Animal Health in Australia 1999
## Contents

**Foreword** 7

1 Organisation of animal health systems in Australia 8

- **Introduction** 8

  - Commonwealth veterinary services 9
    - National Offices 9
    - Australian Quarantine and Inspection Service 10
    - Commonwealth Scientific and Industrial Research Organisation 10

  - State and Territory veterinary services 10

- **Animal Health Laboratory Network** 11
  - Current animal health laboratory network 11
  - Standards and accreditation 12
  - Quality assurance 12

- **Animal Health Australia** 12
  - Special programs 13

- **Organisation of aquatic animal health in Australia** 13

- **Development of a national animal welfare strategy** 14
  - Animal Welfare Committee 14
  - The National Consultative Committee on Animal Welfare 14
  - Developing a national strategy 15

- **Management of agricultural and veterinary chemicals** 15

2 Livestock industries in Australia 16

- **Introduction** 16

  - Beef cattle 16
  - Sheep 18
  - Dairy cattle 18
  - Pigs 19
  - Poultry 19
  - Fisheries and aquaculture 20
  - Other livestock industries 21
3 Disease status, surveillance and control — livestock

Introduction

Significant diseases listed by OIE

National Animal Health Information System

Disease surveillance programs
  Northern Australia Quarantine Strategy
  Tuberculosis Freedom Assurance Program
  National Arbovirus Monitoring Program
  National Transmissible Spongiform Encephalopathy Surveillance Program
  National Residue Survey
  National Salmonella Surveillance Scheme
  National Notifiable Diseases Surveillance System
  National sentinel hives
  Bovine brucellosis surveillance

Disease accreditation and control programs
  Johne’s disease
  Anthrax
  Enzootic bovine leucosis
  Cattle tick
  Ovine footrot
  Ovine brucellosis
  Equine herpesvirus
  American foulbrood
  Bat viruses (Hendra virus, Australian bat lyssavirus, Menangle virus)
  Mastitis in dairy cattle

4 Disease status, surveillance and control — fisheries and aquaculture

Aquatic animal health status

OIE diseases

Other significant diseases

Disease events in 1999
  Pilchards
  Black striped mussels
  Glugea stephani in farmed flounder
  Ganglioneuritis in farmed prawns

National strategic plan for aquatic animal health

5 Other significant issues in 1999

Newcastle disease outbreaks
  Mangrove Mountain outbreak
  Western Sydney outbreak
  Reviews of activities
  Epidemiology
  Current government–industry agreements on eradication of virulent Newcastle disease
  Conclusion
### Nipah virus: a new threat to regional animal health stability

- Nipah virus disease in people
- Nipah virus infections in pigs
- Nipah virus in other domestic species
- Epidemiology
- The source of Nipah virus
- Surveillance and control
- Economic impact
- Issues for trade and animal movements
- Summary

#### National Livestock Identification Scheme

- Quarantine requirements for horses entering Australia for competition or racing purposes

#### Northern Cattle Export Enhancement Project

- Project outputs

#### Regional projects

- The Australian government overseas aid program
- Agricultural research in the aid program

---

## Consumer protection

### Introduction

### International standards

### Meat

- Domestic meat inspection
- Export meat inspection
- Meat hygiene controls
- Microbial monitoring
- Meat Safety Enhancement Program
- Meat inspection technical reform
- Electronic documentation
- Cattlecare and Flockcare
- Management of pathogenic *Escherichia coli*

### International requirements for BSE and scrapie

### Chemical residues

- Australian National Residue Survey
- Joint Expert Technical Advisory Committee on Antibiotic Resistance
- Meat safety and hygiene

### Microbial food safety

- National Safe Food Working Group
- Food Regulation Review

### Processed foods

- Processed food exports
- Quality assurance programs
- Food imports
7 Imports and exports

<table>
<thead>
<tr>
<th>Imports</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislative framework for imports</td>
<td>80</td>
</tr>
<tr>
<td>Quarantine policy</td>
<td>80</td>
</tr>
<tr>
<td>Quarantine stations</td>
<td>80</td>
</tr>
<tr>
<td>Biologicals</td>
<td>81</td>
</tr>
<tr>
<td>Quarantine response to the East Timor crisis</td>
<td>82</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exports</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislative framework for animal exports</td>
<td>84</td>
</tr>
<tr>
<td>Export policy for live animals and reproductive material</td>
<td>84</td>
</tr>
<tr>
<td>Market access</td>
<td>85</td>
</tr>
</tbody>
</table>

8 Managing animal health emergencies

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Animal Disease Preparedness Program</td>
<td>86</td>
</tr>
<tr>
<td>AUSVETPLAN</td>
<td>86</td>
</tr>
<tr>
<td>Specific preparedness programs</td>
<td>86</td>
</tr>
<tr>
<td>Exotic disease awareness</td>
<td>87</td>
</tr>
<tr>
<td>National Emergency Animal Disease Training Program</td>
<td>89</td>
</tr>
<tr>
<td>Emergency animal disease information system</td>
<td>90</td>
</tr>
<tr>
<td>Funding of animal health emergencies</td>
<td>90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency animal disease responses</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newcastle disease</td>
<td>91</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>91</td>
</tr>
<tr>
<td>Infectious bursal disease</td>
<td>91</td>
</tr>
<tr>
<td>Asian honeybee (<em>Apis cerana</em>)</td>
<td>91</td>
</tr>
</tbody>
</table>

Appendixes

<table>
<thead>
<tr>
<th>Appendix 1 Animal health contacts in Australia</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commonwealth</td>
<td>92</td>
</tr>
<tr>
<td>State and Territory</td>
<td>92</td>
</tr>
<tr>
<td>Animal Health Australia</td>
<td>93</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 2 Investigations of suspected exotic and other emergency diseases in 1999</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acronyms and abbreviations</td>
<td>98</td>
</tr>
</tbody>
</table>
Figures

Figure 1  Organisation of animal health in Australia  
Figure 2  Committee involvement in aquatic animal health  
Figure 3  Cattle distribution in Australia, 1997  
Figure 4  Sheep distribution in Australia, 1997  
Figure 5  Areas of Northern Australia Quarantine Strategy activity  
Figure 6  Arbovirus vector monitoring sites in Australia, 1998–99  
Figure 7  Limits of bluetongue virus, 1998–99  
Figure 8  Limits of Akabane virus, 1998–99  
Figure 9  Limits of bovine ephemeral fever, 1998–99  
Figure 10  Bovine Johne’s disease zones in Australia, 31 December 1999  
Figure 11  Ovine Johne’s disease zones in Australia, 31 December 1999  
Figure 12  Area of Australia where anthrax is known to occur on a sporadic basis  
Figure 13  Distribution of the cattle tick Boophilus microplus in Australia, 1999  
Figure 14  Location of Mangrove Mountain Newcastle disease outbreak  
Figure 15  Linkages among various computer systems to track movements and processes for individual cattle from birth  
Figure 16  Data flows and processing in the arbovirus risk forecasting system  
Figure 17  AQIS meat rejection rates (per cent), 1992–99

Tables

Table 1  Number of veterinarians and other animal health personnel, 1999  
Table 2  Trends in livestock numbers, 1996–2000  
Table 3  Cattle production statistics, 1998–2000  
Table 4  Sheep production statistics, 1998–2000  
Table 5  Dairy production statistics, 1998–2000  
Table 6  Pig production statistics, 1998–2000  
Table 7  Poultry production statistics, 1998–2000  
Table 8  Fisheries production statistics (wild-caught fish), 1998–2000  
Table 9  Production and gross value of Australian aquaculture, 1997–98  
Table 10  OIE List A diseases that do not occur in Australia  
Table 11  OIE List B diseases that do not occur in Australia  
Table 12  OIE List C diseases that do not occur in Australia  
Table 13  Target endemic and exotic diseases and sources of information for the National Animal Health Information System  
Table 14  Summary of testing undertaken in the Northern Australia Quarantine Strategy Program, 1999  
Table 15  National Arbovirus Monitoring Program: numbers of sites and collections, 1998–99  
Table 16  National Transmissible Spongiform Encephalopathy Surveillance Program: summary of results, 1999  
Table 17  Number of serological tests for Brucella abortus in cattle in Australia, 1995–99  
Table 18  Enrolment in market assurance programs for Johne’s disease at the end of 1999  
Table 19  Australian bat lyssavirus surveillance of opportunistically sampled bats by year, 1996–1999  
Table 20  Status of OIE-listed diseases of aquatic animals in Australia, 1999  
Table 21  Occurrence of OIE-listed diseases of aquatic animals in Australia  
Table 22  Status of non-OIE listed diseases of aquatic animals in Australia, 1999  
Table 23  Research projects related to animal health — Animal Sciences Program, Australian Centre for International Agricultural Research  
Table 24  Research projects related to animal health — Fisheries Program, Australian Centre for International Agricultural Research  
Table 25  Meat production in Australia, 1998–2000
Government services, industry and scientific groups continue to work closely together to ensure that Australia maintains the highest standards of animal health. This partnership approach ensures that national systems of animal health management meet the requirements of Australia’s primary producers and of both domestic and overseas customers.

In 1999, Australia continued to deal with occurrences of virulent Newcastle disease in New South Wales, first detected in western Sydney in September 1998. There was a major outbreak in the Mangrove Mountain area north of Sydney, where approximately 2 million birds were destroyed. This was the largest animal health emergency ever recorded in Australia. The direct cost to the Commonwealth and State governments in sharing the burden of operational and compensation costs to New South Wales was estimated at approximately $A26 million. Industry experienced similar financial losses. Efforts are continuing to improve our understanding of the scientific and epidemiological aspects of this disease.

Australia has continued to allocate resources to the development of aquatic animal health through the implementation of the National Strategic Plan for Aquatic Animal Health (AQUAPLAN). This reflects the importance of aquaculture, which is considered to be one of our fastest growing industries.
The continuing emphasis on food was reflected in a number of initiatives, including a review of the impact of antibiotic resistance. Australian governments and industries are working together to implement quality assurance measures in line with contemporary approaches to risk assessment and management. There is commitment to a whole-of-food-chain approach.

Australia continued to place strong emphasis on emergency management with further development of the Australian Veterinary Emergency Plan (AUSVETPLAN) and associated aspects such as competency standards for training. Australia assisted Malaysia in dealing with the outbreak of Nipah virus disease in pigs and humans. The CSIRO Australian Animal Health Laboratory at Geelong was able to accept samples and undertake important pathogenicity and other studies using the live virus to assist Malaysia in responding to the public health crisis. An Australian specialist was a key presenter at the World Organisation for Animal Health (or Organisation Internationale des Epizooties; OIE) Regional Workshop on managing animal health emergencies held in Taipei, in conjunction with the OIE Regional Conference.

Nationally, other major work activities included policy development and technical issues for control of paratuberculosis (Johne’s disease) and consideration of a number of animal welfare issues, including the development of a national strategy.

Australia continued to contribute strongly and assist international organisations such as the OIE and the Food and Agriculture Organization of the United Nations (FAO). During 1999, Australia led an external review team to evaluate progress of the OIE foot-and-mouth disease campaign in Southeast Asia. A major food conference on important issues affecting international food trade beyond 2000 was convened in Melbourne during October 1999, organised by the FAO in cooperation with the World Health Organization and the World Trade Organization. Australia was also asked to host the Sixth World Congress on Meat and Poultry Inspection.

I commend this report as a valuable information source on Australia’s animal health system. Further information can be obtained from the Animal Health Australia website (www.aahc.com.au). Other websites are included throughout the report at which more information on various topics is available.

Gardner Murray
Managing Director National Offices/Chief Veterinary Officer
Introduction

Australia is a federation of States and Territories governed by a Commonwealth Government, six State governments and two Territory governments. The Australian Constitution sets out the powers of the Commonwealth Government. The State and Territory governments have exclusive authority in areas that do not come within the authority of the Commonwealth Government.

Government-run veterinary services in Australia involve officers from the Commonwealth Government, State and Territory governments, and local government. A system of consultative committees ensures that these three levels of government work together to serve the overall interest of Australia (see Figure 1). In addition, the interests of government and industry are served through Animal Health Australia, a public company established to advance Australia’s economic and trade interests by providing leadership in facilitating a national approach to animal health services and standards. Members of the company include the Commonwealth, State and Territory ministers for agriculture, presidents of the peak national councils of Australia’s livestock industries and various key research, veterinary and educational organisations.

The Commonwealth 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 disease control programs.

Australian State and Territory governments are responsible for disease control and eradication within their own boundaries. Each State and Territory is subdivided into veterinary regions or divisions that

**Figure 1 Organisation of animal health in Australia**

- Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)
  - Commonwealth Minister for Agriculture, Fisheries and Forestry
  - Standing Committee on Agriculture and Resource Management (SCARM)
- Animal Health Australia
  - State and Territory ministers for agriculture or primary industries
  - Peak livestock industry councils
  - Veterinary Committee
  - Consultative Committee on Emergency Animal Diseases (CCEAD)
  - Animal Welfare Committee
  - Animal Industries Public Health Committee
  - Specialist subcommittees and working parties (eg Subcommittee on Animal Health Laboratory Standards)
are under the control of a government veterinary officer. Each region or division is further subdivided into animal health districts, which are administered by inspectors who may be veterinarians or qualified animal technicians. The numbers and categories of veterinarians and other animal health staff in Australia are shown in Table 1.

The Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) is the forum for developing agricultural policies that are consistent with the objectives of the Commonwealth Government and the State/Territory governments of Australia, and the New Zealand Government. ARMCANZ membership consists of the Australian Commonwealth and State/Territory ministers, and the New Zealand minister responsible for agriculture. Further information, including publications, is available at the ARMCANZ website.1

A permanent committee, the Standing Committee on Agriculture and Resource Management (SCARM), provides support to ARMCANZ. It includes the heads the Commonwealth Department of Agriculture, Fisheries and Forestry (known as Agriculture, Fisheries and Forestry — Australia, or AFFA), the State and Territory departments of agriculture, and representatives of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Commonwealth departments of finance and of foreign affairs and trade, and the New Zealand Government.

Several committees advise SCARM on specialist issues and in turn have their own infrastructure of subcommittees, working parties and expert panels that focus on particular areas within each committee's terms of reference. The Veterinary Committee (formerly the Animal Health Committee) provides advice on animal health matters, but focuses on the technical and regulatory aspects. The members of the Veterinary Committee are Commonwealth, State and Territory chief veterinary officers, a CSIRO representative and the Chief Veterinary Officer of New Zealand. The Veterinary Committee may use specialist task forces to advise it on technical issues and regulatory standards pertaining to national disease control programs, veterinary public health and animal health laboratory matters. It also provides technical support to Animal Health Australia, ARMCANZ, SCARM, committees and other agencies dealing with chemical residues, animal identification, animal welfare and other animal health-related matters.

The multidisciplinary Animal Industries Public Health Committee and the Animal Welfare Committee have also been established. ARMCANZ, SCARM and its subsidiary bodies shape the overall policies for veterinary services in Australia. This framework ensures that veterinary services coordinate their priorities so that Australia is served efficiently and effectively.

### Commonwealth veterinary services

The animal health role of the Commonwealth Government is delivered through the National Offices of Animal and Plant Health and Food Safety (the National Offices) and the Australian Quarantine and Inspection Service (AQIS), which are both located within AFFA. Diagnostic services, exotic and emergency disease support, and independent scientific advice are provided by CSIRO.

The Commonwealth Government is the largest single employer of veterinarians in Australia because of the large number employed in the meat inspection service. It is therefore able to provide an important reserve force to the States and Territories in the event of any major exotic animal disease incursion.

### National Offices

The National Offices provide a coordinated national approach to issues related to animal health and welfare, plant health and protection, and residues and food safety that affect Australian agriculture, fisheries and forestry.

---

The Australian Chief Veterinary Officer is Managing Director of the National Offices. He is Australia’s principal representative on animal health matters nationally and internationally, including its permanent representative to the World Organisation of Animal Health (Organisation International des Epizooties, or OIE). The Office of the Chief Veterinary Officer provides an international reference point on animal health and manages Australia’s commitments to OIE and other international agencies dealing with animal health.

Further information on the Office of the Chief Veterinary Officer is available at the website of the National Offices.2

Australian Quarantine and Inspection Service

AQIS is responsible for export health certification and regulation of the importation of animals and plants, their genetic material and their products. The veterinary functions of AQIS include responsibility for:

- veterinary public health inspection of meat through a national inspection service;
- animal quarantine involving imports of live animals and animal products; and
- health certification of exports of live animals and animal reproductive material.

Although the Commonwealth Government has responsibility for formulating policy and ultimate responsibility for quarantine under the Australian Constitution, the States and Territories may act as operational field agents of the Commonwealth to assist the delivery of quarantine and export certification services. Under the provisions of the Accreditation Program for Australian Veterinarians, AQIS-accredited veterinarians also play an important role in delivery of export certification services. Further information is available at the AQIS website.3

Commonwealth Scientific and Industrial Research Organisation

CSIRO undertakes animal health research and operates the Australian Animal Health Laboratory (AAHL) at Geelong. This is a national facility for disease diagnosis and research and also carries out training, develops and tests vaccines, maintains the National Animal Serum Bank (used for retrospective studies on diseases) and acts as a regional reference laboratory. It is Australia’s exotic animal disease diagnostic facility and a designated OIE reference laboratory for bluetongue, Newcastle disease, and epizootic haematopoietic necrosis. The laboratory also has considerable expertise on endemic diseases, plant toxins and food pathogens. Further information on CSIRO and AAHL is available at the CSIRO website.4

State and Territory veterinary services

Under the Australian Constitution, State/ Territory governments have legislative responsibility for animal health services within their respective borders. State/ Territory animal health services administer relevant acts and regulations involved with livestock identification and movement (within and between States and Territories), disease surveillance, diagnosis, reporting (notifiable diseases) and control, chemical residue and other programs. This requires the maintenance of close links with livestock producers, private veterinarians and others associated with livestock industries.

3 www.aqis.gov.au
4 www.ah.csiro.au
An animal health administrative unit headed by a veterinarian designated as the chief veterinary officer carries out these tasks. Veterinary officers located in regions supervise inspectors and administer the application of relevant State and Territory acts and regulations. They also maintain records of the animal health status of farms in their region that assist in the reliable certification of animals moving within Australia and overseas.

The States and Territories also have government animal health laboratories that as well as providing a disease diagnosis and investigation service may undertake applied research.

Animal Health Laboratory Network

Australia’s animal health laboratory network facilitates international and domestic trade in livestock commodities and contributes to the health and productivity of Australia’s livestock industries.

The Sub-Committee on Animal Health Laboratory Standards undertakes national coordination of Australian animal health laboratories, on behalf of Veterinary Committee and SCARM. Membership includes the heads of State/Territory laboratories plus representatives of AAHL, Office of the Chief Veterinary Officer and Ministry of Agriculture and Fisheries New Zealand. It has secretariat support from the Office of the Chief Veterinary Officer and is chaired by a member of the Veterinary Committee.

Improvement of laboratory performance is continuously addressed through the use of standardised techniques, quality assurance, accreditation, proficiency testing and research.

- Standardised techniques are achieved by developing Australian standard diagnostic techniques for important diseases that comply with international standards where these are available.
- Proficiency testing is performed under the Australian National Quality Assurance Program.
- Quality assurance and accreditation is undertaken by the National Association of Testing Authorities.
- Quality assurance and accreditation is based on International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Guide 25 standards.\(^5\)
- Research, development, approval and implementation provide new diagnostic tests for important animal diseases.


Current animal health laboratory network

There are 15 government animal health laboratories within the national veterinary laboratory framework, six being central State government laboratories, eight regional laboratories (including Mount Pleasant, Tasmania) and AAHL. In one State, a private laboratory has been contracted to do diagnostic and investigative work for the government in addition to work done by the government veterinary laboratory. In another State, a private veterinary laboratory has been contracted to manage and operate the government laboratory. Each of the State laboratories and AAHL deliver a range of services.

