plant. Mass on-farm humane destruction and composting is becoming more frequent as the commercial disposal of spent layers becomes more difficult. Disposal of spent hens though farm gate sales to Asian markets in Australia is increasing.

Composting of dead birds is discouraged in the duck industry. Where possible, duck growers are required by their industry biosecurity manual to bag, seal and freeze dead birds for transfer to a by-products plant. Dead ducks may also be disposed of by incineration (although meeting environmental standards is costly, and incineration is not permitted in some council areas) or via landfill disposal. Waste materials from duck processing plants and dead birds sent to rendering plants are processed into fats, oils and protein meals. Specialist rendering plants handle feathers and down that cannot be used for other purposes.

All turkey breeders are disposed of through processing plants and transported using company vehicles. Dead birds and cracked and dirty eggs are usually disposed of on-farm through burial or composting. Hatchery waste is usually sent to landfill.

The types of waste generated by emu farms are similar to other species (brooding litter, reject eggs, dead birds) except that litter waste quantities are much smaller. The abattoir at Wycheproof composts emu farm offal and sells it as fertiliser.

The most common forms of waste produced on ostrich farms are brooding litter, dead birds and reject eggs. These are usually discarded on farm in a pit or burnt.

The wastes generated by game bird properties are used litter, dead birds and reject eggs. Because properties are usually small, waste is normally discarded on site in either a pit or composting bin, or is used as fertiliser.

Farm wash down and sanitation

In its issues paper *Biosecurity for Highly Pathogenic Avian Influenza*, the FAO recommends that producers clean and disinfect poultry transport, tools, clothing and housing—particularly following depopulation (FAO, 2008: 27).

In Australia, growing sheds for meat chickens, turkeys and ducks are cleaned out and washed and sanitised between batches. Sheds normally run four to six batches per year.

While farm wash down and sanitation may be undertaken by the chicken meat grower, it is more commonly done by independent specialised crews instructed in company biosecurity policy. Specific programs designed by the integrator, who supplies the chemicals, are followed by the crew. Microbiological sampling is periodically undertaken to ensure the effectiveness of procedures.

The layer breeder companies supplying commercial layers have the same rigorous farm wash down procedures as chicken meat companies. Farm cleaning practices vary at the level of the independent layer producer. Many layer producers dry clean without a wet wash down procedure.

Duck meat sheds are cleaned out after each cycle. Duck breeder flocks have a 45-week production cycle, and sheds are cleaned out, washed down and sanitised on an annual basis unless circumstances demand more frequent cleaning.

Larger game bird producers use contractors instructed in company biosecurity plans in their wash down and sanitation programs. On smaller quail farms, wash down and sanitation practices can vary widely. Major cleaning and sanitation is done at the end of the nesting period on squab farms.

Feed manufacture and supply

The FAO identifies biosecure feed as an important element of poultry biosecurity (ibid.). It recommends that all feed supplied to birds be heat-treated to deactivate HPAI virus, and transported and stored in a way that prevents contamination.

Independent and integrated company mills in Australia usually have modern technology and operate well structured in-house quality assurance (QA) programs.[50] While company mills manufacture for poultry alone, the independent mills may manufacture for other avian species and sometimes pigs. Commercial mills producing poultry feeds cannot manufacture ruminant feeds due to the prohibition on feeding meat meals to ruminants. Most bird feed produced is heat-treated.

Most large mills have truck washing bays and trucks are washed on return to the mill.

Procedures for farm delivery are subject to company biosecurity plans and drivers are directed to stay in the vicinity of silos. On poultry breeder farms with modern design, feed chutes are usually extended outside the immediate farm boundary fence. This overcomes the need for vehicles to enter production sites.

Water supplies

The FAO specifies that as a basic biosecurity measure, poultry water supplies should be from treated sources and that poultry should have no access to surface water potentially contaminated with the faeces or other materials (including carcasses) of poultry or wild birds (FAO, 2008).

In 2009 the Australian Government published the manual *National Water Biosecurity Manual: Poultry Production*.[51] The manual describes the water sources most commonly used by the Australian poultry industry, and provides guidelines on water sanitation systems for biosecure poultry water supply.

In Australia, meat chickens and layers are supplied, where available, with town or bore water. Farms without access to town or bore water use surface water and chlorination remains the most commonly used water sanitation method. In some recently developed sites, chlorine dioxide units have been installed as a method of water sanitation.

The majority of chicken breeder and grow-out meat stock are supplied with town or bore water. Where surface water is supplied to breeder farms, it is of a significantly higher standard than that supplied to grow-out chicken meat farms. This is due to more rigorous auditing and implementation of best practice on breeder farms. Water supplies for chicken meat parent breeder farms are commonly derived from non-mains water supplies because of their isolation. Underground or surface water is used as an alternative, with the latter being sanitised with chlorine or chlorine dioxide.

The water supplies for turkey producers are from mains, surface or underground sources. Surface water is generally sanitised but bore water (which is not subject to contamination by water fowl) is rarely sanitised.

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50 Feed Safe at www.sfmca.com.au

51 http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/biosecurity/animal_biosecurity/bird-owners/water_biosecurity

Ducks are supplied water from mains, surface or underground sources. Where surface water is used it is sanitised. The high-risk practice in Asia of free-grazing ducks associated with rice production systems is not seen in Australia.

The water supply for ratites is usually surface water.

Quail farms source water from town supplies or an underground bore. Squab farms and game bird farms without mains water supply rely on dams or rainwater tanks. Water supplies to larger game bird producers are usually from a secure source.

Water for the SPF facility comes from a ground water source (bore). This water is passed through several sets of filters and is also treated with a combination of chlorination, acidification and UV.

4.3 Disease monitoring programs and reporting of disease

Please refer to Chapter 8.

4.4 Vaccination

Vaccination plays an important part in the health management of poultry as numerous diseases can be prevented through vaccination.

4.4.1 Chicken meat and layer sectors

Health management of parent breeders is a high priority and vaccination programs continue to be broad and extensive. Killed Newcastle disease virus (NDV) vaccination is not mandatory in chicken meat breeders but live NDV (V4) vaccination with monitoring serology must still be undertaken. Vaccinations for chicken meat breeders include: Marek’s Disease (MD) (usually Rispen’s and occasionally bivalent Rispen’s and HVT); infectious bronchitis virus; ILT; Avian Encephalomyelitis (AEV); Fowl Pox (FP); Fowl Adenovirus (FAV); Egg Drop Syndrome (EDS); chicken anaemia virus; Infectious Bursal disease (IBD); and coccidiosis. Approximately 25% of chicken meat breeders are also vaccinated with autogenous killed Fowl Cholera vaccines.

It is estimated that about 10% of flocks are tested throughout lay for *Mycoplasma gallisepticum* (MG), *Mycoplasma synoviae* (MS) and infectious bronchitis. There is also serological monitoring of commercial layer flocks for ND antibody in accordance with the standard operating procedures (SOPs) of the National ND Management Plan. Some flocks in NSW and Victoria are enrolled in the national *Salmonella* Enteritidis (SE) monitoring scheme. The scheme tests for freedom from SE for the export of eggs to the Singapore market. Drag swabs are tested by bacteriological culture.

Salmonella vaccination is not undertaken universally across Australian chicken meat breeders. However, there is some use of autogenous killed vaccines containing a number of serovars.

Ongoing surveillance for assurance about vaccination efficacy is undertaken for a range of diseases. Most breeder flocks (chicken layer and meat) are tested by serological tests for antibody to: chicken anaemia virus, AEV, infectious bronchitis virus, fowl adenovirus type 8 (FAV-8), infectious bursal disease (IBD) virus, MG, MS, and EDS virus after vaccination. About 50% of flocks are tested by serology for MG, MS, IBD and infectious bronchitis during lay. During lay there is also active testing for *Salmonella* spp and *S*. Pullorum by bacteriological culture of drag swabs.

Breeder flocks are monitored by ND serology as part of the National ND Management Plan, available online.[52] Some serological testing for avian leucosis (AL) is performed on breeder flocks.

Grow-out chickens are vaccinated for three diseases in Australia. Marek's disease (MD) vaccine is administered either *in ovo* or to day-old chicks. Infectious bronchitis vaccination is given by automatic coarse spray at the hatchery or, occasionally, at the farm by aerosol or by drinking water. ND vaccine is administered using live V4 vaccine at the hatchery, or by drinking water at between 7 and 14 days at the farm. The revised industry NDV standard operating procedures introduced in 2009 removed the requirement for killed NDV vaccination in layers and meat breeders in four states: Queensland, South Australia, Tasmania and Western Australia. The requirement for live NDV vaccination with V4 remains.

Serology is undertaken in rearing stock to test for vaccine efficacy against endemic diseases. It is also undertaken to ensure that titres meet the necessary minimum requirements mandated by the chicken industry ND management program.

Vaccination for egg drop syndrome, and other diseases such as AE, MG, fowl pox, and ILT, is commonly practised on breeder and commercial egg layer farms.

Ongoing surveillance is also undertaken for assurance about vaccination efficacy for a range of diseases. As part of the National ND Management Plan, a proportion of chicken meat flocks are tested for ND by serology at around 5 to 8 weeks of age. Some MD testing by reverse transcriptase polymerase chain reaction (RT-PCR) is performed on feather follicle dust to monitor effectiveness of vaccination.

In commercial chicken layer flocks, around 60% of producers serology test birds for AEV, EDS, MG, MS and infectious bronchitis vaccination efficacy.

4.4.2 Duck industry

Ducks in Australia are generally not vaccinated against infectious diseases, although autogenous vaccines are occasionally used in some flocks to control bacterial diseases. Duck viral enteritis and duck viral hepatitis do not occur in Australia.

4.4.3 Turkey industry

In Australia, turkeys are strategically vaccinated using predominantly autogenous bacterial vaccines. Vaccination is carried out by the farmer or company staff, thus limiting contact between farms. The turkey industry has not had an outbreak of virulent ND and is not part of the national ND vaccination program.

4.4.4 Ratite industry

Ostrich are vaccinated with clostridial vaccines. Some farms vaccinate emus with autogenous inactivated vaccines against *Erysipelothrix rhusiopathiae*.

52 www.animalhealthaustralia.com.au/programs/special/ndv.cfm

4.4.5 Game bird industry

No vaccination is carried out in quail or squab flocks. Minimal vaccination is undertaken in other game bird flocks.

4.5 Licensing, approval and registration of poultry holdings and services

4.5.1 Property Identification Codes

The national introduction of property identification codes (PICs) for poultry establishments in Australia is currently under consideration by the national, state and territory governments. Queensland and Victoria already require properties (including hatcheries) holding a minimum number of poultry to be allocated a PIC.

4.5.2 Council/Local Government Approvals

In Australia, local governments must issue a planning permit before a poultry farm, feed mill, rendering plant or poultry processing plant can be established. A separate application is also needed to gain local government approval to use town water supply, bore water, irrigation channel water or to collect ground water. A council building permit must also be obtained to construct poultry production, feed mill or rendering operation buildings.

In South Australia, there are no regulated guidelines for the establishment of egg layer or chicken meat farms but guidelines are currently under development by the Environment Protection Agency (EPA).

The *National Chicken Farm Management Plan*[53] is an agreement between a farm owner/operator or processing company and the local council about how a meat chicken farm will be run, particularly with respect to odour, dust, noise, pest and chemical management.

4.5.3 Rendering Plants

The FAO (1991) recommends that rendering plants be subjected to regular veterinary inspection for the purposes of animal disease control and food safety.

Rendering plants in Victoria, New South Wales and Queensland are registered with local authorities as well as with Prime Safe (Victoria), the NSW Food Authority, and Safe Food Queensland. In these states, plants are monitored for compliance with the *Australian Standard for the Hygienic Rendering of Animal Products Second Edition*.

The national standard for the rendering of waste animal products in Australia is the *Australian Standard for the Hygienic Rendering of Animal Products, Second Edition*[54]. While this standard is not enforced in South Australia, it is proposed that it will be included in the new food safety legislation under development.

In Tasmania and South Australia, plants are registered with local authorities and audited for compliance with the labelling and handling of ruminant meat meals.

Animal health agencies throughout Australia carry out monitoring of plants for compliance with the production and labelling of ruminant protein.

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53 http://www2.campbelltown.nsw.gov.au/BusinessPaper/2002/020604/attachments/pb020528-3-2.pdf
54 www.publish.csiro.au/nid/22/pid/5666.htm

4.5.4 Feed mills

Feed mills that service the Australian poultry industries are registered with local authorities after satisfying environmental conditions in all states. Commercial premises operate under the *Australian Code of Good Manufacturing Practice for Home-Mixed Feeds, Feed Milling Industry and Stock-feed Premixes*.[55] A new national standard for feed mills with audit requirements is expected to be completed shortly.

4.5.5 Poultry Slaughtering Establishments

Poultry processing plants must operate according to the *Australian standard for construction of premises and hygienic production of poultry meat for human consumption*.[56] Planning authorities and local councils must approve processing plants and rendering works.

Ratites are slaughtered in special abattoirs according to the *Australian Standard for the Hygienic Production of Ratite (Emu / Ostrich) Meat for Human Consumption*.[57]

AQIS undertakes the approval of processing premises that inspect poultry products for import and export. State and territory governments are responsible for the regulation of plants processing poultry for domestic production and consumption.

In order to improve public health and safety, Australian governments have agreed that food safety should be managed throughout all parts of the food supply chain (i.e. paddock to plate). Work on the development of a PPP standard for poultry meat started in February 2004 with the establishment of a standard development committee. The committee includes government and industry members and a representative of the Australian Consumers' Association. Industry members include producers and processors of chicken, ducks and game birds.

A draft assessment report was released in December 2005 for consultation. This report included a scientific assessment of the public health and safety of poultry meat in Australia. The assessment was used to inform the development of risk management measures for the production and processing of poultry meat.

To assist with the interpretation of the PPP standard for poultry meat, Food Standards Australia and New Zealand (FSANZ) has developed an explanatory memorandum which provides information on the intent of the clauses in the standard. Implementation arrangements for the PPP standard are currently under consideration by the Implementation Sub-Committee.

The final assessment report (which includes the standard and the explanatory memorandum) was considered by the ANZFRMC in May 2010. It is noted that the standard will not come into effect until 2 years from the date of gazettal into the Food Standards Code

The integrated poultry processing companies have developed food safety assurance programs for farms that seek to satisfy the draft PPP standards. These companies monitor farm food safety assurance programs for compliance. The food safety assurance programs of processing plants are monitored by state authorities.

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55 www.publish.csiro.au/nid/22/pid/373.htm
56 www.publish.csiro.au/books/download.cfm?ID=5203
57 www.publish.csiro.au/nid/22/pid/1602.htm

4.5.6 Producer Registration

Some state food authorities[58] have mandated the licensing of commercial egg farms and the implementation of quality assurance programs regulating the distribution and traceability of produce.

Work on the development of a PPP standard for the egg industry commenced in 2006.[59] A detailed scientific risk assessment of the potential chemical and microbiological hazards associated with the production and processing of eggs and egg products was completed in January 2008 as part of the risk analysis process. The risk assessment has been summarised in the document *Public health and safety of eggs and egg products in Australia* available online.[60] This report was made publicly available when a draft of the egg PPP standard was released for the second round of public consultation in 2009.[61]

In Queensland and Tasmania, the state authorities require registration of egg farms and adherence to QA programs focussing on food safety. In Tasmania, farmers are required to register a holding with more than 20 layer hens, or if retail sales of eggs are made.

Safe Food Queensland has proceeded to register egg layer farms and egg processing premises in that state. Premises with 100 or more birds and which sell eggs or meat birds are required to register.

The Department of Primary Industries, Victoria, now requires poultry farms to apply for a PIC. South Australia and Western Australia, however, do not yet have legislation requiring the registration of egg and chicken meat production farms.

New South Wales is seeking to licence egg grading floors and to require the listing of egg farms that produce more than 20 dozen eggs per week.

The farming of ratites in each state requires a farming license from the local department of primary industries (DPI). This involves a PIC which uniquely identifies the parcel of land upon which the ratites are farmed. This number is used to identify the farm of origin on movement records. As part of the accreditation process, each farm must develop and implement a biosecurity plan.

4.6 Animal movements

4.6.1 Livestock and product movements

The turkey and chicken meat and layer industries keep records of their livestock movements to allow traceability in the event of a disease incursion. As it is a requirement for export to the European Union, the ostrich industry also keeps detailed records on production and bird movements.

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58 www.foodauthority.nsw.gov.au, www.safefood.qld.gov.au, www.health.vic.gov.au/foodsafety, http://www.dhhs.tas.gov.au/health__and__wellbeing/public_and_environmental_health/related_topics/food_safety
59 www.foodstandards.gov.au/thecode/primaryproductionprocessingstandards/eggstandard/
60 http://www.foodstandards.gov.au/_srcfiles/Eggs_healthandsafety.pdf
61 http://www.foodstandards.gov.au/foodstandards/proposals/proposalp301primaryp3426.cfm

Chickens

Australia exports small numbers of:

- grandparent or parent chicken meat breeder stock into the Oceanic countries
- commercial layer day-old chicks to Pacific Island countries (Kiribati, Samoa, and Micronesia) and the Philippines
- chicken meat breeders to Asian countries including Bangladesh, Malaysia, Thailand, Philippines, Vietnam, Myanmar, Nepal, and China
- layer day-old chicks to the Oceania and the Philippines
- live turkey parent breeders to Malaysia, the Philippines, and Taiwan.

The SPF producer exports fertile egg surplus to New Zealand, the United States and Southeast Asia.

Poultry meat is exported to a variety of countries or regions including the Middle East, Subcontinent Asia, Oceania, Hong Kong, Japan, Singapore, Korea, Indonesia, Southeast Asia, Russia and South Africa. Spent layer hen meat is exported to South Africa and Southeast Asia and kosher poultry meat to Hong Kong, French Polynesia, and Thailand. Poultry offal meal and feather meal are exported to a number of Southeast Asian countries including Indonesia.

The most significant markets for table eggs and egg products are Hong Kong, Singapore, Pacific islands, Brunei, New Zealand, and the United States.

Livestock and product movements within Australia for the chicken meat and egg layer industries are extensive. Large numbers of both live birds and eggs move great distances on a daily basis. Day-old chick trucks can transport up to 80 000 birds at a time while live bird cartage trucks carry between 4000 to 7000 birds depending on the weight of the bird. Although the movement of layer pullets is limited compared to the movements of day-old chicks, there is extensive movement of pullets up and down the eastern seaboard states and into South Australia.

Ducks

In the duck industry there is minimal movement of breeding stock throughout Australia. However, some smaller and developing producers transport hatching eggs and day-old ducklings. The movement of mature breeding or reared stock is very infrequent.

Duck companies do not sell any breeders or day-old meat chickens to third parties. Instead they produce all progeny on site for placement in grow-outs regional to their hatcheries and processing plants. Grown ducks, though, may be transported over limited distances to various small processing plants.

A small volume of duck meat is exported to Southeast Asian and Pacific countries.

Turkeys

Turkey eggs and poults are frequently moved interstate. Fertile turkey eggs are sent from two parent farms to four commercial hatcheries. Both the large and small breeder companies also sell production poults to hobby farmers to grow out for Thanksgiving and Christmas.

Turkeys are raised in areas with ready access to processing plants. This means that company poults are normally transported in a company-owned vehicle to a local grow-out farm. Without ready access to processing plants, poults travel long distances interstate by air.

The movement of meat turkeys between farms is rare. However, movement between sheds on a farm may occur where brooding is conducted in one shed and grow-out in another shed on the same farm.

Ratites

Only one ostrich producer in Victoria exported live chicks and fertile eggs internationally between 2005 and 2009. Ostrich meat is exported to Japan, the European Union and the United States. Ratite oil and skins are also exported to Europe and the United States. Ostrich meat between 2008 and 2009 was mainly exported to Japan, Canada and the United States. Over 95% of ostrich skins are exported as wet salted skins to Israel, Korea and South Africa where they are further processed. Only 20% of emu skins are collected and these are mainly used domestically.

Game birds

Game bird meat (including whole birds and cuts, poussin, squab, silkie chicken, quail, duck, ratites and pheasants) are exported to Hong Kong, Singapore, the United Arab Emirates, Japan, Maldives, Bangladesh, and Mauritius. There are also other smaller consignments to Asia Pacific countries (e.g. Tahiti). Shipment sizes vary from 120 kilograms to ten megatons. Within the quail industry there is generally very limited movement of birds internationally, interstate, or between farms.

SPF eggs and chickens

Fertile eggs and chickens from the SPF facility are shipped to many laboratories and vaccine production sites in all Australian states. Typically, fertile eggs are transported by road while chickens travel either via road or air. Fertile eggs from this facility are also exported to the United States for production of Australian vaccines that are then re-imported to Australia.

4.6.2 Introduction of genetic stock

Both chicken meat and layer genetic stock can only be imported into Australia through government or government approved hatching egg import facilities. The conditions for the importation of genetic stock is discussed in Chapter 2. Currently only three importation facilities exist in Australia for importing commercial poultry genetic stock.

Suppliers of chicken layer and meat GGP and GP stocks have strict biosecurity measures in place and use their own vehicles for the transport of day-old chicks. There is restricted access to breeder flocks and rigorous vehicle sanitation.

Day-old parent breeder chicks are usually distributed by road transport and occasionally by air transport to facilities in Victoria, New South Wales, South Australia, Queensland and Western Australia.

The sources of stock for the Australian egg industry are closely linked to the companies importing genetic stock, although company involvement often ceases following hatching. In contrast, most chicken meat breeder companies maintain control over the majority of the hatched stock. Adult birds are rarely exchanged between companies. However, a farm may house stock of different strains acquired as either day-old chicks or started pullets, the latter acquired from a specialist rearing farm.

4.6.3 Fertile Egg and Hatchery Movements

The movement of fertile chicken meat eggs is extensive throughout Australia both within and between companies. State-based hatcheries are supplied with fertile eggs from parent breeder farms and these hatcheries then supply day-old chicks to production or meat chicken growing farms.

Fertile eggs are normally transported in refrigerated vehicles to local and regional hatcheries. Where interstate movement is required (particularly when between different companies) independent transport contractors are used to carry palletised and shrink-wrapped eggs in refrigerated vehicles.

Meat chicken hatcheries are generally located near meat chicken farms. Day-old chicks are transported in vehicles that are mechanically ventilated with either heated or cooled air. A small proportion of chicks may be moved interstate to accommodate production changes, or for sale to interstate companies. In some cases, day-old chicks are air transported within Australia and overseas. There are also small numbers of hatchery door sales to a range of purchasers such as free range farmers and schools. The capacity of hatcheries ranges from 100 000 to 800 000 day-old chicks per week with hatching usually four days a week. Vaccination is undertaken at the hatchery for infectious bronchitis, Marek's disease and ND.

Unlike the chicken meat industry, there is virtually no movement of fertile hatching eggs between egg layer stock suppliers.

Egg hygiene and hatchery hygiene remain critical in all hatchery operations. Fumigation is still a standard operating procedure in many hatcheries, provided detailed and monitored SOPs are in place.

4.7 Traceability of poultry and poultry products

The OIE *Terrestrial Animal Health Code* (Article 4.1.1) recommends that countries have traceability systems for live animals to improve the effectiveness of activities such as: the management of disease outbreaks and food safety incidents, vaccination programmes, herd/flock husbandry, zoning/compartmentalisation, surveillance, early response and notification systems, animal movement controls, inspection, certification, fair practices in trade, and the utilisation of veterinary drugs, feed and pesticides at farm level.

In the Australian chicken meat industry, all parent stock, hatching eggs and meat chickens are traceable right up to the processing door. Within the processing plant, some detailed traceability is lost, but birds can still be traced back to a day of production or to a few farms. The same level of traceability applies for layer stock; layers can be traced from parent to hatching egg, to pullet to layer and then depopulation. In the larger firms, eggs are bar coded and can be traced back to the shed while smaller operators can trace eggs back to a farm. If eggs are moved into central packing floors dealing with a number of independent farms then traceability is reduced.

In the event of an EAD, affected hatching eggs can be traced and identified in cool storage, incubators and (if required) the grow-out farm.

All meat chicken growers are mandated to complete and maintain batch record sheets. During depopulation, growers keep records for reconciliation with processors. Growers also sign off on dockets recording the movements of birds brought into (or depopulated from) the farm. With such a flow of information it is possible to trace a processed meat chicken:

- back from the processing plant
- to the live bird transport vehicle
- to the contracted meat chicken grower
- to the day-old chick delivery vehicle
- back to the hatchery and the incubator and hatcher used
- back to the breeder donor flock and the days eggs were collected
- to the origin of the parent flock
- to the grandparent origin of the day-old parent stock.

Within the Australia New Zealand Food Standards Code, under Standard 3.2.2—Food Safety Practices and General Requirements—there is a requirement for food manufacturers (including chicken meat processors) to have a recall system that will ensure the recall of unsafe food.

All ratites must be permanently and individually identified. This identification must include the property of origin’s unique three letter Ratite Farm Accreditation code, and an individual number to identify each ratite. Each ratite enterprise must maintain a ratite identification, movement and death register.

CHAPTER 5 HISTORY & EPIDEMIOLOGY OF AI IN DOMESTIC POULTRY

5.1 Introduction

The aim of this chapter is to describe the history and epidemiology of AI detections in domestic poultry in Australia.

Five outbreaks of highly pathogenic avian influenza (HPAI) have occurred, all of which were caused by H7 subtypes of AI virus. All outbreaks were eradicated by stamping out before infection spread beyond the affected farm's immediate vicinity. The rapid outbreak detection and the subsequent coordinated response (including surveillance measures to prove freedom) demonstrate that Australia's animal health systems are capable of early detection and supporting rapid eradication of HPAI. In accordance with AUSVETPLAN and OIE guidelines, surveillance was used to demonstrate freedom from AIV in chicken farms in the surveillance zones. As the five outbreaks occurred over a period of 22 years, the AIV status of Australian flocks was assessed over a long period. Analyses of these disease outbreaks have also provided an opportunity for review and improvement of animal health systems and emergency response arrangements, and engagement with the poultry industry to enhance biosecurity and surveillance.

Low pathogenicity avian influenza (LPAI) viruses (or evidence of past infection with LPAI viruses) have also been detected during routine disease investigations, although most were not H5/H7 subtypes (see Section 5.3.1). LPAI viruses were detected as isolated incidents involving production losses in commercial poultry, as incidental findings during disease investigations, and in ducks during surveillance associated with HPAI outbreaks. While detection of any strain of AI virus is notifiable in Australia, the OIE defines low pathogenicity notifiable AI (LPNAI) viruses as those viruses of the H5 and H7 subtypes that are not highly pathogenic. Detection of LPAI viruses of subtypes other than H5 and H7 in poultry does not require reporting to the OIE.

5.2 Highly Pathogenic Avian Influenza

5.2.1 History and epidemiology of HPAI outbreaks in Australia

Table 5.2 provides a summary of the five HPAI outbreaks recorded in Australia. Three of these have occurred in Victoria, one in NSW and one in Queensland.

In all cases, eradication was achieved using a stamping out (slaughter) program, and was then confirmed by local, state and national surveillance.

Table 5.2 Summary of HPAI outbreaks in Australia

DATE	LOCATION & STATE	VIRUS SUBTYPE	FARM DETAILS
January 1976	Keysborough, Vic	H7N7	One egg layer farm (25 000 birds) with mortality up to 25% in the affected shed of 4000 birds, and variable mortality in other sheds One contiguous meat chicken farm (17 000 birds) with clinical signs

			(depression, oedema of wattles) One duck farm (16 000 birds) with no clinical disease
May 1985	Bendigo, Vic	H7N7	Multi-age chicken farm with 12 sheds and 120 000 birds. Reduced egg production, respiratory signs and mortality up to 80% in breeder birds
August 1992	Bendigo, Vic	H7N3	Meat chicken breeder farm of 17 000 birds, with increased mortality in one shed of 4300 birds One adjacent duck farm (5700 birds with no clinical signs) with shared personnel
December 1994	Lowood, Qld	H7N3	Multi-age layer farm with 22 000 birds; increasing mortality
November 1997	Tamworth, NSW	H7N4	1. A farm complex of meat chicken breeder facilities (128 000 birds) with increased mortality in affected sheds 2. Meat chicken breeder farm (32 000 birds) with controlled environment sheds; infection detected during surveillance before development of clinical signs 3. Asymptomatic emus (261 birds) in open pens near chicken sheds

Keysborough, Victoria – 1976

This HPAI outbreak on two contiguous meat chicken and egg layer farms in Victoria was the first to occur in Australia. The affected poultry exhibited variable mortality of up to 25% in the most severely affected layer shed of 4000 birds (Victoria Division of Animal Health, 1976).

A virus was isolated in embryonated chicken eggs and demonstrated by complement fixation to be influenza type A, subtype H7N7 (Westbury, 1997). All chickens on the affected farms were disposed of and buried on the farm. The farm was never restocked.

Surveillance, including examination of dead birds from nearby farms, led to the detection of infection with AI virus on a poorly-managed duck farm adjacent to the index property. Ducks on this property showed no clinical signs of infection. Sequential serological testing of the domestic ducks suggested active spread of the virus and the farm was subsequently depopulated. Subsequent testing of the duck farm virus showed it to be an LP H7N7 (Bashiruddin et al., 1992).

During investigation and surveillance of the outbreak, approximately 76 000 sera were tested by haemagglutination inhibition (HI) test, and 3400 swabs were taken and passaged for virus isolation (Victoria Division of Animal Health, 1976). No seroconversion was recorded on farms in contact with the affected three properties, nor was it recorded on poultry farms elsewhere in the control area. A small sample of wild birds on the duck farm and in the local area also recorded no seroconversion (Westbury, 1997).

Bendigo,Victoria – 1985

HPAI occurred on a multi-age chicken farm with meat chicken breeders, meat chickens and layers. Reduced egg production, respiratory signs and mortality were reported in four of 12 sheds. The disease outbreak occurred in birds already affected with a complex of diseases (Barr et al., 1986).

The farm had poor biosecurity practices, with personnel shared between all sheds. Drinking water was derived from untreated surface water from the farm's dam which was frequented by waterfowl. Waterfowl and escaped poultry were observed to forage on land outside the breeder sheds, and wild birds had access to the sheds (Barr et al., 1986; Morgan & Kelly, 1990). A poultry processing plant was also situated on the farm, processing birds from six separate contract growing farms as well as the farm's own birds.

Diagnostic testing showed high titres to several pathogens, including AI virus, and a HP H7N7 subtype was isolated in embryonated chicken eggs. The source of infection was undetermined, but direct and indirect contact with wild birds, untreated surface water contaminated by waterfowl, and contaminated feed were suggested as possible sources (Forman et al., 1986; Morgan & Kelly, 1990; Westbury, 1997). Wild birds trapped on the infected farm were also tested for evidence of AI infection. From 208 cloacal swabs, a single isolate of H7N7 AI virus was made from a starling trapped in the infected shed during the outbreak (Cross, 1987).

Respiratory signs and cyanosis of the wattle were observed on one of the six contract grower farms associated with this property, and a decision was made to proceed with slaughter of chickens on all six farms (Cross, 1987).

All commercial poultry farms within a five kilometer radius were serologically tested by sampling numbers sufficient to have a 95% chance of detecting 1% seropositive prevalence. In addition, one third of the commercial poultry flocks in Victoria as well as some flocks in other states were tested serologically to detect 2% infection with 90% confidence (Morgan & Kelly, 1990). There was no evidence of further spread of AI virus from the depopulated properties.

Bendigo, Victoria – 1992

This HPAI outbreak was detected in July when a poultry farm manager observed increased mortalities in one shed of 4300 meat chicken breeders. No disease was evident in the other three sheds on the farm. Serological testing for HI antibody to AI virus was negative. However, pancreatic impression smears were positive to an antigen immunofluorescence test using H7 antigen. AI virus (H7N3) was isolated from tracheal swabs inoculated into embryonated eggs (Forsyth et al., 1993). The absence of HI antibody and the relatively low mortality at the time of diagnosis suggested that the outbreak had been detected at an early stage (Forsyth et al., 1993).

As in previous outbreaks, all neighbouring poultry farms were quarantined and all dead birds from these farms were submitted for virological and pathological examination.

Clinically unaffected ducks on a poorly managed neighbouring duck farm were found to have antibodies to several H subtypes of AI virus, including H1, H4, H5, H7 and H9 (Westbury, 1997; Selleck et al., 2003). These ducks had access to paddocks and a small dam, and the farm shared personnel with the affected chicken farm. Transmission of the virus may, therefore, have occurred from the ducks to the chickens (Selleck et al., 1997).

Stamping out on both the index property and the neighbouring duck farm was carried out, and hatching eggs (including those from the infected chicken farm) were destroyed at a local hatchery (AQIS, 1992). After disinfection of infected premises, testing for residual virus was done using sentinel birds with negative results. Again, serological surveillance was done on a regional, state-wide and national basis, all with negative results (Westbury, 1997).

Lowood, Queensland – 1994

This HPAI outbreak occurred on a multi-age layer farm housing approximately 22 000 chickens. The outbreak was first recognised following a rapid increase in mortalities and H7N3 was isolated in embryonated chicken eggs. As in previous outbreaks, neighbouring farms were quarantined and monitored for the presence of infection by pathological and pancreatic impression smear testing of all dead chickens, and serological testing. No AIV infection was detected during tracing activities or subsequent surveillance.

Investigation of the source of the outbreak was inconclusive. However, the farm sourced water from a river with a high concentration of waterfowl. Wild birds (ducks, geese, sparrows and other birds) also congregated at a small dam near the entrance of layer sheds and at isolated waterholes along the border of the property (Bunn, 2004).

A small sample of wild birds captured near the farm revealed no detectable virus or antibody. Nucleotide sequencing demonstrated that there was no relation to the 1992 Bendigo H7N3 virus. Subsequent analysis also concluded that the virus (as well as isolates from the previous three outbreaks) were of Australian lineage (Banks and Alexander, 1997).

The infection did not spread to contact premises or traced farms and the affected farm was restocked after disinfection, spelling and placement of sentinels to monitor for residual virus. Serological testing in other areas of the state and the country showed no evidence of infection (Westbury, 1997).

Tamworth, New South Wales – 1997

This HPAI outbreak was detected following increased mortalities and clinical signs of diarrhoea, respiratory distress and cyanotic combs in one shed of a chicken meat breeder farm. A company veterinarian made a provisional diagnosis of fowl cholera and prescribed antibiotics which resulted in a corresponding drop in mortalities. However, increased mortalities became evident in two other sheds six days later, and a combined investigation with NSW government veterinary specialists led to laboratory confirmation by positive AI serology, and later by virus isolation, of AI. The virus was identified as a H7N4 subtype with an Intravenous Pathogenicity Index (IVPI) of 2.52.

A second infected premises was detected following the testing of dead birds as part of surveillance activities associated with the disease control campaign. The second farm was a meat chicken breeder farm owned by a separate company, and was located two kilometers south of the index property.

A few days later, a third infected farm was detected during active surveillance activities. H7N4 virus was isolated from cloacal swabs taken from clinically unaffected 3-month-old free range emus raised on a chicken farm less than 300 meters from the index shed.

Following confirmation of HPAI, all three farms were depopulated, all birds destroyed, contaminated materials buried, and sheds decontaminated. Surveillance of avian species was carried out on all other poultry properties in the area. Regular post-mortem examinations were carried out on dead birds, and serology performed to check for evidence of AI antibodies. Backyard poultry within a three kilometer zone were also checked for evidence of infection but no evidence of any AIV was found outside the three infected properties. A survey of wild waterfowl in the area was also conducted at the time (and again 6 weeks later) with no antibodies or isolates to H7 detected (Selleck et al., 2003). NSW was officially declared free in June 1998, in accordance with the OIE Code requirements in place at that time.

Emus on the third infected premises were implicated as a possible source of infection for the chickens on other properties (Selleck et al., 2003; McCallum et al., 2008). Other possible sources of infection included nomadic wild bird carriers, and inadequate sanitation of the river water supplied to housed birds (Selleck et al., 2003). However, the exact source of the virus and mechanisms of spread were not determined (Selleck et al. 2003).

The outbreaks described above have contributed to the understanding of HPAI in the Australian context, and to the development of biosecurity awareness activities involving all poultry industry sectors. A common theme in all outbreaks was poor biosecurity and, in particular, inadequately treated surface water.

Recognising that improved biosecurity is necessary for the prevention of avian influenza and other diseases in domestic poultry, the Australian poultry industry has been actively engaged with government in enhancing biosecurity measures in the poultry industry. A Biosecurity Consultative Group, comprising members from all commercial poultry industry sectors, government and AHA, has developed a *National Farm Biosecurity Manual for Poultry Production* which describes minimum biosecurity standards to be applied across all sectors. The group also commissioned a *National Water Biosecurity Manual for Poultry Production* to improve producers' awareness of the importance of, and methods for, treatment of surface water before use in poultry sheds. Both manuals have been widely distributed to the poultry industry and are available on the DAFF web site.[62]

5.3 Low Pathogenicity Avian Influenza

Low pathogenicity H5 and H7 subtypes of AI viruses can mutate to HPAI strains and a mutation event may have occurred in the five HPAI outbreaks in Australia, although this has not been proven (McCallum et al., 2008).

5.3.1 History and epidemiology of LPNAI detections in poultry in Australia

There have only been three detections of LPAI H5 and H7 virus strains recorded in Australian domestic poultry.

Victoria 1976

A low pathogenicity H7N7 virus was isolated on a duck farm during investigation of an HPAI (H7N7) outbreak in chickens in Victoria in 1976. The ducks showed no signs of clinical disease. Further details of this detection are provided in Section 5.2.1 above.

Victoria 1992

Antibodies to H5, H7 and other subtypes of AIV were detected by cELISA and HI in commercial domestic ducks during investigation of an HPAI (H7N3) outbreak in chickens in Victoria in 1992. However, as virus was not isolated from the ducks, the pathogenicity of the

62 http://www.daff.gov.au/birds

viruses was not determined. The ducks which were depopulated as part of the response to the H7N3 outbreak in chickens showed no signs of clinical disease. Further details of this detection are provided above under Sections 5.2.1 and 5.3.2.

<u>Tasmania 2006</u>

The owner of a non-commercial, multi-species smallholding reported 17 deaths over three weeks in a flock of 300 free-range chickens. The flock was in contact with domesticated and wild ducks on a surface water source (dam). Housed chickens (300) on the same property and ducks in contact with the free-range chickens were unaffected. Pathology was consistent with infectious laryngotracheitis (ILT) infection, and a herpesvirus was isolated. In addition, *Mannheimia (Pasteurella) haemolytica*, *Pasteurella multocida* and *Pseudomonas aeruginosa* were isolated from post-mortem swabs of the trachea and sinuses of chickens. Low levels of antibody (1:16) to H5 AI virus were detected during serological (HI) testing of two out of 13 birds, and movement restrictions were imposed on the property while the finding was further investigated.

No AI viruses were detected by PCR or isolated from cloacal or tracheal swabs. Follow-up investigations showed that five out of 30 serological samples had low antibody titres for AI virus, which did not increase over several weeks. This finding is consistent with past, but not current, infection. The AI antibodies were found only in older birds (two years old) and not in younger birds, suggesting historical exposure to a source of AI viruses, probably wild birds.

The deaths that initiated the investigation stopped in response to antibiotic treatment. The owner then separated the free-range chickens from the domesticated and wild waterfowl by moving them to a site away from the dam. Movement restrictions were lifted after completion of the investigation.

5.3.2 History and epidemiology of LPAI (non H5 and H7) detections in poultry in Australia

<u>Victoria 1992</u>

Antibodies to H1, H4, H5, H7, and H9 subtypes of AIV were detected by cELISA and HI in ducks on a farm during investigation of an HPAI (H7N3) outbreak in chickens (see Section 5.2.1 and 5.2.2). No virus was isolated from the ducks, which were depopulated as part of the response to the H7N3 outbreak.

<u>Victoria, 1994</u>

In 1994, a multi-age, commercial duck farm in Victoria was investigated for suspected *Riemerella anatipestifer* infection. Because the clinical signs were considered unusual, including sinusitis, the investigating veterinarian requested laboratory examination for other bacteria and viruses. *Riemerella anatipestifer* was confirmed as the main causative organism, but on one occasion during the investigation, H4N8 AI virus was isolated from the flock. The flock was treated with antimicrobials for the *Riemerella* infection, and improved biosecurity was implemented. Before the detection of AI virus in the flock, ducks had been kept in multi-age sheds with wild bird access. Following the disease investigation, wild birds were excluded from the flock, and an all-in, all-out single-age regime was applied to breeders and growers. Since then, there has been no recurrence of *R. anatipestifer* infection or sinusitis. No specific control measures, other than improvements in biosecurity, were implemented for the LPAI virus infection. Subsequent testing of the flock on a number of occasions at a government laboratory was negative for AI viruses (Paul Gilchrist, pers. comm. 2008).

Queensland 2006

Chickens that were part of a mixed non-commercial flock (70 chickens and 30 ducks) exhibited depression, respiratory signs and increased mortality. On initial investigation, samples from a duck were positive on PCR test for influenza A. The property was quarantined pending the results of further investigation. Subsequent investigation led to the isolation of an H6N4 virus from a single duck. Quarantine on the property was lifted after no further PCR positive samples were detected from the chickens.

New South Wales, 2006

A 0.5% increase in mortality and ten percent drop in egg production were investigated in a biosecure chicken breeder flock in late 2006. Chickens in several sheds on the farm tested sero-positive to H6. Pools of tracheal swabs and cloacal swabs were collected but only one shed yielded positive tests in one cloacal and one tracheal swab pool by real-time PCR for AI virus matrix gene. Affected birds were sent for early processing. Testing of archived sera from the farm revealed additional sheds with seropositive chickens, but these birds had already been processed by the time of testing. No virus was isolated from any sample, and no evidence of AI virus was found during sampling of the processing plant. The subtype was determined to be H6N4.

During subsequent investigation of surrounding poultry farms, positive serology (H6) was detected in older ducks belonging to another company on a nearby farm. On this farm, only older ducks were seropositive; all younger ducks tested were seronegative. No virus was isolated from any of the seropositive birds.

Subsequent monitoring (2008) of ten poultry farms in the vicinity and three other poultry farms in a wider area has shown no more seropositive cases. Research into the prevalence of AI viruses in wild birds frequenting poultry farms in the area has not found evidence of AIV in any of the wild ducks sampled during the 12 month project.

New South Wales, 2010

A 15% drop in egg production and a slight increase in mortality was investigated in a chicken breeder flock in 2010. Samples collected from the flock were positive to ELISA testing for influenza A, and the subtype was confirmed as H10N7. Investigation of the incident by the NSW government was continuing at the time of writing.

5.4 Source, detection and management of AI detections in Australian poultry

All outbreaks of HPAI in Australia have been due to H7 viruses. The H7 isolates detected during Australian outbreaks of HPAI were phylogenetically distinct to those found in North America, Europe and Africa (Arzey, 2004; Banks & Alexander, 1997; Banks et al., 2000). This subject is discussed in more detail in Part 2, Chapter 7.

All occurrences of AI infection in Australian domestic poultry have been detected through passive surveillance at an early stage, greatly facilitating their rapid eradication. Flock monitoring of production and mortality parameters led to disease investigation and diagnostic efforts which identified the presence of AI. Subsequent spread of AI from the index infected property, where it occurred, was detected by active surveillance.

Most outbreaks were associated with a combination of poor biosecurity practices; namely the use of untreated or inadequately treated surface water and possible linkages with wild waterfowl and domestic ducks. Four of the HPAI outbreaks were in areas of relatively low poultry density, and this may have prevented the outbreaks from becoming more widespread. However, early diagnosis and rapid response were also critical to limiting spread.

Epidemiological lessons learnt from detections of AI in Australian domestic poultry have made a significant scientific contribution to the development of Australia's AI surveillance and biosecurity systems, and to Australia's emergency preparedness and response capabilities.

The link between risk of infection and poor biosecurity practices is clear. For this reason, cost-sharing arrangements under Australia's Emergency Animal Disease Response Agreement are linked to the implementation of biosecurity plans by signatories (see Chapter 1).

Further surveillance activities are described in the next three chapters of this document.

PART 2 AUSTRALIA'S AVIAN INFLUENZA SURVEILLANCE SYSTEMS

CHAPTER 6 SURVEILLANCE AND REPORTING SYSTEMS

6.1 Introduction

The OIE *Terrestrial Animal Health Code* (2009) in Article 1.4.1 identifies animal health surveillance as:

> an essential tool to detect disease or infection, to monitor disease trends, to facilitate the control of disease or infection, to support claims for freedom from disease or infection, to provide data for use in risk analysis, for animal and/or public health purposes, and to substantiate the rationale for sanitary measures (OIE, 2009).

The FAO manuals on emergency disease preparedness and disease surveillance also emphasise the importance of surveillance.

> Early detection enables early warning and an early reaction. Surveillance is the primary key to effective disease management (Paskin, 1999: 4).

> Disease surveillance should be an integral and key component of all government veterinary services. This is important for early warning of diseases, planning and monitoring of disease control programmes, provision of sound animal health advice to farmers, certification of export livestock and livestock products and international reporting and proof of freedom from diseases. It is particularly important for animal disease emergency preparedness (Geering et al., 1999).

The Australian Government and state and territory governments regard disease surveillance and monitoring as a major function of the animal health system. This chapter describes government and non-government programs that contribute to disease surveillance and monitoring capability at a national level.

Australia's disease reporting systems ensure that zoonotic diseases as well as notifiable exotic and endemic diseases of poultry are reported to government. Poultry diseases on the national notifiable list[63] include: AI (all subtypes), avian mycoplasmosis (*M. synoviae*), duck virus enteritis (duck plague), duck virus hepatitis, infectious bursal disease (hypervirulent and exotic antigenic variant forms), ND, pullorum disease (*Salmonella* Pullorum), and *Salmonella* Enteritidis (SE) infection in poultry.

The state and territory governments—responsible for the control of endemic and exotic diseases within their boundaries—have notifiable disease lists that reflect the national list but may also include additional diseases like avian tuberculosis, chlamydiosis and infectious laryngotracheitis.

Reporting of mortalities or sick birds is mandatory where there is suspicion of an emergency animal disease, or need for a differential diagnostic exclusion of an emergency animal

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63 www.daff.gov.au/animal-plant-health/pests-diseases-weeds/animal/notifiable

disease. Reporting is the responsibility of the owner, manager, or person in control of the animal. A veterinarian attending an animal and suspecting an exotic or notifiable disease is required by law to report the incident to the state authority, which is usually the state department of agriculture. The time period for notification is outlined in the legislation of each state and territory. For EADs such as AI, *immediate* notification is required by law.

6.2 National reporting systems

Official national disease reporting systems provide a mechanism for formal, ongoing recording and analysis of both livestock and wildlife disease investigations and surveillance data. Australia has a number of official reporting systems and these are described in more detail below.

6.2.1 National Animal Health Information System (NAHIS) Program

The NAHIS program collates data from a wide range of government and non-government programs to provide an overview of animal health, disease surveillance and disease control. The information collected by NAHIS is essential for supporting trade in animal commodities, and for meeting Australia's international reporting obligations.

Data for NAHIS are provided by:

- Australian national, state and territory animal health authorities
- diagnostic laboratories
- disease surveillance programs
- disease control and accreditation programs
- universities
- research programs.

NAHIS also collects and stores summary information on:

- animal diseases and their control in Australia
- slaughter statistics
- residue surveillance
- emergency and emerging disease investigations
- key animal health contacts.

Data from all available laboratory investigations is entered on a quarterly basis by state and territory coordinators. NAHIS is a web-based system for managing national animal disease surveillance data. NAHIS has the capacity to store detailed surveillance information in addition to disease investigation data.

Data from the NAHIS database is routinely reported in the newsletter *Animal Health Surveillance Quarterly*[64], together with case reports of veterinary investigations. The data is also used by the Australian Government in reports to the World Organisation for Animal Health (OIE), the Food and Agriculture Organization of the United Nations, and the World Health Organization. Current disease surveillance reports and publications are available on the NAHIS page of the Animal Health Australia web site.[65]

Information on AI disease exclusions in domestic poultry and other captive birds is included in the avian influenza/Newcastle disease (AIND) project within NAHIS. The AIND project was established in 2007, following consultations within AHC, to standardise reporting on submissions, specimens and testing for AI. The database records the date of investigation, species, location, level of response, and information on the outcome of each test establishing the negative or positive status of specimens. Although detailed information is recorded in the database for reporting purposes, only summary data (such as the number of investigations and number of positive tests) is made publicly available.

Details about samples tested for AI and/or ND at state and territory laboratories are sent to the AHA Surveillance Coordinator, who ensures that information entered by state and territory coordinators matches database requirements. Results of testing for AI since 2007 are reported in Chapter 8.

6.2.2 electronic Wildlife Health Information System (eWHIS)

The Australian Wildlife Health Network (AWHN) is a not-for-profit organisation comprising a network of organisations and people across Australia. It is an initiative of the Australian Government and is managed under the Wildlife Exotic Disease Preparedness Program.[66] The network's aim is to promote and facilitate collaborative investigation and management of wildlife health across Australia, in order to support public and livestock health, biodiversity and trade. The network is managed by a national coordinator and a management committee.