AAHL undertakes diagnosis and research for exotic animal diseases and provides training to the Australian animal health services (field and laboratory staff) on exotic diseases. It has reference laboratory status for bluetongue, brucellosis, avian influenza, Newcastle disease, rabies and epizootic haemorrhagic necrosis, and provides a service to other countries in the region such as during the Nipah virus outbreak in Malaysia. With the transfer of the CSIRO Animal Health Division to AAHL, an endemic disease component is now also located there.

State/Territory veterinary laboratories provide a wide range of diagnostic services in addition to undertaking research. National reference laboratories have been formalised for Johne’s disease (Victorian Institute of Animal Science), anthrax (Elizabeth McArthur Agricultural Institute, New South Wales) and tuberculosis (Animal Health Laboratories, Western Australia). In addition, some laboratories provide an informal national service for specific pathogens because of their particular expertise. For example, the Animal Research Institute, Queensland is recognised for its expertise in respiratory pathogens of intensively managed livestock while the Elizabeth Macarthur Agricultural Institute has particular expertise in pestiviruses.

In addition to government animal health laboratories, there are veterinary diagnostic laboratories associated with each of Australia’s four veterinary schools plus 10 private veterinary laboratories located in five different States that employ approximately 30 veterinary pathologists and 150 other staff. Although private veterinary laboratories provide services mainly to companion animal industries, they are also providing an increasingly wider range of services to livestock industries. There are also a number of specialist laboratories providing services to livestock industries in the areas of residue and microbiological testing of meat and other products.
Standards and accreditation

The OIE is developing standards to improve the quality of animal health laboratory results and is considering a paper from the International Atomic Energy Authority that will involve the implementation of ISO 9000 standards together with ISO/IEC Guide 25 which includes a proficiency testing component. The Australian Chief Veterinary Officer has agreed that Australia will respond to the OIE proposal for laboratory standards and the Veterinary Committee has agreed that government animal health laboratories will achieve a combination of certification and accreditation to the ISO/IEC Guide 25 standards.

The National Association of Testing Authorities has a memorandum of understanding with government to undertake accreditation for trade purposes and is the accreditation authority. Many government and private laboratories have been accredited by this organisation and others are in the process of obtaining accreditation.

Australian standard diagnostic techniques for animal health laboratory testing were initially published in 1993. Standardised procedures for new tests have been added as necessary and existing standards revised as appropriate. In 1999, it was decided to review all the test procedures and publish a new set of Australian and New Zealand diagnostic protocols. To date, the protocols for equine viral arteritis, Q fever and the transmissible spongiform encephalopathies have been revised and will be published on the Animal Health Australia’s website when they are completed.

Quality assurance

The Australian National Quality Assurance Program facilitates interlaboratory proficiency testing in 19 government and private veterinary laboratories in Australia and New Zealand. This program was instigated by the Animal Health Committee, and is coordinated at the Victorian Institute of Animal Science. It focuses on assays used in quarantine, export certification and national disease control programs.

Quality assurance procedures are complementary to the use of Australian standard diagnostic techniques and to external accreditation with ISO/IEC Guide 25 and ISO 9002, which require laboratories to provide evidence of participation in external quality audits.

The Australian National Quality Assurance Program was established in 1991 and is considered to be the most comprehensive veterinary quality assurance program in the world. Other veterinary quality assurance programs generally cater for a small number of local laboratories and are usually disease specific. At recent international conferences, the Australian National Quality Assurance Program was recognised as the most advanced veterinary serological proficiency-testing program available for Johne’s disease and leptospirosis microagglutination testing.

In 1999, the testing and assessment of 291 tests in 40 assays were carried out under the program, including bacteriological quality assurance testing for footrot gelation gel for *Dichelobacter nodosus*, and culture and identification of *Mycobacterium bovis* and *Mycobacterium paratuberculosis*. Of the laboratory results in 1999, 99% were classified as acceptable or demonstrated minor variation on original testing or retesting. Some retests and re-endorsements are currently in progress.

Animal Health Australia

Animal Health Australia is a unique organisation that brings industry and government closer together in policy development and funding of animal health services. It is a nonprofit public company limited by guarantee and incorporated under Australian Corporations Law in January 1996. Its members or shareholders are the Commonwealth, State and Territory ministers responsible for agriculture, as well as the presidents of the national livestock industry councils (cattle, wool, dairy, sheep meat, pork, chicken meat, eggs, goat, honeybee and horse), the Australian Veterinary Association, CSIRO and deans of Australian veterinary faculties. Its board of seven directors (including the chairman) is not a representative board, but the members are selected and appointed for their skills. Animal Health Australia’s memorandum and articles of association determine the objectives and operations of the company. Its principal objectives are to:

- assist the Australian animal health service to maintain acceptable national animal health standards that meet consumer needs and market requirements at home and overseas; and
• aid improvement in the quality of animal health infrastructure and services in Australia by:
  – providing strategic leadership in the identification of national priorities and the development of national policy for Australia’s animal health system;
  – facilitating the resourcing and performance of the national animal health system to meet market and commercial requirements; and
  – promoting international confidence in the capability of Australian animal health services.
Animal Health Australia works to a three-year strategic plan and an annual operational plan. Its operations are funded by contributions from members in one-third shares from the Commonwealth Government, State and Territory governments, and the livestock industry, respectively. As well as administration and policy development, national programs that benefit all members are managed including:
• the National Animal Health Information System, which gathers information on Australia’s animal health status; and
• the Emergency Animal Disease Preparedness Program, which assists national preparedness to deal with animal disease emergencies.
Animal Health Australia may take responsibility for financial and strategic management of other programs at the request of a subset of government and industry members. This may involve the adoption of an existing program or the creation of a new one. Each program and the additional funding required is individually negotiated but with the expectation that there will be joint contributions from government and industry.
To facilitate industry funding, the Commonwealth Government has legislated to enable the collection of industry-wide levies to support Animal Health Australia.

Special programs
Currently, the following special programs are managed for subsets of members:
• National Johne’s Disease Control Program;
• National Ovine Johne’s Disease Control and Evaluation Program;
• a major evaluation of options for the control of bovine Johne’s disease;
• National Arbovirus Monitoring Program;
• Tuberculosis Freedom Assurance Program;
• Accreditation Program for Australian Veterinarians; and
• Transmissible Spongiform Encephalopathy Surveillance Program.

Organisation of aquatic animal health in Australia
The development and management of aquatic animal health policies in Australia involves several committees including ARMCANZ, SCARM and the Veterinary Committee (Figure 2). However the Ministerial Council of Forestry, Fisheries and Aquaculture and its technical/advisory committees have prime carriage for the majority of issues of aquatic animal health management.
The Ministerial Council of Forestry, Fisheries and Aquaculture is the forum for the development of policies which are consistent with both the objectives of the Commonwealth Government and State/Territory governments and, where relevant, the New Zealand Government. Where appropriate, the council provides a means to achieve integrated action by governments on forest, fisheries and aquaculture issues. The council is consultative only, with final decisions remaining with member governments.
A permanent, technical committee, the Standing Committee on Fisheries and Aquaculture, meets independently of the Ministerial Council of Forestry, Fisheries and Aquaculture and provides ongoing support on the management of fisheries and aquaculture in Australia. The members are the heads of the State/Territory agencies responsible for fisheries, the Director-General of the Ministry of Agriculture and Fisheries, New Zealand and Commonwealth government representatives from CSIRO, AFFA and the Australian Fisheries Management Authority.

Information on Animal Health Australia operational and strategic priority issues is available at the Animal Health Australia website.

Animal Health Australia website: www.aahc.com.au
The Standing Committee on Fisheries and Aquaculture is advised by five subsidiary committees, two of which are involved in aquatic animal health issues: the Aquaculture Committee and the Environment and Health Committee. The Aquaculture Committee provides advice on aquaculture issues of regional and national significance, and facilitates the development of the sector. The members are State, Territory and Commonwealth aquaculture managers.

The Environment and Health Committee advises on current and emerging national issues relating to the aquatic environment, the protection of fisheries ecosystems and fish health. The members are senior representatives of State/Territory and Commonwealth fisheries environmental agencies.

The Fish Health Management Committee is responsible for the National Strategic Plan for Aquatic Animal Health (AQUAPLAN). It reports directly to the Standing Committee on Fisheries and Aquaculture. The members are the Commonwealth Chief Veterinary Officer, Commonwealth Director of Fisheries and Aquaculture, one representative each from SCARM and the Standing Committee on Fisheries and Aquaculture, CSIRO Animal Health and representatives from peak aquaculture and fisheries industry bodies. The Fish Health Management Committee was established in 1997, and will continue to operate during the first five-year planning phase for AQUAPLAN.

Development of a national animal welfare strategy

Governments, industry and community groups in Australia are jointly developing a national strategy for animal welfare. This strategy will provide an important basis for improved national approaches and help in formulating international animal welfare standards. The strategy will recognise the fundamental point that animal welfare concerns the humane use and care of animals and is of fundamental concern to all members of the community. Animal welfare is a significant issue for the veterinary profession, as the community expects veterinarians to fill a special role in alleviating animal suffering and pain.

Many varied community expectations and concerns within Australia influence the development of animal welfare standards. Each State and Territory has a bureau or office to deal with animal welfare issues. Established processes provide well-defined roles for national bodies such as the Animal Welfare Committee (of SCARM) and the National Consultative Committee for Animal Welfare.

Animal Welfare Committee

The Animal Welfare Committee focuses on livestock industries. The members are representatives of the relevant State/Territory government agencies. A major function of the committee is the development of model codes of practice for the welfare of animals. These codes provide a national approach to animal welfare standards that are increasingly referred to in quality assurance systems. The codes are available on the internet.9

9 www.affa.gov.au/armcanz
The Australian Code of Practice for the Care and Use of Animals for Scientific Purposes was developed by the National Health and Medical Research Council. It has been incorporated into legislation in most States and Territories to create an effective system of self-regulation. This code has been in operation for some 15 years, is characterised by a high level of compliance and helped establish Australia as a world leader in developing and ensuring welfare standards for animals used in teaching and science.

**National Consultative Committee on Animal Welfare**

The National Consultative Committee on Animal Welfare is a non-statutory body established in 1989 to advise the Commonwealth minister responsible for animal welfare on the national implications of animal welfare issues. The Committee’s terms of reference are sufficiently broad that it can address any animal welfare issue. The members include nominees from the National Farmers’ Federation, Australian Veterinary Association, National Health and Medical Research Council, Royal Society for the Prevention of Cruelty to Animals, Animals Australia, Environment Australia, each State and Territory, and AFFA.

**Developing a national strategy**

Australia has quite comprehensive and up-to-date animal welfare legislation and standards. It also has good mechanisms to involve industry, animal welfare bodies and governments in improving legislation and standards. However, Australia has not yet done well in communicating these facts domestically and overseas. Internationally, animal welfare is becoming an important market access issue. Along with quality, price and safety, it is fast becoming a determinant of competitiveness in world markets for animals and animal products.

The development of a national animal welfare strategy will incorporate issues relating to market access and trade. It will also:

- be evidence-based and founded on sound science;
- enable international benchmarking of animal welfare outcomes; and
- improve communication on Australian animal welfare initiatives and policies.

Anticipated benefits of a national strategy include:

- more efficient and effective use of resources;
- greater communication, awareness and ownership; and
- input to developing international standards;
- integration of animal welfare standards and industry quality assurance initiatives; and
- prevention of any discrimination against Australian products.

The National Office of Animal and Plant Health is coordinating the development of the national strategy for animal welfare. There will be extensive consultation with community groups, industry and a wide range of government bodies. The aim is to submit a strategic plan for endorsement by ministers at the August 2000 meeting of ARMCANZ.

**Management of agricultural and veterinary chemicals**

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) assesses and registers agricultural and veterinary chemicals. For this task, the NRA receives input from the States, Territories, and three other Commonwealth agencies — the Chemicals and Non-Prescription Drug Branch of the Therapeutic Goods Administration of the Department of Health and Aged Care; the Chemicals and the Environment Branch of Environment Australia; and the Agricultural and Veterinary Chemicals Section within the National Occupation and Health Safety Commission.

The States and Territories have responsibility for regulation of control of use, including surveillance, and managing and investigating field compliance. In addition, AQIS must approve any substance of biological origin entering Australia, the Genetic Manipulation Advisory Committee must approve any substance derived from or containing genetically manipulated organisms, and the Working Party on Antibiotics of the Department of Health and Aged Care must assess all new antimicrobials.

Summaries are prepared for public comment before release of new chemicals intended for use in or on food and/or fibre plants or animals. A trial permit from the NRA is needed to test a chemical on plants or animals that are destined for human consumption.

The Agricultural and Veterinary Chemicals Code Act 1994 includes provisions to enable licensing of manufacturers to enhance the existing voluntary Code of Good Manufacturing Practice for Veterinary Preparations and for a reporting scheme for suspected adverse chemical reactions.

Further information on the NRA is available at their website.10

10 www.affa.gov.au/nra
Introduction

Australia is a significant livestock producer and a major exporter of livestock, livestock products, and livestock genetic material. In 1998–99, the gross value of Australian livestock and livestock products was $12.3 billion, with exports worth $10.5 billion. Fisheries products were worth an additional $1.5 billion.

Animal production in Australia is largely based on extensive grazing and is dominated by wool, sheepmeat, beef and dairy production (Table 2). Australia also has smaller intensive pig and poultry industries. The livestock industries extend from the beef cattle areas of tropical north Queensland to the sheep areas of southern Tasmania, and from the dairying areas of coastal New South Wales to the merino wool producing areas of Western Australia.

Table 2 Trends in livestock numbers, 1996–2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>96</td>
<td>97</td>
<td>98</td>
<td>99</td>
<td>2000</td>
</tr>
<tr>
<td>Sheep (millions)</td>
<td>120.2</td>
<td>117.5</td>
<td>115.8</td>
<td>114.3</td>
<td></td>
</tr>
<tr>
<td>Cattle (millions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26.78</td>
<td>26.83</td>
<td>25.83</td>
<td>25.3</td>
<td></td>
</tr>
<tr>
<td>Beef</td>
<td>23.82</td>
<td>23.75</td>
<td>22.67</td>
<td>22.05</td>
<td></td>
</tr>
<tr>
<td>Dairy</td>
<td>2.96</td>
<td>3.08</td>
<td>3.16</td>
<td>3.25</td>
<td></td>
</tr>
<tr>
<td>Pigs (millions)</td>
<td>2.56</td>
<td>2.77</td>
<td>2.60</td>
<td>2.60</td>
<td></td>
</tr>
</tbody>
</table>

a Preliminary results


Beef cattle

Cattle are raised over much of Australia (Figure 3). There are two main production systems. Across northern Australia, cattle are produced on large extensive cattle holdings, grazing native pastures at low stocking rates. Tropical breeds, which are better adapted to the harsh conditions in the north, dominate. The main outputs are manufacturing beef, and animals for lot-feeding and live cattle exports. In southern Australia, cattle are produced on smaller holdings, grazing largely on improved pastures. Temperate breeds, either British or Continental-derived, dominate. Smaller and younger animals are produced, largely for the Australian domestic market.

Queensland has the most cattle (43%), followed by New South Wales (26%) and Victoria (11%). Cattle are bred and produced in a range of farm enterprises, from specialist beef producers, to mixed farm operations that may include sheep and/or cropping. Specialist beef enterprises range from an average of 250 hectares in Victoria, to more than 1 200 000 hectares in the Northern Territory. Pasture feeding is the major method of beef production, but the use of feedlots to finish cattle for specific markets has been a significant development, with feedlot capacity doubling over the past five years. Most of the feedlots are located in the wheat–sheep zone of New South Wales and southern Queensland.

The growth of the live cattle export trade in recent years has been another important feature of the Australian beef industry, providing an alternative to slaughter for producers in northern Australia. Most of the cattle exported go to feedlots in Southeast Asian countries. The setbacks suffered by the economies of a number of Australia’s live cattle markets led to a significant reduction in live cattle exports in 1997–98 compared to previous years. Live cattle exports are forecast to recover as demand continues to improve in Southeast Asia, North Africa and the Middle East.
Cattle producing regions experienced good pastoral conditions this year. Improved saleyard prices, together with the good pastoral conditions have contributed to the rebuilding of herds in 1998–99. Overall, Australian cattle slaughter in 1999–2000 is forecast to fall by 5.4% as producers retain greater numbers of female cattle (Table 3).

**Table 3 Cattle production statistics, 1998–2000**

<table>
<thead>
<tr>
<th>Cattle production</th>
<th>1998–99</th>
<th>1999–2000&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cattle (millions)</td>
<td>25.83</td>
<td>25.30</td>
</tr>
<tr>
<td>Slaughterings (‘000)</td>
<td>9100</td>
<td>8608</td>
</tr>
<tr>
<td>Production (kilotonnes)</td>
<td>2011</td>
<td>1944</td>
</tr>
<tr>
<td>Exports (kilotonnes)</td>
<td>883</td>
<td>836</td>
</tr>
<tr>
<td>Export value ($million)</td>
<td>2863</td>
<td>2928</td>
</tr>
<tr>
<td>Live cattle exports (‘000)</td>
<td>730</td>
<td>844</td>
</tr>
</tbody>
</table>

<sup>a</sup> Preliminary results

Sheep

Sheep are produced over a wide range of conditions, from the arid and semiarid inland to the higher rainfall areas of southeastern Australia (Figure 4).

Most sheep in Australia are produced as part of a mixed farming enterprise, often for lamb production, and frequently with crops, beef and dairy cattle. Sheep numbers fluctuate according to seasonal conditions, movements in wool prices, and the relative profitability of other enterprises. Numbers have been declining slowly, since a high of 173 million head in 1990.

Australia is the world's largest supplier of apparel wool. The sheepmeat industry has developed along with the wool industry, but rather than being a byproduct of fibre production, it is an important industry in its own right (Table 4). Although wool and mutton production is spread throughout the sheep raising areas, prime lamb production is generally confined to higher rainfall areas with good pasture conditions.

Dairy cattle

The Australian dairy industry is the third largest rural industry in terms of the wholesale value of production (Table 5). The industry operates in all States. Victoria has about 56% of all dairy farms and produces 61% of the milk, followed by New South Wales (15% of farms and 13% of milk production) and Queensland (13% of farms and 10% of production). Nationally, about 22% of milk produced is sold as fresh milk,
although there are marked differences between States. In New South Wales, about 56% of milk is sold as fresh milk, while in Victoria only 11% is sold as fresh milk.

Over the past 20 years, the dairy industry has been extensively restructured as a result of changes in government regulation and changes to both domestic and export markets for dairy products. As a result, the number of dairy farms more than halved and cow numbers have fallen by 20%. However, production per cow and overall production efficiency have increased markedly over the same period. The trend is to have larger herds. The average herd size is 120 milking cows. Most dairy farms are family owned and operated.

**Table 5** Dairy production statistics, 1998–2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cow numbers ('000)</td>
<td>2 121</td>
<td>2 180</td>
</tr>
<tr>
<td>Total milk (megalitres)</td>
<td>10 178</td>
<td>10 780</td>
</tr>
<tr>
<td>Annual milk yield per cow (litres)</td>
<td>4 799</td>
<td>4 947</td>
</tr>
<tr>
<td>Gross value of production ($million)</td>
<td>2 897</td>
<td>2 850</td>
</tr>
<tr>
<td>Value of exports ($million)</td>
<td>2 257</td>
<td>2 251</td>
</tr>
</tbody>
</table>

a Preliminary results


**Table 6** Pig production statistics, 1998–2000

<table>
<thead>
<tr>
<th>Pig production</th>
<th>1998–99</th>
<th>1999–2000a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total pigs ('000)</td>
<td>2.60</td>
<td>2.60</td>
</tr>
<tr>
<td>Breeding sows ('000)</td>
<td>307</td>
<td>298</td>
</tr>
<tr>
<td>Slaughterings ('000)</td>
<td>5176</td>
<td>4920</td>
</tr>
<tr>
<td>Pig meat production (kilotonnes)</td>
<td>370</td>
<td>360</td>
</tr>
<tr>
<td>Gross value of production ($million)</td>
<td>663</td>
<td>852</td>
</tr>
<tr>
<td>Value of pig meat exports ($million)</td>
<td>71</td>
<td>165</td>
</tr>
</tbody>
</table>

a Preliminary results


**Pigs**

Although small by world standards, the Australian pig industry is well-organised and efficient. From a historical basis as an adjunct to the dairy industry, pig farming is now highly specialised. The number of establishments with pigs has shown a steady decline over the years, although the number of sows has remained relatively stable. Many of the larger establishments are vertically integrated companies, and the largest 2% of farms account for about 40% of the total sow population.