AWHN has five key theme areas: surveillance and investigation, support for research, communications and marketing, emergency animal disease preparedness and response, and education and training. AWHN also administers a rapid alert system and coordinates the national Wild Bird AI Surveillance Program. In addition, the network maintains an interactive web site[67] and a database for network members known as eWHIS (electronic Wildlife Health Information System).

Developed by AWHN, eWHIS is a database for the recording, management and analysis of wildlife health data. State and territory wildlife coordinators enter data from wild bird surveillance, disease investigations and mortality events into eWHIS and data on wildlife disease events occurring around Australia is also stored. This allows users to access information about an event, its location, the species involved (their taxonomy and the number of dead/affected animals over time), the diagnoses made for each species involved, and the actions that are either scheduled or completed for each event.

A scheduled review of eWHIS will make recommendations for future development, thus ensuring that the needs of end-users are met, and that eWHIS aligns with NAHIS.

64 http://www.animalhealthaustralia.com.au/publications/reports.cfm
65 http://www.animalhealthaustralia.com.au/nahis/
66 http://www.daff.gov.au/animal-plant-health/emergency/wedpp
67 http://www.wildlifehealth.org.au/AWHN/home.aspx

6.2.3 National Notifiable Diseases Surveillance System (NNDSS)

The National Notifiable Diseases Surveillance System coordinates the national surveillance of more than 50 communicable diseases, or disease groups of importance to human health, including laboratory-confirmed influenza. The data are published weekly on the NNDSS web site[68] and quarterly in the journal *Communicable Diseases Intelligence*. Data on five important zoonoses are replicated in *Animal Health Surveillance Quarterly*.

National Enteric Pathogen Surveillance Scheme

The National Enteric Pathogen Surveillance Scheme (NEPSS) monitors human disease caused by enteric pathogens of both humans and animals such as *Salmonella* spp., pathogenic *Escherichia* coli, *Yersinia* spp., and *Campylobacter* spp. Data from human notifications are reported within NNDSS.

Salmonella isolates made at veterinary laboratories are forwarded to one of two reference laboratories where Salmonella isolates are confirmed and phage typed; the Australian Salmonella Reference Laboratory, in Adelaide, and the Microbiological Diagnostic Unit, in Melbourne. Results are documented in annual report compiled by the Australian Salmonella Reference Centre.

6.2.4 Emergency Animal Disease Watch Hotline

Australia operates a national Emergency Animal Disease Watch Hotline so that producers and other members of the public can report unusual or suspicious disease incidents in livestock and wildlife. A call to the hotline is referred to a duty person in the caller's jurisdiction. AHA coordinates and publicises the program, as well as conducting audits to ensure that publicity reaches livestock owners. With the spread of H5N1 HPAI, first in Southeast Asia and then to Europe and Africa, extensive use was made of this network to report and submit dead wild birds and backyard poultry. However, follow up of these reports ruled out AI. Since the end of 2006, when international media coverage of the H5N1 epidemic diminished, submissions of wild birds and backyard poultry have declined. However, the national hotline was used extensively in 2007 for reporting suspected cases during an outbreak of equine influenza in Australia.

6.2.5 Salmonella Enteritidis and Pullorum Accreditation Program

The purpose of the program is to promote the early detection of *Salmonella* Enteritidis in layer and breeder flocks. Accreditation under the program requires microbiological sampling every one to three months of the participant's poultry environment, and certain biosecurity requirements must also be met. The program operates in the two main poultry producing states in Australia: New South Wales and Victoria.

6.3 Other reporting mechanisms

6.3.1 Surveillance and state government poultry veterinarians

The role of state and territory government veterinarians, including technical specialist poultry veterinarians, is described in Chapter 2, Section 2.4.2. Incidents of high mortality are reported by industry poultry veterinarians, private practitioners, or poultry producers to state and territory government poultry specialists, who may then instigate or assist with investigation.

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68 http://www9.health.gov.au/cda/Source/CDA-index.cfm

State and territory government veterinarians keep records of field investigations, and laboratory investigation results that exclude AI and ND are reported through NAHIS.

6.3.2 Surveillance and Private Veterinary Practitioners

Australian states and territories have legislation that requires all private (including industry) veterinary practitioners to report suspicion or confirmation of a notifiable disease.

New South Wales

In the commercial poultry sector, suspect notifiable diseases are usually investigated by industry veterinarians in collaboration with the state poultry technical specialist, and diagnostic specimens are submitted to one of the government veterinary laboratories.

In the non-commercial sector, investigations may involve a variety of veterinarians from the private, district, and government sectors. In some cases, for example where chlamydiosis or avian tuberculosis is investigated, district government veterinarians may assume management of cases in their district—in consultation with the state technical specialist.

Private practitioners receive subsidised laboratory testing for cases in which they investigate mortalities of commercial livestock (including poultry). They also receive training in sample submission and disease investigation for some notifiable diseases. Those submitting samples are not charged by laboratories for the investigation of suspected notifiable animal diseases.

Northern Territory

Private practitioners in the Northern Territory are requested to report significant animal disease events to departmental veterinary officers (Northern Territory Government Department of Resources) who assume management for investigations. Practitioners are encouraged to submit livestock samples for laboratory investigation, which are processed free of charge.

Queensland

Private practitioners support national surveillance programs. Veterinary officers from the Department of Employment, Economic Development and Innovation (DEEDI) (which incorporates the former Queensland Department of Primary Industries and Fisheries) regularly liaise with private veterinary practitioners in their regions to assist with the investigation of complex livestock disease events, including any that occur in poultry. In addition, a senior state government veterinary pathologist liaises frequently with practitioners who engage in a significant amount of farm animal work.

This liaison helps to keep the department informed of the prevalence of endemic diseases affecting poultry and other livestock, and enables early recognition of new and emerging disease problems.

South Australia

The Animal Health group of Primary Industries and Resources South Australia (PIRSA) maintains close communication with rural private veterinary practitioners. PIRSA Animal Health has established the PIRSA Animal Health Enhanced Disease Surveillance Program to promote disease incident investigations. This program funds laboratory submission fees for suspect infectious diseases in livestock, and fully reimburses contracted private veterinary practitioners for their costs incurred investigating unusual disease events.

Tasmania

The Department of Primary Industries, Parks, Water and Environment contracts twelve Tasmanian veterinary practices to supply information gained from their visits to farms. Nine contracted veterinary practices also report information on wildlife illness investigations by classification of cases into 11 syndromes.

The contracted private veterinary practitioner program is in its sixth year.

Victoria

The Department of Primary Industries in Victoria incorporates private veterinary practitioners in animal health surveillance activities by providing a subsidy for disease investigation, and providing an investigation training program.

With prior approval from the Department of Primary Industries, a private veterinary practitioner may carry out an extensive disease investigation and claim subsidies for both reporting and laboratory costs. Approximately 80 of these investigations were undertaken during 2008.

Since 2008, the Department of Primary Industries has offered a 12-month course in field gross pathology and a short course in animal disease investigation methods. Both courses are well attended by private veterinary practitioners.

Western Australia

In recent years, Western Australia has promoted the surveillance and reporting of significant livestock disease events by private practitioners through: personal networking (by departmental veterinary officers), regional training workshops in disease investigation, and production of a quarterly surveillance newsletter. Laboratory diagnostic work on cases of a suspect notifiable disease, or cases that are considered to be of public benefit, are exempt from laboratory charges.

The Australian Veterinary Practitioners Surveillance Network

The Australian Veterinary Practitioners Surveillance Network (AVPSN) is a web-based system designed to collect information about on-farm investigations by non-government veterinarians. The AVPSN collates information that adds to, and complements, information provided by existing surveillance activities. In particular, the AVPSN:

- collects data on the frequency of on-farm investigations by non-government veterinarians; data are organised geographically, by livestock type, and by farm visit reasons and outcomes

- enhances Australia's ability to recognise the emergence of new disease syndromes

- enables detection of changes in trends for an expanded range of endemic diseases via enhanced farm-based surveillance.

In 2008, 73 veterinary practices participated in the AVPSN. Participants were selected using pilot trials and strategic recruitment across Australia's 12 animal production regions. This approach ensured geographic diversity, as well as a diversity of livestock industries and animal production systems.

Participating practitioners entered data about farm visits made during two reporting periods; March–May (inclusive) and September–November (inclusive). In 2008, the 73 enrolled practices recorded 2881 visits.

The AVPSN continues to expand, enlarging the database of farm visits (managed by DAFF). Importantly, the system provides quantitative evidence of the amount of passive surveillance performed by Australia's network of veterinary practitioners, who are located across geographic regions and production systems.

National Significant Disease Investigation Program

The National Significant Disease Investigation (SDI) Program is described in Chapter 2, Section 2.5.1. The National SDI Program subsidises livestock disease investigations made by veterinary practitioners where financial limitations to their investigation exist. Significant diseases are broadly defined as those that may impact trade, regional or national productivity, or public health. Significant diseases may include clinical signs such as high morbidity, mortality or rapid rate of spread. Summary case data is collated in NAHIS.

6.3.3 Laboratory accessions

Samples from suspected emergency animal diseases must be submitted to state and territory veterinary laboratories, either government-owned or government-contracted. These laboratories are strategically placed to undertake first-line investigation of animal disease events. Where there is suspicion of an exotic or other emergency disease, these laboratories carry out initial exclusion testing of specimens and are required to refer relevant specimens to the CSIRO Australian Animal Health Laboratory (AAHL) for confirmation. They may also forward specimens directly to AAHL if relevant initial exclusion testing service is not available. The testing for AI in state and territory veterinary laboratories comprises RT-PCR, c-ELISA, and HI. Virus culture is permitted in state laboratories only after confirmation by AAHL that the AI virus is not HPAI or an LPNAI of the H5 or H7 subtypes. In the event of a positive diagnosis, the Chief Veterinary Officer of the state or territory and the Australian Chief Veterinary Officer are informed, and emergency management procedures are activated as described in Part 1, Chapter 3.

Poultry disease cases are generally assessed by competent and experienced veterinarians as either 'likely' or 'unlikely' to be AI or NDV. Even unlikely cases can finish up as material for AI exclusion. Laboratory submissions are further assessed at state and territory laboratories for the likelihood of AI and ND. Where a veterinary pathologist or officer has confidently established a (tentative) diagnosis of disease(s) other than NAI or ND, laboratory testing for NAI or ND may not be undertaken. However, some state governments require regular and opportunistic screening of poultry submissions for ND and AI, even when the differential diagnosis does not include these diseases. Such screening provides surveillance information and also assists laboratories to maintain proficiency in testing methodologies.

Although state and territory government and private veterinary laboratories maintain data on testing undertaken on poultry specimens received, only data from AI and ND testing is recorded nationally and reported in NAHIS. The Subcommittee on Animal Health Laboratory Standards (SCAHLS) facilitates a network between government, AAHL, private, and university animal health laboratories.

6.3.4 Poultry industry surveillance for avian influenza

Surveillance for AI in the poultry industries is described in Chapter 8.

6.3.5 Informal mechanisms for reporting information about poultry diseases

Queensland, Victoria and New South Wales each have a Poultry Health and Welfare Liaison Group. These groups meet regularly to share information on disease occurrence, and permit industry veterinary and scientific personnel to discuss industry concerns with government officers. Technical specialists in NSW, VIC, QLD, and SA maintain close and regular liaison with industry personnel. An Avian Industries Consultative Group operates in WA, meeting four times a year. This group includes representatives from fancy poultry, pigeon and other avian interest groups.

These mechanisms have proved valuable to industry and government for sharing information about disease occurrence and control programs. In particular, the meetings have contributed to industry and government understanding of disease occurrence, and have encouraged the submission of flock specimens where mild problems and/or low mortality occur.

In addition, the Australasian Veterinary Poultry Association (AVPA)[69] holds regular meetings at which private and government veterinarians and other scientists present papers and hold discussions on poultry disease matters.

69 http://www.jcu.edu.au/vbms/avpa/

CHAPTER 7 SURVEILLANCE OF WILD BIRDS IN AUSTRALIA

7.1 Introduction

The aims of this chapter are:

- to describe the likelihood of introduction to Australia of exotic (especially highly pathogenic) strains of the AI virus through the movement of wild bird populations between Australia and other countries

- to describe surveillance of wild birds in Australia undertaken between 2005 and 2008.

7.2 Risks to Australia from wild bird reservoir species

The risk of introduction of AI viruses into Australia from other countries has been assessed in a number of recent studies (East et al., 2008a; East et al., 2008b; McCallum et al., 2008; Tracey et al., 2004). These studies suggest a very low, but not zero, likelihood of introduction of exotic strains of AI viruses via migratory or nomadic birds into Australia.

7.2.1 Biogeographic regions

Australia is an island continent, with the closest neighbouring land masses being New Zealand to the east, and New Guinea and the Indonesian archipelago to the north.

As an island continent, Australia has a unique population of native fauna, distinct from that seen in Asia. Wallace’s Line is a recognised bio-geographical boundary that separates the Australasian and Asian faunal realms (McCallum et al., 2008). Predominantly Asian fauna is found to the west of the line, and Australasian fauna found to the east, with a relatively narrow transitional zone in between. The east-west demarcation of animal species, including birds, is remarkably complete on either side of this line (McCallum et al., 2008). With the exception of *Charadriiformes* (shorebirds and waders), few avian species cross Wallace’s line. Many Australian species of birds, including *Anseriformes* (ducks, geese and swans), limit their movement to the Australo-Papuan region or to the limited region east of Wallace’s Line (Figure 7.1). Studies have recorded 656 species of bird regularly observed in Australia (Barrett et al., 2003), but only approximately 90 species move regularly between Asia and Australia (Tracey et al., 2004).

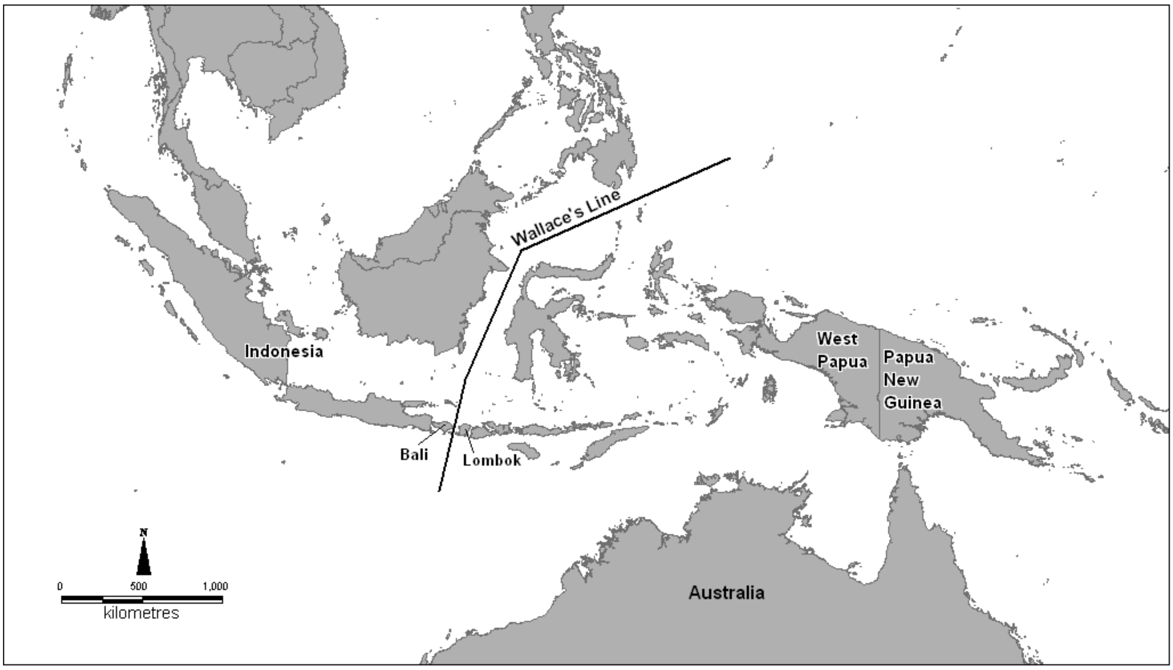

Figure 7.1 **Position of Wallace's line, which separates Asian from Australasian fauna (Provided by Iain East, DAFF)**

7.2.2 Wild bird reservoirs of avian influenza virus

Anseriformes are an order of web-footed water birds that include the waterfowl family *Anatidae* (ducks, geese and swans). *Anseriformes*, and in particular *Anatidae,* are considered the major wild bird reservoir for AI worldwide. *Anatidae* are the only bird group in which AI viruses have been found all year round in wild populations, and are the bird family from which H5N1 HPAI virus subtypes have been most commonly recovered. Studies have shown that *Anatidae* appear to shed higher quantities of AI virus for a longer period of time than other families of wild birds, including *Charadriidae* (shorebirds) (Perkins & Swayne, 2002b; Perkins & Swayne, 2002a; Hulse-Post et al., 2005).

Waterfowl species have been implicated in the spread of HPAI H5N1 from east Asia to Russia, Europe and Africa. For example, an examination of the spread of H5N1 HPAI from Russia and Kazakhstan to the Black Sea basin concluded that spread was consistent with the hypothesis that birds of the *Anatidae* family seed the virus along their autumn migration routes (Gilbert et al., 2008). However, movement of birds via human trading patterns probably also contributed to spread of H5N1 in these regions (Alexander, 2007).

Detections of AI viruses in Australian wild birds have overwhelmingly involved *Anatidae* species (see Sections 7.3.3 and 7.3.4). For example, in the period from June 2007 to July 2008, 48 of 53 identifications of AI subtypes in Australian wild birds were from waterfowl, and the other five from shorebirds (Table A.6.2). In Australia, as in other countries, the main reservoir for LPAI viruses appears to be dabbling ducks (Tracey, 2010).

Indeed, shorebirds are also recognised hosts for AIV, although to significantly less extent than waterfowl, as viruses tend to be detected seasonally in shorebirds rather than year-round. Studies have also shown that *Charadriidae* appear to shed lower quantities of AI virus and for shorter periods of time than *Anatidae* (Perkins & Swayne, 2002b; Perkins & Swayne, 2002a; Perkins & Swayne, 2001) and therefore they may present a lower risk for introduction of HPAI to Australia (East et al., 2008a).

AI viruses have been detected from very few Australian *Charadriiformes* since the advent of the National AI Wild Bird Surveillance Program in 2005 (see Sections 7.3.3 and 7.3.4).

A number of studies have shown that the duration of viral shedding is likely to be variable between species (Brown et al 2006). For example, H5N1 HPAI titres excreted from waterfowl rapidly decline from 10 days after infection, although Mallard ducks have been recorded to shed some H5N1 HPAI for up to 17 days after infection (Hulse-Post et al., 2005). Laughing gulls artificially infected with H5N1 HPAI shed virus for seven days after infection (Perkins & Swayne, 2002b), but virus could be isolated from oropharyngeal swabs for as long as 10 days after infection (Brown et al, 2006). The shortest time recorded for the migratory journey by a wild shorebird from Australia to Asia is seven days by a Great knot and 11 days by a Bar-tailed godwit (East et al., 2008a). It seems unlikely that *Charadriiformes* infected in Asia at the beginning of their migration would still be shedding virus by the time they arrived in Australia. However, this has not been proven for the species that migrate to Australia from Asia. Nevertheless, Australia is still free of H5N1 despite an annual migration of 3 million shorebirds[70] which cumulatively presented approximately 18 million opportunities between 2004 and 2010 for the entry of H5N1.

Wild bird species other than *Anseriformes* and *Charadriiformes* are comparatively uncommon hosts for AI. Of the 26 families (approximately 90 species) known to move regularly between Australia and Asia, AI infection was suggested to occur commonly in *Anatidae* (*Anseriformes*) and occasionally in *Charadriiformes*. Occurrence was rare in *Ardeidae* (herons, egrets, night-herons and bitterns), *Threskiornithidae* (ibis and spoonbills), *Procellariidae* (petrels, shearwaters and prions) families, and in other families of birds (Table 7.1) (Tracey et al., 2004).

Table 7.1 The relative occurrence of avian influenza in families of birds known to move between Australia and Asia

ORDER	FAMILY	COMMON FAMILY	RELATIVE OCCURRENCE OF AVIAN INFLUENZA
Anseriformes	*Anseranatidae*	Magpie Geese	Unknown
	Anatidae	Waterfowl	Common
Charadriiformes	*Scolopacidae*	Turnstones/Sandpipers/ Phalaropes/Red-necked stint, Eastern curlew	Occasional
	Charadriidae	Plovers	Occasional
	Glareolidae	Pratincole	Unknown
	Laridae	Gulls/Terns	Occasional
Ciconiiformes	*Ardeidae*	Herons/Bitterns	Rare
	Threskiornithidae	Ibises	Rare
Columbiformes	*Columbidae*	Pigeons/Doves	Extremely Rare

70 Source: Wetlands International (www.wetlands.org)

Coraciiformes	*Halcyonidae*	Kingfishers	Unknown
	Meropidae	Bee-eaters	Extremely Rare
	Coraciidae	Dollarbird	Unknown
Cuculiformes	*Cuculidae*	Cuckoos	Unknown
Gruiformes	*Rallidae*	Rails	Unknown
Passeriformes	*Meliphagidae*	Honeyeaters	Unknown
	Dicruridae	Drongoes	Unknown
	Campephagidae	Cuckoo Shrikes	Unknown
	Oriolidae	Orioles	Unknown
	Sturnidae	Starlings	Extremely Rare
Pelecaniformes	*Phaethontidae*	Tropicbirds	Unknown
	Sulidae	Boobies/Gannets	Unknown
	Phalacrocoracidae	Cormorants	Rare
	Pelecanidae	Pelicans	Unknown
	Fregatidae	Frigatebirds	Unknown
Procellariiformes	*Procellariidae*	Shearwaters/Petrels	Rare
	Hydrobatidae	Storm Petrels	Unknown

(Adapted from Tracey et al., 2004)

Tracey et al. (2004) classified wild birds according to the relative occurrence of AI within species by using a subjective increasing scale (unknown, extremely rare, rare, occasional, common). The scale was derived from information in prior published research (Downie & Laver, 1973; Downie et al., 1977; Hanson et al., 2003; Kawaoka et al., 1988; Lipkind et al., 1984; Mackenzie et al., 1985; Mackenzie et al., 1984; Morgan & Kelly, 1990; Peroulis & O'Riley, 2004; Romvary & Tanyi, 1975; Roslaya et al., 2009; Slemons et al., 1973; Stallknecht & Shane, 1988).

Birds other than *Anseriformes* and *Charadriiformes* are therefore considered to pose a very low risk of introduction of AI viruses to Australia, as they either restrict their movements to the Australian mainland with occasional or rare movements to New Guinea, or are pelagic species rarely observed inside the continental shelf.

7.2.3 Threat to Australia from migratory birds

In Australia, birds of the *Anatidae* family are considered nomadic within the Australo-Papuan region, rather than migratory (Bunn, 2004; Bunn, 2004; Turner, 2004; East et al., 2008b). The term ‘nomadic’ is used to differentiate unpredictable movement, usually in response to drought or flooding events, from the predictable annual movement of truly migratory birds (Tracey et al., 2004).

HPAI has not become established in poultry in the Australo-Papuan region, which includes the southern areas of the island of New Guinea and extends as far north as the Central Highlands (Dingle, 2004). Isolated HPAI outbreaks have occurred in poultry in the Indonesian part of the island of New Guinea, but the virus does not appear to have become endemic in native birds. Future establishment of HPAI in this region could open a potential pathway for HPAI introduction into Australia through the movements of nomadic waterfowl.

In contrast to *Anseriformes*, *Charadriiformes* (shorebirds) migrate annually throughout the East Asian-Australasian (EAA) flyway (Figure 7.2). The EAA flyway extends from Siberia and Alaska to Australia and New Zealand, and incorporates eastern Asia and part of south Asia (Bamford et al., 2008). About three million birds, from 35 or more species of *Charadriiformes*, regularly migrate to and from Australia each year (Tracey et al., 2004). Some of this migratory movement is through Asian countries with endemic or previously confirmed outbreaks of HPAI H5N1.

A banding study of 26 shorebird species in Australia demonstrated that a common feature of their migration routes was the use of the coastline of China as a stopover location, especially during the northward migration occurring between March and May (Minton et al., 2006). Most of the species fly over the islands and countries between the north coast of Australia and China, such as Indonesia, on both their northward and southward migration (Minton et al., 2006). Four of the 26 species studied also venture as far west as the Indo-Chinese peninsula (Minton et al., 2006).