In Australia, pig farmers mainly use three breeds — the large white, the landrace and the duroc. Most pigs are housed indoors. Extensive pig-keeping systems are expanding slowly.

The value of Australian pigmeat exports in 1999 more than doubled from the level in 1998 (Table 6). Asian demand for Australian pigmeat is expected to remain strong in 2000–01 however lower priced meat from other exporting countries will affect competitiveness.

**Table 7** Poultry production statistics, 1998–2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry slaughterings (million)</td>
<td>374.98</td>
<td></td>
</tr>
<tr>
<td>Broilers (million)</td>
<td>75.5</td>
<td></td>
</tr>
<tr>
<td>Poultry meat production (kilotonnes)</td>
<td>608</td>
<td>634</td>
</tr>
<tr>
<td>Value of production ($million)</td>
<td>1174</td>
<td>1218</td>
</tr>
<tr>
<td>Exports of poultry meat (kilotonnes)</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Layer hens (million)</td>
<td>14.04</td>
<td>10</td>
</tr>
<tr>
<td>Other poultry (million)b</td>
<td>2.4</td>
<td></td>
</tr>
</tbody>
</table>

a Preliminary results

b Ducks, turkeys, gamebirds etc


**Poultry**

The poultry industry in Australia includes both broiler (meat) and egg production (Table 7). Broiler meat production has increased by more than 50% in the last decade in response to continued growth in consumer demand. The broiler industry is dominated by two large integrated companies and several medium-sized operators. About 850 growers produce some 80% of birds under contract to processing companies. The economics of transport in relation to feed, and access to markets, determine the location of growers. Most operations are in or within 50 kilometres of capital cities. Other important areas are around Tamworth, Newcastle and Griffith in New South Wales; Geelong and Bendigo in Victoria; and Murray Bridge in South Australia.

The egg industry comprises about 1000 commercial producers, supplying about 200 million dozen eggs for the domestic market. A further 26 million dozen eggs are produced by noncommercial, backyard flocks. The average commercial farm consists of 10 000 hens. About 95% of eggs are produced under intensive production systems, with the balance from free-range and other systems.
Fisheries and aquaculture

In 1998–99, the gross value of fisheries products was $1903 million. Australia has an advanced wild-caught fishery and a popular recreational fishery of both native and introduced species. The production and value of wild-capture fisheries for 1998–99 are shown in Table 8.

Although still a relatively small industry, the value of Australian aquaculture has been increasing and now accounts for about 25% of the total value of fisheries production. Aquaculture occurs Australia-wide, from tropical climates to cold water, from marine through brackish to freshwater, and includes all major species groups. Figures for the production and gross value of aquaculture harvests in 1997–98 (latest available figures) are shown in Table 9.

**Table 8** Fisheries production statistics (wild-caught fish), 1998–2000

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Volume of production (kilotonnes)</th>
<th>Value of production ($million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuna</td>
<td>17.3</td>
<td>18.7</td>
</tr>
<tr>
<td>Other finfish</td>
<td>125.9</td>
<td>136.4</td>
</tr>
<tr>
<td>Prawns</td>
<td>30.3</td>
<td>29.0</td>
</tr>
<tr>
<td>Rock lobster</td>
<td>18.8</td>
<td>20.1</td>
</tr>
<tr>
<td>Other crustaceans</td>
<td>6.5</td>
<td>8.2</td>
</tr>
<tr>
<td>Abalone</td>
<td>5.6</td>
<td>5.5</td>
</tr>
<tr>
<td>Scallops</td>
<td>7.2</td>
<td>10.2</td>
</tr>
<tr>
<td>Oysters</td>
<td>9.3</td>
<td>9.3</td>
</tr>
<tr>
<td>Pearls</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Other molluscs</td>
<td>8.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>

<sup>a</sup> Preliminary results


**Table 9** Production and gross value of Australian aquaculture, 1997–98

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Production (tonnes)</th>
<th>Gross value ($million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon</td>
<td>7 069</td>
<td>63.6</td>
</tr>
<tr>
<td>Trout</td>
<td>2 118</td>
<td>70.9</td>
</tr>
<tr>
<td>Tuna</td>
<td>4 371</td>
<td>12.7</td>
</tr>
<tr>
<td>Other&lt;sup&gt;a&lt;/sup&gt;</td>
<td>966</td>
<td>9.3</td>
</tr>
<tr>
<td>Total</td>
<td>14 524</td>
<td>156.5</td>
</tr>
<tr>
<td>Crustaceans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prawns</td>
<td>1 393</td>
<td>32.7</td>
</tr>
<tr>
<td>Yabbies</td>
<td>230</td>
<td>n.a.</td>
</tr>
<tr>
<td>Marron</td>
<td>55</td>
<td>n.a.</td>
</tr>
<tr>
<td>Other&lt;sup&gt;b&lt;/sup&gt;</td>
<td>108</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td>1 796</td>
<td>38.6</td>
</tr>
<tr>
<td>Molluscs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edible oysters</td>
<td>9 206</td>
<td>43.9</td>
</tr>
<tr>
<td>Pearl oysters</td>
<td>n.a.</td>
<td>189.6</td>
</tr>
<tr>
<td>Other&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1 482</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>10 687</td>
<td>238.3</td>
</tr>
<tr>
<td>Total</td>
<td>26 998</td>
<td>491.4</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes eels and native fish
<sup>b</sup> Includes crab and brine shrimp
<sup>c</sup> Includes mussels, scallops and giant clams

Source: ABS Yearbook Australia 1999.

Salmon farm in the Huon delta, southern Tasmania

Source: AusVet Animal Health Services
Other livestock industries

Australia has a rapidly growing goat industry, producing angora and cashmere fibres, as well as milk, meat and live goat exports. There is also a small, farmed deer industry with about 1500 farmers with mainly fallow and red deer, producing both venison and velvet. There are many other small, developing livestock industries in Australia, including farmed buffalo, ostriches and alpacas.

Trade in wild animals and their products has increased in Australia since the late 1970s. In some cases, wild stock form the basis for new farming enterprises. Although these industries are small individually, they can be quite important regionally. Kangaroos and wallabies are the main species harvested commercially from the wild, for both their skins and meat. Others include brushtail possums (fur and meat), and chicks of the short-tailed shearwater or muttonbird (meat, oil and feathers). Two emerging industries are emu farming, and crocodile farming. These industries are not based on harvesting animals from the wild, but wild-caught stock have been used as the basis of commercial farms and some crocodile farms use wild-harvested eggs.
Disease status, surveillance and control – livestock

Introduction

Australia is fortunate to be free of all the major epidemic diseases of livestock and is relatively free of other serious animal pests and diseases. Historically, this can be attributed to Australia’s geographical isolation from other livestock-raising countries. In the early colonial period, the long sea voyage was itself an effective quarantine barrier. In more recent times, application of sound quarantine procedures has successfully prevented the entry of major diseases with imported livestock, genetic material and products. Evidence for the continued excellent health status of Australia’s animal populations is provided through a range of surveillance activities as well as specific disease control programs.

Significant diseases listed by OIE

Diseases recognised internationally as being of significant importance to trade are defined by the World Organisation for Animal Health (Office International des Epizooties; or OIE) as List A diseases. These are diseases that can spread very rapidly and have serious socioeconomic or public health consequences. Australia is free of the List A diseases shown in Table 10.

Table 10  OIE List A diseases that do not occur in Australia

<table>
<thead>
<tr>
<th>Disease</th>
<th>Date of last occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot-and-mouth disease</td>
<td>1872</td>
</tr>
<tr>
<td>Vesicular stomatitis</td>
<td>Never occurred</td>
</tr>
<tr>
<td>Swine vesicular disease</td>
<td>Never occurred</td>
</tr>
<tr>
<td>Rinderpest</td>
<td>1923</td>
</tr>
<tr>
<td>Peste des petits ruminants</td>
<td>Never occurred</td>
</tr>
<tr>
<td>Contagious bovine pleuropneumonia</td>
<td>1967</td>
</tr>
<tr>
<td>Lumpy skin disease</td>
<td>Never occurred</td>
</tr>
<tr>
<td>Rift Valley fever</td>
<td>Never occurred</td>
</tr>
<tr>
<td>Sheep pox and goat pox</td>
<td>Never occurred</td>
</tr>
<tr>
<td>African horse sickness</td>
<td>Never occurred</td>
</tr>
<tr>
<td>African swine fever</td>
<td>Never occurred</td>
</tr>
<tr>
<td>Hog cholera or classical swine fever</td>
<td>1962</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>1997</td>
</tr>
<tr>
<td>Bluetongue disease</td>
<td>Never occurred</td>
</tr>
</tbody>
</table>

a No clinical disease, serological evidence in cattle.

OIE defines a second group of diseases (List B diseases) that are considered to be of socioeconomic or public health importance within infected countries and are significant in international trade. Australia is free of the List B diseases shown in Table 11.
The Food and Agriculture Organization (FAO) defines a third group of animal diseases (List C) that are of socioeconomic or sanitary importance at the local level. OIE includes List C diseases in their reporting requirements. List C diseases that do not occur in Australia are shown in Table 12.

Australia’s annual reports to OIE, FAO and World Health Organization (WHO) can be obtained from Animal Health Australia’s, National Animal Health Information System website.11

Table 11 OIE List B diseases that do not occur in Australia

<table>
<thead>
<tr>
<th>Diseases affecting several species</th>
<th>Diseases of poultry</th>
<th>Diseases of rodents/lagomorphs</th>
<th>Diseases of bees</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aujeszky’s disease</td>
<td>Duck virus hepatitis</td>
<td>Tularaemia</td>
<td>Acariasis</td>
<td>Leishmaniasis</td>
</tr>
<tr>
<td>Heartwater</td>
<td>Duck virus enteritis</td>
<td></td>
<td>Varroasis</td>
<td></td>
</tr>
<tr>
<td>New World screw-worm fly (Cochliomyia hominivorax)</td>
<td>Fowl typhoid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old World screw-worm fly (Chrysomyia bezziana)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rabiesa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
a On two recent occasions (in 1987 and 1990), human cases have been reported after acquiring the disease while outside Australia.
b Australia declared free from bovine brucellosis in 1989.
c Australia declared free from bovine tuberculosis on 31 December 1997. Because of the nature of the disease, occasional cases are still reported.
d Strains of Pasteurella multocida do occur in Australia, but not the strains (6B or 6E) that cause haemorrhagic septicaemia.
e Theileria parva and T. annulata do not occur, but T. buffeli is present.
f Mycoplasma agalactiae has been isolated in Australia, but the Australian strains do not produce contagious agalactia in sheep.
g Mycoplasma capricolum subsp. capripneumoniae (previously referred to as strain F38) is not present.
h The strains of Chlamydia psittaci that cause typical enzootic abortion are not present in Australia.
i Salmonella abortus ovis was isolated in 1994 from two children in New South Wales but serological and bacteriological surveillance has not shown any evidence of infection in sheep.
j Last reported in 1976
k Last occurred in 1952
l Varroa jacobsoni was identified in 1994 on Dauan Island in the Torres Strait. It does not occur on mainland Australia.

Table 12 OIE List C diseases that do not occur in Australia

<table>
<thead>
<tr>
<th>Diseases of pigs</th>
<th>Diseases of poultry</th>
<th>Diseases of rodents/lagomorphs</th>
<th>Diseases of bees</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cysticercosis (Taenia solium)</td>
<td>Sheep scab (Psoroptes ovis, free since 1896)</td>
<td>Tularaemia</td>
<td>Acariasis</td>
<td>Leishmaniasis</td>
</tr>
<tr>
<td>Porcine reproductive and respiratory syndrome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmissible gastroenteritis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichinellosis (Trichinella spiralis)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterovirus encephalomyelitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
National Animal Health Information System

In Australia, information on animal health is available from a range of government and nongovernment sources. Disease surveillance is recognised as a major function of government animal health services in Australia. In addition to State and Territory activities, there are a number of national disease surveillance and control programs. The National Animal Health Information System (NAHIS) has been set up to collate findings and provide a national overview of animal health in Australia.

NAHIS is managed as a key program of Animal Health Australia. The purpose is to provide timely and accurate summary information on Australia’s animal health status and on disease surveillance and control activities, to support trade in animal commodities and to meet Australia’s international reporting obligations.

NAHIS contains information on a wide range of animal diseases. The system is based around quarterly reporting of data on selected diseases (see Table 13) utilising a range of data sources. It also contains summary textual information on animal diseases and their control in Australia, livestock numbers, slaughter statistics, residue surveillance data, exotic disease investigations, animal health regulations, exotic disease contingency plans and key animal health contacts.

Sources of data include Commonwealth, State and Territory animal health authorities, diagnostic laboratories, disease surveillance programs, disease control and accreditation programs, universities, and research programs. The main national disease surveillance and control and accreditation programs are summarised in the remainder of this chapter. For the target diseases, reporting agencies provide data according to agreed specified criteria. Three main types of information are collected, depending on the disease:
- the results of laboratory testing;
- outbreak investigations; and
- control activities.

A wide range of NAHIS information, textual and numerical, including maps, graphs and tables is available by anonymous remote access through the Animal Health Australia website. Other outputs include quarterly newsletters and Australia’s OIE, FAO and WHO returns.

Disease surveillance programs

The disease surveillance programs on which the NAHIS is based are each described below. In addition to specific national programs, passive surveillance data is collected on a wide range of diseases such as bovine brucellosis (now exotic to Australia), equine infectious anaemia and equine viral arteritis. A summary of passive surveillance for bovine brucellosis since 1995 is included at the end of this chapter. Other data is accessible through Animal Health Australia’s, National Animal Health Information System website.

Northern Australia Quarantine Strategy

During 1999, Northern Australia Quarantine Strategy continued with a range of activities aimed at early detection of exotic disease in the high-risk areas of northern Australia, and determining the risks in the countries closest to the northern coastline (Figure 5). The onshore program includes regular inspections of remote sites, collection of samples, community awareness, sentinel programs for pig and cattle diseases and arboviruses, a trapping program to check for incursions of screw-worm fly and monitoring for Asian honeybee and the mites they carry.

Data collected by Australia’s field veterinary services are reported through the National Animal Health Information System

Sources: www.aahc.com.au/nahis
### Table 13: Target endemic and exotic diseases and sources of information for the National Animal Health Information System

<table>
<thead>
<tr>
<th>Disease</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akabane</td>
<td>State veterinary laboratories, National Arbovirus Monitoring Program&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Anthrax</td>
<td>State government records</td>
</tr>
<tr>
<td>Aujeszky’s disease</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>State veterinary laboratories</td>
</tr>
<tr>
<td>Avian influenza</td>
<td>State government records, Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bluetongue</td>
<td>State veterinary laboratories, National Arbovirus Monitoring Program&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bovine ephemeral fever</td>
<td>State veterinary laboratories, National Arbovirus Monitoring Program&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bovine brucellosis (Brucella abortus)</td>
<td>State veterinary laboratories</td>
</tr>
<tr>
<td>Bovine spongiform encephalopathy</td>
<td>National Transmissible Spongiform Encephalopathies Surveillance Program&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bovine tuberculosis (Mycobacterium bovis)</td>
<td>National Granuloma Submission Program&lt;sup&gt;d&lt;/sup&gt;, Tuberculosis Freedom Assurance Program&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Classical swine fever</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Echinococciosis</td>
<td>National Notifiable Diseases Surveillance System&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Enzootic bovine leucosis</td>
<td>State veterinary laboratories, accreditation scheme records</td>
</tr>
<tr>
<td>Equine infectious anaemia</td>
<td>State veterinary laboratories</td>
</tr>
<tr>
<td>Equine viral arteritis</td>
<td>State veterinary laboratories</td>
</tr>
<tr>
<td>Infectious bursal disease</td>
<td>State government records, Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Japanese encephalitis</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Johne’s disease</td>
<td>National Johne’s Disease Market Assurance Program&lt;sup&gt;g&lt;/sup&gt;, State government records</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>National Notifiable Diseases Surveillance System&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>National Notifiable Diseases Surveillance System&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>State government records, Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ornithosis</td>
<td>National Notifiable Diseases Surveillance System&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ovine brucellosis (Brucella ovis)</td>
<td>State government accreditation scheme records</td>
</tr>
<tr>
<td>Porcine reproductive and respiratory syndrome</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Q fever</td>
<td>National Notifiable Diseases Surveillance System&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Scrapie</td>
<td>National Transmissible Spongiform Encephalopathies Surveillance Program&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Salmonella isolations</td>
<td>National Salmonella Surveillance Scheme&lt;sup&gt;h&lt;/sup&gt;</td>
</tr>
<tr>
<td>Surra (Trypanosoma evansi)</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Varroa mite</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tropilaelaps mite</td>
<td>Northern Australia Quarantine Strategy&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

**Notes:**

- <sup>a</sup> National Arbovirus Monitoring Program, managed by Animal Health Australia.
- <sup>b</sup> Northern Australia Quarantine Strategy, run by the Australian Quarantine and Inspection Service.
- <sup>c</sup> National Transmissible Spongiform Encephalopathies Surveillance Program, managed by Animal Health Australia.
- <sup>d</sup> National Granuloma Submission Program, managed by Animal Health Australia.
- <sup>e</sup> Tuberculosis Freedom Assurance Program, managed by Animal Health Australia.
- <sup>f</sup> National Notifiable Diseases Surveillance System, managed by the Commonwealth Department of Human Services and Health on behalf of the Communicable Diseases Network Australia and New Zealand.
- <sup>g</sup> National Johne’s Disease Market Assurance Program, managed by Animal Health Australia.
- <sup>h</sup> National Salmonella Surveillance Scheme, maintained on behalf of the Commonwealth and State/Territory governments by the Microbiological Diagnostic Unit at the University of Melbourne.
The offshore component includes surveys, monitoring of sentinel herds, strengthening of quarantine services and laboratory support and takes place in eastern Indonesia and Papua New Guinea. The achievement of independence by East Timor will require the development of new strategies in the future.

A summary of the test result are shown in Table 14.

**OFF-SHORE COMPONENT**

**Papua New Guinea**

There were two surveys during 1999. No significant targeted animal diseases were detected apart from Japanese encephalitis, which is regarded as endemic to this area. *Culcoideis* trapping added information on the distribution of the genus in this area.

A survey for Japanese encephalitis was conducted in pigs in the Milne Bay area, and confirmed that the infection was present. Japanese encephalitis is now regarded as endemic in Papua New Guinea and has been removed from the target list of diseases for that country.

The monitoring program involves sentinel herds at strategic locations. Cattle tested quarterly for surra and annually for bluetongue. Pig sentinel herds are tested quarterly for classical swine fever and six-monthly for porcine reproductive and respiratory syndrome and Aujeszky’s disease viruses. Poultry flocks are tested quarterly for avian influenza and Newcastle disease viruses.

Other activities in 1999 included laboratory support through training and supply of reagents, facilitation of communication between the quarantine officers of Papua New Guinea and West Papua and cooperation with the Agricultural Quarantine Support Project.

There were courses in recognition of animal diseases for field staff.
West Papua (Irian Jaya)

An animal health survey of Irian Jaya was conducted jointly with Indonesia in April 1999 in conjunction with a plant pest and disease and weed survey. Pigs and cattle were sampled and the sera were tested for classical swine fever, swine influenza, porcine reproductive and respiratory syndrome, transmissible gastroenteritis and Aujeszky’s disease (pigs), and surra and bluetongue (cattle) antibodies. Two cattle parasites collected near Port Numbay (Jayapura), the blood-sucking fly Hippobosca maculata and the cattle tick Boophilus microplus, were recorded for the first time in the province.