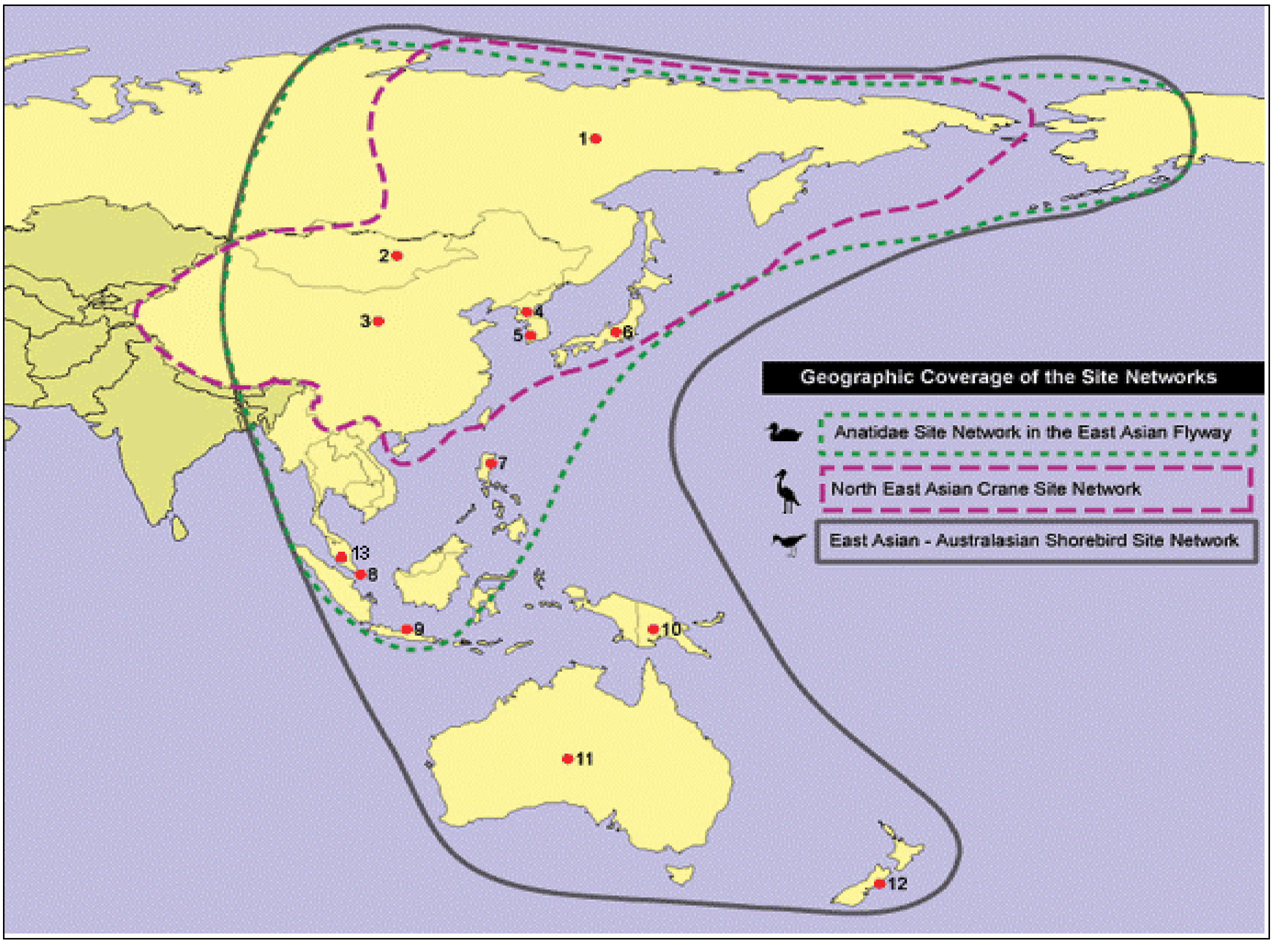

Figure 7.2 **Flyways monitored by Asian waterbird census (Wetlands International)**

Of all the species orders, *Charadriiformes* presents the highest migratory risk in terms of HPAI introduction to Australia. However, it seems unlikely that migratory shorebirds will still be actively shedding virus on arrival in Australia after travelling the great distances between China and the coastline of Australia, given the relatively short duration of viral shedding.

Shorebirds aggregate along Australian coastlines and at specific inland wetlands in remote locations of Australia. There has been an observed significant decline in the populations of migratory and resident shorebirds in Australia, possibly due to loss of wetland habitat (Nebel et al., 2008). This reduction in population may reduce the likelihood of shorebirds transferring AI viruses to local populations of waterfowl or to domestic poultry; however, the reduction in waterways could also increase the likelihood of commingling between migratory and resident water birds in remaining wetlands. The range and behaviour of shorebirds within Australia does not generally bring them into close contact with the inland and urban/semi-urban locations of Australian poultry farms.

7.2.4 Threat to Australia from nomadic birds

Data on the movements of Australian waterfowl indicate that they have limited flight paths to and from New Guinea. Reviewing flight data obtained from banding-recapture of the four waterfowl species most active on eastern Australian freshwater bodies, East et al. (2008b) suggested that Cape York is the most likely source of entry and exit for nomadic waterfowl to and from New Guinea.

Satellite-based tracking systems have also been used to monitor waterfowl movements in Papua New Guinea (Roshier et al., 2006). Tracking studies of Wandering Whistling-Ducks in the Western Province of Papua New Guinea showed that none of the birds made significant progress towards the three regions of New Guinea where HPAI H5N1 has previously been reported. Nor did any birds attempt to travel over water to Australia, or to any of the intervening islands (Roshier et al., unpublished data).

Within Australia, waterfowl movements are related to erratic rainfall patterns and the presence of surface water. Australia does not have the predictable fly-ways of migratory waterfowl that are found in the northern and western hemispheres. There have been few major breeding events for waterfowl in Australia since the onset of a severe and prolonged drought in 2001. However, several breeding events occurred in early 2008 following major rains in eastern Australia (McCallum et al., 2008). An obvious and consistent decline in abundance has been reported for many of Australia's *Anseriformes* and migratory and resident *Charadriiformes* (Nebel et al., 2008).

Despite the primary role of waterfowl as natural reservoir hosts for AI, they present a limited risk of introduction of highly pathogenic strains of AI virus since flight distances and times to reach the Australian mainland (and susceptible poultry) are long, and virus shedding periods comparatively short. H5N1 HPAI titres excreted from native waterfowl rapidly decline from 10 days after infection, although Mallard ducks have been recorded to shed some H5N1 HPAI for up to 17 days after infection (Hulse-Post et al., 2005). Australian Mallards predominantly populate southern parts of Australia (Barrett et al., 2003) and are not considered likely to introduce AI viruses from overseas.

Bewick's swans naturally infected with LPAI virus experienced delayed migration, travelled shorter distances, and fed at reduced rates (van Gils et al., 2007). This also suggests there is a low probability that birds actively infected with an AI virus will transport the virus across long distances from offshore locations to Australia (East et al., 2008b).

East et al. (2008) calculated the risk of introduction of H5N1 HPAI to domestic poultry via nomadic waterfowl moving from New Guinea to Australia as ‘rare or nil’ for all regions of Australia except north Queensland. In Queensland, the comparative risk rises; the greatest risk occurring on the Atherton Tableland where 17 poultry farms are located (East et al., 2008b).

Given the specific migratory, host and poultry contact characteristics of shorebirds and waterfowl, some authors hypothesise that the greatest risk of the introduction of exotic AI to Australian poultry comes from the association between migratory shorebirds and local or nomadic waterfowl (East et al., 2008b; Tracey, 2005; Tracey et al., 2004). Due to shared Australian habitats, shorebirds may infect native waterfowl on their return to Australia each year during the spring (August to October) (East et al., 2008a). Waterfowl may then transmit exotic AI strains to Australian poultry if they are attracted to surface water or feed on poultry farms. However, spring is nesting season for waterfowl, a time when they are at their most sedentary, and less likely to move significant distances and spread AIV.

The overall likelihood of exotic AI introduction to poultry through the association of *Charadriiformes* and *Anseriformes* is probably only slightly greater than the likelihood attributable to either of the species orders alone. This is due to the dependent nature of separate risk factors incorporating shorebird migration from Asian sources and the maintenance of viral shedding, establishment of AI in Australian waterfowl populations from association with infected shorebirds and transmission by carrier waterfowl to Australian poultry.

7.2.5 Threat to Australian poultry from endemic strains of AI virus

There have been five documented outbreaks of HPAI in domestic poultry in Australia, due to AI viruses of the H7 subtype. Analyses of Australian H7 viruses showed that they form a genetic lineage which is distinct from Eurasian isolates, suggesting geographical and temporal influences on the evolution of H7 AI viruses in Australia (Banks et al., 2000). Some authors suggest these findings indicate that there have been limited or no introductions of viruses from a different lineage in the interval between 1976 and 1997 (Turner, 2004; Arzey, 2004).

Recently enhanced surveillance of wild birds in Australia has demonstrated the presence of most subtypes of AI virus in resident and migratory wild water bird populations. The presence of endemic strains of H5 and H7 AI viruses in Australian wild water birds poses a continuous low-level threat to the Australian poultry industry, which is best managed by biosecurity measures that exclude direct or indirect contact between wild birds (especially water birds) and domestic poultry (Hamilton et al 2009).

7.2.6 Summary – wild bird reservoirs of AI viruses

In summary, the likelihood of introduction of exotic strains of AI viruses to Australia from other countries via the movement of wild water birds is very low. An assessment of the relevant bio-geography reveals that movement of many Australian bird species is limited to the Australo-Papuan region, or to the limited region to the east of Wallace’s Line that passes between the Indonesian islands of Bali and Lombok.

The likelihood of virus introduction via migratory birds from Asia is considered very low because of:

- the species of migratory birds that visit Australia (*Charadriiformes* rather than *Anatidae*)

- an observed recent reduction in migratory shorebird populations
- the negative impact of LPAI and HPAI on the migratory habits of birds
- the time delay occurring between migratory birds leaving Asia and arriving in Australia, and
- the seasonality of migration resulting in arrival of migratory species coinciding with a time where native waterfowl are sedentary due to their nesting season.

These conclusions are supported by analysis of the sequence of Australian isolates of AI that suggest that Australian isolates are a lineage distinct from Eurasian virus isolates (Banks & Alexander, 1997; Banks et al., 2000).

The likelihood of introduction of HPAI via nomadic waterfowl moving throughout the Australo-Papuan region is firstly dependent upon the establishment of HPAI in this region. To date, whilst there have been several sporadic outbreaks in domestic poultry, there is no evidence that HPAI has become endemic in native birds. Even if HPAI becomes established in that region, the likelihood of entry into Australia is low because of:

- the time delay between birds becoming infected and coming into contact with Australian poultry
- the unpredictability of nomadic bird movements within New Guinea and the low likelihood of their movement to Australia.

However, there are endemic AI viruses in Australian wild water birds, and the possibility exists that AI viruses could be introduced to Australian domestic poultry from local wild water bird reservoirs. This likelihood has been described, to some extent, in the following section.

7.3 Wild bird surveillance in Australia

Australia undertakes AI surveillance in wild birds to provide epidemiological information about circulating viruses and to identify changes in subtype prevalence in reservoir species. Information on AI in wild birds gained through active and passive surveillance contributes to Australia's risk assessment, risk management and risk communication of the AI threat. In particular, analysis of the results of wild bird AI surveillance makes an ongoing contribution to Australia's poultry surveillance, poultry biosecurity and further wild bird surveillance policies and activities.

Prior to mid 2005, ad hoc AI wild bird surveillance was undertaken by a number of researchers in Australia. From mid 2005 until the present time, AI wild bird surveillance in Australia has been more comprehensively and strategically undertaken under the National Avian Influenza Wild Bird Surveillance Program. This program includes active and passive surveillance undertaken by states and territory governments, the Australian Government, universities and private veterinarians, as well as investigations and exclusion testing of wild bird mortality events. The active surveillance component is both opportunistic and targeted.

Surveillance to date confirms that most AI virus subtypes are currently circulating in wild water birds in Australia, but their prevalence appears to be low compared to prevalence rates reported in other countries (Alexander, 2007).

7.3.2 Australian AI surveillance in wild birds prior to 2005

HPAI Viruses in Wild Birds

An HPAI virus was isolated a starling (*Sturnus vulgaris*) trapped inside a poultry shed during an HPAI (H7) outbreak in Victoria in 1985, and it is likely that the bird acquired infection from poultry rather than being the source of infection for the farm (Nestorowicz et al., 1987). Further details of the 1985 Victoria outbreak are provided in Chapter 5.

LPAI (H5/H7) Viruses in Wild Birds

Only one LP virus of the H5 subtype was isolated from wild water birds in Australia prior to 2005. This detection was from pelagic birds (shearwaters; *Puffinus pacificus*) on a Great Barrier Reef island off the Queensland coast well away from the poultry industry (Downie et al., 1977). No LPAI H7 subtype viruses were detected in wild birds prior to 2005.

LPAI (non H5/H7) viruses in Wild Birds

Before mid 2005 and the establishment of the National Wild Bird Surveillance Program, AI viruses other than H5 or H7 subtypes were isolated predominantly from birds in the orders *Anseriformes* (including Pacific black duck (*Anas superciliosa*), Australian shelduck (*Tadorna tadornoides*), grey teal (*Anas graxilis*) and mallard hybrid (*Anas superciliosa x platyrhynchos*)); less commonly from *Charadriiformes* including red-necked stints (*Calidris ruficollis*), lesser noddy (*Anous tennirostris*), silver gulls (*Larus novaehollandiae*)); and with some isolations from *Procelliformes* (shearwaters) (Puffinus pacificus). The AI viruses isolated from Australian wild birds before 2005 included H1, H3, H4, H6, H11, H12 and H15 subtypes (Arzey, 2004). Mackenzie reported isolating 24 AI viruses from 3736 sampled birds over three years in Western Australia (Mackenzie et al., 1985). More recently, five AI viruses of the H3 subtype were detected from 605 birds sampled in Victoria (Peroulis & O'Riley, 2004).

Table 7.2 Summary of detection of AI virus infections in Australian wild birds prior to 2005[71]

YEAR	VIRUS SUBTYPE	LOCATION	DETECTION	REFERENCE
1973	H6	Barrier Reef Qld	Isolated	Downie & Laver, 1973
1975	H5, H11	Barrier Reef Qld	Isolated	Downie et al., 1977
1977-79	H1, H3, H4, H6, H15	Western Australia	Isolated	Mackenzie et al., 1984
Early 1980s	H1, H4	Victoria	Isolated	Hampson, unpublished
1996	H3	New South Wales	Isolated	Arzey, 2004
2001/02	H3	Victoria	Isolated	Peroulis & O'Riley, 2004
2004	H4, H11	New South Wales	Isolated	Hurt et al., 2006

71 Cited by Mackenzie et al., 1984.

2004	H4	Victoria	Isolated	Warner & O'Riley, 2005

7.3.3 AI surveillance in wild birds July 2005 – July 2009: The National Avian Influenza Wild Bird Surveillance Program

A National Avian Influenza Wild Bird Surveillance Program commenced in Australia in July 2005. The program is managed by a steering group and was developed to facilitate collaboration between all state, territory and Australian government programs. The objective of the program is to gain an understanding of the influenza viruses circulating in wild birds in Australia. The program aims to detect and report circulating AI viruses and to exclude H5 (including H5N1) and H7 AI viruses as the cause of reported wild bird mortality events in Australia. Surveillance activity is undertaken by each of Australia's state and territories, under the Australian government's Northern Australian Quarantine Strategy (NAQS) program and as part of investigation of wild bird disease/mortality events within Australia.

Sampling Methods

Sampling in the Northern Territory, and the majority of the sampling in Queensland and Western Australia, were conducted under the Australian government NAQS program. Remaining sampling was conducted under individual state and territory programs.

The National Avian Influenza Wild Bird Surveillance Program included sampling of wild birds in New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia from July 2005.

Sampling was based on factors including practical considerations, species most likely to carry the virus, their relative abundance, migratory patterns, seasonal fluctuations in virus prevalence, and locations where these species have the greatest likelihood of interacting with poultry.

A combination of healthy, live and hunter-killed wild birds (active surveillance) and sick/dead wild birds (passive surveillance) were sampled. Healthy, live wild birds were captured using either walk-in traps or cannon nets, and sampled by blood collection and /or cloacal and/or oropharyngeal swabbing. Fresh faecal (environmental) samples (i.e. wet faeces) were collected from roosting or feeding sites. Hunter-killed birds were sampled during duck hunting seasons in New South Wales, Victoria and Tasmania. Samples from sick birds were collected from various veterinary clinics and zoos/sanctuaries. Investigations of selected wild bird mortality events included AI exclusion testing to rule out AI as the cause of death.

A wide range of bird species were sampled, based on selection of major natural reservoir host species for influenza A, and the likelihood of AIV introduction associated with their migratory behaviour. The species targeted included members of the orders *Anseriformes*, *Charadriiformes* and *Procellariiformes*. A small number of opportunistic samples (e.g. from veterinary clinics) were also taken from others such as *Caprimulgiformes* (frogmouths), *Columbiformes* (pigeons, doves), *Gruiformes* (coot), *Passeriformes* (perching birds), *Psittaciformes* (parrots) and *Struthioniformes* (emu).

Laboratory Methods

Cloacal, oropharyngeal and faecal (environmental) swabs were tested at state or university laboratories using real-time polymerase chain reaction (PCR) for the AI Type A Matrix gene, the most highly conserved genome segment of influenza A viruses (Fouchier et al., 2000; Hurt et al., 2006; Spackman et al., 2002). H5 and H7 positive PCR samples were forwarded to the CSIRO Australian Animal Health Laboratory (AAHL) for viral culture in embryonated hen eggs and/or to the World Health Organisation Collaborating Centre for Reference and Research on Influenza (Melbourne) for subtyping of the HA and NA genes. PCR positive samples for subtypes other than H5 and H7 were cultured in state government laboratories.

Serological samples were collected from New South Wales, Northern Territory, Tasmania, Queensland and Western Australia. Serological samples collected outside of the NAQS program were analysed at state laboratories. The NAQS employed ELISA testing of serological samples from live birds in northern Australia. The NAQS samples were analysed at AAHL for the presence of antibodies using a competitive enzyme-linked immunosorbent assay (c-ELISA) for influenza A virus nucleoprotein (Harley et al., 1990; Zhou et al., 1998). The ELISA test has not been validated in wild birds and interpretation of results is based on known performance of the test in domestic chickens (Haynes et al., 2009). Only a small proportion of the positive samples underwent further testing to identify specific HA subtype (H5, H7 and H9) antibodies because of the small volumes of sera available.

The methodology employed by NAQS for both its serological and virological testing is shown in Figure 7.3.1 and 7.3.2 below:

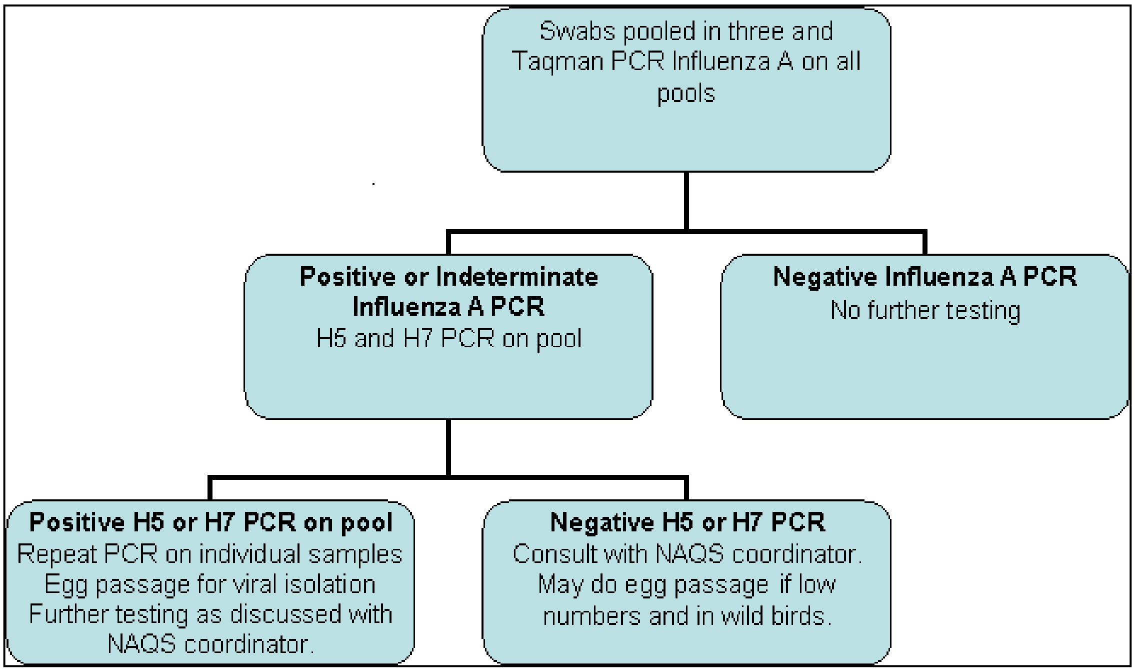

Figure 7.3.1 NAQS swab testing method

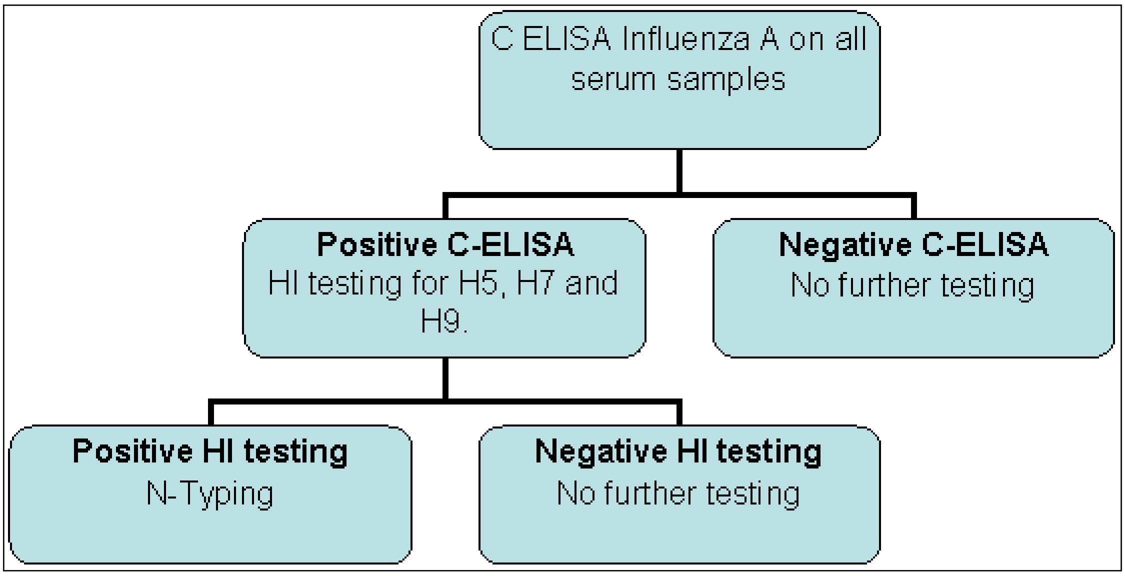

Figure 7.3.2 NAQS serum testing method

Active Surveillance results July 2005 – June 2007

During the period July 2005 to June 2007, a total of 16 303 swabs and 3782 blood samples were collected from 16 420 wild birds (environmental or live/hunter-killed) in Australia (Table 7.3). Data for this period is largely taken from datasets collated by Haynes (2009). The majority of wild birds sampled were *Anseriformes* and *Charadriiformes* (Table 7.4).

PCR and serological testing identified 164 positive results for the AI Type A Matrix gene and 567 positive tests for AI Type A antibodies respectively (Table 7.5). The positive results came from a variety of wild water bird species. Positive PCR samples underwent further genetic and antigenic analysis leading to the identification of 46 LPAI virus subtypes (Appendix 6 Table A.6.1). Forty four of the LPAI viruses were detected in duck or mixed waterbird species and the remaining two were from waders (Red-necked Stint, *Calidris ruficollis*). Of the 44 PCR positive tests found in duck or mixed waterbird species, 39 were found in dabbling ducks (i.e. Pacific Black Duck (*Anas superciliosa*), Grey Teal (*A. gracilis*), Chestnut Teal (*A. castanea*), Australasian Shoveler (*A. rhynchotis*), Mallard hybrid (*A. superciliosa x platyrhynchos*), Pink-eared Duck (*Malacorhynchus membranaceus*)). One was found in a grazing duck (Australian Wood Duck (*Chenonetta jubata*)), one in a mixed dabbling and grazing duck faecal swab (Mixed Teal/Pacific Black Duck/Australian Shelduck (*Tadorna tadornoides*)) and the remaining three detections in mixed waterbird species.

Virus was cultured from five samples, which enabled full analysis of hemagglutinin and neuraminidase subtypes. Three of the isolated virus subtypes were from dabbling ducks and also had a corresponding positive result for PCR identification and subtyping (included in Table A.6.1). The remaining two virus isolations came from a dabbling duck and a gull without a corresponding positive PCR result.