A large project, Strengthening of Quarantine, was completed in 1999. Activities included an exotic disease course at the Australian Animal Health Laboratory for veterinarians, training in disease recognition for quarantine officers, and laboratory support.

ON-SHORE COMPONENT

The on-shore program consists of animal health surveys for classical swine fever, Aujeszky’s disease, porcine reproductive and respiratory syndrome, Nipah virus, surra and other targeted diseases, trapping for adult screw-worm flies, monitoring sentinel pig herds for Japanese encephalitis during the wet season, and monitoring for Asian honeybees and the mites they carry. Summary findings are contributed to the National Animal Health Information System and reported in Animal Health Surveillance Quarterly.13

RESEARCH ACTIVITIES

A collaborative project to develop the diagnostic capability for the detection of Trypanosoma evansi was completed. This resulted in improved knowledge of the performance of a range of parasitological and serological tests in several species, but further research is needed to achieve more sensitive testing for ruling out the disease. Two species of wallaby were found to be infected and also suffered clinically from surra, raising serious questions about the potential environmental impact of establishment of the disease in Australia.

Research is progressing on the development of better screw-worm fly traps and lures. Adult screw-worm fly trapping at 44 sites within Australia including the Torres Strait Islands resulted in no positive identifications from 627 clearances.

No reports of exotic disease resulted from examination and autopsy of animals in the surveys.


Tuberculosis Freedom Assurance Program

The Tuberculosis Freedom Assurance Program is a 5-year program, that commenced following Australia’s declaration as a free area for bovine tuberculosis in December 1997. It is designed to detect any resurgence of bovine tuberculosis in Australia and to quickly eradicate any detected cases.

The Commonwealth Government, State and Territory governments, and the beef and dairy industries fund the program. These bodies are signatories to a formal deed of agreement, which outlines areas of responsibility and operations, and all are represented on a consultative committee.

A significant activity of the Tuberculosis Freedom Assurance Program is the National Granuloma Submission Program. This is in place at all export and domestic abattoirs, and involves the Australian Quarantine and Inspection Service, and all State and Territory agriculture departments. The program requires the submission of all granulomatous lesions found in cattle at slaughter to approved veterinary laboratories for examination for evidence of tuberculosis, according to a national standard. The Australian Reference Laboratory for Bovine Tuberculosis reviews any suspicious lesions.
In 1999, 3423 granulomas were submitted from a total of 6,589,454 cattle slaughtered. Two of the granulomas (0.058%) were diagnosed as tuberculosis, both cases involving relatively small beef herds in the Northern Territory. These properties have been quarantined and completely or partially destocked. Following destocking and tuberculosis testing, there has been no evidence of spread of the disease from the original cases. This detection rate compares with 3 positives from 2871 granulomas examined in 1997–98 and 5 positives from 4307 granulomas examined in 1996–97.

National Arbovirus Monitoring Program

The Australian National Arbovirus Monitoring Program is managed by Animal Health Australia. It is an integrated national program jointly funded by industry and governments to monitor the distribution of economically important insect-borne viruses of livestock and their vectors. These include bluetongue, Akabane and bovine ephemeral fever viruses. While bluetongue viruses occur in Australia, there is no evidence of clinical disease in the field.

The National Arbovirus Monitoring Program provides data so that regulatory agencies in Australia and internationally can accurately assess the nature and distribution of arboviral infections in this country, and hence facilitate trade by promoting confidence in scientifically based risk management strategies. Information from the program has been used by some countries to develop practical import protocols for Australian cattle. These increase the range of animals available for selection by accurately defining the geographical areas from which they may be sourced.

Data is gathered by monitoring cattle located in sentinel herds throughout the country. At sentinel locations groups of 10 young cattle previously unexposed to arboviral infections are blood tested at regular intervals to detect the incidence of infection with the various viruses. Sampling frequency is proportional to the probability of arbovirus activity. Insect traps located near these animals indicate whether Culicoides vectors are present during the period (Figure 6). Sentinel sites are selected to allow plotting of the distribution of infections. Hence most are positioned in areas along the border between expected infected and uninfected areas, or where infection occurs irregularly. Expected free areas are monitored to verify their free status. Known infected areas are sampled to assess the seasonal intensity of infection with each virus. At one site in the Northern Territory virus isolation is conducted to detect incursions of viruses from overseas. The total number of sites which were monitored in 1998–99 and the total numbers of collections are shown in Table 15.

BLUETONGUE VIRUSES

Transmission of bluetongue viruses occurred throughout the endemic areas of far northern Australia and along all of coastal Queensland and the far north coast of New South Wales (Figure 7). In 1999, there was widespread bluetongue activity in the Northern Territory and the far north of Western Australia. Seroconversions were detected at one or more locations during most of the year. Infections with serotype 1 were common and in the Top End of the Northern Territory, there was also transmission of serotype 20. Seroconversions were detected along the length of the Queensland coast. There was activity with serotypes 1 and 21 in the tropical north during the dry season and later, in the second half of the year, during the summer/autumn period in central and southern Queensland. There was some inland movement of virus into southwestern districts of the State, perhaps beyond their usual western limit in southern Queensland. Activity in New South Wales
was confined to the far north coast of New South Wales where cattle were infected with serotype 1. Nationally, the bluetongue-free area that was defined in the previous year was not greatly altered this year (see maps) with all regions in southern Australia and most pastoral regions in eastern Australia remaining free of bluetongue viruses.

The patterns of bluetongue serology in 1998–99 and genetic analyses of virus isolates again showed no evidence of movement of more pathogenic viruses out of the far northern ‘high-risk’ zone and no evidence of the incursion of any new virus serotypes into Australia. There was no evidence of bluetongue viruses in proximity to any of the major sheep populations and our bluetongue disease-free status continues.

**AKABANE VIRUS**

Akabane activity was widespread throughout the established vector areas in both northern and eastern Australia (Figure 8). In northern Western Australia and the Northern Territory, transmission was more common during the dry season. There was a similar pattern in the northern half of Queensland, especially in the tropical areas. Virus transmission in central and southeast Queensland was extensive, but mostly during the summer and autumn months. Infection was not limited to coastal areas as in recent years. With quite favourable seasonal conditions in late summer and autumn, there was spread into southwestern districts, into areas where infection has not been recorded for some time. In New South Wales, there was early transmission on the north coast, but subsequent spread southwards was relatively slow, eventually reaching the upper part of the south coast. Akabane virus reached the western limits of the vector area and there was slight spill-over into one district in the vector ‘buffer’ zone. As a consequence there were a number of calves born with Akabane disease along the eastern fall of the Great Dividing Range in the Armidale region of New South Wales.

**Table 15** National Arbovirus Monitoring Program: numbers of sites and collections, 1998–99

<table>
<thead>
<tr>
<th>State</th>
<th>Sites</th>
<th>Collections</th>
<th>Sites</th>
<th>Collections</th>
<th>Sites</th>
<th>Collections</th>
<th>Sites</th>
<th>Collections</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>26</td>
<td>247</td>
<td>33</td>
<td>127</td>
<td>33</td>
<td>127</td>
<td>33</td>
<td>124</td>
</tr>
<tr>
<td>Vic</td>
<td>5</td>
<td>25</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Qld</td>
<td>26</td>
<td>141</td>
<td>28</td>
<td>61</td>
<td>21</td>
<td>31</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>WA</td>
<td>15</td>
<td>80</td>
<td>12</td>
<td>41</td>
<td>10</td>
<td>39</td>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>SA</td>
<td>5</td>
<td>26</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Tas</td>
<td>4</td>
<td>27</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>NT</td>
<td>13</td>
<td>69</td>
<td>11</td>
<td>78</td>
<td>12</td>
<td>79</td>
<td>12</td>
<td>79</td>
</tr>
</tbody>
</table>

**Source:** National Arbovirus Monitoring Program 1998–1999 Report
BOVINE EPHEMERAL FEVER VIRUS

In contrast to the previous year, bovine ephemeral fever infections were relatively widespread. Seroconversions were detected at most sites in the far north of Western Australia, the Northern Territory, northern and central coastal Queensland and also inland in southwestern Queensland (Figure 9). In the Northern Territory, the virus also spread southwards as far as Alice Springs. Clinical cases were observed in many districts. Infections were also observed in northern and central coastal New South Wales and westwards through the Hunter Valley as far as Scone where there was a low prevalence. No seroconversions or clinical cases were observed in other southern States.

VECTOR MONITORING

The distribution of vectors followed the normal pattern in most of Australia. In the eastern and western coastal areas of nontropical and southern Australia, the main vector of interest is Culicoides brevitarsis, and to a lesser extent, C. wadai. C. brevitarsis was found throughout the endemic area. C. wadai was found only in the far north of the Northern Territory, in coastal regions of Queensland and for the second successive year, on the north coast of New South Wales. During the year it was found further south in New South Wales than previously recorded. In northern Australia there were no new vector species detected.

There was again a close relationship between the arbovirus-free and vector-free areas of southern Australia, with the viruses less widely distributed than their vectors. The vector-free areas defined in recent years were largely maintained.

National Transmissible Spongiform Encephalopathy Surveillance Program

Australian cattle and sheep are free of bovine spongiform encephalopathy (BSE) and scrapie, which are both members of the group of transmissible spongiform encephalopathies (TSEs). However, the OIE International Animal Health Code chapter on BSE requires countries that claim to be free of TSEs to have in place a surveillance system to detect BSE and scrapie should they occur.

The National Transmissible Spongiform Encephalopathy Surveillance Program (NTSESP) is an integrated national program jointly funded by industry and governments to demonstrate Australia’s ongoing freedom from BSE and scrapie, and to provide early detection of those diseases should they occur. The program was developed in 1997 and became operational in 1998. It is managed by Animal Health Australia.

The program complies with the OIE International Animal Health Code and gives assurance to all countries that import cattle and sheep commodities that Australia remains free of these diseases.

The results from the NTSESP for 1999 are summarised in Table 16. Further information is available from Animal Health Australia’s NTSESP website, which includes the Australian National Guidelines for Field Operations for TSE surveillance.

National Residue Survey
The National Residue Survey is a monitoring program for chemical residues in agricultural commodities. The program provides an unbiased estimate of the frequency of residues in meat and other commodities. Primary producers fund the operating costs by a livestock transaction levy on meat, or by similar means for other foods. Sampling is stratified to reflect different classes of stock, the geographical location of abattoirs and seasonal variation in throughput. Requests for the submission of samples are generated at random by a computer and posted direct to the officer-in-charge of inspection at each abattoir. Sampling is on a ‘test and release’ basis and all participating laboratories are required to undergo proficiency testing before and during contracted performance of tests.

Further information about the National Residue Survey can be found in the Chapter 6 and on the NRS website.16

National Salmonella Surveillance Scheme
The National Salmonella Surveillance Scheme is operated and maintained on behalf of the Commonwealth Government and States/Territory governments by the Microbiological Diagnostic Unit at the University of Melbourne. Data on isolates of salmonellae and other pathogens are submitted from participating laboratories around Australia. Quarterly newsletters and annual reports of both human and nonhuman isolates are submitted from participating laboratories around Australia. There are no commercial sheep farms in the Northern Territory.

National Notifiable Diseases Surveillance System
Information on human cases of important zoonoses in Australia is available from medical sources. The National Notifiable Diseases Surveillance System was established in 1990 under the auspices of the Communicable Diseases Network of Australia and New Zealand, and is the continuation of the national compilation of notifiable diseases that has been published since 1917. Further information on the program is available from the Department of Health and Aged Care website.18

The National Animal Health Information System obtains information from this system on cases of brucellosis, hydatidosis, leptospirosis, listeriosis, ornithosis and Q fever. Notifications of these zoonoses in 1999 have shown little change from previous years.

National sentinel hives
A national port surveillance program is being established to enhance the early detection of exotic bee parasites. Exotic parasites of primary quarantine concern to the Australian apiary industry are varroa mites, tropilaelaps mites and tracheal mites.

---

16 www.nrs.gov.au
Recent bee incursions at the ports of Darwin (1998) and Brisbane (1999) have highlighted the very real threat of introduction of exotic bee parasites being faced by the Australian apiary industry. Incursions by exotic bees via containerised cargo transported on ocean-going vessels present a significant risk for the introduction, establishment and spread of exotic bee parasites in Australia.

A key element of the national port surveillance program is that sentinel hives will be provided and maintained at selected ports by cooperating beekeepers thereby minimising program establishment and maintenance costs. Sentinel hives will be located within reasonable proximity (eg 500 metres) of selected ports. Surveillance will be conducted quarterly under the supervision of each State and Territory’s apiary officers and results summarised nationally and included in the National Animal Health Information System. As well as providing an enhanced early detection capacity, the port surveillance program will provide additional data to support health certification for live bee exports.

Each State and Territory will have officers trained to undertake the surveillance in conjunction with cooperating beekeepers. Two hives will be maintained at each sentinel site to ensure a continuity of surveillance if one hive swarms or becomes queenless.

Samples of brood and adult bees from sentinel hives will be submitted to diagnostic laboratories to be examined for the presence of exotic bee parasites.

The ports selected for the program receive a significant volume of containerised cargo, and hence are considered to present a greater risk of bee incursions than ports that primarily handle bulk shipment commodities. Additional ports may eventually be included subject to port suitability and the availability of cooperating beekeepers. The ports currently selected are:

- **New South Wales**: Sydney, Port Botany, Darling Harbour, White Bay, Garden Island Navy Base
- **Victoria**: Portland, Geelong, Melbourne
- **Queensland**: Brisbane, Gladstone, Townsville
- **Western Australia**: Wyndham, Broome, Port Hedland, Dampier, Geraldton, Fremantle, Bunbury, Albany, Esperance
- **South Australia**: Adelaide, Port Augusta
- **Tasmania**: Hobart, Bell Bay, Devonport, Burnie
- **Northern Territory**: Darwin, Gove

### Bovine brucellosis surveillance

After an eradication campaign that started in 1970, Australia was declared free of bovine brucellosis (caused by *Brucella abortus*) in July 1989 and has remained free. Active serological surveillance through collection of blood samples from all adult female cattle at slaughter continued until the end of 1993. Since that time, considerable further passive surveillance data has been collected and has demonstrated ongoing freedom. Table 17 shows the number of serological tests for bovine brucellosis carried out at State veterinary laboratories as part of abortion investigations and for all other reasons, such as for export.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Abortion serology</td>
<td>864</td>
<td>691</td>
<td>629</td>
<td>510</td>
<td>491</td>
</tr>
<tr>
<td>Other serology</td>
<td>7 820</td>
<td>15 601</td>
<td>13 427</td>
<td>7 546</td>
<td>9 404</td>
</tr>
</tbody>
</table>

*a* All test results were negative for *Brucella abortus*

**Table 17 Number of serological tests for *Brucella abortus* in cattle in Australia, 1995–99**
Disease accreditation and control programs

Many of the animal diseases that are present in Australia tend to be regionally distributed. This means that most disease control activities focus on the local or regional level. However, in a number of cases where diseases are widely distributed or are of national significance, more wide-ranging controls have been instituted.

In this section, control activities undertaken by States/Territories during 1999 are summarised for the following such diseases:
- Johne’s disease — bovine, ovine and camelid
- anthrax
- enzootic bovine leucosis
- cattle tick
- ovine footrot
- ovine brucellosis
- equine herpesvirus
- American foulbrood
- bat viruses — Hendra virus, Australian bat lyssavirus, Menangle virus
- mastitis in dairy cattle

Johne’s disease

Australia has relatively little Johne’s disease compared to most developed livestock-producing countries. Large areas of the continent and a high proportion of its livestock populations have no known infection. To protect that situation, Australia is an international leader in Johne’s disease research and control. The National Johne’s Disease Control Program, managed by Animal Health Australia, provides high quality programs to work with the affected livestock industries and with governments to reduce the spread and impact of Johne’s disease in Australia. These programs include market assurance, disease control and surveillance, animal movement, research, communication, training and extension, and diagnostic methods.

MARKET ASSURANCE PROGRAMS

Identifying, protecting and promoting herds and flocks that demonstrate a low risk of being infected with Johne’s disease is a cornerstone of the market assurance program. A new market assurance program for goats was launched in 1999 to complement three existing programs that have been operating since 1996. The numbers of herds and flocks enrolled in the four market assurance programs at the end of 1999 are shown in Table 18.

To help make the market assurance programs more practicable for cattle and sheep breeders, Animal Health Australia held major reviews in early 1999 that led to the incorporation of greater flexibility and better risk management into the programs. When launched in early 2000, the main improvements will be options to introduce animals and the ability to maintain a herd or flock status level by less intensive testing.

The public can access lists of assessed herds and flocks that have been under a market assurance program on a fax-back service (1902 940 579) and on the Internet.19

ZONING FOR JOHNE’S DISEASE

Both bovine and ovine Johne’s disease are unevenly distributed in Australia, with the northern and western parts of the continent considered highly unlikely to be infected. To protect these areas, zoning for Johne’s disease was formally introduced in Australia in 1999 as shown in Figures 10 and 11. Western Australia was declared a free zone and the Northern Territory, Queensland and a large part of New South Wales now have protected zone status. Relative to other southeastern States, Tasmania has a lower bovine Johne’s disease status of residual zone, as it effectively had no control program in place.

The constraints on market access resulting from the movement accompanying zoning has increased surveillance activities in areas wanting to improve their status. Tasmania has started a large investigation of beef herds to determine the disease situation of the industry in that State.

Source: NSW Agriculture Resource Information March 2000

Note: Northern Territory has no commercial sheep flocks.
Source: NSW Agriculture Resource Information September 1999
CONTROL PROGRAMS

At the end of 1999, there were 2107 cattle herds known to be infected in Australia. This was an increase of 6% during the year, some of which was due to reclassifying herds according to the new edition of the standard definitions and rules (see below). There were also 534 known infected sheep flocks, 29 infected goat herds and 12 infected alpaca herds. The numbers of known infected sheep flocks fluctuates as tracings and surveillance detect new flocks, and some existing infected flocks voluntarily depopulate.

In 1999, the first Australian case of Johne’s disease in a deer was confirmed in Queensland in a mature animal that had been introduced from southern Australia. Investigations found no further cases.

The standard definitions and rules for bovine and ovine Johne's disease are the agreed national standards for the disease control programs. The second edition of the Bovine Standard Definitions and Rules was published by the Standing Committee on Agriculture and Resource Management (SCARM) in July 1999. Ovine Standard Definitions and Rules were published in 1998 and revision started in 1999 to improve them in light of a better understanding of the disease and the availability of improved diagnostic testing by pooled faecal culture.

An initial review of the Victorian Agreed Test and Control Program, in which about 600 cattle herds have participated, confirmed that the incidence of new infection dropped significantly in most herds when they introduced management strategies to minimise infection of calves. To promote better calf rearing and to reduce the spread of infection to calves, the Johne’s Disease Calf Accreditation Program was developed in Victoria for release as an audited quality assurance program in early 2000.

Both New South Wales and South Australia developed draft State plans for improving the long-term control of bovine Johne’s disease. These included increased surveillance of, and assistance in, controlling infection on farms. A National Bovine Johne’s Disease Evaluation is under way and when completed it is expected that complementary national and State initiatives will be developed and implemented.

Control of Johne’s disease in the goat, alpaca and deer industries is conducted under the banner of control of bovine or ovine Johne’s disease. Several goat herds have been infected with the sheep strain of Mycobacterium paratuberculosis. The implications of this for the control of ovine Johne’s disease are being investigated. The known incidence of Johne’s disease in alpaca in recent years has been extremely low, with owners managing movements and testing animals and progressively adopting the market assurance program.