In summary, during 2005–2007 a total of 48 LPAI viruses were detected using PCR and/or virus isolation. Based on these results the prevalence of subtyped LPAI viruses in wild birds was 0.3% (48/16 303). The overall prevalence of positive PCR results was 1.0% (164/16 303).

Serological analysis was performed on samples collected in New South Wales, Northern Territory, Queensland, Tasmania and Western Australia (Table 7.5). The overall prevalence of positive serology samples during 2005–2007 was 15.0%. New South Wales and Tasmania consistently had the highest sero-prevalence during 2005–2006 and 2006–2007. Positive c-ELISA samples did not routinely undergo additional testing to identify specific antibody subtypes because of the small volume of sera available. Sporadic testing on a number of samples were negative for H5 and H7 antibodies. Antibodies for subtype H13 were identified in Silver Gulls (*Larus novaehollandiae*) in Tasmania.

Evidence of all AI subtypes except H10 and H14-16 were detected during the survey period of July 2005 and June 2007. All 48 LPAI detections were from *Anseriformes* and *Charadriiformes*, which comprise the major natural reservoir for influenza A viruses (Olsen et al., 2006). Only six of the 48 LPAI detections were not from a duck species.

Table 7.3 Summary of Australian surveillance for avian influenza viruses in wild birds (July 2005 to June 2007)

STATE/TERRITORY	NUMBER of BIRDS SAMPLED	NUMBER of SWABS	NUMBER of SERA
New South Wales	5053	5053	377
Northern Territory	268	222	229
Queensland	330	260	232
South Australia	2848	2848	n/a
Tasmania	829	829	290
Victoria	4263	4263	n/a
Western Australia	2829	2828	2654
TOTAL	16420	16303	3782

Table 7.4 Summary of wild bird groups sampled for avian influenza viruses (July 2005 to June 2007)

BIRD GROUPS	NUMBER OF BIRDS SAMPLED IN EACH STATE							TOTALS
	New South Wales	Northern Territory	Queensland	South Australia	Tasmania	Victoria	Western Australia	
Anseriformes	3379	268	92		347	1721	1042	6849
Charadriiformes	841		0		293	2511	103	3748
Other/mixed Waterbirds[a]	570		146	2848	189	31	1629	5413
Other Birds	263		92				55	410

a) Includes some mixed *Anseriformes* and *Charadriiformes*

Table 7.5 Prevalence and number of positive PCR and c-ELISA during Australian surveillance for avian influenza viruses in wild birds (July 2005 to June 2007)

STATE/TERRITORY	POSITIVE PCRs and PREVALENCE [a] (%)		POSITIVE c-ELISAs and PREVALENCE[a] (%)	
	2005/06	2006/07	2005/06	2006/07
New South Wales	1 (0.1%)	46 (1.2%)	26 (16.8%)	56 (25.2%)
Northern Territory	0	0	5 (4.8%)	37 (29.6)
Queensland	2 (2.6%)	0	n/a	2 (0.9%)
South Australia	2 (0.2%)	28 (1.4%)	n/a	n/a
Tasmania	2 (0.5)	5 (1.3%)	45 (20.6%)	20 (27.7%)
Victoria	45 (2.0%)	27 (1.3%)	n/a	n/a
Western Australia	0	6 (0.3%)	215 (18.9%)	162 (8.1%)
SUBTOTAL	52 (0.9%)	112 (1.0%)	291 (25.6%)	276 (10.4%)
TOTAL	164 (1.0%)		567 (15.0%)	

a) prevalence is defined as the number of positive PCR or c-ELISA results divided by the total number of swabs or serology samples

Table 7.6 Summary of Australian surveillance for avian influenza viruses in wild birds (July 2007 to June 2009)

STATE/TERRITORY	NUMBER of BIRDS SAMPLED (2007-2009)	NUMBER of SWABS[a]	NUMBER of SERA
New South Wales	7417	4899	111
Queensland	1719	2671	1072
South Australia	4210	4210	0
Tasmania	721	738	0
Victoria	5331	5296	35
Western Australia	1329	1329	592
NAQS[b]	2658	2660	2556
TOTAL	23 385	21 803	4366

a) Includes environmental faecal swabs, cloacal swabs and oropharyngeal swabs – for some birds, more than one sample was collected (e.g. a cloacal, an oropharyngeal swabs and or sera collected from one individual.)
b) NAQS sampling is undertaken in Western Australia, Northern Territory and Queensland, and replaces some of the state wild bird sampling in those regions.

Table 7.7 Prevalence and number of positive PCR and c-ELISA during Australian surveillance for avian influenza viruses in wild birds (July 2007 to June 2009)

STATE/TERRITORY	POSITIVE PCRs and PREVALENCE[a,b] (%)		POSITIVE c-ELISAs and PREVALENCE[a,b] (%)	
	2007/08	2008/09	2007/08	2008/09
New South Wales	74 (3.9%)	97 (3.4%)	13 (25%)	0 (0%)
Queensland	12 (1.4%)	20 (1.1%)	36 (8.3%)	74 (11.6%)
South Australia	32 (1.3%)	12 (2.0%)	n/a	n/a
Tasmania	n/a	2 (0.7%)	n/a	n/a
Victoria	80 (3.1%)	24 (1.5%)	0 (0%)	n/a
Western Australia	2 (0.2%)	12 (2.4%)	239 (50.6%)	69 (57.5%)
NAQS	0 (0%)	13 (1.1%)	321 (23.3%)	149 (13.5%)
SUBTOTALS	200 (2.0%)	180 (2.1%)	609 (25.7%)	292 (15.2%)
TOTALS	380 (2.0%)		901 (20.6%)	

[a]prevalence is defined as the number of positive PCR or c-ELISA results divided by the total number of swabs or serology samples.
[b]NAQS sampling is undertaken in Western Australia, Northern Territory and Queensland, and replaces some of the state wild bird sampling in those regions.

Active Surveillance Results July 2007 - June 2009

Between July 2007 and June 2008, 10 046 swabs and 2442 blood samples were collected from 12 123 wild birds in Australia. Between July 2008 and June 2009, 11 757 swabs and 1924 blood samples were collected from 11 262 wild birds. The combined data for these two years is presented in Table 7.6. A combination of healthy, live and hunter-killed wild birds and sick/dead wild birds were sampled. The majority of samples were collected from ducks, magpie geese and waders and a smaller number from other species such as shearwaters and gulls.

In 2007–2008, PCR and serological testing identified 200 positive results for the AI type A matrix gene and 609 positive tests for AI type A antibodies respectively. The positive results came from a variety of wild water bird species. Positive PCR samples underwent further analysis leading to the identification of 54 virus subtypes (H1, 2x H2, 9x H3, 5x H4, 22x H5, H6, H8, 8x H9, H10, 2xH11 and 2x H13) from NSW, South Australia and Victoria, as shown in Table A.6.2

All confirmed virus subtypes were from environmental faecal swabs, except for one H4 from a cloacal swab from a Red-necked Stint. Twenty LP H5 PCR positives were detected in NSW from mixed duck species and Magpie Geese, however, attempts at pathotyping and NA subtyping at AAHL were not successful. Two LP H5 PCR positive tests were obtained in Victoria from mixed Pacific Black Ducks. Subsequent virus isolation was successful for one LPAI H5N3 virus. No H7 subtypes were identified during this sampling year.

The 321 positive c-ELISA samples from NAQS surveillance underwent additional testing and all, except three samples, were negative for H5, H7 and H9.

In summary between July 2007 and June 2008, the overall prevalence of positive PCR and c-ELISA tests for AI was 2.0% and 25.7% respectively

Between July 2008 and June 2009, 11 757 wild birds were sampled in all states of Australia. PCR tests were positive for the AI type A matrix gene in 180 tests, and 63 of these were identified to subtype. RNA from LP H5 AI viruses was present in wild bird samples from NSW (11), South Australia (1), Victoria (2) and Western Australia (1). LP H7 AI virus was detected in wild bird samples from South Australia (2) and Victoria (1). Further genetic analysis of PCR positives led to the successful identification of the following subtypes: 4xH1, 8xH3, 4xH4, 15xH5, 5xH6, 5xH7, 4xH8, 2xH9, 3xH10, 3xH11, 2xH12 and H13 from NSW, Victoria, South Australia, Queensland and Western Australia (Table A.6.3). The majority of confirmed virus subtypes were from environmental faecal swabs, except for 6 subtypes identified from cloacal swabs. Approximately 15% of wild bird samples tested by c-ELISA showed evidence of exposure to AI viruses, based on a total of 292 positive tests. However, only 0.17% (based on 20 positive tests out of 11 757 samples) showed evidence of exposure to NAI viruses (H5 and H7).

The samples had been collected from birds which were reportedly healthy, and all corresponding viral testing from faecal swabs were negative.

Of the wild waterbird species from which LPAI subtypes were detected in this study, the Red-necked Stint (*Calidris ruficollis*) is the only true migratory species. This bird breeds in the arctic tundra (north-central Siberia to western Alaska) and regularly migrates to Australia, via Asia (Minton et al., 2006). While Asian HPAI H5N1 has not been detected in the Red-necked Stint, the greatest likelihood of migratory introduction to Australia may be associated with this species due to its migratory route through Asian HPAI H5N1 endemic areas (FAO, 2007).

7.3.4 Surveillance Results from the Northern Australian Quarantine Strategy

AI surveillance under the NAQS has been incorporated into the surveillance results included above as part of the National Surveillance Program. All of the wild bird surveillance in the Northern Territory, and the majority of the surveillance in Queensland and Western Australia is undertaken by the NAQS program. Given the long history of this program and its distinct identity, a summary of overall findings from NAQS is included here.

NAQS has undertaken systematic wild bird surveillance for AI in northern Australia since 1992. Serological samples have shown variable results from year to year. For example, seropositive c-ELISA results were recorded in 44% of Plumed Whistling Ducks (*Dendrocygna eytoni*) at Kununurra (Western Australia) in 2005, but only 7% of birds sampled were positive in 2006. Serology results also showed that *Anseriformes* had higher rates of exposure to AI viruses than *Charadriiformes*. However, the ELISA test has not been validated in wild birds, and interpretation of results is based on known performance of the test in domestic chickens.

7.3.5 Wild Bird Mortality Events

Passive surveillance of wild bird mortality events, via investigation and exclusion testing as required, forms another important component of the wild bird surveillance program. Although AI in waterfowl reservoir hosts is traditionally regarded as being sub-clinical, a large mortality event in bar-headed geese at Qinghai Lake in western China in May 2005 was attributed to infection with HPAI H5N1 virus. In Europe, mortality events in wild waterfowl were also reported to be associated with H5N1. Recent research undertaken in Sweden on 10 000 mallard ducks demonstrated that birds infected with influenza A were leaner than uninfected birds, and that weight loss reflected increased levels of shedding of the virus (Latorre-Margalef et al., 2009).

Given this background of emerging evidence of a clinical association with AI infection and shedding in wild birds, Australia has incorporated wild bird mortality events into its national AI surveillance program.

Wild Bird Mortality Events Occurring From July 2005 to June 2007

From July 2005 to June 2007, 50 wild bird mortality events were investigated and AI was specifically excluded in 47 of the events. Nineteen investigations involved waterfowl. Based on clinical signs, history and prevailing environmental conditions, the remaining three events did not warrant specific AI exclusion testing. Intoxication was diagnosed or suspected as being the cause of death in 23 events. Botulism was confirmed in two events and suspected in three others. The remaining mortality events were caused by infection, trauma, parasitism, bone disease or were undetermined.

Wild Bird Mortality Events Occurring from July 2007 to June 2009

Between July 2007 and June 2008 there were 67 wild bird mortality events recorded in the national database. While all of these events were atypical of AI, specific AI testing was undertaken in 29 events and AI was excluded as the cause of death. The remaining mortality events did not warrant AI testing based on the clinical signs, history, environmental conditions and/or other diagnosis. Intoxication was diagnosed or suspected as being the cause of death in 16 events. Botulism was diagnosed in seven events. The remaining mortality events were caused by infection, trauma, parasitism, starvation, *Chlamydophila*, metabolic bone disease, avipox, psittacine circovirus and unknown syndromes.

Between July 2008 and June 2009 there were 108 wild bird mortality events recorded in the national database. For 82 of these events, specific AI testing was undertaken and AI was excluded as the cause of death. As with the preceding period the remaining mortality events did not warrant AI testing based on clinical signs, history, environmental conditions and/or other diagnoses. Intoxication was diagnosed or suspected as being the cause of death in 21 events. Botulism was confirmed in two events and suspected in two. The remaining mortality events were caused by infection, *Chlamydophila*, trauma, parasitism, starvation, and psittacine circovirus. The diagnosis in some cases remains open.

7.3.6 Conclusion

National coordinated surveillance of Australian wild birds is providing valuable information concerning circulating AI virus subtypes. Evidence of exposure to most AIV subtypes has been found in Australian wild water birds. There is also evidence that the prevalence of endemic LPAI H5 and H7 subtypes in wild waterfowl in Australia is very low: ranging between 0.17% to 0.21% in the period between 2007 and 2009. However, the risk of incursion into poultry and mutation to HP AIV justifies Australia’s continued vigilance and maintenance of high levels of biosecurity to exclude direct or indirect contact with wild birds, especially waterfowl.

There remains a possibility, albeit of low likelihood, of AI viruses being introduced to Australia via migratory birds such as Red-necked Stints and Red Knots.

CHAPTER 8 SURVEILLANCE OF DOMESTIC POULTRY

8.1 Introduction

The aim of this chapter is to describe existing surveillance activities in domestic poultry in Australia, and to report data collected from that surveillance from 2006 to 2009. Surveillance activities are described as either passive or active surveillance.

Passive surveillance activities are those that use data that has already been collected for some other purpose, for example, clinical surveillance of flocks, examination of production parameters and disease investigations.

Active surveillance activities are those designed and initiated by the prime users of the data. The main purpose of the activities is disease surveillance, for example, through serological surveys.

Most countries undertake some form of surveillance of domestic poultry, particularly for H5N1 (FAO, 2009).

A country's veterinary infrastructure, in terms of established disease reporting systems, veterinary coverage of the animal population at risk, response capacity, and incentives for disease reporting, is an important determinant of surveillance efficacy (Sims, 2007). The lack of a functional passive surveillance system has been cited as a contributing factor in the delayed detection of outbreaks of H5N1 in Southeast Asia in 2003 to 2004 (Sims et al., 2005). Sims (2007) also notes that while the efforts of donor organisations have increased the H5N1 surveillance capacity of many poor countries, much more work is required to enable early diagnosis of all cases of infection.

Surveillance in a number of developed countries (the United States, Canada, the Netherlands, Australia, Japan) has led to the early detection of outbreaks, and subsequent eradication, or compartmentalisation, of poultry diseases (Sims, 2007).

In Australia, apart from planned structured surveys of the commercial chicken meat and egg layer industry sectors in 2006, surveillance for domestic poultry has been based on structured, non-random surveillance activities. Such activities include: disease investigations; disease reporting or notifications; disease control programs; targeted testing and screening of flocks; ante-mortem and post-mortem flock inspections; records of laboratory investigations; biological specimen banks; sentinel units; field observations; farm production records, and flock testing for export consignments.[72]

8.2 Clinical surveillance

The avian influenza chapter in the OIE *Terrestrial Animal Health Code* states that:

72 Types of surveillance activities are described in more detail in the OIE Terrestrial Animal Health Code Chapter 1.4 Animal Health Surveillance, available at: http://www.oie.int/eng/normes/mcode/en_chapitre_1.1.4.htm

> It may, for example, be appropriate to target clinical surveillance at particular species likely to exhibit clear clinical signs (e.g. chickens).

The code chapter defines ‘clinical surveillance’ as:

> Monitoring of production parameters such as increased mortality, reduced feed and water consumption, presence of clinical signs of a respiratory disease or a drop in egg production, is important for the early detection of NAIV infection.

Clinical surveillance, as defined by OIE, is conducted by the poultry industry and is described below.

8.2.1 Chicken meat industry

Chicken meat breeding stock

All Australian chicken meat companies have extensive in-house biosecurity policies and HACCP[73] based quality assurance programs. The compliance with these programs is identified to be very high within the Australian chicken meat industry (East, 2007).

All farms are inspected daily and flock health monitored.

All farms also maintain batch summary or production record sheets which are either paper, electronic or both. Recording sheets allow for the daily entry of environmental observations, bird treatments and production parameters. These entries include observations about daily production, daily mortalities and culls, feed and water quantities, shed and ambient temperatures, feed deliveries and silo distribution, bird weights and any treatments such as vaccinations or medications. On weekly recording sheets, planned and actual activities such as vaccinations and serological testing are recorded. With ongoing clinical observations, the farm manager uses the daily record sheets to identify any changes in flock performance. Electronic records can also be viewed remotely by company management and technical staff in another location. All records are forwarded weekly to farming administration for compilation and incorporation into total company records.

Staff are trained to immediately investigate negative production changes and report them to company personnel. Surveillance conducted in this manner is a sensitive measure of changes in flock performance which might indicate a disease incursion. This clearly meets the OIE definition of clinical surveillance.

Serology for AI infection is not done routinely but is undertaken as part of an exclusion diagnosis when birds are submitted to government laboratories for disease investigations.

Hatchery surveillance

Within the hatchery, monitoring is mainly aimed at detecting alterations in hatchability and egg shell quality. Abnormalities are reported to the breeder farm manager and to technical services. Reporting is also required for high levels of bacterial contamination or the presentation of large numbers of abnormal day-old chicks.

73 HACCP – Hazard analysis and critical control point – used in the food industry to identify potential food safety hazards, and often adapted for other biosecurity purposes.

Chicken meat grow-out farms

The majority of grow-out farms are now run by independent growers who are contracted to a particular integrator. Contractors are obligated under contractual arrangements to follow the directions of company management and technical personnel. Directions include using best practices such as effective sanitary procedures, biosecurity measures and the maintenance of daily production records. Flocks are inspected daily and any deviations in mortalities and growth rates are reported to the company.

Contracted growers are paid according to the number of birds picked up, live weight, and feed conversion efficiency. Thus, there is a commercial incentive to report mortalities and poor performance, and contracted growers are consequentially proactive in monitoring flock performance. Grower observations are also clinically based, as laboratory testing is undertaken through the parent company.

Surveillance for NAI is based on the daily flock inspection, ongoing monitoring of flock performance parameters, clinical diseases and post-mortem examinations. No on-farm testing is undertaken for AI exclusion. Birds are submitted to government veterinary diagnostic laboratories for evaluation of flock performance problems, clinical signs of disease and where there is suspicion of a possible EAD.

In the first half of 2010, serological samples were collected from meat chicken flocks for AI testing in conjunction with sampling in Tasmania and Western Australia as part of the National Newcastle Disease Management Plan.[74] All 523 samples collected returned negative serological results for influenza A.

8.2.2 Chicken layer industry

Layer breeder stock

Monitoring and surveillance for disease in layer breeding stock consists of daily flock inspection and daily recording of performance figures. As in the chicken meat industry, parent layer flocks are vaccinated and serologically monitored for vaccine efficacy, and flock health status monitored for endemic disease. Alterations in flock performance or production will trigger an investigation to exclude endemic and exotic disease agents.

Commercial layer farms

The commercial egg layer industry consists of some integrated companies and a lot of independent farms. As detailed in Chapter 4 of this document, the layer industry is represented by the AECL, a signatory to the Emergency Animal Disease Response Agreement (EADRA). The AECL is thus required to be compliant with a formal biosecurity plan (see Part 1, Section 3.2.1). The AECL has introduced an Egg Corp Assured program to assist egg producers develop a quality assurance program that is HACCP based, and addresses food safety, biosecurity, animal welfare, animal health, environmental issues, egg labelling and disease prevention.[75] Membership of other industry groups, such as Free Range Egg and Poultry Australia (FREPA), also entails responsibility to comply with biosecurity, animal welfare standards and health monitoring of flocks. AECL and FREPA do not, however, represent all egg producers, and both biosecurity and animal health monitoring vary across the commercial layer industry.

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74 http://www.animalhealthaustralia.com.au/programs/drm/ndv.cfm
75 http://www.aecl.org/index.asp?pageid=363

Additionally, some layer companies in Australia have individual farms accredited with the Agri-Food and Veterinary Authority (AVA) of Singapore.[76] This accreditation allows the export of table eggs from Australia to Singapore. Participating farms must belong to a government-backed *Salmonella* Enteritidis Accreditation program. The application for approval to export table eggs to Singapore is extensive and details must be supplied about the company, veterinary contacts, farm location and layout, housing, source of stock, production records, biosecurity program, perimeter fencing, bird proofing, vaccination program, medications, disease surveillance program, farm sanitation program, source of feed and water and sanitisation, and waste disposal.

All flocks are inspected daily. In general, the degree to which clinical surveillance is conducted on commercial layer farms varies between owners. Consequently, on a proportion of independently operated layer farms, little is known about the quality of monitoring of subtle production parameters or minor mortality.

8.2.3 Other chicken producers

The standard of clinical surveillance varies across other chicken producers. SPF flocks are rigorously monitored and detailed records are kept so that any alteration in production or sign of disease can be immediately investigated. Such flocks also undergo routine active surveillance for endemic and exotic diseases of poultry, including NAI and ND.

Monitoring is variable among smaller commercial producers and ‘backyard’ poultry keepers. However, government veterinarians do provide services to backyard poultry producers and fancy flocks when requested, and this service includes laboratory investigations where indicated. Owners of small flocks frequently make enquiries regarding flock health problems through government advisory channels and the emergency animal watch disease hotline (see Section 6.2.4) and are directed to government poultry veterinarians for assistance.

8.2.4 Duck industry

The two large duck producers, responsible for 95 % of Australian duck meat production, document farm performance, operating procedures, disease monitoring and biosecurity. Flocks are monitored daily by the owners, and service personnel routinely visit the flocks. Daily farm records are reported electronically and investigations carried out if performance is poorer than expected. The Australian Duck Meat Association is a member of AHA and has developed a formal industry biosecurity plan.

Consultant veterinarians are used in the duck industry to conduct ante- and post-mortem examinations, make farm visits as required, and to prescribe and monitor medication in consultation with company technical staff. Veterinary input into the duck industry is not as extensive as for the chicken industry because ducks are generally healthy birds and flocks require minimal vaccination. Australia is free of major duck diseases such as duck virus enteritis and duck virus hepatitis. Farm health and husbandry programs are managed by company technical staff.

Smaller, independent duck farmers have variable disease surveillance and production monitoring procedures.

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76 http://www.ava.gov.sg

8.2.5 Turkey industry

Two major integrated companies, one producing both chickens and turkeys (at separate sites), provide a complete veterinary and technical support team, including laboratory services, to the turkey operation. Clinical surveillance for production parameters and disease occurrence is similar to that for the chicken meat component of the company. Most of the larger independent companies in the turkey industry have rigorous clinical surveillance programs involving both health and production parameters and are capable of promptly noticing any changes in flock performance. Growers respond promptly to observed changes in production parameters or possible disease incidents because of the higher value and generally lower mortality of turkeys.

For independent turkey producers, animal health services are provided by consultant or government veterinarians. Depending on the nature of performance problems, producers may also choose to contact their poult supplier (e.g. for a high first week mortality), feed mill technical services (e.g. for feed quality and feed conversion issues), consultant veterinarians (e.g. for mortality issues and egg production drops) or breeding companies (e.g. for hatchability issues and medium-term below-standard performance).

The occurrence of fowl cholera (*Pasteurella multocida*) on some turkey farms could complicate recognition of an emergency animal disease unless promptly investigated.

8.2.6 Game bird industry

Some of the larger game bird companies have in-house veterinarians. Large producers use consultant poultry veterinarians in conjunction with government veterinarians and laboratories to coordinate the oversight of the health of their birds. The larger producers also have in-house programs involving production reports, biosecurity policies and husbandry practices allowing the identification of flock health problems. Minimal vaccinations are undertaken in game birds, with the most common being autogenous killed bacterial vaccines used for site-specific diseases. Serology is not undertaken routinely in game birds, and is only done in cases of disease investigation.

Those larger game bird processors using outside contractors to grow out birds have developed minimum standards for their contractors. These standards include record keeping and mortality records as a condition of supply. Altered performance or signs of disease would therefore trigger a disease investigation.

8.2.7 Ratite industry

Following the 1999 ND outbreak in Australia, the Australian Ratite Industry On-Farm Surveillance Plan (ARIOFSP) was developed to comply with requirements for exporting ratite products to the European Union. Ratite meat destined for export to the European Union must come from farms on which surveillance for ND has been carried out on a statistically-based sampling plan with negative results for at least six months. Sampling must be carried out under the supervision of an AQIS veterinarian, state veterinarian or an AQIS approved veterinarian.

As part of the accreditation process, each farm must develop and implement a biosecurity plan. Some components of this plan are that:

- the farm must be designated as a quarantine area and introduced ratites must be quarantined

- a policy is in place ensuring no other poultry species are kept on farm and that staff do not own or come in contact with other poultry species

- attention is paid to transport vehicle hygiene and biosecurity

- clinical signs of a severe infectious disease must be recorded and the farm's veterinarian contacted.

Participating farms also receive regular veterinary visits to ensure that the biosecurity plan is being implemented and records are maintained of all animal health incidents. Records include probable causes of illness and the results of investigations. In addition, all movements to abattoirs must be formally documented. Under the National Significant Disease Investigation Program, any significant mortality of emus and ostriches is investigated free of charge by government laboratories. Given the normally low mortality rates in emus, any major mortality event not due to adverse weather conditions or trauma would be considered significant and subsequently investigated.

Serological surveillance is undertaken on a statistical basis. Any seroconversion must be followed by attempts to isolate virus to allow differentiation of endemic V4 viruses from virulent strains of ND virus. There is currently no requirement in the ARIOFSP for the testing for NAI, although some export markets have required this and some NAI testing data is provided in Section 8.4.7.

In contrast to ostrich farms, few emu farms operate under the ARIOFSP.

8.3 Disease investigations and exclusions

In Australia, case reporting and submissions of poultry for disease investigation are assessed for the likelihood of AI or ND infection by field veterinarians, government poultry specialists and veterinary laboratories. Testing for AI or ND may not be undertaken if the veterinarian or a veterinary pathologist clearly excludes the possibility of NAI. NAI could be excluded on epidemiological or clinical grounds, or if a causal association with a disease or event is identified which is likely to explain the clinical history, morphological and laboratory findings. However, opportunistic testing of poultry submissions for ND and AI viruses is regularly undertaken in state laboratories in several jurisdictions, even in the absence of suspicion of these diseases.

Each year, numerous field investigations are carried out by private, consultant or government veterinarians to evaluate flock problems. Field and veterinary investigations that do not lead to testing for AI or ND are not reported to NAHIS (see Section 6.2.1.) but the data are recorded at state and territory level. For example, of 87 poultry submissions made to the government veterinary laboratory in Western Australia in 2006, 44% were priority tested for AI. The remainder were not tested because another condition was determined to be the cause of the presenting complaint (e.g. other infectious disease, injury, toxic, nutritional causes).

Disease investigations that specifically incorporate exclusion testing for AI are reported to NAHIS. The number of AI investigations for 2007 to 2009 that were reported by government veterinary laboratories and incorporated into NAHIS are reported below in Tables 8.2 to 8.11. Results from 2006 were obtained directly from the states and territories because NAHIS did not incorporate the results of AI testing prior to 2007. Diseases investigations for exclusion of

AI and ND infection were carried out over a wide geographic area between 2006 and 2009, and all commercial poultry-raising areas were represented (Figure 8.1).

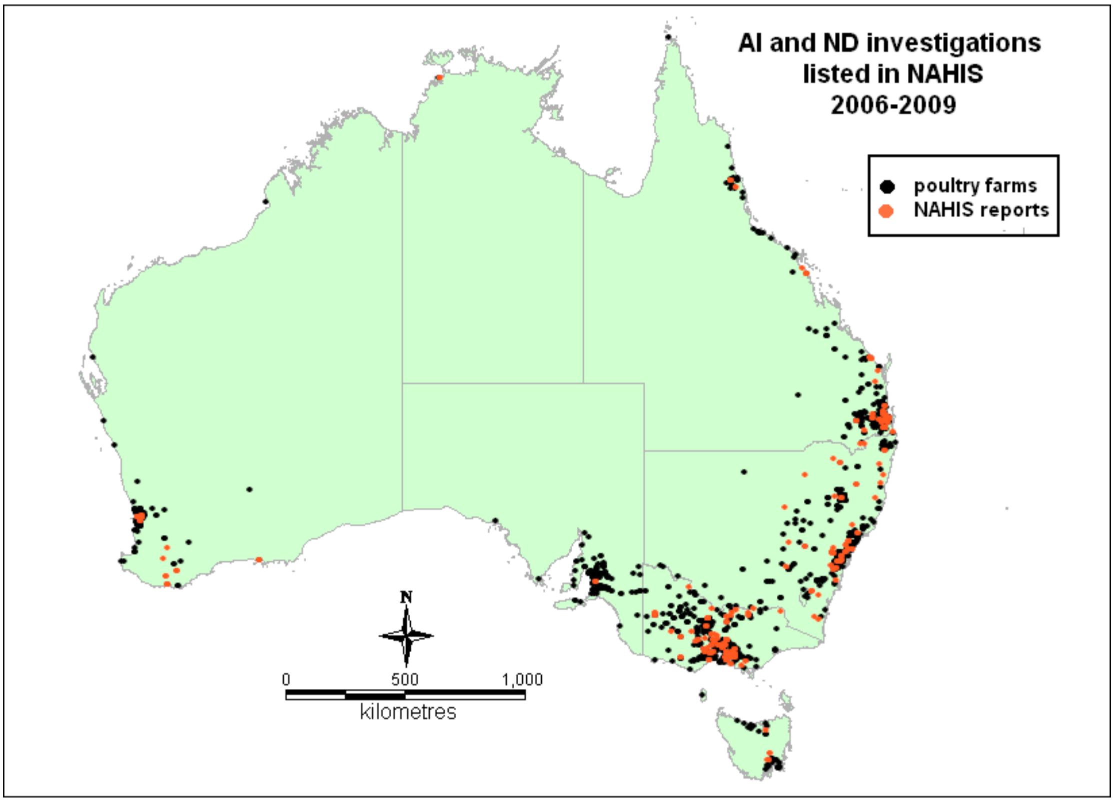

Figure 8.1 Disease investigations for exclusion of avian influenza and Newcastle disease, reported to the National Animal Health Information System (NAHIS) between 2006 and 2009[77]

The testing for AI comprised RT-PCR, c-ELISA, virus culture and/or haemagglutination inhibition (HI) for H5 and H7. Antibodies to an H5 AIV were detected in a non-commercial mixed-species poultry flock in Tasmania in 2006. No AI viruses were detected by PCR, or isolated from cloacal or tracheal swabs from the flock. Further epidemiological details of this case are provided in Section 5.3.2.

No positive results for LPNAI were obtained in 2007–2009, although antibody to an H6N4 virus was detected in NSW in a meat chicken breeder flock in late 2006, and a duck flock in 2006. In 2010, H10N7 virus was isolated from a meat chicken breeder flock in NSW. Further details on these detections are provided below.

Table 8.2 Submissions and samples* tested for avian influenza in 2006 and reported to NAHIS

POULTRY CLASS	TESTING	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
BACKYARD	Submissions	5	0	29	0	7	12	17	70
	Samples	5	0	123	0	18	22	72	240

77 Locations of investigations are shown in relation to locations of commercial poultry farms (Source, Iain East, DAFF).

FREE RANGE	Submissions	5	0	5	0	6	2	16	34
	Samples	20	0	24	0	40	4	144	232
HOUSED	Submissions	20	0	8	0	1	59	5	93
	Samples	133	0	49	0	5	132	50	369
TOTAL	Submissions	30	0	42	0	14	73	38	197
	Samples	158	0	196	0	63	158	266	841

(Submission = a batch of samples from one premises submitted on one day. Sample = a bird or sample from a bird within a submission.)

Table 8.3 Submissions and samples tested for avian influenza in 2007 and reported to NAHIS

POULTRY CLASS	TESTING	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
BACKYARD	Submissions	2	2	9	0	2	2	6	23
	Samples	3	2	11	0	2	2	12	32
FREE RANGE	Submissions	2	3	0	0	3	0	0	8
	Samples	5	4	0	0	28	0	0	37
HOUSED	Submissions	18	2	3	0	1	30	7	61
	Samples	189	2	11	0	4	174	81	461
TOTAL	Submissions	22	7	12	0	6	32	13	92
	Samples	197	8	22	0	34	176	93	530

Table 8.4 Submissions and samples tested for avian influenza in 2008 and reported to NAHIS

POULTRY CLASS	TESTING	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
BACKYARD	Submissions	9	3	10	1	12	1	1	37
	Samples	15	3	37	1	26	1	1	84
FREE RANGE	Submissions	4	1	1	0	1	1	0	8
	Samples	6	1	5	0	2	1	0	15
HOUSED	Submissions	26	1	2	0	0	29	11	69
	Samples	155	1	7	0	0	127	70	360
TOTAL	Submissions	39	5	13	1	13	31	12	114
	Samples	176	5	49	1	28	129	71	459

Table 8.5 Submissions and samples tested for avian influenza in 2009 and reported to NAHIS

POULTRY CLASS	TESTING	NSW	NT	QLD	SA	TAS	VIC	WA	TOTAL
BACKYARD	Submissions	4	26	13	3	9	1	17	73
	Samples	6	174	18	3	21	1	55	278
FREE RANGE	Submissions	6	2	2	-	-	-	4	14
	Samples	21	4	8	-	-	-	18	51
HOUSED	Submissions	10	-	10	-	1	46	21	88
	Samples	68	-	26	-	2	144	201	441
UNKNOWN	Submissions	-	-	3	4	-	-	1	8
	Samples	-	-	17	356	-	-	9	382
TOTAL	Submissions	20	28	28	7	10	47	43	183
	Samples	95	178	69	359	23	145	283	1152

Table 8.6 Species submissions examined for avian influenza throughout Australia in 2007 and reported to NAHIS

POULTRY CLASS	CHICKEN	DUCK	PHEASANT	RATITE	TURKEY	TOTAL
BACKYARD	20	2	0	1	0	23
FREE RANGE	4	0	2	0	2	8
HOUSED	56	4	0	0	1	61
TOTAL	80	6	2	1	3	92

Table 8.7 Samples submitted and tested for avian influenza throughout Australia in 2007 and reported to NAHIS (figures do not include pigeons tested for export)

POULTRY CLASS	CHICKEN	DUCK	PHEASANT	RATITE	TURKEY	TOTAL
BACKYARD	29	2	0	1	0	32
FREE RANGE	8	0	26	0	3	37
HOUSED	398	60	0	0	3	461
TOTAL	435	62	26	1	6	530

Table 8.8 Species submissions examined for avian influenza in 2008 and reported to NAHIS

POULTRY CLASS	CHICKEN	DUCK	GEESE	TURKEY	TOTAL
BACKYARD	28	5	3	1	37
FREE RANGE	6	0	1	1	8
HOUSED	65	2	0	2	69
TOTAL	99	7	4	4	114

Table 8.9 Samples submitted and examined for avian influenza in 2008 and reported to NAHIS (figures do not include pigeons tested for export)

POULTRY CLASS	CHICKEN	DUCK	GEESE	TURKEY	TOTAL
BACKYARD	55	12	15	2	84
FREE RANGE	8	0	5	2	15
HOUSED	345	4	0	11	360
TOTAL	408	16	20	15	459

Table 8.10 Species submissions examined for avian influenza throughout Australia in 2009 and reported to NAHIS

POULTRY CLASS	CHICKEN	DUCK	GEESE	PIGEON	RATITE	TURKEY	TOTAL
BACKYARD	65	4	1	3	-	-	73
FREE RANGE	11	2	-	-	1	-	14
HOUSED	78	4	-	1	-	5	88
UNKNOWN	7	-	-	-	-	1	8
TOTAL	161	10	1	4	1	6	183

Table 8.11 Samples submitted and tested for avian influenza throughout Australia in 2009 and reported to NAHIS (figures do not include pigeons tested for export)

POULTRY CLASS	CHICKEN	DUCK	GEESE	PIGEON	RATITE	TURKEY	TOTAL
BACKYARD	259	11	1	7	-	-	278
FREE RANGE	44	6	-	-	1	-	51
HOUSED	414	14	-	1	-	12	441

UNKNOWN	282	-	-	-	-	100	382
TOTAL	999	31	1	8	1	112	1152

As an example of the laboratory investigations conducted as a result of suspect findings during clinical surveillance activities, the NSW Department of Primary Industries has supplied the following information on investigations for AI for the period 2006 to 2008 (Table 8.12).

In addition to the AI exclusion data reported to NAHIS, an additional 18 AI exclusions from NSW have not yet been reported to NAHIS for 2009. These included five commercial breeder flocks for export testing; ten backyard flocks with reported mortalities (five of which involved small numbers of duck mortalities), and three commercial layer flocks. Diagnoses in cases of mortality included infectious laryngotracheitis, parasitism and coccidiosis.

The most common reasons for poultry being referred to the government veterinary laboratory were mortalities, changes in egg production, and respiratory and nervous signs. The trigger causes for sample submission to the government laboratory are listed in Table 8.13.

The submission of these specimens for veterinary examination provides confidence in the likelihood of early detection an emergency animal disease outbreak in the poultry industries. The submission of birds or specimens for examination at a government veterinary laboratory, as undertaken, constitutes reporting of a suspicion of an emergency animal disease to a government officer.

In late 2006, a 0.5% increase in mortality and 10% drop in egg production were investigated in a meat chicken breeder flock in NSW (see Section 5.3.2). Chickens in several sheds on the farm tested sero-positive to H6. Pools of tracheal swabs and cloacal swabs were collected but only one shed yielded positive tests in one cloacal and one tracheal swab pool by real-time reverse transcriptase PCR (RT-PCR) for AI virus matrix gene. The subtype was determined to be H6N4. Other nearby breeder flocks, four duck broiler farms and a turkey farm within a 3 km radius, were all negative on testing using C-ELISA and HI for H6 subtype AI virus and PCR tests for AI. A duck breeder flock was serologically positive for exposure to H6 subtype but RT-PCR and virus isolation attempts in this flock were negative. The investigation of the surrounding farms involved testing over 900 blood samples and conducting over 300 RT-PCR tests with negative results.

In 2007, as a result of elevated mortalities, 25 layer samples were sent for testing for AI by the RT-PCR test but all had negative results.

Similarly, in 2008, exclusion testing for AI was conducted when infectious laryngotracheitis (ILT) was causing mortalities in meat chicken flocks. Samples from 15 flocks were tested by the RT-PCR test and found to be negative for AI.

In NSW there was a significant increase in the submission of chickens in 2008 for veterinary laboratory examination for respiratory signs and drop in egg production. An outbreak of ILT was at its peak at this time, and ILT was the most common disease diagnosed in association with the specimens submitted. All submissions were negative for AI.

Table 8.12 Species and husbandry of submissions to NSW government veterinary laboratory from 2006–08

YEAR	CHICKEN	DUCK	TURKEY	TOTAL
2006	27	2	2	31
2007	26	2	1	29
2008	71	4	0	75
	124	8	3	135
	BACKYARD	FREE RANGE	HOUSED	TOTAL
2006	6	5	20	31
2007	7	4	18	29
2008	19	21	35	75
TOTAL	32	30	73	135

Table 8.13 Clinical signs recorded in flocks from which specimens were sent for veterinary laboratory examination for AI in NSW 2006-08

CLINICAL SIGN	YEAR	SPECIES			TOTAL
		CHICKEN	DUCK	TURKEY	
MORTALITY	2006	26	2	2	30
EGG DROP		2	0	0	2
RESPIRATORY SIGNS		8	0	0	8
NERVOUS SIGNS		5	0	0	5
SUBMISSIONS		27	2	2	31
MORTALITY	2007	23	0	1	24
EGG DROP		2	0	0	2
RESPIRATORY SIGNS		0	0	0	0
NERVOUS SIGNS		10	0	0	10
SUBMISSIONS		26	2	1	29
MORTALITY	2008	58	3	0	22
EGG DROP		7	0	0	7
RESPIRATORY SIGNS		21	0	0	5
NERVOUS SIGNS		7	0	0	19

SUBMISSIONS		71	4	0	74

In addition to laboratory testing of samples in which AI was actively excluded, several findings of AI infection in wild birds have resulted in impromptu surveys of surrounding properties.

In early 2008, wild ducks tested positive for H7 subtype AI virus infection in New South Wales. Blood samples were collected from meat chicken and turkey flocks within a 10 km radius from the sampling site of the wild ducks. Blood samples from healthy meat chicken flocks were largely collected at slaughter. In all, samples from four chicken meat breeder flocks (total 60 blood samples), eight healthy meat chicken flocks (152 blood samples), one meat chicken flock with endemic disease problems (16 blood samples) and three turkey flocks (30 blood samples) were collected for testing. All samples tested were negative for AI infection by the C-ELISA test.

Between 2007 and 2010, about half of the commercial meat chicken properties in Victoria were affected by an outbreak of infectious laryngotracheitis (ILT). All cases were investigated either by laboratory submission to the state laboratory (resulting in exclusion of AI and ND) or property visit by industry or company personnel.

In 2009, fifteen farms were involved in an ILT outbreak in Queensland, including 13 commercial farms (2 layer farms and 11 meat chicken farms) and two non-commercial farms. AI was excluded by PCR testing of 56 samples from 8 farms.

In early 2010, a 15% drop in egg production and a slight increase in mortality was investigated in a chicken breeder flock in NSW. Samples collected from the flock were positive to ELISA testing for influenza A, and the subtype was confirmed as H10N7. Investigation of the incident by the NSW government, included surveillance of surrounding farms, was continuing at the time of writing.

8.3.1 Summary

The results from Table 8.13 and results from flock testing during ILT outbreaks provide confidence that suspect cases identified through clinical evaluation progress through to laboratory testing. The reported positive LPAI findings in Tasmania and in New South Wales in 2006 and 2010 also demonstrate that the surveillance program is capable of detecting LP AIV infection when it occurs.

8.4 Opportunistic surveys

8.4.1 Sentinel Chicken Flocks

New South Wales, Northern Territory, Victoria, and Western Australia operate sentinel chicken programs in areas epidemiologically suited for detecting the spread of insect-borne viral diseases of humans. At the start of each disease season, new adult chickens that are serologically negative for all viruses to be tested across the sampling season, are maintained in areas where insect populations can provide early detection of virus spread. As water birds are the major amplifiers of the virus infections being surveyed, the sentinels are exposed to any infection with an AI virus in the wild bird populations. Monthly blood samples are taken from sentinel chickens throughout the season and tested for flavivirus infection by serology and virus isolation. The disease season for flavivirus infection typically extends from September/October to May/June the following year.

A retrospective investigation of stored serum from the Northern Territory sentinel chickens between 2002 and 2008, to test for antibody to AI viruses by the C-ELISA test. Additional confirmatory tests, including HI testing, were undertaken at AAHL for positive samples. Of the more than 1100 samples tested, one blood sample (taken from a chicken at Gove in February 2004) gave an equivocal serological reaction in the C-ELISA test. Subsequent testing of blood samples taken on other dates during the surveillance program from the same chicken confirmed infection with AI but the subtype of AI was not determined. The sites in the Northern Territory that have been used for keeping sentinel birds have varied but currently include: Alice Springs (2), Beatrice Hill, Darwin (2), Gove, Groote Eylandt, Jabiru, Katherine, Nathan River, Robinson River, and Tennant Creek. Sentinel birds are tested twice each year for AI, at placement (April) and at the end of season (September) and the results of testing are reported by the Northern Territory Department of Resources to NAHIS.

Testing of ten sentinel chicken flocks in the Murray Valley by the Victorian Department of Primary Industries identified 17 (0.85%) positive and 87 (4.35%) suspect samples from 2000 serum samples collected from 1991-1994 and 2002-2006, using the C-ELISA. The remaining 1896 (94.8%) samples were negative. While the numbers of positive and suspect samples are too small to be statistically significant, there was a clustering of positive and suspect results in the years 1994, 2003 and 2004, and a clustering of positive results in the flock at Barmah. The subtype of AI was not determined.

8.4.2 Specialty chicken flocks

The Victorian Department of Primary Industry obtains fertile eggs from a research flock in Melbourne's north-east. Twice yearly testing of a sample of the breeder flock (15 samples) for AI since 2004 has shown negative serology results using the C-ELISA.

To maintain the SPF status as required by the European Union, United States and Australian therapeutics legislation for making vaccines, a private company producing SPF eggs undertakes testing to demonstrate its freedom from AI infection. Blood samples are taken from the SPF production flock and the two rearing flocks at the rate of 1.25% (40–200 samples per flock) and tested. The blood samples are tested for AI by both the c-ELISA and agar gel precipitin (AGP) tests to meet the different testing regimes of the countries to which exports are made. To date, all AI test results have been negative.

8.4.3 Duck industry

Surveillance was conducted on four broiler duck farms and one duck breeder farm within 3 km of a chicken breeder farm with positive serology for H6N4 AI virus in 2006. Testing of the broiler duck farms was negative for AI using the C-ELISA and other tests including RT-PCR. A duck breeder farm of 10 sheds had positive serology to H6 subtype AI virus in three sheds, but no RT-PCR reactions were obtained and no AI viruses were isolated.

8.4.4 Turkey industry

Thirty blood samples from three turkey flocks in NSW were collected for AI testing in early 2008, in response to detection of AI virus (H7) in wild ducks in the area. All samples tested were negative for AI infection by the C-ELISA test.

8.4.5 Game bird industry

There are no records of AI testing in quail between 2006 and 2009.

8.4.6 Ratite industry

In 2005, 60 blood samples from a large consignment of ostriches were tested for AI for export purposes, with all tests being negative. In 2006, three consignments of emus (total of 38 birds) from NSW were tested for AI for export purposes, with negative results. There is no record of active surveillance for AI in 2007. In 2008, 28 ostriches were tested for AI for export purposes, again with negative results.

Ratite producers that wish to export products take part in the Ratite On-Farm Surveillance Plan. Active surveillance for ND is conducted in the ratite industry. The Australian Ratite Industry On-Farm Surveillance Plan is approved by the EU for the export of ostrich and emu meat to EU countries. To demonstrate flock freedom from virulent ND, ratite producers must individually identify birds and undertake on-farm surveillance and testing for ND at six-monthly intervals under the supervision of a veterinarian. Where there is a detection of positive ND serology, either an ND virus isolation or detection by RT-PCR is performed to determine that infection with virulent ND is not the cause of the antibody reaction (and virus isolation attempts would also detect AI infection). There is currently no formal surveillance for AI required of ratite flocks.

8.5 Structured surveys

8.5.1 Serological sampling of meat chicken flocks

Serum samples were collected from meat chickens in Tasmania and Western Australia in the first half of 2010 as part of the Newcastle disease management plan. Sera were collected from flocks processed during a 6-week sampling window, and were analysed for avian influenza antibody using C-ELISA, and for Newcastle disease. For Tasmania, 104 birds from 4 separate farms were sampled, and all returned negative results for avian influenza and Newcastle disease. In Western Australia, 419 birds from 28 farms were sampled, and all were negative for avian influenza.

8.5.2 Chicken meat industry

In 2006, the Australian Chicken Meat Federation (ACMF), with the assistance of DAFF, carried out a geographically representative serological survey across the whole Australian chicken meat industry for evidence of infection with H5 or H7 subtype AI. Samples from all companies undertaking chicken meat production were included in the survey. The meat chicken farms in a regional area were selected for sampling on the basis of having the highest risk factors for NAI infection. These risk factors included nearby bodies of surface water and populations of wild birds, and free-ranging flocks.

Breeder flocks were separately selected proportional to the breeder flocks in the various regions across Australia. Breeder flocks more than 40 weeks of age were selected, if available, to maximise the likelihood of detecting NAI infection if present. Blood samples were taken from 50 meat breeder and 84 meat chicken flocks. Ten serum samples from each of the 134 flocks were tested by the HI test using two H5 and two H7 viruses. The H subtypes had different neuraminidases to distinguish cross reactions in the HI test being related to the H or N antigen. There was no evidence of previous infection with a NAI virus in the 1340 serological tests.

Also in 2006, an integrated chicken meat company collected blood samples across their national breeder and production flocks, and tested 495 birds with negative results for AI by C-ELISA. Thirty-three flocks were sampled, with 17 tested in New South Wales (5 breeder and 12 meat chicken flocks), three in South Australia (1 breeder and 2 meat chicken flocks) and 13 flocks in Victoria (3 breeder and 10 meat chicken flocks).

8.5.3 Chicken layer industry

In 2006, the AECL carried out a planned serological survey for AI across the whole Australian commercial egg layer industry, incorporating 64 farms. Flocks selected for sampling ensured geographic representation across the Australian egg layer industry. Blood samples were taken from both breeder and commercial production flocks. Serum samples were tested by the HI test using antigens from two H5 and two H7 viruses. No samples tested positive for NAI.