Anthrax

Anthrax is a notifiable disease subject to compulsory government controls, including quarantine, disposal of carcasses, and vaccination. It is present in well-defined areas in the northern and northeastern districts of Victoria and central New South Wales as shown in Figure 12. In these areas, anthrax has a low and decreasing prevalence, and occurs only sporadically. Occasional outbreaks have occurred in other States. South Australia last recorded an outbreak in 1914 and Tasmania in 1933, and these States are now considered free. Anthrax was diagnosed in Queensland in 1993 and in Western Australia in 1994. The disease has never been reported in the Northern Territory.

During 1999 there were no reported outbreaks of anthrax and no farms under quarantine for anthrax in the Northern Territory, Queensland, South Australia or Tasmania.

NEW SOUTH WALES

There were two anthrax incidents confirmed in New South Wales during 1999, one in sheep and one in cattle, both in known anthrax areas. Anthrax was also excluded as the cause of death in 15 other investigations during the year, six in sheep and nine in cattle.

VICTORIA

No cases of anthrax have been detected since June 1998 in the area in northern central Victoria where a large outbreak of anthrax occurred in early 1997. Testing at a local knackery of 400 animals dying on-farm in the area during 1999 did not detect any cases. Preventive vaccination will be required until mid-2000 on the 84 properties on which cases occurred in 1997. However, the vaccination of properties within a 1-kilometre radius of properties where cases occurred ceased in early 1999, after two years of vaccinations.

WESTERN AUSTRALIA

There were no outbreaks of anthrax in Western Australia during 1999. Three properties remained under management notices for the control of anthrax near Walpole on the south coast of Western Australia. No further cases were diagnosed on these or any
other properties. Two of the three properties remain destocked and planted to trees. The third property was grazed by fully vaccinated young, dry dairy stock moved on and off the property by a local dairy farmer.

**Enzootic bovine leucosis**

Enzootic bovine leucosis is endemic in Australia. It is a minor cause of direct production loss in Australia, and is of greater importance as a potential barrier to trade. Infection is uncommon in beef cattle but has a moderate prevalence in dairy cattle in some regions. Queensland has had a voluntary accreditation scheme to eradicate enzootic bovine leucosis from individual dairy herds since 1983, and other States undertake similar schemes. There is only one dairy herd in the Northern Territory and it is free of the disease. At the end of 1999, 12,998 of 13,764 Australian dairy herds were negative representing 94.4% of the national dairy herd.

**NEW SOUTH WALES**

Excellent progress with the enzootic bovine leucosis eradication program was made during 1999. From 1 July 1999 a regulatory policy was introduced in dairy cattle, including compulsory slaughter of all reactor animals, and quarantine of known infected herds. The results of bulk milk testing carried out in November 1999 were the best achieved yet, with only four positive and two inconclusive test results from 1696 herds tested. Of the six farms giving a positive or inconclusive bulk milk test result, two herds had no history of enzootic bovine leucosis infection. An individual animal test detected one positive animal in one herd, while the second herd is still under investigation. The other four farms were known to be infected with the virus and were already involved in an intensive eradication program. At the end of 1999, there were 21 dairy herds under quarantine because of active infection from a total of 1737 herds in the State.

**VICTORIA**

The Victorian Enzootic Bovine Leucosis Control and Eradication Program was started in late 1994. The program is based on monitoring all dairy herds by bulk milk testing twice per year, and offering subsidised testing to those herds that return a positive result. In Victoria, some 470 herds have returned a suspicious result since November 1994. Any herds that return a positive or suspicious result to the bulk milk test are offered free herd testing (once per year) to help eradicate the disease. More than 97% of Victoria's 8200 dairy herds are now free of enzootic bovine leucosis.
QUEENSLAND
The Enzootic Bovine Leucosis Accreditation Scheme in Queensland made further progress in 1999 with all Queensland dairy herds now participating. Out of a total of 1633 herds in the State, 1595 had at least one clear whole-herd test (individual animal blood and/or milk samples) by the end of 1999.

WESTERN AUSTRALIA
Bulk milk testing continued, with negative results, on the 450 dairy herds under the auspices of the Western Australian Dairy Industry Authority. Testing of four agricultural area dairy herds not under the auspices of the Dairy Industry Authority was undertaken also with negative results. Dairy herds in southern Western Australia met the criteria of ‘bulk milk test negative’ status according to national guidelines. One dairy herd in the northwest of the State continued testing under a management notice, which was suspended late in the year on cessation of milking.

SOUTH AUSTRALIA
The quarterly whole-herd bulk milk testing of all dairy herds continues. After a number of years of no new positive herds detected and only two infected herds at the beginning of the year, two newly infected herds were found in 1999 and one previously infected herd broke down after achieving provisionally clear status.

TASMANIA
Bulk milk testing has been conducted over the past six years with no cases of disease detected. Most dairy herds in Tasmania are classified as bulk milk test negative or better.
**Cattle tick**

The cattle tick, *Boophilus microplus*, mainly infests cattle, but may occasionally infest horses, sheep, deer and water buffalo. Infestations cause damage to hides, loss of production, anaemia and death. The tick also transmits bovine babesiosis, anaplasmosis and spirochaetosis. *Boophilus microplus* was first introduced to northern Australia in the late nineteenth century. From Darwin, the tick steadily spread over northern Australia, stabilising at its current geographical distribution by about 1918. The distribution of the cattle tick is largely determined by climatic factors. *B. microplus* requires high humidity and ambient temperatures of at least 15–20°C for egg laying and hatching. It persists only in northern and northeastern coastal regions of Australia as indicated in Figure 13. Tick control by acaricide dipping has been widely used in endemic areas. Acaricides used for this purpose include various synthetic pyrethroids, amitraz, and some organophosphates. Spread from endemic areas is restricted by State-managed zoning policies. Dipping is compulsory for cattle leaving defined tick areas in Queensland, Western Australia and the Northern Territory. Many producers in the tick endemic area have changed to *Bos indicus* type cattle because of their greater resistance to tick infection.

**NEW SOUTH WALES**

The New South Wales cattle tick control program includes a program of two cattle tick examinations of all cattle on every property within the Cattle Tick Protected Area of northeastern New South Wales, as well as examination of suspect herds outside this area. Surveillance is also undertaken at saleyards and abattoirs in the vicinity of the protected area. During 1999, about 1120 herds were inspected as part of the program, with only 84 cattle tick infestations being detected. Investigations revealed that most infestations were interrelated and 16 were ‘single tick’ infestations.

Towards the end of 1999, the section of the protected area west of the Richmond Range, containing 151 cattle properties, was released.

**VICTORIA**

Live engorged female cattle ticks (*Boophilus microplus*) were found on three horses that returned to Victoria after spending one month competing in events in Queensland. Infestation occurred in the Rockhampton area of Queensland where acaricide (tick spray) resistance is widespread. Acaricide resistance, combined with the pinpoint size of larval ticks at the time of inspection for ticks and treatment at the Queensland–New South Wales border, allowed the ticks to travel south of the tick infested area. Management in Victoria has included isolation of the horses from cattle grazing areas, as well as treatment and grooming, and a period of pasture spelling.

**Figure 13** Distribution of the cattle tick *Boophilus microplus* in Australia, 1999
QUEENSLAND

Queensland is divided into three tick control areas — infected, protected and free. The infected area extends around the coast from the southern border with New South Wales to the western border with the Northern Territory, and includes about 6 million cattle. The free area comprises the central and southwestern portions of the State and includes about 4 million cattle. Three protected areas lie between the infected and free areas. Stock moving out of the infected area to other areas or interstate are subjected to inspection and treatment, most of which is undertaken at official clearing dips.

In the infected area, cattle ticks are controlled by strategic use of acaricides and by the use of tropically adapted breeds of cattle. The tick fevers, babesiosis and anaplasmosis, are controlled by vaccines produced by the Queensland Department of Primary Industries.

Tick outbreaks sometimes occur in the marginal protected areas and occasionally in the free area. Affected farms are placed under movement restrictions and the ticks eradicated by the farm owners with the Department of Primary Industries providing appropriate advice and regulatory support.

The Queensland Government is also assisting the cattle industry to expand the tick-free area by facilitating the voluntary eradication of cattle ticks from appropriate groups of infested properties adjoining the free and protected areas.

In 1999, approximately 630 000 cattle, 12 000 horses, 20 000 sheep, 2000 goats, 1000 deer and 200 camelids were cleared by the Department of Primary Industries for movement out of tick-infected areas of the State. A total of 106 tick outbreaks in the protected and free areas were eradicated while 1020 properties in southeastern Queensland were removed from the infected area following successful voluntary eradication. A further 300 properties were moved from the protected to the free area. Preliminary studies were initiated into the possible use of biopesticides, such as fungi, for tick control.

Ovine footrot

Footrot has been present in Australia for many years, and was probably introduced in the early days of the Australian sheep industry. Virulent footrot causes significant economic loss in southern Australia. Several States have eradication or control programs — Western Australia has a formal eradication program, and New South Wales, South Australia and Victoria operate control programs. Tasmania does not routinely quarantine for footrot, although there is legislation available to do so if required. Footrot is not regarded as a significant problem in Queensland and there are no commercial sheep farms in the Northern Territory.

National agreement has been reached on standard definitions for infected and protected areas and on standards for diagnostic tests for footrot. The States are working towards coordinating their advisory and regulatory programs.

NEW SOUTH WALES

The New South Wales Footrot Strategic Plan is still on target to achieve control or protected area status throughout the whole of the State by the end of December 2000. During 1999, footrot quarantines actually increased from 242 at the start of 1999 to 400 at the end of the year. This was mainly associated with an increase in the number of areas achieving control.
or protected area status (where footrot quarantine is compulsory) and an increase in the number of cases detected in the New England area following increased field surveillance. Audits of seven rural lands protection boards over the last three years have endorsed the progress of the strategic plan. A change in legislation has made footrot a notifiable disease throughout the whole of the State, effective from February 2000.

QUEENSLAND
Ovine footrot is a notifiable disease in Queensland. During 1999, two properties near the New South Wales border had ovine footrot diagnosed in November and early December. *Dichelobacter nodosus* was isolated. Quarantine was imposed on both properties and they were destocked direct to slaughter. Neighbouring flocks were checked by physical inspection and no further cases detected.

WESTERN AUSTRALIA
The number of properties in quarantine for virulent footrot in Western Australia rose from 62 to 72. Over 20 new cases were quarantined in one shire, mostly originating from a clearing sale. Tracings, abattoir monitoring and targeted on-farm surveillance methods of detection were used to identify infected properties. Approximately 0.7% of Western Australian sheep flocks are currently in quarantine compared to an estimated 15% of flocks at the start of the eradication program many years ago. The benefit–cost ratio for footrot eradication has been calculated at 2.8:1. A risk analysis undertaken to ascertain the risk of reintroduction of the causative organism from eastern Australia following eradication in Western Australia indicates that an importation could occur approximately once in every 20 years.

SOUTH AUSTRALIA
The number of properties reported with footrot in South Australia during 1999 was similar to that of previous years with approximately eight new cases detected and a similar number being released from movement restrictions. A control program on Kangaroo Island is beginning to have an effect, with the number of new infections dropping and a 30% decrease in properties under restriction.

**Ovine brucellosis**
Contagious epididymitis, caused by *Brucella ovis*, is endemic in commercial flocks in some States of Australia, but its prevalence is low. Well-supported accreditation schemes for stud flocks are operated by State animal health authorities and breed societies. In 1999, there were 11,167 accredited free flocks in Australia.

NEW SOUTH WALES
An accreditation program for ovine brucellosis has been running in New South Wales for many years. The number of accredited free flocks remains fairly constant at about 1250, although there are minor changes as flocks enter and leave the scheme. During 1999, the Ovine Brucellosis Accreditation Rules and Guidelines were reviewed and revised in consultation with breed societies and the Australian Veterinary Association.

VICTORIA
The Ovine Brucellosis Control Area in the mallee region of northwestern Victoria was proclaimed in August 1997. This sheep/cereal cropping region has a large population of British breed rams used to produce first cross ewes and prime lambs. Ovine brucellosis was present in over 50% of flocks in this region.

Ovine brucellosis testing continued in 1999, extending the area tested to include the northeastern mallee, now covering about 70% of the Mallee Ovine Brucellosis Control Area. Prevalence of infection continued to decline in each of the three previously tested areas, with 7% of 406 flocks and 1.8% of 4600 rams found infected. High prevalence was found, as expected, in the previously untested area with 46% of 141 flocks and 29% of 1528 rams infected.
QUEENSLAND

An Ovine Brucellosis Accreditation Scheme is in place in Queensland and most stud breeding flocks are in the scheme. At the end of 1999, there were 73 flocks participating and 62 accredited free flocks. Ovine brucellosis is endemic in some commercial flocks.

SOUTH AUSTRALIA

Ovine brucellosis is still detected in some commercial flocks in South Australia but flocks in the Ovine Brucellosis Free Accreditation Scheme appear to be maintaining their freedom. A small number of animals return positive serological results at the re-accreditation test, but none have been found positive when checked by semen or testicular culture.

TASMANIA

The number of accredited flocks in Tasmania fell from 150 to 131 following a review of the testing history of some flocks during 1999.

Equine herpesvirus

A case of equine herpesvirus (EHV1) abortion in a thoroughbred mare occurred on a property north of Melbourne in early October 1999. The mare and her two companions were already in isolation on nonstud premises because they originated from a property in New South Wales where equine herpesvirus abortion occurred earlier in the year. Guidelines for control were followed and no other cases occurred in the Victorian group.

American foulbrood

American foulbrood is a brood disease of honeybees caused by the spore forming bacteria, Bacillus larvae. It attacks older larvae and young pupae. It is a particularly virulent brood disease because the bacteria form heat- and drought-resistant spores. The disease is subject to control programs in several States.

VICTORIA

In 1999, there were 1847 registered beekeepers in Victoria owning a total number of 104,771 beehives. American foulbrood remains a notifiable disease in this State and was notified by beekeepers or detected by inspectors in most parts of the State during 1999, although the numbers of outbreaks and total hives affected was lower than for previous years. There were 39 outbreaks of American foulbrood confirmed, with a total number of 357 hives destroyed. Infected apiaries were placed under quarantine or had movement restrictions imposed. In some cases, and under strict protocols, permission was given to extract infected honey as an alternative to destruction by burning. Only burning, wax dipping or irradiation of infected hive material was permitted as a suitable method of disease eradication.

QUEENSLAND

Bulk honey culture tests for American foulbrood from Queensland apiaries continues to detect infected apiaries under the control program. Two hundred and ninety five apiaries are now known to be infected representing 9.2% of total apiaries. The prevalence of infected apiaries in larger operations (>200 hives) is over 30%, which is slowing the control program.

SOUTH AUSTRALIA

Resulting from a decision by an apiaries task force, a surveillance system was instituted through honey packers beginning with spring honey deliveries. South Australia primary industry department staff investigate apiaries supplying the spore-positive honey to confirm the findings. If this investigation confirms the positive status, control measures are instituted.

TASMANIA

American foulbrood is present in Tasmania, but there is no formal control program.

Bat viruses (Hendra virus, Australian bat lyssavirus, Menangle virus)

HENDRA VIRUS

Hendra virus (or equine morbillivirus) was first recognised in Australia in September 1994. Thirteen racehorses, associated with a racing stable at Hendra, a suburb of Brisbane, Queensland, died after showing acute respiratory illness. There were also four nonfatal cases in this outbreak, two of which were left with mild neurological signs. A further three horses in the stable were subsequently found to have seroconverted in the course of the outbreak without demonstrable clinical signs. All seven surviving horses were subsequently euthanased. Two people at the stables also contracted the disease, one of whom subsequently died.

In October 1995, a second Hendra virus outbreak in horses was retrospectively diagnosed after the death of a stud-owner who suffered a relapsing encephalitic disease over a one-year period was attributed to Hendra virus. This outbreak (near Mackay in central Queensland, 800 kilometres north of Brisbane) chronologically preceded the Brisbane outbreak by several weeks, and involved the death of two horses.
with no other animals affected. In January 1999, four and a half years after the previous cases, a new fatal case of Hendra virus infection was reported in a single horse near Cairns in north Queensland. Outbreaks have not been reported from any other State or Territory of Australia. Extensive surveillance has demonstrated that the virus does not occur naturally in domestic animals or most wildlife species.

Serology and virology have confirmed that the virus is prevalent in all four species of Australian flying foxes (also known as fruit eating bats, fruit bats or megabats). There appears to be an endemic pattern of subclinical infection with Hendra virus in flying fox populations throughout Australia. No gross pathology or history of attributable illness has been detected in infected flying foxes, and there are no historical reports of major unexplained illness or death in flying fox populations in Australia. Analysis of accumulated serological data from Queensland indicates a crude seroprevalence in flying foxes of approximately 40%.

The evidence to date suggests that Hendra virus is a natural virus of flying foxes with rare spill-over of infection to horses causing serious illness. Although infection is not sustained in horses, people coming into contact with affected animals are at risk.

AUSTRALIAN BAT LYSSAVIRUS

During 1996, a new lyssavirus was identified in bats in Australia. The virus was found when rabies was included as a differential diagnosis for a case of encephalitis seen in a sick black flying fox (Pteropus alecto) at Ballina, New South Wales in May 1996. Samples were initially sent to the Animal Research Institute, Brisbane, as part of a surveillance program for equine morbillivirus. A lyssavirus was subsequently isolated at the Australian Animal Health Laboratory, Geelong. It was sent to the Centers for Disease Control and Prevention, Atlanta, United States for comparative studies.

To date, the Australian bat lyssavirus has only been found in Australia. It has been isolated from all four species of flying foxes on mainland Australia and one species of insectivorous bat.

Surveillance of bats for Australian bat lyssavirus continues to be undertaken by all States and Territories of Australia. The surveillance is largely passive, the sample primarily consisting of ‘rescued’ sick, injured or dead bats, and bats presented for Australian bat lyssavirus exclusion subsequent to a potential human exposures. Active surveillance of wild-caught bat populations has also been undertaken. Table 19 shows a summary of the results of passive surveillance while a more detailed analysis is available in the Animal Health Surveillance Quarterly for the fourth quarter 1999.20 While species are not listed in the Table 19, 7 of the 12 megabat species (includes flying foxes) in Australia and at least 23 of the 57 microbat species (includes insectivorous bats) have now been surveyed though sample size is limited for many species.

Australian bat lyssavirus has been identified in bats in the Northern Territory and all States except Western Australia and South Australia.

A pamphlet — Information on zoonotic bat viruses for veterinary practitioners — endorsed by the Commonwealth Department of Agriculture, Fisheries and Forestry – Australia (AFFA), the Australian Veterinary Association, and the Communicable Diseases Network Australia New Zealand can be obtained from the Internet.21

MENANGLE VIRUS

In mid-1997, researchers at the New South Wales Department of Agriculture’s Elizabeth Macarthur Agricultural Institute isolated a new paramyxovirus (since named Menangle virus) from stillborn piglets at a large commercial piggery near Menangle in New South Wales. The piggery experienced severe reproductive failure. There were large numbers of within-litter foetal deaths at a variety of gestational ages. Most sows carried their litters to term but the occasional abortion was seen. Farrowing rates were also reduced. The problem occurred over 14 weeks from mid-April to early August.

Two of 35 piggery workers, both of whom had experienced a significant febrile illness with a measles-like rash in June 1997, had high levels of antibodies to the new virus. Occupationally, one had frequent contact with birthing pigs, and the second performed postmortems on pigs. Neither had any known direct exposure to flying foxes.

A large colony of grey-headed flying foxes (*Pteropus poliocephalus*) seasonally roost from November to April within 200 metres of the affected piggery and have done since it was established in 1968. Flying foxes were investigated as a potential source of the infection. In a preliminary study, 42 of 125 sera collected from flying foxes in New South Wales and in Queensland were positive by virus neutralisation test (26/79 *P. poliocephalus*, 11/20 *P. alecto*, 4/10 *P. conspicillatus*, 0/15 *P. scapulatus* and 1/1 unidentified species). The study included sera collected in 1996, before the time of infection of pigs, supporting the hypothesis that flying foxes were the primary source of the virus. A range of other animal species in the vicinity of the affected piggery were seronegative, including 19 rodents, 13 birds, 60 cattle, 70 sheep, 25 cats and 1 dog. Additional studies of flying foxes at Menangle and at other colonies within 30 kilometres of the piggery have shown the presence of neutralising antibodies to Menangle virus.

Attempts to isolate viruses from a range of flying fox tissues from animals captured at the site have been unsuccessful. However paramyxovirus particles have been seen by electron microscopy in several pools of flying fox faeces collected on tarpaulins underneath the Menangle colony. Immunogold labelling of these paramyxovirus particles with convalescent sow serum indicates they are Menangle virus. To date, the evidence suggests flying foxes are the natural reservoir for Menangle virus. Further studies of the colony are under way. It is notable that the colony and the piggery coexisted for 29 years before the incident. Since the outbreak, the infection has cycled endemically in the piggery until recently when it was eradicated by a combination of quarantine and culling procedures.

### Mastitis in dairy cattle

‘Countdown Downunder’, Australia’s new mastitis control program for dairy cattle, was launched in December 1998 at the Annual General Meeting of the Australian Dairy Industry Council. Mastitis lowers farm profitability, reduces product quality and quantity, and potentially damages exports and the image of milk. It has a ‘big picture’ impact on the whole Australian dairy industry, and is a daily concern for everyone who milks cows or advises farmers about udder health or milk quality issues. The goal is to have 100% of Australian dairy farms supplying milk with a cell count of less than 400 000 cells/millilitre in all milk supply periods. The program is the result of a response by the Dairy Research and Development Corporation to the wet winter of 1996 when many dairy farmers had problems with mastitis in their herds. ‘Countdown Downunder’ has been developed by the Australian Mastitis Advisory Council.
Aquatic animal health status

The nature of aquatic animal diseases and the volume of the aquatic animal trade are such that no aquatic animal diseases are categorised by the World Organisation for Animal Health (OIE) as List A diseases. Therefore, in the OIE International Aquatic Animal Health Code, the term ‘diseases notifiable to the OIE’ has been used instead of ‘List B diseases’. The OIE also defines a list of ‘other significant diseases’.

OIE diseases

Diseases notifiable to the OIE appear on a list of transmissible aquatic animal diseases that are considered to be of socioeconomic and/or public health importance within countries and that are significant in the international trade of aquatic animals and aquatic animal products.

Other significant diseases

Other significant diseases are diseases that are of current or potential international significance in aquaculture but that have not been included in the list of diseases notifiable to the OIE. Other significant diseases are considered less important than notifiable diseases, or have a limited geographical distribution of the disease, or, conversely, are too widespread for notification to be meaningful. Some diseases that appear on this list have not yet sufficiently been defined; or because the aetiology of the disease is not well enough understood; or approved diagnostic methods are not available.

Australia is free of most of the diseases notifiable to the OIE as well as many of the diseases currently listed as other significant diseases. The status of each disease is shown in Table 20 and further details of disease occurrences in Australia are shown in Table 21.
### Table 20: Status of OIE-listed diseases of aquatic animals in Australia, 1999

<table>
<thead>
<tr>
<th>Disease/agent</th>
<th>OIE status</th>
<th>Status in Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Finfish</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epizootic haematopoietic necrosis</td>
<td>Notifiable</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Infectious haematopoietic necrosis</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Oncorhynchus masou virus disease</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Spring viraemia of carp</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Viral haemorrhagic septicaemia</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Channel catfish virus disease</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Viral encephalopathy and retinopathy</td>
<td>Other significant</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Infectious pancreatic necrosis</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Infectious salmon anaemia</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Epizootic ulcerative syndrome (Aphanomyces invadens)</td>
<td>Other significant</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Bacterial kidney disease (Renibacterium salmoninarum)</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Enteric septicaemia of catfish (Edwardsiella ictaluri)</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Piscirickettsiosis (Piscirickettsia salmonis)</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Gyrodactylosis (Gyrodactylus salaris)</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td><strong>Mollusc</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonamiosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonamia sp</td>
<td>Notifiable</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>B. ostreae</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Haplosporidiosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haplosporidium costale</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>H. nelsoni</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Marteliiosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martelia refringens</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>M. sydneyi</td>
<td>Notifiable</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Mikrocytosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mikrocytos mackini</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>M. roughleyi</td>
<td>Notifiable</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Perkinsiosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perkinsus marinus</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>P. olseri</td>
<td>Notifiable</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Iridoviruses</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td><strong>Crustacean</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellowhead disease</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>White spot disease</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Taura syndrome</td>
<td>Notifiable</td>
<td>Exotic</td>
</tr>
<tr>
<td>Baculoviral midgut gland necrosis</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Nuclear polyhedrosis baculoviroses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baculovirus penaei</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Penaeus monodon-type baculovirus</td>
<td>Other significant</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>Infectious hypodermal and haematopoietic necrosis</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
<tr>
<td>Crayfish plague</td>
<td>Other significant</td>
<td>Exotic</td>
</tr>
</tbody>
</table>
### Disease Occurrence in Australia

#### Finfish

<table>
<thead>
<tr>
<th>Disease</th>
<th>Occurrence in Australia</th>
</tr>
</thead>
</table>
| Epizootic haematopoietic necrosis| Not reported in 1999.  
Passive surveillance and known to have occurred in NSW (last year 1996), Vic (last year 1996) and SA (last year 1992).  
Targeted active surveillance and never reported in Tas and WA.  
Passive surveillance and never reported in NT and Qld.  
Suspected annual occurrence of the disease in the ACT on the basis of clinical signs but there has been no laboratory confirmation. |

#### Viral encephalopathy and retinopathy

<table>
<thead>
<tr>
<th>Disease</th>
<th>Occurrence in Australia</th>
</tr>
</thead>
</table>
| Reported in October, November and December 1999 in Qld, based on electron microscopy and histology.  
Not reported in NT during 1999 (targeted surveillance) but known to have occurred (last year 1994).  
Not reported in SA since an isolated outbreak in July 1998 despite passive surveillance by histology.  
Passive surveillance and never reported in NSW, Tas, Vic and WA.  
No information available from the ACT. |

#### Epizootic ulcerative syndrome

<table>
<thead>
<tr>
<th>Disease</th>
<th>Occurrence in Australia</th>
</tr>
</thead>
</table>
| Reported from Qld in November (histology) and from NSW in December (clinical signs and histology).  
Not reported but known to have occurred earlier in 1998 in WA, and 1999 in NT (passive surveillance).  
Passive surveillance and never reported in SA, Tas and Vic.  
No information available from the ACT. |

#### Molluscs

<table>
<thead>
<tr>
<th>Disease</th>
<th>Occurrence in Australia</th>
</tr>
</thead>
</table>
| Bonamia sp                       | Reported from Tas and WA in October.  
Regarded as enzootic in WA.  
Not reported in 1999 but known to have occurred in Vic (last year 1993).  
Passive surveillance and never reported in NSW, NT, Qld and SA. No information available in the ACT (no marine water responsibility). |
| B. ostreae                       | Passive surveillance and never reported in NSW, NT, Qld, SA, Tasmania, Vic and WA. No information available in the ACT (no marine water responsibility). |
| Marteilia refringens             | Active surveillance and never reported in Tas.  
Passive surveillance and never reported in NSW, NT, Qld, SA, Vic and WA.  
No information available from the ACT (no marine water responsibility). |
| M. sydneyi                       | Target active surveillance — occurred in NSW in early 1999.  
Considered enzootic in Qld, but lack of diagnostic submissions.  
Not reported during 1999 (passive surveillance) but known to have occurred in WA (last year 1994).  
Active surveillance and never reported in Tasmania.  
Passive surveillance and never reported in NT, SA and Vic. No information available from the ACT (no marine water responsibility). |
| Mikrocytos mackini               | Active surveillance and never reported in Tas.  
Passive surveillance and never reported in NSW, NT, Qld, SA, Vic and WA.  
No information available in the ACT (no marine water responsibility). |
| Mikrocytos roughleyi             | Not reported during 1999 (passive surveillance) but known to have occurred in NSW (last year 1996) and WA (last year 1996).  
Considered enzootic in Qld but lack of diagnostic submissions.  
Passive surveillance and never reported in NT, SA and Vic. No information available in the ACT (no marine water responsibility). |
| Perkinsus marinus                | Active surveillance and never reported in Tas.  
Passive surveillance and never reported in NSW, NT, Qld, SA, Vic and WA.  
No information available for the ACT (no marine water responsibility). |
| P. olseni                        | Not reported during 1999 (passive surveillance) but known to have occurred in SA (last year 1997), NSW and WA (last year 1995).  
Active surveillance and never reported in Tas.  
Passive surveillance and never reported in NT, Qld and Vic.  
No information available in the ACT (no marine water responsibility). |
Australia also has a national reporting system for aquatic animal diseases of national significance. All the OIE-listed diseases are included (both notifiable and other significant diseases). Other diseases of national concern covered by the reporting system are listed in Table 22.

### Table 22 Status of non-OIE listed diseases of aquatic animals in Australia, 1999

<table>
<thead>
<tr>
<th>Disease/agent</th>
<th>OIE status</th>
<th>Status in Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Finfish</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furunculosis</td>
<td>Not listed</td>
<td>Exotic</td>
</tr>
<tr>
<td>(Aeromonas salmonicida subsp. Salmonicida)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goldfish ulcer disease</td>
<td>Not listed</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>(Aeromonas salmonicida atypical strains)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whirling disease</td>
<td>Not listed</td>
<td>Exotic</td>
</tr>
<tr>
<td>(Myxobolus cerebralis)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteric redmouth disease</td>
<td>Not listed</td>
<td>Exotic</td>
</tr>
<tr>
<td>(Yersinia ruckeri Hagerman strain)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yersiniosis</td>
<td>Not listed</td>
<td>Restricted to some areas</td>
</tr>
<tr>
<td>(Yersinia ruckeri)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crustaceans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Necrotising hepatopancreatis</td>
<td>Not listed</td>
<td>Exotic</td>
</tr>
</tbody>
</table>

### Disease events in 1999

#### Pilchards

The pilchard mortalities that commenced in Spencer Gulf in October 1998 continued to spread along the Australian coastline with mortalities occurring until May 1999. The mortalities spread as far as Geraldton on the west coast and Sydney on the east coast.

As in the 1995 pilchard mortality incident, dead and dying pilchards were found to contain a herpesvirus in their gill tissues. A strategic research program cofunded by various State agencies, CSIRO Animal Health and the Fisheries Research and Development Corporation is investigating the cause of the mortality, the development of diagnostic tools and the epidemiology of the event.

#### Black striped mussels

Although exotic marine pests are primarily the responsibility of Environment Australia, the National Offices of the Commonwealth Department of Agriculture, Forestry and Fisheries — Australia (AFFA) provided expertise in the field of emergency management and nationwide coordination of the response to the incursion of black striped mussels into Darwin harbour. The elimination of this incursion was the first example of successful elimination of an exotic marine pest incursion anywhere in the world. A national taskforce was subsequently established to identify the most appropriate method of response to future outbreaks of exotic marine pests. AFFA provided several staff to participate in the working group whose report is currently being considered by federal cabinet.
Glugea stephani in farmed flounder

During December 1999, an outbreak of disease in juvenile farmed flounder in Tasmania was associated with florid gross and histological gut lesions resembling those described for *Glugea stephani*, a significant microsporean parasite of northern Atlantic flat fish. *G. stephani* has not so far been described from Australia, and has been previously regarded as an exotic organism. The microsporean parasite from this outbreak had not been speciated. Previous reports of microsporea from the gut of Australian marine fish include *Glugea atherinae* from atherinids (hardyheads). Unidentified microsporea have been seen in the gut of wild and farmed flounder since at least 1993, but infection of this magnitude has not been recorded here previously.

Ganglioneuritus in farmed prawns

As part of an active surveillance program on New South Wales prawn farms, a new syndrome, temporarily designated ‘monodon ganglioneuritus’ (MGN), was recognised during April 1999. MGN was associated with minor to major losses (up to 50% mortality rates) in affected *Penaeus monodon* ponds on the farm during the middle to later stages of the 1998–99 grow-out period. Major histological lesions were confined to the nervous system. The cause of MGN has not yet been determined. No causal agents were seen in lesions and no definitive viral inclusion bodies were recognised. Preliminary transmission electron microscopy failed to show evidence of viral infection. Transmission trials and further virological studies are in progress in an attempt to identify a causal infectious agent.

National strategic plan for aquatic animal health

AQUAPLAN, Australia’s National Strategic Plan For Aquatic Animal Health 1998–2003, was published and formally launched by the Hon. Warren Truss, Commonwealth Minister for Agriculture, Fisheries and Forestry. AQUAPLAN is a comprehensive strategy targeting aquatic animal health and aimed squarely at improving productivity and sustainability of Australia’s fishery and aquaculture industries. AQUAPLAN incorporates a range of programs including border controls, import certification, disease surveillance and monitoring, improved veterinary education and better disease outbreak management, all supported by detailed operational plans.

A stakeholder workshop held in 1999 critically assessed the progress made with the implementation of AQUAPLAN projects to date and drafted the priorities for the next financial year (1999–2000). Among the most significant achievements to date,
is the development of coordinating arrangements to respond to aquatic animal disease emergencies; these strategies have been successful in the pilchard mortality event off southern Australia and the striped mussel incursion off Darwin.

**SIMULATION EXERCISES**

At the AQUAPLAN workshop, participants agreed that a series of simulation exercises to test preparedness for disease incursions was a major priority for the aquaculture industries. The Queensland Department of Primary Industries together with the Australian Prawn Farmers Association was the first to volunteer for such an exercise.

During the exercise, key managers of the fisheries section of the Queensland Department of Primary Industries together with staff of the Animal and Plant Health Service, the Queensland Fisheries and Boating Patrol, the Queensland Environment Protection Agency and the Australian Prawn Farmers Association met together to plan the response to an outbreak of ‘prawn blight’, a fictitious disease with more than superficial similarities to white spot syndrome virus. Throughout the exercise, the participants dealt with a range of problems, ranging from disease tracing and response options through to poachers and public relations. The exercise was hailed as a success for building contacts between the various government departments and increasing awareness of the need to plan for disease incidents. Major issues arising during the exercise included compensation for compulsory slaughter and relations with industry, the public and the media.

A review of surveillance and monitoring activities in the fisheries and aquaculture industries was completed. A wide range of surveillance programs was identified and these will be used as the basis for development of an enhanced capacity to detect emergency disease events.

At a national level, AFFA coordinated the response to the two aquatic animal disease and pest emergencies, the pilchard mortalities in the Southern Ocean and the black-striped mussel incursion in Darwin (see the section on disease events in 1999, above). Other issues of interest included identification and characterisation of a new orthomyxo-like virus from pilchards.
Newcastle disease outbreaks

The outbreak of Newcastle disease in western Sydney in 1998 was the first case of virulent Newcastle disease in Australia since an outbreak in 1930, which was finally eradicated in 1932. The outbreak in 1930 related to the feeding of chickens with ships’ waste, while the feeding of infected carcases that were frozen over from the 1930 outbreak led to a fresh outbreak in 1932.

The virulent virus causing the outbreak in 1998 was shown to have arisen from the mutation of an Australian nonvirulent endemic virus known to occur at Peat’s Ridge, New South Wales. The presence of the Peat’s Ridge virus had only been shown shortly before. During 1999, there were two further outbreaks of virulent Newcastle disease close to the areas where the disease had occurred in 1998: Mangrove Mountain and the Schofields area of western Sydney.

Mangrove Mountain outbreak

In late March 1999, virulent Newcastle disease was suspected at a Mangrove Mountain farm of 27 000 started pullets contained in three sheds. The pullets had been recently placed in cages and showed nervous signs and coughing and sneezing consistent with virulent Newcastle disease infection. Only the pullets in one shed had clinical Newcastle disease and antibody to Newcastle disease virus. Mortality had been steadily increasing over the four days before diagnosis originally confined to the part of the shed adjacent to the entry door but later an increased number of birds were sick and dying in other areas of the shed.

The diagnosis was established in affected pullets using immunofluorescence, detection of a virus with virulent virus sequence by polymerase chain reaction in nervous tissue and isolation of a virus with virulence characteristics at the Australian Animal Health Laboratory (AAHL), Geelong, on 1 April 1999. The pullets in the other two sheds remained without evidence of Newcastle disease infection.

Following the implementation of quarantine, eradication procedures were commenced. The pullets were all dead and destroyed by burning by 4 April and all the litter was disposed of and the farm cleaned up and disinfected by 14 April.

On 12 April, broiler chickens in one shed on a farm about 1 kilometre from the initially infected farm had an increase in sickness and culls. Two days later, illness and mortality had risen tenfold. Clinical signs displayed included sneezing, lethargy, paralysis, swaying of the head from side to side and occasional diarrhoea, signs consistent with virulent Newcastle disease. Within five days there were obvious respiratory and nervous signs seen in chickens in another of the four sheds on the farm. On 15 April, chickens in another broiler flock about 1 kilometre from the index farm were displaying clinical signs of virulent Newcastle disease. On 22 April, three further broiler flocks all within 5 kilometres of the index farm, were diagnosed with virulent Newcastle disease. On 27 April and 5 May, two further farms were confirmed infected, giving a total of nine commercial farms that had developed clinical Newcastle disease.

THE RESPONSE

This outbreak in the Mangrove Mountain area had particular significance because the area had a high density of around 70 poultry broiler farms containing about 4.5 million broiler chickens. There were also a small number of layer and started pullet flocks, one duck flock, one ostrich flock and numerous noncommercial poultry and pet aviary birds in the area.

The Mangrove Mountain area has four separated rural regions, Mangrove Mountain Ridge, Kulnura, Peat’s Ridge and Somersby Plateau, each surrounded by native forest (Figure 14). At the start of the outbreak, restricted and control areas were established using...
AUSVETPLAN and OIE disease control principles: the restricted area (RA) was to the boundaries of the infected farm and the control area (CA) was a 10 by 18-kilometre area covering the Mangrove Mountain ridge. Controls were placed on the movements of live birds and poultry products from the RA and CA. The Consultative Committee on Emergency Animal Diseases (CCEAD) met regularly by teleconference and in-person meetings to provide advice to NSW Agriculture, the chief combatant agency.

Later, the RA was extended to take account of the increasing numbers of infected farms while maintaining a minimum 3-kilometre radius from infected farms. The CA was also expanded to take account of the 10-kilometre radius about all infected farms. Ultimately, the RA was expanded to take in the whole Mangrove Mountain Ridge and the CA was expanded to take in the other three parts of the Mangrove Mountain area (Kulnura, Peat’s Ridge and Somersby Plateau) (Figure 14). The whole Mangrove Mountain area is surrounded by native Australian forest. Between 1 April and 10 May 1999, virulent Newcastle disease was confirmed on nine commercial poultry farms in the RA.

At a meeting of CCEAD in Orange, New South Wales on 20 April, it was decided that salvage of poultry from the Mangrove Mountain Ridge (the RA) would not be pursued because salvage had an undetermined risk of moving subclinically affected birds during transport and possibly infecting other poultry flocks. All commercial poultry were to be slaughtered out and disposed of locally. It was also decided that, should clinical Newcastle disease occur in the CA, stamping out and decontamination would apply to that flock and processing out continue from other farms unless there was evidence of further widespread infection.

Subsequently, as a risk management strategy, flocks in the CA were processed under permit to decrease the population at risk.

By 1 May, around 1 142 000 birds had been destroyed on 14 farms and 18 further farms were awaiting destruction. At this time around 900 people were working from the local disease control centre (LDCC), at Kariong near Gosford, in the RA and CA and 13 people were working at the State disease control headquarters at Orange. The organisations and people taking part in the response included NSW Agriculture (chief combatant agency), emergency services organisations from New South Wales and Queensland, Australian Navy, Commonwealth and interstate agricultural agencies, volunteers and many other groups. The response mounted to this disease outbreak was the largest animal health emergency response ever made in Australia.