APPENDICES

Appendix 1 Details of the Chief Veterinary Officers

Dr Andy Carroll
Chief Veterinary Officer (Australia)
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(T) 02 62724644
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Dr Will Andrew
Chief Veterinary Officer
Australian Capital Territory
ACT Veterinary Services
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Dr Bruce Christie
Chief Veterinary Officer
Industry & Investment NSW
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Dr Brian Radunz
Chief Veterinary Officer
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Dr Ron Glanville
Chief Veterinary Officer,
Biosecurity Queensland
Department of Employment, Economic Development and Innovation
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Dr Rob Rahaley
Chief Veterinary Officer
South Australia
Primary Industries & Resources South Australia

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Dr Rod Andrewartha
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(F) 03 62781875

Dr Hugh Millar
Chief Veterinary Officer
Victoria Department of Primary Industries
Biosecurity Victoria
475 Mickleham Rd
Attwood VIC 3049
(T) 03 92174247
(F) 03 92174322

Dr Tony Higgs
Chief Veterinary Officer
Western Australia
Division of Animal Biosecurity
Department of Agriculture and Food WA
444 Albany Highway
Albany WA 6330
(T) 08 98928479
(F) 08 98418496

Appendix 2 Regional/district veterinary offices

National/State/Territory Veterinary Authorities	Address	Number of veterinarians employed in 2010
Commonwealth (Department of Agriculture Fisheries and Forestry	Office of the Chief Veterinary Officer Biosecurity Services Group Department of Agriculture Fisheries and Forestry 18 Marcus Clarke Street Canberra Australian Capital Territory 2600 Department of Agriculture Fisheries and Forestry GPO Box 858 Canberra Australian Capital Territory 2601	213
Australian Capital Territory	ACT Veterinary Services 12 Wattle Street Lyneham Australian Capital Territory ACT Veterinary Services Parks Conservation & Land (Athllon) GPO Box 158 Canberra ACT 2601	1
New South Wales (Industry & Investment NSW)	Industry & Investment NSW 161 Kite Street Orange New South Wales 2800 Industry & Investment NSW Locked Bag 21 Orange New South Wales 2800 In addition, the NSW Animal Health system works with the Livestock Health and Pest Authority who have 12 Senior District Veterinarians (SDV) and 31 District Veterinary (DV) Officers. Veterinarians (including SDV and DV officers) are located in 44 different areas.	57 43 (Total = 100)
Northern Territory (Department of Resources)	Department of Resources Berrimah Farm Makagon Road Berrimah Northern Territory 0828 Department of Resources GPO Box 3000 Darwin Northern Territory 0801 Veterinarians also located at: Darwin, Katherine, Alice Springs.	9

Queensland (Department of Employment, Economic Development and Innovation)	Biosecurity Queensland Department of Employment, Economic Development and Innovation 80 Ann Street Brisbane QLD 4000 Biosecurity Queensland Department of Employment, Economic Development and Innovation GPO Box 46 Brisbane QLD 4001 Biosecurity Service Centres with a Veterinary Officer: Northern Queensland – Cairns; Malanda; Townsville. Central Queensland – Biloela, Emerald, Mackay Southern Queensland – Dalby, Roma, Toowoomba, Warwick. South East Queensland - Brisbane Animal Research Institute, Caboolture, Ipswich, Maryborough. Western Queensland –Longreach.	38
South Australia (Department of Primary Industries and Resources)	Primary Industries & Resources South Australia 33 Flemington Street Glenside South Australia 5065 Primary Industries & Resources South Australia GPO Box 1671 Adelaide South Australia 5001 Veterinary Officers are also based at: Flaxley, Naracoorte, Mt Gambier, Clare, Nuriootpa.	17
Tasmania (Department of Primary Industries, Parks, Water and Environment)	Tasmania Department of Primary Industries, Parks, Water and Environment 13 St Johns Avenue New Town Tasmania 7008 Tasmania Department of Primary Industries, Parks, Water and Environment GPO Box 44 Hobart Tasmania 7001 Veterinary Officers are also based at: Flinders Island, Launceston and Devonport.	14
Victoria (Department of Primary Industries)	Victoria Department of Primary Industries Biosecurity Victoria 475 Mickleham Rd Attwood Victoria 3049 Veterinarians are located in: Bairnsdale, Ballarat, Benalla, Bendigo, Camperdown, Echuca, Ellinbank, Geelong, Hamilton, Horsham, Kyneton, Leongatha, Maffra, Seymour, Swan Hill, Tatura, Wangaratta, Warrnambool, Wodonga. Fifty-four (54) Animal Health Officers (not veterinarians but para-veterinary field officers trained in animal health activities) are located in: Ararat, Box Hill, Cobram, Colac, Frankston, and Tallangata, as well as at the locations above.	42.5

Western Australia (Department of Agriculture and Food)	Division of Animal Biosecurity Department of Agriculture and Food WA 3 Baron Hay Court South Perth Western Australia 6151 Division of Animal Biosecurity Department of Agriculture and Food WA Locked Bag No. 4 Bentley Delivery Centre South Perth Western Australia 6983 Veterinarians are also located at: Albany, Merredin, Northam.	36
Total number of Government veterinarians		470.5

Appendix 3 Legislation relating to control of disease in domestic livestock[78]

ACT	APPLICATION
Commonwealth (national) More details available on the Commonwealth consolidated legislation web site.[79]	
Agricultural and Veterinary Chemicals Act 1994	An Act to make provision for the evaluation, registration and control of agricultural and veterinary chemical products, and for related matters, for the purposes of the Agricultural and Veterinary Chemicals Act 1994.
Biological Control Act 1984	An Act to make provision for the biological control of pests in the Australian Capital Territory, and for related purposes.
Meat Inspection Act 1983	An Act relating to the inspection by the Commonwealth of meat that is intended for human consumption or for use as animal food.
Mutual Recognition Act 1992	An Act to provide for the recognition within each state and territory of the Commonwealth of regulatory standards adopted elsewhere in Australia regarding goods and occupations. The principal purpose of the Act operates under paragraph (xxxvii) of section 51 of the Commonwealth Constitution for the purpose of promoting the goal of freedom of movement of goods and service providers in a national market in Australia.
Quarantine Act 1908	An Act relating to quarantine, which includes but is not limited to measures for, or in relation to, the examination, exclusion, detention, observation, segregation, isolation, protection, treatment and regulation of vessels, installations, human beings, animals, plants or other goods or things; and having as their object the prevention or control of introduction, establishment or spread of disease or pests that will or could cause significant damage to human beings, animals, plants or other aspects of the environment or economic Activities.
New South Wales (state) More details available on the New South Wales consolidated legislation web site.[80]	
Agricultural And Veterinary Chemicals (New South Wales) Act 1994	An Act to apply certain laws of the Commonwealth relating to agricultural and veterinary chemical products as laws of New South Wales; and for other purposes.
Agricultural Livestock (Disease Control Funding) Act 1998	An Act to assist agricultural industries to provide and fund services to control diseases in livestock; and for other purposes.
Animal Diseases (Emergency Outbreaks) Act 1991,	An Act to provide for the detection, containment and eradication of certain diseases affecting livestock and other animals; to amend the Stock Diseases Act 1923 and certain other Acts consequentially; and for other purposes.

78 Legislation regulating bees and deer also exists but has not been included here. Note that many Acts have associated Regulations and these have not been listed here but appear in the poultry and avian influenza legislation listed in Appendix 5.
79 http://138.25.65.50/au/legis/cth/consol_Act
80 http://138.25.65.50/au/legis/nsw/consol_Act/toc.html and http://138.25.65.50/au/legis/Act/consol_Act

ACT	APPLICATION
Biological Control Act 1985	An Act to make provision for the biological control of pests in New South Wales, and for related purposes.
Non-Indigenous Animals Act 1987	An Act to control and regulate the introduction into the State of certain species of animals and the movement and keeping of those animals within the State.
Poultry Meat Industry Act 1986	An Act to constitute the Poultry Meat Industry Committee and to define its functions; to regulate and control the poultry growing industry; to repeal the Chicken Meat Industry Act 1977 ; and for other purposes.
Prevention Of Cruelty To Animals Act 1979	An Act for the prevention of cruelty to animals.
Rural Lands Protection Act 1998 Rural Lands Protection Amendment Act 2008	An Act to provide for the protection of rural lands; to provide for the constitution and functions of rural lands protection boards and a State Council of Rural Lands Protection Boards; to repeal the Rural Lands Protection Act 1989; to amend the Impounding Act 1993 to provide for the boards to exercise functions as impounding authorities under that Act; to make consequential amendments to various other Acts; and for other purposes. An Act to amend the Rural Lands Protection Act 1998 to make further provision with respect to the protection of rural lands, to provide for the establishment of the State Policy Council of Livestock Health and Pest Authorities and the constitution of livestock health and pest authorities and the State Management Council of Livestock Health and Pest Authorities and to provide for the functions of those bodies; and for other purposes.
State Emergency and Rescue Management Act 1989	An Act relating to the management of state emergencies and rescues.
Stock Diseases Act 1923	An Act relating to diseases in stock; to repeal the Stock Diseases (Tick) Act 1901 and the Stock Diseases (Tick) Amendment Act 1915; and for purposes connected therewith.
Stock Foods Act 1940	An Act to regulate the sale of food for stock; and for other purposes.
Stock Medicines Act 1989 Stock Medicines Amendment Act 2004	An Act relating to medicines for stock and other animals for the purposes of enhancing the quality of agricultural production, protecting the environment and safeguarding the health of stock and other animals; and for other purposes. An Act to amend the Stock Medicines Act 1989 to make further provision for the regulation of stock medicines in relation to food producing species, to remove obsolete provisions and to make other amendments in connection with national competition policy reform; and for other purposes.

ACT	APPLICATION
Stock (Chemical Residues) Act 1975	An Act to prevent the slaughter for human consumption of stock which contain certain concentrations of residues of chemicals or which are otherwise chemically affected; to prevent stock from becoming chemically affected; and for purposes connected therewith.
Veterinary Practice Act 2003	An Act relating to the practice of veterinary science, to repeal the Veterinary Surgeons Act 1986; and for other purposes
Queensland (state) More details available on the Queensland consolidated legislation web site.[81]	
Agricultural and Veterinary Chemicals (Queensland) Act 1994	An Act to adopt the provisions of the Agvet Code Act (Commonwealth) to establish a regulatory system for the uniform registration of Agvet chemicals to protect the health and safety of human beings, animals and the environment in an ecologically sustainable manner.
Agricultural Standards Act 1994	An Act to provide for the making of agricultural standards and for other agricultural matters.
Animals Protection Act 1925	An Act for the prevention of cruelty to animals.
Animal Care and Protection Act 2001	An Act to promote the responsible care and use of animals and to protect animals from cruelty, and for other purposes.
Biological Control Act 1987	An Act to make provision for the biological control of pests in Queensland, and for related purposes.
Brands Act 1915	An Act to consolidate and amend the law relating to brands and earmarks on stock to provide for legal identification for the purposes of ownership of cattle, goats, horses, pigs and sheep.
Chemical Usage (Agricultural And Veterinary) Control Act 1988	An Act to control the use of certain chemicals and the use of substances in or on which is the residue of certain chemicals and for related purposes.
Exotic Diseases in Animals Act 1981	An Act to provide for the control, eradication and prevention of exotic diseases of animals, the compensation of owners for loss or destruction of animals and property during outbreaks of exotic diseases, the establishment of an exotic diseases expenses and compensation fund; and for related purposes.
Pest Management Act 2001	An Act to provide for the registration of pest control and fumigation activities, and for other purposes.
Stock Act 1915	An Act to consolidate and amend the law relating to diseases in stock by preventing, controlling and eradicating diseases in livestock.
Veterinary Surgeons Act 1936	An Act relating to the qualifications and registration of veterinary surgeons and the regulation and control of the prActice of veterinary surgeons and for connected purposes.

81 http://www.legislation.qld.gov.au/Legislation.htm and http://138.25.65.50/au/legis/qld/consol_Act/

ACT	APPLICATION
Victoria (state) More details available on the Victorian consolidated legislation web site.[82]	
Agricultural and Veterinary Chemicals (Control Of Use) Act 1992	The purposes of this Act are to impose controls in relation to the use, application and sale of agricultural and veterinary chemical products, fertilisers and stock foods and the manufacture of fertilisers and stock foods.
Agricultural and Veterinary Chemicals (Victoria) Act 1994	The purpose of this Act is to apply certain laws of the Commonwealth relating to agricultural and veterinary chemical products as laws of Victoria.
Emergency Management Act 1986	An Act to provide for the organisation of emergency management in Victoria.
Livestock Disease Control Act 1994	An Act for the prevention, control and eradication of significant diseases of livestock, including powers to control the entry of animals and animal diseases.
The Livestock Management Act	The introduction of the Bill is scheduled for December 2009. The Act would take effect once particular standards are developed and agreed to nationally. The integration of the first set of standards, Australian Standards and Guidelines for the Welfare of Animals – Land Transport, will commence in early 2010. The national standards will be introduced over the next three to five years.
Meat Industry Act 1993	An Act to set standards for meat production for human consumption and pet food.
Prevention of Cruelty To Animals Act 1986	An Act to prevent cruelty to animals.
Stock (Seller Liability and Declarations) Act 1993	An Act that requires stock to be of particular disease status when sold; establishes a system that gives confidence to buyers in declarations concerning the health of stock; protects and ensures the quality of livestock and livestock products for national and international markets.
Veterinary Practice Act 1997	An Act relating to the qualifications and registration of veterinary surgeons and the regulation and control of the practice of veterinary surgeons and for connected purposes.
South Australia (state) More details available on the SA consolidated legislation web site.[83]	
Agricultural and Veterinary Chemicals (South Australia) Act 1994	An Act to apply certain laws of the Commonwealth relating to agricultural and veterinary chemical products as laws of South Australia; and for other purposes.
Agricultural and Veterinary Products (Control of Use) Act 2002	An Act relating to agricultural chemical products, fertilisers and veterinary products; to amend the Agricultural and Veterinary Chemicals (South Australia) Act 1994 and the Livestock Act 1997; and for other purposes.

82 http://www.dms.dpc.vic.gov.au and http://www.austlii.edu.au/au/legis/vic/consol_Act/
83 http://138.25.65.50/au/legis/sa/consol_Act/

ACT	APPLICATION
Animal and Plant Control (Agricultural Protection and Other Purposes Act 1986	An Act to provide for the constitution of an Animal and Plant Control Commission and regulation of its powers, functions and duties; management, control and prevention of certain plants and animals.
Animal Welfare Act 1985	An Act for the promotion of animal welfare; and for other purposes.
Branding of Pigs Act 1964	An Act relating to the registration and use of brands for disease trace-back purposes.
Brands Act 1933	An Act relating to the registration and use of brands and earmarks for stock.
Livestock Act 1997	An Act for the prevention, control and eradication of diseases in livestock, and to the establishment of an Exotic Diseases Eradication Fund.
Primary Industries Funding Scheme Act 1998	An Act to make provision for schemes establishing funds for primary industry purposes; and for other purposes.
Primary Produce (Food Safety Schemes) Act 2004	An Act to provide for food safety matters relating to the production of primary produce; to repeal the Dairy Industry Act 1992 and the Meat Hygiene Act 1994; to amend the Prevention of Cruelty to Animals Act 1985; and for other purposes.
Veterinary Practice Act 2003	An Act that defines who can perform various husbandry practices and procedures.
Northern Territory (state) More details available on the NT consolidated legislation web site.[84]	
Agricultural And Veterinary Chemicals (Northern Territory) Act	An Act to apply certain laws of the Commonwealth relating to agricultural and veterinary chemical products as laws of the Northern Territory, and for other purposes.
Agricultural And Veterinary Chemicals (Control Of Use) Act	An Act to control the use of agricultural and veterinary chemicals and the manufacture, sale and use of fertilisers and stockfoods, to manage land and agricultural produce contaminated by chemicals, and for related purposes.
Animal Welfare Act	An Act to provide for the welfare of animals, prevent cruelty to animals and for related purposes.
Biological Control Act	An Act to make provision for the biological control of pests in the Northern Territory, and for related purposes.
Brands Act	An Act relating to brands for stock and to the collection of statistics relating to animal industry.
Exotic Diseases (Animals) Compensation Act 1981	An Act to provide compensation for certain losses occasioned by exotic diseases of animals.
Livestock Act 2008	An Act relating to transport, identification, disease control and management of livestock.

84 http://138.25.65.50/au/legis/nt/consol_Act/

ACT	APPLICATION
Meat Industries Act	An Act to protect public health and promote domestic and export markets for the meat industry by providing for the processing of wholesome meat for human consumption and for related purposes.
Notifiable Diseases Act	An Act to consolidate and amend the law relating to notifiable, infectious and other diseases, and for related purposes.
Stock Diseases Act 1954	An Act relating to the control of diseases in stock and for other purposes.
Stock Routes And Travelling Stock Act	An Act to provide for the maintenance and control of stock reserves and stock routes, for the construction, maintenance and control of watering places and dips for stock, for the control of travelling stock, and for other purposes.
Territory Parks and Wildlife Conservation Act	An Act to control and monitor wildlife and feral animals.
Veterinarians Act	An Act relating to the qualifications and registration of veterinary surgeons and the regulation and control of the practice of veterinary surgeons and for connected purposes.
Western Australia (state) More details available on the WA consolidated legislation web site [85]	
Agriculture and Related Resources Protection Act 1976	An Act for the management, control and prevention of certain plants and animals.
Animal Welfare Act 2002	An Act to provide for the welfare, safety and health of animals, to regulate the use of animals for scientific purposes, and for related purposes.
Biosecurity and Agriculture Management Act 2007	The main purposes of Act are to prevent new animal and plant pests and diseases from entering Western Australia, to manage the impact and limit the spread of those already present in the State and to safely manage the use of agriculture and veterinary chemicals and ensure agricultural products are not contaminated with chemical residues.
Cattle Industry Compensation Act 1965	An Act for the testing and compensation to owners of cattle and carcasses in specific situations.
Exotic Diseases of Animals Act 1993	An Act for the detection, containment and eradication of certain (exotic) diseases affecting livestock and other animals.
Stock (Identification and Movement) Act 1970	An Act for the registration and use of brands, earmarks for stock and movement of stock.
Stock Diseases (Regulations) Act 1968	An Act for the prevention, control and eradication of diseases in livestock.

85 http://138.25.65.50/au/legis/wa/consol_Act/

ACT	APPLICATION
Veterinary Chemical Control And Animal Feeding Stuffs Act 1976	An Act to provide for the control of the use of veterinary chemical products; and to control and regulate the production, importation, treatment, preparation for sale, marketing, storage, and sale of animal feeding stuffs,
Veterinary Surgeons Act 1960	An Act relating to the qualifications and registration of veterinary surgeons and the regulation and control of the practice of veterinary surgeons and for connected purposes.
Tasmania (state) More details available on the Tasmanian consolidated legislation web site [86]	
Agricultural and Veterinary Chemicals (Control of Use) Act 1995	An Act to control the use and application of agricultural chemical products and veterinary chemical products, to provide for related matters and to repeal certain Acts.
Agricultural and Veterinary Chemicals (Tasmania) Act 1994	An Act to apply certain laws of the Commonwealth relating to agricultural and veterinary chemical products as laws of Tasmania; and for other purposes.
Animal (Brands and Movements) Act 1984	An Act relating to identification and movement control of livestock.
Animal Farming (Registration) Act 1994	An Act to regulate the farming of prescribed wildlife and other prescribed animals; and for related purposes.
Animal Health Act 1995	An Act relating to the prevention, control and eradication of significant diseases in livestock, including powers to control the entry of animals and animal diseases.
Egg Industry Act 2002	An Act to provide for improvements in the quality of egg production and in associated aspects of human health, animal welfare and food safety, and to repeal the Egg Industry Act 1988.
Veterinary Surgeons Act 1987	An Act relating to the qualifications and registration of veterinary surgeons and the regulation and control of the practice of veterinary surgeons and for connected purposes.
Australian Capital Territory (state)	
Animal Diseases Act 2005	An Act to provide for the control of endemic and exotic diseases of animals, and for other purposes. To repeal the Animal Diseases Act 1993
Animal Welfare Act 1992	An Act for the promotion of animal welfare; and for other purposes.
Stock Act 2005	An Act about stock; and for other purposes. (Reference to marking and registration of stock).

86 http://www.austlii.edu.au/au/legis/tas/consol_act/

Appendix 4 National Notifiable Animal Diseases List as at April 2010

1. African horse sickness
2. African swine fever
3. Anaplasmosis in tick free areas
4. Anthrax
5. Aujeszky's disease
6. Australian bat lyssavirus
7. Avian Influenza
8. Avian mycoplasmosis *(M. synoviae)*
9. Babesiosis in tick free areas
10. Bluetongue (clinical disease)
11. Borna disease
12. Bovine Virus DiarrhaeaType 2
13. Brucellosis *(B.abortus, B suis, B canis and B. melitensis)*
14. Camelpox
15. Chagas' disease *(T cruzi)*
16. Classical swine fever
17. Contagious agalActia
18. Contagious bovine pleuropneumonia
19. Contagious caprine pleuropneumonia
20. Contagious equine metritis
21. Crimean Congo Haemhorragic Fever
22. Devil Facial Tumour Disease
23. Dourine
24. Duck virus enteritis (duck plague)
25. Duck virus hepatitis
26. East Coast fever
27. Encephalitides (tick-borne)
28. Porcine enterovirus encephalomyelitis (Teschen)
29. Enzootic bovine leucosis
30. Epizootic lymphangitis
31. Equine encephalomyelitis (eastern, western and Venezuelan)
32. Equine encephalosis
33. Equine herpes-virus 1 (abortigenic and neurological strains)
34. Equine infectious anaemia
35. Equine influenza
36. Equine piroplasmosis *(Babesia equi, Babesia caballi and Theileria equi)*
37. Equine viral arteritis
38. Foot and mouth disease
39. Getah virus infection
40. Glanders
41. Haemorrhagic septicaemia
42. Heartwater
43. Hendra virus infection
44. Infectious bursal disease (hypervirulent and exotic antigenic variant forms)
45. Japanese encephalitis
46. Jembrana disease
47. Leishmaniosis of any species
48. Louping ill
49. Lumpy skin disease
50. Maedi-visna
51. Malignant catarrhal fever (wildebeest-associated)
52. Menangle virus infection
53. Nairobi sheep disease
54. Newcastle disease (virulent)
55. Nipah virus infection
56. Paratuberculosis (Johne's disease)

57. Peste des petits ruminants
58. Porcine cysticercosis *(C. cellulosae)*
59. Porcine myocarditis (Bungowannah virus infection)
60. Porcine reproductive and respiratory syndrome
61. Post-weaning multi-systemic wasting syndrome
62. Potomac fever
63. Pullorum disease *(Salmonella pullorum)*
64. Pulmonary adenomatosis (Jaagsiekte)
65. Rabies
66. Rift Valley fever
67. Rinderpest
68. Salmonella enteritidis infection in poultry
69. Salmonellosis *(S. abortus-equi)*
70. Salmonellosis *(S. abortus-ovis)*
71. Screw-worm fly - New World *(Cochliomyia hominivorax)*
72. Screw-worm fly - Old World *(Chrysomya bezziana)*
73. Sheep pox and goat pox
74. Sheep scab
75. Surra *(Trypanosoma evansi)*
76. Swine influenza
77. Swine vesicular disease
78. Transmissible gastroenteritis
79. Transmissible spongiform encephalopathies (bovine spongiform encephalopathy, chronic wasting disease of deer, feline spongiform encephalopathy, scrapie)
80. Trichinellosis
81. Trypanosomiasis
82. Tuberculosis (mammalian or avian)
83. Tularaemia
84. Vesicular exanthema
85. Vesicular stomatitis
86. Warble-fly myiasis
87. Wesselsbron disease
88. West Nile virus infection - clinical

Bee Agent List

1. Acariasis tracheal mite *(Acarapsis woodi)*
2. American foulbrood *(Paenibacillus larvae)*
3. European foulbrood *(Melissococcus pluten)*
4. Small hive beetle *(Aethina tumida)*
5. Tropilaelaps mite *(Tropilaelaps clareae)*
6. Varroasis *(Varroa destructor)*
7. Varroasis *(Varroa jacobsoni)*

Appendix 5 Legislation related to reporting of avian influenza in poultry

STATE/TERRITORY	LEGISLATIVE INSTRUMENT	COMMENT
Australian Capital Territory	*Animal Diseases Act 2005* effective 2 February 2009	Listed as avian influenza (highly pathogenic, low pathogenic virus subtypes H5 and H7) in Animal Diseases (Exotic Diseases) Declaration 2005 (No. 1) effective 28 October 2005. No specific definition for poultry, rather a definition for 'animal'.
New South Wales	*Animal Diseases (Emergency Outbreaks) Act 1991* No 73, *Stock Diseases Act 1923* No 34 and *NSW Exotic Diseases of Animals Act 1991*	Listed in Proclamation No. 568 of the *Stock Diseases Act 1923* No 34 on 6 February 2009, as an exotic disease. No specific definition for poultry, rather a definition for 'animal', which includes any birds or eggs of any birds.
Northern Territory	*Stock Diseases Act* [dated 14 December 2005] *Livestock Act 2008* (No 36 Of 2008) - Section 30	Listed in Table 1 Notifiable Animal Diseases (November 2008) under Emergency Animal Diseases as HPAI, & Listed under Emergency Diseases of Livestock in the Notifiable Diseases of Livestock Reporting Form (effective 15 October 2008). Under the Stock Diseases Act, poultry is defined as ducks, geese, turkeys and domestic fowls. A notifiable disease is defined as 'a disease or animal pathogen that poses a threat to the livestock industry.'
Queensland	*Stock Regulation 1988* [last reprint 17 October 2008] *Exotic Diseases In Animals Regulation 1998*	Listed in Schedules 1 and 6 [notifiable diseases]. Under the Stock Regulation 1988, domestic fowl is defined as Gallus gallus domesticus. Disease is listed as an exotic disease under Schedule (of) Exotic Diseases.
South Australia	*Livestock Act 1997*, Notifiable Diseases [last amended 22 February 2007]	Listed as an exotic disease. Under the Livestock Act 1997, poultry are considered livestock, and are animals kept or usually kept in a domestic or captive state.
Tasmania	*Animal Health Act 1995*	List last published on 16 June 2008, as an exotic disease. No specific definition for poultry, rather a definition for 'animal',

STATE/TERRITORY	LEGISLATIVE INSTRUMENT	COMMENT
		which means any bird or its eggs alive or dead.
Victoria	*Livestock Disease Control Act* (1994) & *Livestock Disease Control Regulations 2006* (especially Schedule 2)	As declared in the Order of 1 May 2008 –Notifiable, exotic disease (highly pathogenic, low pathogenic virus subtypes). Under the Livestock Disease Control Regulations 2006, poultry means domesticated fowl, chickens, duck, geese, turkey, guinea fowl, pigeons, emus or ostriches.
Western Australia	Diseases under *Exotic Diseases of Animals Act (1993)* and *Stock Diseases (Regulations) Act (1968)*	Notifiable Stock Diseases list last updated July 2005 and reviewed in January 2007. No specific definition for poultry, rather a definition for 'animal', which means any bird alive or dead.