The operational costs, associated with the response to eradicate the virulent Newcastle disease outbreak, were covered by the Commonwealth–States Cost Sharing Agreement. This agreement provided for the costs of compensation and operations, over and above normally employed staff, to be cost-shared according to a formula whereby the Commonwealth Government paid 50% and the State and Territory governments paid the other 50% according to the size of the poultry industry in their State or Territory.

**SURVEILLANCE**

Mortality records on all commercial farms in the RA and CA were forwarded to the LDCC on a weekly basis; any increase in mortality or illness was to be reported immediately. Virological surveillance of dead and culled birds was started in the RA in early April. An enhanced surveillance program was agreed with CCEAD on 20 April and implemented across both the RA and CA. The results indicated that nonvirulent Peat’s Ridge virus, the precursor virus for the virulent virus, was a widespread infection throughout the restricted and control zones.
In addition to Peat's Ridge virus, virulent virus was isolated from a small noncommercial flock on the Mangrove Mountain Ridge, four broiler flocks on Peat's Ridge and two broiler flocks at Kulnura and viruses intermediate between virulent virus and Peat's Ridge virus were isolated from two broiler flocks on Somersby Plateau.

A feature of the virulent virus isolations was that all were achieved retrospectively from broiler flocks that had been destroyed or had reached processing age (35 days of age upwards to 60 days) and in which there was no evidence of overt clinical signs of Newcastle disease. Invariably the surveillance results were obtained at the time a flock was completing depopulation by slaughter or to processing. Nevertheless, these mutated viruses were isolated from sick or dead chickens and only virulent Newcastle disease virus was demonstrated in brain tissue.

DESTOCKING THE MANGROVE MOUNTAIN AREA OF POULTRY

The isolation of intermediate and virulent viruses in the absence of clinical disease from flocks in the CA forced a review of policies for dealing with the outbreak. Farms from which virulent virus was isolated were subjected to clean-up and disinfection as for farms that had had clinical disease. Broiler chickens in the CA, otherwise normal when attaining processing age, were processed under permit restrictions that required containment of meat and byproducts into biosecure systems that would maximise virulent virus containment. Meat and other poultry products were subject to controls that would minimise any spread of virulent disease. A decision was taken to slaughter out the remaining commercial poultry in the CA before restocking commenced.

A total of 9 commercial farms in the RA recorded clinical Newcastle disease and 1 900 000 poultry on 32 broiler farms, ostrich, duck and layer flocks were destroyed by 12 May 1999. Over 2 000 000 broilers were sent to processing in the depopulation of the control zone. The last commercial farm was depopulated on 9 June 1999. In addition, more than 2000 avairy birds and noncommercial poultry in the restricted zone were destroyed by 28 May 1999. Secure disposal of litter and disinfection of the last farm was completed in early July 1999.

RESTOCKING THE MANGROVE MOUNTAIN POULTRY FARMS

In deciding to depopulate all commercial poultry from the whole of the restricted and control zones, the decision was taken that restocking would not take place until all farms had been depopulated, each premises was cleaned out and disinfected and a second disinfection was applied at least 14 days after the first disinfection. These conditions for restocking were not met until mid-August.

On restocking, the whole Mangrove Mountain area reverted to a control zone.

After restocking, serological and virological surveillance was undertaken to determine whether endemic, nonvirulent Newcastle disease virus, Peat's Ridge

Newcastle disease virus: quarantine control
Source: NSW Agriculture
strain or virulent virus were re-establishing in the poultry population. The first evidence of Newcastle disease virus infection re-establishing was obtained from serological surveillance in two broiler flocks at the end of October 1999. Virological surveillance showed other flocks in the area had not only reacquired the endemic Peat’s Ridge virus but intermediate and virulent viruses were also isolated, even though there were no clinical signs of virulent Newcastle disease. Morbidity and mortality in the replacement broiler chicken flocks were far lower than the industry average.

**VACCINATION AT MANGROVE MOUNTAIN**

In the face of this evidence, it was decided that all flocks in the Mangrove Mountain area would be vaccinated with Australian V4 vaccine. Vaccination was undertaken at poultry industry expense and, using industry expertise, the area was vaccinated in 2 days. Vaccination was carried out on all commercial poultry flocks of more than 100 birds across the whole Mangrove Mountain area. The aim of the vaccination was to prevent infection with virulent virus and Peat’s Ridge and related viruses spreading in and between flocks and hopefully to see its elimination from the poultry industry in the area. Elimination of Peat’s Ridge virus would remove the precursor for virulent virus. With the commencement of vaccination, the Mangrove Mountain area became a ‘control zone with vaccination’ and the whole of Cumberland County, encompassing the whole of greater Sydney and areas to the north, west and south, was declared the ‘control zone without vaccination’ in mid-December 1999.

Since the start of the vaccination program, broilers at slaughter have been serologically surveyed by the poultry industry to monitor for satisfactory vaccination titres. From March 2000, broiler flocks of chickens will be virologically surveyed in the third replacement round following restocking. The surveillance will be carried out on dead and sick birds from 6 weeks of age.

**GOVERNMENT–INDUSTRY COOPERATION**

The sheer size of this outbreak forced poultry industry and government representatives into new relationships and cooperation. From early May 1999, high-level government industry meetings and working parties operated to develop policies and strategies for dealing with the unfolding situation and future outbreaks of Newcastle disease in Australia. Particular emphasis has been placed on the development of standard operating procedures that will minimise the risk of spreading virulent Newcastle disease to new areas of Australia. The high-level meetings also decided that there should be a national survey for Newcastle disease viruses conducted across the whole Australian poultry industry. While this survey was mooted in early 1999, the survey will not commence until early 2000, when funding and survey details are agreed between government and industry parties.

The standard operating procedures are agreed industry operating standards taking account of the fact that virulent Newcastle disease is mutating from endemic nonvirulent strains. These procedures focus on the biosecurity factors of industry operations being carried out at best practice while retaining the industry’s capacity to meet commercial and customer needs for movements of live birds and poultry products. The standard operating procedures cover broiler production and processing, egg-layer operations, elite and parent breeding flock and hatchery operations, initial and ongoing vaccination programs using V4 and imported inactivated vaccines, feed delivery, live bird pick-up, delivery and movements, handling poultry byproducts and waste from processing and composting litter on farm. The emphasis in all the documentation is to incorporate biosecurity measures into operations that will minimise the spread of virulent Newcastle disease viruses associated with the outbreaks in New South Wales. The standard operating procedures initially developed for products and birds from vaccinated flocks in the Mangrove Mountain area, are likely to become industry-wide operating standards in 2000.
Western Sydney outbreak

In another outbreak during 1999, clinical Newcastle disease occurred in a small multiage layer farm at Schofields, northwestern Sydney — about 3 kilometres from the index farm in the September 1998 outbreak. There were about 9000 pullets and layers of various ages on the farm and disease occurred in only the 4 and 17-week-old birds. Ataxia and other nervous signs were reported in a small number of chickens. All the layer birds on the infected farm were destroyed and buried.

Clinical surveillance on surrounding farms did not detect further disease. However, virulent virus was isolated from chickens in 1 of 7 sheds on a large farm of 100 000 broilers, adjacent to the infected premises. The broilers were normal throughout the growing period and virulent Newcastle disease virus was isolated retrospectively, along with Peat’s Ridge strain of virus, on this farm. This was the first time that Peat’s Ridge virus was isolated outside of the Mangrove Mountain area.

The sheds on both farms were cleaned out and disinfected and litter from both premises was treated by composting to destroy Newcastle disease virus. No further clinical Newcastle disease was detected and no further isolations of virulent Newcastle disease virus were made in the Schofields area.

Reviews of activities

A review of the biosecurity factors that might have led to the spread of infection on Mangrove Mountain concluded that the virus entering the first infected farm was virulent at the time. No conclusion was able to be made about the source of the virus. It was concluded that the spread of virus from the initially infected farm was by the airborne route. The reviewer believed weather, topography and timing of the outbreaks provided support for the above views. The review of biosecurity identified problems relating to proximity of farms and accessibility of birds and there were lessons to be learnt about isolation and security.

It was pointed out that quality assurance systems based on ‘hazard analysis and critical control point’ (HACCP) principles need to be implemented in the poultry industry if there are to be long-term solutions to poultry industry disease problems. It was seen that incentives and disincentives need to be provided by government and industry to ensure that improved methods of biosecurity are adopted in the livestock industries generally.

A review commissioned by the Commonwealth Government on how Newcastle disease eradication should proceed in the postvaccination period, made a series of recommendations. The recommendations were used and built on by the industry–government committee developing the standard operating procedures to strengthen biosecurity operations in the poultry industry.

Epidemiology

The Newcastle disease viruses isolated by culture in embryonated eggs or detected in tissues were examined for virulence sequence at the cleavage site of the F gene, using polymerase chain reaction to determine pathogenicity. The intracerebral pathogenicity index of representative virulent viruses isolated during 1998 and 1999 ranged from 1.6 to 1.9. All had the virulence sequence of RRQRRF at the F gene cleavage site. The strains that were intermediate in virulence between Peat’s Ridge virus and virulent virus had intracerebral pathogenicity indices of 1.4 to 1.6, a virulent classification by the World Organisation for Animal Health (OIE) standards, although no clinical signs of Newcastle disease were seen in flocks from which these viruses were isolated and they were not demonstrated outside of epithelial tissues in the respiratory tract.

Peat’s Ridge virus, with the distinct F gene sequence at the cleavage site of that virus, was first isolated from a broiler flock at Peat’s Ridge, Mangrove Mountain,
in July 1998. Virus isolations from chickens across the major poultry areas of Australia up until 1995 had not yielded a Newcastle disease virus with more than two of the six amino acids at the cleavage site being of the virulence configuration. The precursor virus for Peat's Ridge virus was probably a virus first isolated in 1988 from southwestern Sydney broilers. This virus had only two amino acids at the cleavage site of the virulence sequence but importantly it had other genetic features in the F and HN genes and HN extension consistent with the virulent viruses isolated in 1998, 1999 and 2000. The gene sequences of the various viruses at the F gene cleavage site isolated from the various areas are:

- GKQGRL — southwestern Sydney, 1988
- RRQRRL — intermediate virus: Somersby, May 1999
- RRQGRF — intermediate virus: Peat's Ridge (PR-32), December 1999; Orchard Hills, January 2000

While genetic sequencing studies indicate that the virulent viruses isolated from the various outbreaks are closely related, they are detectably different by minor nucleotide changes in the F and HN genes. The same minor differences in nucleotide sequences apply to the many Peat's Ridge viruses isolated from the outbreak areas. First isolated on Peat's Ridge, Peat's Ridge virus was subsequently detected outside of the Mangrove Mountain area in the Schofield's area in September 1999. It is unclear at this time when and where the southwestern Sydney virus became Peat's Ridge virus and when Peat's Ridge virus first evolved to virulent virus. This may never be known because there was little national virological surveillance for Newcastle disease viruses between 1995 and 1999. However, it is now clear that Peat's Ridge virus was the precursor virus of the virulent Newcastle disease virus. In broiler flocks, infection with this virus becomes widespread when chickens are between 30 to 40 days of age. It is believed that infection with intermediate and virulent viruses is suppressed by the level of Newcastle disease immunity in the flock. When virulent virus gained entry to the naive pullets at the start of the Mangrove Mountain outbreak, it is believed virulent virus production was sufficient for airborne infection to occur. Even so, spread of the virulent virus was slow in chickens in cages and this has been a feature of all the outbreaks involving chickens in cages. Later in the Mangrove Mountain outbreak, when broiler flocks had Peat's Ridge virus firmly established, virulent and intermediate viruses were not able to produce widespread infections and virus production appeared to be suppressed by the immunity of the chickens.

Periodic updates on Newcastle disease cases are available through the Animal Health Surveillance Quarterly.23

These events have brought into focus the need to clarify the type, prevalence and distribution of Newcastle disease viruses in Australian poultry flocks. The national Newcastle disease virus survey will be commencing across Australia in March 2000 and will determine, in addition to the various virus strains present in Australia, the seroprevalence of Newcastle disease-positive flocks and identify possible risk factors for exposure to Newcastle disease viruses on Australian poultry farms. With this information to hand, it will be possible to develop strategies for controlling the occurrence of Peat's Ridge virus and any other viruses that have virulence or near virulence sequences in the F gene at the cleavage site. This is a unique situation that no other country has faced before.

An important feature of virulent Newcastle disease in layer flocks has been the relatively low mortality and morbidity in many affected layer farms. This suggests that the virulent virus has low transmissibility, particularly in the cage layer situation. Australia has sought OIE to request its Standards Commission to consult experts to reconsider the clinical description and diagnostic criteria for Newcastle disease.

The molecular data used in preparing the epidemiology report was provided by the AAHL. Over 400 virus isolates and numerous tissues were processed for Newcastle disease in support of the surveillance program.

**Current government–industry agreements on eradication of virulent Newcastle disease**

It is generally accepted by industry and governments that virulent Newcastle disease must not be allowed to become endemic in Australia. To this end, it is also agreed that the detection of virulent Newcastle disease virus of Australian origin will be handled on a case-by-case basis by government and industry consultation. It is also agreed that the occurrence of virulent Newcastle disease not of an Australian virus type will see the full implementation of AUSVETPLAN to eradicate the disease.

In the absence of the results of the national Newcastle disease virus survey, it has been difficult to develop a firm policy for the control of Newcastle disease in the event that virulent Newcastle disease occurs from mutation of the Australian virus. Until the results of the national survey are available, it is agreed that ring vaccination will proceed in a 3-kilometre restricted zone when virulent virus of Australian origin has been demonstrated. The occurrence of low-level infection, particularly in layer flocks with little illness and mortality, has presented a dilemma for disease control authorities. The future will become clearer when the national Newcastle disease virus survey is completed and a strategy is developed to deal with nonvirulent Newcastle disease viruses that could mutate into virulent viruses.

**Conclusion**

The outbreak of virulent Newcastle disease in the Mangrove Mountain area of the central coast of New South Wales was the largest and most costly emergency animal disease control program ever undertaken in Australia. The depopulation of a densely populated poultry industry by slaughter and processing of over 4 million broiler chickens proved to be a most difficult logistical exercise. The secure disposal of nearly 2 million chicken carcasses and some 4500 cubic metres of litter while meeting stringent environmental conditions, posed special problems for New South Wales disease control personnel. The cost of the outbreak to the Commonwealth, State and Territory governments, under the cost-sharing agreement, will be of the order of $26 million.

The need to carry out virological surveillance across a wide area taxed the resources of the virus isolation facilities of the New South Wales and Victorian government laboratories processing swab samples and the resources of the AAHL in undertaking the polymerase chain reaction and other specialist tests under very tight timelines. At the same time as the Australian Animal Health Laboratory was providing services to the Mangrove Mountain area outbreak, the laboratory was committed to important laboratory studies on Nipah virus on behalf of the Malaysian government.

The outbreak has also tested the capacity of Australia’s disease control authorities in making rational disease control decisions in the face of the spread of virulent disease. Australia has, fortunately, not had a disease outbreak of such size and complexity previously and this recent event has forged new working relationships with the poultry industry. Industry and government have worked to develop new and ongoing policies and strategies for dealing with an emerging disease outbreak.
Nipah virus: a new threat to regional animal health stability

Australian animal health authorities and organisations cooperate with and assist animal health authorities of other countries in the region. The following information on Nipah virus, contributed with the kind permission of Dr M. N. Mohd. Nor, Director-General, Department of Veterinary Services, Malaysia, is one example of this cooperation. Nipah virus does not occur in Australia.

In late 1998 and early 1999 there was an alarming outbreak of deaths from encephalitis among pig farm workers in Malaysia. Initially, Japanese encephalitis (JE) was suspected because of the association of human cases with pigs, but JE vaccination and mosquito control were not successful in halting the outbreak. Public health and veterinary agencies, the pig industry, the press and the public were desperately searching for a diagnosis and for effective control measures.

In March 1999, Dr Chua Kaw Bing and Professor Lam Sai Kit at the University of Malaya, isolated a previously unknown virus from a number of people who had died of the encephalitis. The new virus was taken to the Centers for Disease Control and Prevention (CDC) in the United States and found to be related to but different from Hendra virus, the recently discovered virus that had been associated with a small number of deaths of horses and people in Australia in 1994 and 1995. The new virus in Malaysia was called Nipah virus, after the village in which these particular patients had lived.

An international team of scientists with relevant experience to handle investigations with such a dangerous zoonotic virus was assembled in Kuala Lumpur under the coordination of the Malaysian Government. Along with CDC, Australia contributed significantly to the effort. The Queensland Department of Primary Industries contributed a veterinarian who specialises in the investigation of Hendra virus ecology in flying foxes. The CSIRO AAHL at Geelong sent a veterinary epidemiologist with experience in handling biosafety level four (high risk) agents, followed by a senior laboratory scientist to establish a laboratory testing capability for the new virus. AAHL and CDC also performed rapid diagnosis on samples from the investigations in Malaysia, and AAHL conducted animal transmission studies with the Nipah virus.

Nipah virus disease in people

From October 1998 to May 1999, Malaysian health authorities recorded more than 265 cases of encephalitis, with at least 105 deaths. Some patients that survived have been left with ongoing disabilities. Most patients worked on pig farms. Case control studies confirmed that close contact with pigs was usually necessary for human infection. Abattoir workers in both Singapore and Malaysia became ill with Nipah virus after infected pigs were processed. One of these cases in Singapore died. There were no cases associated with eating pork, and the disease did not appear to be transmitted among the family members of patients. Nor was the disease transmitted within the hospitals to nursing staff.

Nipah virus infections in pigs

Infections in pigs were mostly asymptomatic. Only a very small percentage developed neurological signs. A more common syndrome was respiratory disease characterised by an explosive cough. Sudden death was seen in individually penned animals, and abortion was reported in sows. The patterns of disease on farms and the high proportion of animals seroconverting indicated a highly contagious disease among pigs. Pathological studies revealed large amounts of Nipah virus in the lung tissues and airways, indicating probable spread via the respiratory route. Experimental infection of pigs at AAHL reproduced the respiratory, the nervous and the asymptomatic forms of the porcine disease. Virus was isolated from nasal swabs but not from other possible routes of excretion such as the urine. Even asymptomatic pigs excreted virus.

Australian veterinary and laboratory specialists played a key role in the international response to the Malaysian Nipah virus incident
Nipah virus in other domestic species

Farmers reported sickness and death in cats and dogs associated with the epidemic. Serological studies in an affected intensive pig farming area showed over 50% of dogs with antibody to Nipah virus. Most of these animals were culled. A later study along transects leading out from affected farming areas showed no evidence of continuing spread of infection among dogs.

Although very few cats were caught for sampling in Malaysia, some seropositive animals were detected. Experimental infection of cats at AAHL showed these to be susceptible. Infected animals showed severe fever and respiratory disease, with excretion of the virus via the urine.

One equine stable in the initially infected pig farming area showed two of 47 horses with antibodies. Again, there was no evidence of spread from horse to horse, or of persistent infection in the two seropositive animals. Serological testing of some 3000 horses in Malaysia showed no other seropositive animals.

Epidemiology

Trace-back studies have revealed a pattern of spread of Nipah virus from an initial focus via sale of pigs from farm to farm. As the outbreak escalated, larger numbers of pigs were sold over greater distances, and the disease moved from state to state within Malaysia and eventually to Singapore. The patterns of dispersal of pigs were such that, where infected pigs were sold interstate, small consignments of animals went to quite a large number of farms in the new districts and large populations of naive pigs were therefore exposed and became infected in relatively short periods of time. Large numbers of farm workers became sick soon after the purchase of the pigs. Against this background of substantial spread of virus by trading of pigs, it has not been possible to confirm other possible means of farm-to-farm spread, such as by infected cats or dogs.