Appendix 6 Wild bird surveillance results

Table A.6.1 PCR detection of LPAI virus subtypes during Australian surveillance for avian influenza viruses in wild birds (July 2005 to June 2007)*

AI VIRUS SUBTYPE	COMMON NAME	SCIENTIFIC NAME	SWAB TYPE	LOCATION	SAMPLE DATE
2x H1	Pacific Black Duck	*Anas superciliosa*	2x cloacal	Orange (New South Wales)	July 2006
H1	Australian Wood Duck	*Chenonetta jubata*	cloacal	Orange (New South Wales)	July 2006
H1N9	Pacific Black Duck	*A. superciliosa*	cloacal	Orange (New South Wales)	June 2006
H2Nx[a]	Mixed Teal/ Pink-eared Duck/ Australasian Shoveler	*Anas spp./ Malacorhynchus membranaceus/ Anas rhynchotis*	faecal	Werribee Sanctuary (Victoria)	January 2007
H3	Pacific Black Duck	*A. superciliosa*	cloacal	Caroona (New South Wales)	August 2006
H3	Grey Teal	*A. gracilis*	cloacal	Morundah (New South Wales)	May 2006
H3	Grey Teal	*A. gracilis*	cloacal	Tocumwal (New South Wales)	November-December 2005
H3Nx	Chestnut Teal	*A. castanea*	cloacal	Gippsland Region - McCloud's Moras (Victoria)	March 2006
H3N8	Grey Teal	*A. gracilis*	cloacal	Tocumwal (New South Wales)	November-December 2005
H3N8	Mallard hybrid	*A. superciliosa x platyrhynchos*	cloacal	Glenorchy (Tasmania)	February 2006
H4	Mixed waterbird species[b]		faecal	Bolivar Lagoon (South Australia)	November 2006
H4	Pacific Black Duck	*A. superciliosa*	cloacal	Orange (New South Wales)	June 2006

H4N6	Pacific Black Duck	*A. superciliosa*	cloacal	Orange (New South Wales)	June 2006
H4N6	Pink-eared Duck/ Teal	*M. membranaceus/ Anas spp.*	faecal	Werribee Sanctuary (Victoria)	January 2007
H4N6	Pacific Black Duck	*A. superciliosa*	cloacal	Barilla Bay (Tasmania)	February 2006
H5	Pacific Black Duck	*A. superciliosa*	cloacal	Herdsman Lake (Western Australia)	October 2006
H5	Pacific Black Duck	*A. superciliosa*	faecal	Orange (New South Wales)	May 2007
H5Nx	Chestnut Teal	*A. castanea*	cloacal	Gippsland Region - Lake Watt Watt (Victoria)	March 2006
H5N2	Pacific Black Duck	*A. superciliosa*	cloacal	Orange (New South Wales)	June 2006
H5N3	Australasian Shoveler	*A. rhynchotis*	cloacal	Gippsland Region - Lake Watt Watt (Victoria)	March 2006
H5N7	Red-necked Stint	*Calidris ruficollis*	cloacal	Box Beach (Victoria)	February 2007
H5N7	Mixed Pink-eared Duck/ Teal	*M. membranaceus/ Anas spp.*	faecal	Werribee Sanctuary (Victoria)	January 2007
H6Nx	Red-necked Stint	*C. ruficollis*	cloacal	Port Phillip Region (Victoria)	November 2005
H6N8	Pacific Black Duck	*A. superciliosa*	cloacal	Jerilderie (New South Wales)	May 2006
H7	Grey Teal	*A. gracilis*	cloacal	Jerilderie (New South Wales)	September 2006
H7N6	Grey Teal	*A. gracilis*	faecal	Werribee Estuary (Victoria)	November 2006
H7Nx	Mixed Teal/ Pacific Black Duck/ Australasian Shoveler	*Anas spp./ A. superciliosa/ A. rhynchotis*	faecal	Werribee Sanctuary (Victoria)	January 2007

2x H7Nx	Mixed Teal/ Pink-eared Duck/ Australasian Shoveler	*Anas spp./ M. membranaceus/ A. rhynchotis*	2x faecal	Werribee Sanctuary (Victoria)	January 2007
2x H8	Pacific Black Duck	*A. superciliosa*	2x cloacal	Orange (New South Wales)	July 2007
H8	Grey Teal	*A. gracilis*	cloacal	Orange (New South Wales)	July 2007
H8	Grey Teal	*A. gracilis*	cloacal	Inverell (New South Wales)	September 2006
H8	Grey Teal	*A. gracilis*	cloacal	Jerilderie (New South Wales)	September 2006
H8	Pacific Black Duck	*A. superciliosa*	cloacal	Jerilderie (New South Wales)	September 2006
H8	Mixed waterbird species		faecal	Bolivar Lagoon (South Australia)	January 2007
H8Nx	Mixed Teal/ Pink-eared Duck/ Australasian Shoveler	*Anas spp./ M. membranaceus/ A. rhynchotis*	faecal	Werribee Sanctuary (Victoria)	January 2007
2x H9	Pacific Black Duck	*A. superciliosa*	2x cloacal	Orange (New South Wales)	May 2007
H11	Pacific Black Duck	*A. superciliosa*	cloacal	Jerilderie (New South Wales)	July 2006
H11N9	Grey Teal	*A. gracilis*	cloacal	Waterhouse Lake (Tasmania)	March 2006
H12	Pacific Black Duck	*A. superciliosa*	cloacal	Jerilderie (New South Wales)	July 2006
H12Nx	Chestnut Teal	*A. castanea*	cloacal	Gippsland Region - Sale (Victoria)	March 2006

H12Nx	Mixed Teal/ Pacific Black Duck/ Australian Shelduck	*Anas spp./ A. superciliosa/ Tadorna tadornoides*	faecal	Werribee Sanctuary (Victoria)	March 2007
OTHER: H1 or H6 (test could not distinguish)	Mixed waterbird species		faecal	Bolivar Lagoon (South Australia)	January 2007

* Not all positive Influenza A samples could be sub typed.
a) Nx represents an unsuccessful attempt to identify the neuraminidase subtype.
b) Faecal samples from 'mixed waterbirds species' unable to be identified at a specific species level.

Table A.6.2 PCR detection of virus subtypes during Australian surveillance for avian influenza viruses in wild birds (July 2007 to June 2008)[a]

AI VIRUS SUBTYPE	COMMON NAME	SCIENTIFIC NAME	SWAB TYPE	LOCATION	SAMPLE DATE
H1	mixed teal	*Anas spp.*	environmental faecal	Hunter region, NSW	September 2007
H2 x2	mixed teal	*A. spp.*	environmental faecal	Hunter region, NSW	September 2007
H3	mixed waterbird	*Aves*	environmental faecal	Bolivar Lagoons, SA	October 2007
H3	mixed Pacific black duck/teal	*A. superciliosa*	environmental faecal	Werribee, Vic	October 2007
H3	mixed Pacific black duck	*A. superciliosa*	environmental faecal	Werribee, Vic	March 2008
H3	mixed chestnut teal	*A. castanea*	environmental faecal	Hunter region, NSW	April 2008
H3 x3	mixed teal	*A. spp.*	environmental faecal	Hunter region, NSW	Aug-Sept 2007
H3 x2	mixed duck	*Anatinae*	environmental faecal	Hunter region, NSW	September 2007
H4	mixed duck	*Anatinae*	environmental faecal	Hunter region, NSW	April 2008
H4 x2	mixed teal	*A. spp.*	environmental faecal	Hunter region, NSW	September 2007
H4	Red-necked stint	*Calidris ruficollis*	cloacal swab	Werribee, Vic	December 2007
H4	mixed Pacific black duck/teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	January 2008
H5 x3B	mixed teal/mixed duck	*A. spp./ Anatinae*	environmental faecal	Hunter region, NSW	Aug-Sept 2007
H5 x1B	magpie geese	*Anseranas semipalmata*	environmental faecal	Hunter region, NSW	September 2007
H5 x2B	mixed teal/mixed duck	*A. spp./ Anatinae*	environmental faecal	Hunter region, NSW	October 2007
H5 x6B	mixed duck	*Anatinae*	environmental faecal	Hunter region, NSW	December 2007

H5 x2B	mixed chestnut teal	*A. castanea*	environmental faecal	Hunter region, NSW	January 2008
H5 x4B	mixed duck	*Anatinae*	environmental faecal	Hunter region, NSW	February 2008
H5 x2B	mixed duck	*Anatinae*	environmental faecal	Hunter region, NSW	March 2008
H5 x1 H5N3 x1	mixed Pacific black duck	*A. superciliosa*	environmental faecal	Werribee, Vic	March 2008
H6	Plumed whistling duck	*Dendrocygna eytoni*	Tracheal swab	Billabong Sanctuary, Qld	May 2008
H8	mixed black swan	*Cygnus atratus*	environmental faecal	Werribee, Vic	October 2007
H9 x6	black swan chestnut teal 2x Eastern curlew 2x bar-tailed godwit	*C. atratus* *A. castanea* *Numenius madagascariensis* *Limosa lapponica*	environmental faecal	Hunter region, NSW	April 2008
H9 x2	mixed duck	*Anatinae*	environmental faecal	Hunter region, NSW	March 2008
H10	mixed teal	*A. spp.*	environmental faecal	Hunter region, NSW	August-2007
H11	mixed waterbirds	*Aves*	environmental faecal	Bolivar Lagoons, SA	December 2007
H11	mixed Pacific black duck	*A. superciliosa*	environmental faecal	Werribee, Vic	May 2008
H13 x2	mixed waterbirds	*Aves*	environmental faecal	Bolivar Lagoons, SA	November-2007

a) Not all positive Influenza A samples could be sub typed.
b) Attempts at pathotyping and NA subtyping at AAHL were unsuccessful

Table A.6.3 PCR detection of virus subtypes during Australian surveillance for avian influenza viruses in wild birds (July 2008 to June 2009)*

AI VIRUS SUBTYPE	COMMON NAME	SCIENTIFIC NAME	SWAB TYPE	LOCATION	SAMPLE DATE
H1	mixed Pacific Black Duck Pool	*Anas superciliosa*	environmental faecal	Shortland, NSW	August 2008
H1	Chestnut Teal	*Anas castanea*	environmental faecal	Morpeth, NSW	January 2009
H1	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	February 2009
H1	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	March 2009
H1	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	May 2009
H1	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	December 2008
H1 x 2	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	April 2009
H1	Waterfowl (mixed)	*Anseriformes*	environmental faecal	Bolivar, SA	November 2008
H1 x 2	Waterfowl (mixed)	*Anseriformes*	environmental faecal	Bolivar, SA	December 2008
H3	Pacific black duck/Anas superciliosa	*Anas superciliosa*	Cloacal swab	Connewarre State Game Reserve, Vic	March 2009
H3	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	May 2009
H3 x 2	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	August 2008
H3 x 2	Pacific black duck	*Anas superciliosa*	environmental faecal	Morpeth, NSW	June 2009
H3 x2	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	April 2009

H4	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	February 2009
H4	Chestnut Teal	*Anas castanea*	environmental faecal	Morpeth, NSW	May 2009
H4 x 2	Waterfowl (mixed)	*Anseriformes*	environmental faecal	Bolivar, SA	February 2009
H5	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	August 2008
H5	mixed Pacific Black Duck Pool	*Anas superciliosa*	environmental faecal	Shortland, NSW	August 2008
H5	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	October 2008
H5	Waterfowl (mixed)	*Anseriformes*	environmental faecal	Bolivar, SA	February 2009
H5	Red Knot	*Calidris canutus*	environmental faecal	Morpeth, NSW	October 2008
H5	Pacific black duck	*Anas superciliosa*	Cloacal swab	Herdman's Lake, WA	November 2008
H5 x 7	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	April 2009
H5 x 2	Grey Teal	*Anas gracilis*	Cloacal swab	Connewarre State Game Reserve, Vic	March 2009
H6 x 2	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	October 2008
H6 x 2	Chestnut Teal	*Anas castanea*	environmental faecal	Morpeth, NSW	November 2008
H6	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	March 2009
H7	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	December 2008

H7	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	February 2009
H7	Pacific black duck	*Anas superciliosa*	Cloacal swab	Dowds Morass (Sale), Vic	March 2009
H7 x 2	Waterfowl (mixed)	*Anseriformes*	environmental faecal	Bolivar, SA	February 2009
H8 x 4	mixed duck	*Anatinae*	environmental faecal	Morpeth, NSW	October 2008
H9	Pacific black duck	*Anas superciliosa*	Cloacal swab	Cape York, Qld	June 2009
H9	mixed Pacific Black Duck Pool	*Anas superciliosa*	environmental faecal	Shortland, NSW	August 2008
H10 x 3	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	April 2009
H11 x 3	mixed Pacific Black Duck Pool	*Anas superciliosa*	environmental faecal	Shortland, NSW	August 2008
H12	Chestnut Teal	*Anas castanea*	environmental faecal	Morpeth, NSW	May 2009
H12	mixed Black duck/Teal	*A. superciliosa/ A. spp.*	environmental faecal	Werribee, Vic	December 2008
H13	Waterfowl (mixed)	*Anseriformes*	environmental faecal	Bolivar, SA	December 2008
* Not all positive Influenza A samples could be sub-typed.					

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GLOSSARY

ANEMIS	Animal Health Emergency Information System. A system for the collection, assimilation, actioning and dissemination of essential disease control information using paper documentation and a computer database.
Animal Health Committee	A committee comprising the CVOs of Australia and New Zealand, Australian state and territory CVOs, and representatives from Biosecurity Australia, Animal Health Australia, and CSIRO. The committee provides advice to PIMC on animal health matters, focusing on technical issues and regulatory policy. See also Primary Industries Ministerial Council of Australia and New Zealand (PIMC)
Animal products	Meat, meat products and other products of animal origin (e.g. eggs, milk) for human consumption or for use in animal feedstuff.
Australian Chief Veterinary Officer	The nominated senior Australian Government veterinarian in the Department of Agriculture, Fisheries and Forestry who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. See also Chief veterinary officer.
AUSVETPLAN	Australian Veterinary Emergency Plan. A series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.
Chief veterinary officer (CVO)	The senior veterinarian of the animal health authority in each jurisdiction (national, state or territory) who has responsibility for animal disease control in that jurisdiction. See also Australian Chief Veterinary Officer.
Consultative Committee on Emergency Animal Diseases (CCEAD)	A committee of state and territory CVOs, representatives of CSIRO Livestock Industries and the relevant industries, and chaired by the Australian CVO. CCEAD convenes and consults when there is an animal disease emergency due to the introduction of an emergency animal disease of livestock, or other serious epidemic of Australian origin.

Control area	A declared area in which the conditions applying are of lesser intensity than those in a restricted area (the limits of a control area and the conditions applying to it can be varied during an outbreak according to need).
Cost-sharing arrangements	Arrangements agreed between governments (national and states/territories) and livestock industries for sharing the costs of emergency animal disease responses. See also Compensation, Emergency Animal Disease Response Agreement.
Cyanosis (adj. cyanotic)	Blueness of the skin and/or mucous membranes due to insufficient oxygenation of the blood.
Dangerous contact premises	Premises that contain dangerous contact birds or other serious contacts.
Declared area	A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. Types of declared areas include restricted area, control area, infected premises, dangerous contact premises and suspect premises.
Decontamination	Includes all stages of cleaning and disinfection.
Depopulation	The removal of a host population from a particular area to control or prevent the spread of disease. For HPAI this involves the humane slaughter and disposal of flocks on infected premises and exposed flocks on high risk dangerous contact premises.
Destroy (animals)	To slaughter animals humanely.
Disease agent	A general term for a transmissible organism or other factor that causes an infectious disease.
Disease Watch Hotline	24-hour freecall service for reporting suspected incidences of exotic diseases — 1800 675 888.
Disinfection	The application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses. The procedure applies to premises, vehicles and any objects that may have been directly or indirectly contaminated.

Disposal	Sanitary removal of animal carcases and/or animal products, materials and waste through either burial, burning or some other process so as to prevent the spread of disease.
Egg pulp	A homogenous liquid made from either whole liquid egg, egg albumen or egg yolk, pasteurised for marketing as a liquid or frozen product.
ELISA	Enzyme-linked immunosorbent assay — a serological test designed to detect and measure the presence of antibody or antigen in a sample. The test uses an enzyme reaction with a substrate to produce a colour change when antigen–antibody binding occurs.
Emergency animal disease	A disease that is (a) exotic to Australia or (b) a variant of an endemic disease or (c) a serious infectious disease of unknown or uncertain cause or (d) a severe outbreak of a known endemic disease, and which is considered to be of national significance and having serious social or trade implications. See also Endemic animal disease, Exotic animal disease.
Emergency Animal Disease Response Agreement	Agreement between the Australian and state/territory governments and livestock industries on the management of emergency animal disease responses. Provisions include funding mechanisms, the use of appropriately trained personnel and existing standards such as AUSVETPLAN.
Endemic animal disease	A disease affecting animals (which may include humans) that is known to occur in Australia. See also Emergency animal disease, Exotic animal disease.
Epidemiological investigation	An investigation to identify and qualify the risk factors associated with the disease. See also Veterinary investigation
Exotic animal disease	A disease affecting animals (which may include humans) that does not normally occur in Australia. See also Emergency animal disease, Endemic animal disease
Fomites	Inanimate objects (eg boots, clothing, equipment, instruments, vehicles, crates, packaging) that can carry an infectious disease agent and may spread the disease through mechanical transmission.

Fowl cholera	An acute septicaemia of domestic fowl and other birds caused by Pasteurella bacteria.
Fowl plague	Former term for highly pathogenic avian influenza.
Haemagglutination	Agglutination of red blood cells by a specific antibody or other substance.
Index property	The property on which the first or original case (index case) in a disease outbreak is found to have occurred.
Infected premises	A defined area (which may be all or part of a property) in which an emergency disease exists, is believed to exist, or in which the infective agent of that emergency disease exists or is believed to exist. An infected premises is subject to quarantine served by notice and to eradication or control procedures.
Integrator	An individual or party who owns poultry on two or more places and usually owns feed mills and processing plants.
Jurisdiction	Authority to legislate within a geographically defined area.
Local disease control centre (LDCC)	An emergency operations centre responsible for the command and control of field operations in a defined area.
Monitoring	Routine collection of data for assessing the health status of a population. See also Surveillance
Movement control	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
Mycoplasmosis	Infection with Mycoplasma organisms, e.g. chronic respiratory disease of fowl.
National management group (NMG)	A group established to direct and coordinate an animal disease emergency. NMGs may include the chief executive officers of the Australian Government and state or territory governments where the emergency occurs, industry representatives, the Australian CVO (and chief medical officer, if applicable) and the chairman of Animal Health Australia.
Native wildlife	See Wild animals

Newcastle disease	A highly contagious, generalised disease of domestic poultry, cage and aviary birds caused by a paramyxovirus.
OIE Terrestrial Code	OIE *Terrestrial Animal Health Code*. Reviewed annually at the OIE general session in May and published on the internet at: http://www.oie.int/eng/normes/mcode/a_summry.htm
OIE Terrestrial Manual	OIE *Manual of Standards for Diagnostic Tests and Vaccines for Terrestrial Animals*. Describes standards for laboratory diagnostic tests and the production and control of biological products (principally vaccines). The current edition is published on the internet at: http://www.oie.int/eng/normes/mmanual/a_summry.htm
Pathogenicity	The competence of an infectious agent to produce disease in the host species.
Phylogenetic	Relations among various species or populations of organisms, through molecular sequencing data
Polymerase chain reaction (PCR)	A method of amplifying and analysing DNA sequences that can be used to detect the presence of virus DNA or mRNA (using reverse transcriptase, or RT-PCR). See also Real-time PCR.
Poultry	OIE defines poultry as ‘all domesticated birds, including backyard poultry, used for the production of meat or eggs for consumption, for the production of other commercial products, for restocking supplies of game, or for breeding these categories of birds, as well as fighting cocks used for any purpose’.
Premises	A tract of land including its buildings, or a separate farm or facility that is maintained by a single set of services and personnel.
Pre-emptive slaughter	Destruction of animals at high risk of infection but in which infection has not yet been demonstrated.
Prevalence	The proportion (or percentage) of animals in a particular population affected by a particular disease (or infection or positive antibody titre) at a given point in time.

Primary Industries Ministerial Council (PIMC)	The council of Australian national, state and territory and New Zealand ministers of agriculture that develops national agricultural policy. See also Animal Health Committee
Process slaughter	Slaughter of animals for human consumption, transported under movement controls, at a processing plant.
Processing plant	An abattoir for slaughtering poultry for human consumption, with chilled and frozen storage facilities.
Quarantine	Legal restrictions imposed on a place or a tract of land by the serving of a notice limiting access or egress of specified animals, persons or things.
Real-time PCR	A more quantitative form of RT-PCR test. See also Polymerase chain reaction (PCR)
Rendering	Processing by heat to inactivate infective agents. Rendered material may be used in various products according to particular disease circumstances.
Restricted area	A relatively small declared area (compared to a control area) around an infected premises that is subject to intense surveillance and movement controls. See Appendix 1 for further details.
Sentinel animal	Animal of known health status that is monitored to detect the presence of a specific disease agent.
Seroconversion	Appearance in the blood serum of antibodies following vaccination or natural exposure to a disease agent (determined by a serology test).
Serotype	A subgroup of microorganisms identified by the antigens carried (as determined by a serology test).
Stamping out	Disease eradication strategy based on the quarantine and slaughter of all susceptible animals that are infected or exposed to the disease.
Standard operating procedures	Procedures developed to comply with all necessary guidelines and to accord with industry best practice.
State or territory disease control headquarters	The emergency operations centre that directs the disease control operations to be undertaken in that state or territory.

Surveillance	A systematic program of investigation designed to establish the presence, extent of, or absence of a disease, or of infection or contamination with the causative organism. It includes the examination of animals for clinical signs, antibodies or the causative organism.
Susceptible animals	Animals that can be infected with a particular disease (for HPAI, LPAI (H5/H7) - all avian species).
Vaccine	Modified strains of disease-causing agents that, when inoculated, stimulate an immune response and provide protection from disease.
Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A biological vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A mechanical vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. See also Epidemiological investigation.
Virulence	The capacity of an infectious agent to produce pathological changes. The relative competencies of the disease agent to produce disease are described as highly, mildly or lowly virulent. Agents that do not produce any disease symptoms are described as nonvirulent or avirulent (see also Pathogenicity).
Whole of government	Whole of government approaches involve public service agencies working across portfolio boundaries to achieve a shared goal and an integrated government response to particular issues.
Zoning	The process of defining disease-free and infected areas in accord with OIE guidelines, based on geopolitical boundaries and surveillance, in order to facilitate trade.
Zoonosis	A disease agent of animals that can be transmitted to humans.

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