The source of Nipah virus

During the outbreak investigation intensive efforts were made to identify a wildlife host for the Nipah virus. In particular, numerous species of rodent and bat were sampled serologically. The only significant findings were of a proportion of two species of pteropid bat (flying foxes) having neutralising antibodies to Nipah virus, but not to the related Hendra virus. Only occasional bats of other genera showed antibodies. Hence, it is possible that Nipah virus has a wildlife reservoir in pteropid bats, as is also proposed for the related Hendra virus in Australia.

As a consequence of these observations, there is a hypothesis that the Nipah virus outbreak in Malaysia had its origin in an (unexplained) jump of the virus from the fruit bats to pigs, with subsequent spread from farm to farm by local trading in pigs, and then interstate through the larger-scale movement of pigs that occurred after concern arose about the association between pigs and the unusual cases of encephalitis that were occurring with increasing frequency.

Since there is no evidence of multiple ‘jumps’ of Nipah virus to pigs or to other species, it is hard to predict the probability of a new outbreak of Nipah disease arising from a wildlife source of the virus.

Surveillance and control

The Malaysian Government controlled the outbreak with a stamping-out policy of pig farms in defined infected areas, with surveillance of all other farms in Peninsular Malaysia. An enzyme-linked immunosorbent assay testing capability was transferred from AAHL to the Veterinary Research Institute in Ipoh. Under the National Swine Surveillance Program, a statistically significant number of pigs from each farm was tested, with each farm being tested twice. Animals from farms testing positive by predefined criteria were culled, and the remaining farms given a certificate of test to allow sale of pigs to abattoirs. Some 900 farms outside known infected areas were tested, with 5% testing positive.

There is now a surveillance program to quickly detect any new foci of infection that may arise, either from previously infected (but undetected) pigs or from a new ‘jump’ from the wildlife reservoir. Other countries have also responded by planning surveys of their national pig herds to rule out the possibility that these are a source of public health risk.
Economic impact
The magnitude of the Nipah virus outbreak ranks it as a major natural disaster. Tragically, 105 people lost their lives to this new zoonotic infection. The pig industry in Malaysia was totally disrupted, with over half the farms culled and 1.1 million pigs destroyed. Many farmers consequently lost their livelihood. Pork consumption virtually ceased, abattoirs were closed, pork sellers lost their business, support services to the pig industry were left without a market, and the export industry worth approximately US $132 million per year was lost and has still not resumed. In addition to other costs of containing the outbreak, the Malaysian Government has given US $13.7 million in direct assistance to farmers, a figure which is expected to increase. There was also disruption to the racing industry until testing at AAHL cleared horses of involvement.

Issues for trade and animal movements
The cessation of the export trade in pigs from Malaysia to Singapore was an immediate consequence of the outbreak. Singapore routinely screens pigs imported from other sources to ensure freedom from Nipah virus in its supply chain. The steps that Malaysia must take to resume supply of pigs and pig products to other countries is being negotiated. Australia has demonstrated freedom of its pigs from infection with the related Hendra virus.

The movement of horses between Malaysia and Singapore was also banned during the outbreak, but has now resumed under a policy of testing prior to movement. Australia requires testing of cats and dogs from Malaysia to demonstrate freedom from Nipah virus infection before these animals may be brought into Australia.

Associated with the increased concern regarding Nipah and Hendra viruses, a number of countries also require testing of horses and companion animals from Australia prior to their export. This is in spite of clear epidemiological evidence that such animals pose no risk.

Summary
The emergence of the novel Nipah virus in Malaysia was associated with a catastrophic situation unprecedented for a viral zoonosis. Fortunately, the virus was not contagious among people, and infection did not spread in the human population. Although the successful actions by the Malaysian Government have led to a situation where no new Nipah infections in either animals or people have been identified for nearly a year, there remain ongoing issues for public health, trade in pigs and pig products and international movements of other animals.

National Livestock Identification Scheme
The National Livestock Identification System (NLIS) is a major beef industry initiative managed by Meat and Livestock Australia on behalf of the SAFEMEAT partnership (see Chapter 8) in close cooperation with the Australian Quarantine Inspection Service, State and Territory departments of agriculture, farmers, meat processors and livestock saleyard operators. The major function is to track all movements of individual cattle to facilitate life history trace-back. The primary objective of the system is to support the current government and industry-based program of food safety and processing traceability to support Australia’s meat export markets, as well as assisting in the identification of potential disease and residue problems, should they arise in Australian livestock. Unique identification of individual animals and the maintenance of a history of each animal’s movement amongst specifically accredited properties and processors, is a precondition for acceptance of cattle into some export markets.
The scheme is built on the identification of individual cattle through a permanent identification device and the creation and maintenance of a national database to register and trace cattle from property of birth through the supply chain to the ultimate exporter or domestic retailer. The system will involve a number of linkages with other computer systems, as shown in Figure 15.

NLIS creates numerous additional opportunities for adding value, for example:

- facilitating the forwarding of individual carcass feedback information from processors to other stakeholders in the production chain; and
- automation of administration and record keeping for producers, agents, livestock transport and saleyards.

An agreed standard for unique identification numbers for cattle is in place. In essence, the NLIS number has 15 characters (16 in Queensland) where the first eight characters identify the property of birth of the animal (the property identification code), and the last four (five in Queensland) characters uniquely identify the animal itself. Other characters in the number identify the tag manufacturer, the year of manufacture and device type code. Property identification codes are maintained by State and Territory departments of agriculture. One of the uses of the codes by departments and AQIS is to identify properties that have been found to have a history of pesticide residues. Processors refer to this database to gain information about which cattle require mandatory residue testing. The NLIS number is the primary key around which all other data pivots. Every number is paired with a unique radiofrequency identification number that is used in the permanent identification device attached to each individual animal.

Phase 1 of the NLIS initiative, the introduction of machine readable ear tags, was implemented in 1998. A prototype database began operations on 1 December 1999.

**Quarantine requirements for horses entering Australia for competition or racing purposes**

When horses are brought into Australia for competition or racing events, there is the potential for them to introduce serious diseases. The following measures are used to minimise the risk of equine diseases being introduced with horses entering Australia for competitions or races:

- limiting introductions to horses that have resided for at least two months in an approved country that is free from serious exotic diseases, such as equine influenza, African horse sickness, dourine and glanders;
• official certification of regional, premises and horse freedom from specific diseases;
• pre-entry quarantine in approved premises for a minimum of 14 days;
• vaccination for diseases such as equine influenza and eastern and western equine encephalomyelitis;
• testing horses with negative results for diseases such as equine infectious anaemia and vesicular stomatitis;
• requiring competition horses to travel with passports containing records of vaccination and movement;
• travel to Australia by an approved route;
• disinfection of the compartment of the aircraft housing the horse and disinfection of the plane before landing in Australia;
• postarrival quarantine in a gazetted quarantine site for a minimum of 14 days;
• management of wastes during quarantine; and
• testing of blood samples and tissue specimens only at approved laboratories.

One of the main diseases of concern for horses that are brought into Australia, for competitions, races or for permanent import, is equine influenza. The disease is endemic in America, Europe and parts of Asia. Australia is free of this disease, and has an unvaccinated, susceptible horse population. Equine influenza is caused by infection with influenza A/equine 1 (H7N7) or influenza A/equine 2 (H3N8). Influenza A/equine 2 viruses continue to cause major disease outbreaks worldwide. The disease has been introduced to several countries, including South Africa (1986), India (1987) and Hong Kong (1992), following the importation of horses by air from endemic countries and inadequate quarantine controls.

Vaccinated horses are only partially immune to influenza and may be subclinically or clinically infected and shed virus. Clinical signs are generally less severe in vaccinated horses with some exhibiting no more than a transient fever. Infected horses have been reported to shed virus for up to 9 days after infection.

The risk reduction measures in place for equine influenza in Australia include those listed above. During postarrival quarantine, which is an all-in-all-out system, all horses are monitored for clinical signs of disease including temperature. Sanitary measures during quarantine include protective clothing for people on site and dedicated equipment to minimise the spread of disease by fomites.

QUARANTINE REQUIREMENTS FOR HORSES COMPETING IN THE SYDNEY 2000 OLYMPIC GAMES

Unlike the 1956 Melbourne Olympic Games when the equestrian events were held separately in Stockholm because of the difficulties of long sea voyages for competition horses and Australia’s stringent quarantine provisions for those Games, the equestrian events for the Sydney Olympic Games in 2000 will be held in Australia. Nowadays horses are flown into Australia and import conditions are in place for horses from some 26 ‘approved’ countries including United States, Canada, Japan and the European Union.

The 250 horses travelling to Sydney for the Olympic Games will enter Australia under existing import conditions for horses for racing or competition purposes. It is expected that most horses qualifying for the Olympics will be based either in the European Union or North America. They will be arriving from 21–25 August 2000, in time to complete their quarantine before the start of the games. Quarantine will be at the Sydney International Equestrian Centre, the Olympic site, where full training facilities are available. Following the completion of quarantine, the horses will remain on site under quarantine surveillance until their departure from Australia.

Management of quarantine standards at the Olympic site will be of the utmost importance with 250 horses in quarantine, and the associated personnel entering and leaving the quarantine site.

Of particular relevance to the Sydney Olympics is the disease known as equine piroplasmosis. Under Australia’s previous import policy, horses that are serologically positive for this tick-borne protozoal disease would have been prohibited entry. Several competition horses that may qualify for the Olympics are seropositive for this disease. AQIS has recently completed an import risk analysis and concluded that, with appropriate risk reduction measures in place, the risk of establishment of equine piroplasmosis in Australia is negligible and recommends that seropositive horses be permitted temporary entry.
Equine piroplasmosis is caused by *Babesia equi* and *Babesia caballi*. The disease is characterised by fever, anaemia, icterus, hepatomegaly and splenomegaly. Horses infected with *B. equi* may remain carriers for life; whereas *B. caballi* infections may be self-limiting and ticks are a more important reservoir.

For equine piroplasmosis to establish in Australia an effective tick vector would need to be involved. This could result from the introduction and establishment of a tick species exotic to Australia or by transmission from an infected horse to a tick species already established in Australia.

Two species of ticks present in Australia, *Boophilus microplus* and *Rhipicephalus sanguineus*, have been reported as potential vectors of equine piroplasmosis, although natural transmission has not been demonstrated. The site of the Sydney Olympic equestrian events is located in an area free of *Boophilus microplus* and two tick surveys conducted at the site did not find *R. sanguineus*.

The proposed risk management measures are designed to prevent the establishment and spread of equine piroplasmosis and include measures to determine accurately the piroplasmosis status of horses to be imported and prevent the introduction of exotic ticks. The risk management strategies aim to prevent domestic ticks attaching to seropositive horses while in Australia and to preclude the iatrogenic spread of the disease.

The risk of any disease entering with horses competing in the Olympics is no greater than that for horses imported for other competitions. Existing import conditions will apply for Olympic horses with the understanding of the factors influencing their vector distribution, animal movements and management practices. It points out that if these factors are understood, it is possible to determine the distribution of a disease, and use this as the basis for zoning, or the establishment of subnational areas of high and low risk of disease transmission.

The inclusion of the concept of zoning in the International Animal Health Code has opened up the opportunity for many countries to safely export animals or animal products while still controlling the risk of transmitting disease. With many diseases, the main method of spread of disease is through animal movements, or sometimes through the movement of infected animal products. In this case, one critical factor in the establishment of a disease-free zone is quarantine, or the control of animal or animal product movement from infected to free zones.

However not all diseases are spread in this way. The requirements for a zone depend on the characteristics of the disease in question.

A number of arboviruses (arthropod borne viruses, or viruses transmitted by insects) that infect livestock and are of relevance to international trade exist in Australia. Foremost amongst these are the bluetongue viruses. These viruses are spread by several species of biting midge (*Culicoides spp*) that are distributed across north and northeastern Australia. While capable of causing severe disease in sheep and goats overseas, the viruses do not cause clinical disease in Australia, although cattle are frequently infected. Despite the lack of disease, the viruses still serve as an important limitation to the export of cattle from northern Australia.

Unlike many other infectious agents, the distribution of bluetongue viruses and other arboviruses are not only determined by interactions between the virus, the host and the environment, but also the insect vector. The presence of the vector is necessary for the transmission of the virus from one animal to another, so, even in the face of animal movement, the virus cannot become established in areas where the vector is absent.

A clear understanding of the biology of the bluetongue viruses, their hosts and vectors, can lead to a better understanding of the factors influencing their distribution. This premise is the starting point for the Northern Cattle Export Enhancement Project (NCEEP). A better determination of the distribution of the viruses can lead to the establishment of zones that more closely reflect the true virus distribution, and therefore minimise the number of cattle in northern Australia barred from international trade due to the...
risk of bluetongue infection. However, the project developers were far more ambitious than simply aiming for the establishment of a better-defined bluetongue virus zone.

The aim of NCEEP is to extend the concept of disease zones by defining not only the geographical distribution of the viruses, but also the temporal distribution of the viruses. National Arbovirus Monitoring Program scientists have for many years been gathering data to examine changes in the distribution of the viruses over time. NCEEP is using this data to develop an epidemiological model to predict the risk of virus activity.

The distribution of the *Culicoides* vector is determined by a variety of factors, but foremost amongst these is the environmental temperature. During periods of sustained low temperature, the vector either becomes inactive, or dies out altogether. As a result, there is distinct seasonal variation in the extent of the zone of bluetongue virus activity, particularly along the coast of New South Wales. During summer, it may extend as far south as Bega on the southern New South Wales coast, while during winter, the viruses either disappear entirely from New South Wales, or remains only in a small area on the far north coast. Similar variations in the extent of the virus distribution occur in Queensland, Northern Territory and Western Australia. These seasonal trends could be accounted for by identifying seasonal zones, for instance a summer zone and a winter zone. However, such an approach would fail to take into account variations between years, when, for instance, a hot summer may extend the zone further south than anticipated, or a cool summer may result in a much more restricted distribution.

Instead, the project aims to determine the real-time distribution of the viruses, in response to current observed temperatures. The result will be a zone of potential viral activity that changes constantly in response to actual temperature and other factors that determine the distribution of the viruses and their vectors.

**Project outputs**

**NATIONAL ARBOVIRUS DATABASE**

Predictions of the area of potential viral activity will be made using a spatial predictive model. One of the key requirements is an understanding of the bluetongue viruses and their vectors. This data has been collected for many years under the National Arbovirus Monitoring Program that involves a network of sentinel herds and vector trapping sites managed by State and Territory departments of agriculture. One of the first tasks of NCEEP was to standardise the way in which this virus monitoring and vector trapping data was recorded and then to develop a national database containing all virus and vector observations since the late 1960s. Real-time predictions of areas of potential viral activity require that National Arbovirus Monitoring Program data be available for use in the model as quickly as possible. In order to achieve this, the national database was linked to an Internet-based information system for use by State and Territory virologists and entomologists. Using a web interface, scientists are able to upload batches of observations directly into the national database.
Other features include:

- the ability to download the entire database or State/Territory subsets;
- view summary tables of the data online;
- view maps showing the monthly distribution of the viruses and/or vectors;
- add or edit details of monitoring sites; and
- submit quarterly textual reports to the National Arbovirus Monitoring Program Knowledge Base that captures the experience and observations of participating scientists which would not otherwise be held in the database.

In addition to its value in providing input into the risk forecasting model, the database has also been particularly useful to AQIS to provide analysis in support of international trade negotiations. To ensure the integrity of the database and avoid the risk of misinterpretation, access to the raw data is restricted to official personnel. A synoptic report is produced for public release each year.

**RISK FORECASTING SYSTEM**

The predictive model for NCEEP is still under development. It consists of two major components (vector and virus distribution models) and several subcomponents. Some of the key inputs into the model include National Arbovirus Monitoring Program vector and virus observations, daily climatic observations, livestock population distributions, terrain and vegetation. The model is run using geographical information system software and is composed of a series of generic analytical models and a ‘software socket’. This enables a text file describing the model structure and parameters to be ‘plugged in’ to the geographical information system. The advantage of the software socket is that it allows future refinement of the model without the need for complex programming. The major components of the model are shown in Figure 16.

Model predictions will be presented in the form of grid map indicating those areas from which it is safe to export and those from which it is not. The map will be distributed via the Internet. Accredited users (State and Territory veterinary staff, exporters and other stakeholders) will be provided with a CD-ROM containing software to access, decrypt and view the map. It will also contain a series of map layers with detailed landmarks and property boundaries to assist users to determine the status of individual properties.

NCEEP, which is cofunded by AQIS and Meat and Livestock Australia, is an example of government–industry cooperation in applied research to benefit Australia’s producers. The project will be completed in June 2000.

---

**Figure 16 Data flows and processing in the arbovirus risk forecasting system**

Data sources -> Geographical information system -> Analysis engine (Software model socket) -> Output maps and reports

- Candidate models
Regional projects

Australia collaborates with many other countries to improve the animal health and welfare of livestock and other animals. Some of this involvement is through assistance funded under the Australian overseas aid program through AusAID; some is through research projects funded through the Australian Centre for International Agricultural Research (ACIAR). Some is funded through other mechanisms, such as direct liaison between government agencies, veterinary associations and private organisations.

Australian government overseas aid program

The objective of Australia’s overseas aid program is to advance Australia’s national interest by assisting developing countries to reduce poverty and achieve sustainable development. Australian aid focuses on the Asia–Pacific region; Papua New Guinea, Pacific island countries and the poorest regions of East Asia are the areas of highest priority. The program also responds selectively to development needs in South Asia, Africa and the Middle East. It responds promptly and appropriately to humanitarian and emergency relief situations wherever they arise. Seventy percent of Australia’s aid is designed, delivered and assessed jointly with the governments and people of partner countries to meet their most pressing development needs. The balance of the aid program is delivered through international organisations and nongovernment organisations.

The Australian government’s overseas aid program has five priority sectors: health, education, infrastructure, rural development and governance. Gender and the environment are its two cross-cutting priorities. Animal health projects generally fall under the category of rural development. Current projects that focus on or include animal health are described below.

NEWCASTLE DISEASE IN VILLAGE POULTRY WORKSHOP — MOZAMBIQUE

In 1999, a workshop was organised to be held in Maputo, Mozambique in March 2000. The aim of the workshop is to investigate the research and development priorities for the control of Newcastle disease in village poultry in southern Africa. Australia will cofund the workshop, providing A$48 645. It is hoped the workshop will lead to a regional program in southern Africa that will apply Australian research on a wide scale.

BAKELO FOOD SECURITY — ETHIOPIA

The overall aim of this two-year project is to ensure food security and improve the nutritional status of children and adults through the introduction of modern farming methods backed by revolving loan funds. One of the objectives is to reduce the current level of animal mortality by 75% through the utilisation of efficient animal health care programs and development of improved forage. The Christian Children’s Fund of Australia (Ethiopia) is implementing the project. Its second phase (May 1999 – October 2000) has received A$45 092 through AusAID.

FOOT-AND-MOUTH DISEASE CONTROL — PHILIPPINES

The goal of this project is to strengthen the Philippine government’s ability to control the spread of foot-and-mouth disease (FMD), especially from affected areas into disease-free areas. AusAID is providing funding to the Food and Agricultural Organization to establish a buffer zone around an affected area on the Bicol Peninsula. The project started in December 1996 and is expected to finish in December 2001, with Australian funding totalling A$6.7 million.

FOOT-AND-MOUTH DISEASE ERADICATION CAMPAIGN — SOUTHEAST ASIA

The Foot-and-Mouth Disease Eradication Campaign in Southeast Asia is, in the long-term, designed to facilitate and promote the trade of animals and animal products by creating FMD-free areas in Burma, Cambodia, Laos, Malaysia, Philippines, Thailand and Vietnam. The objective of the first phase

ACIAR projects on foot-and-mouth disease in Thailand.
Dr Paul Cleland (Department of Primary Industries, South Australia) in light blue overalls supervising bleeding of buffalos in northern Thailand villages

Source: AusVet Animal Health Services

24 www.ausaid.gov.au
25 www.aciar.gov.au
(September 1997 – September 2000) is to improve veterinary services in FMD-affected countries in Southeast Asia. Australia provided A$600 000 for this phase through the OIE.

SHEEP RAISING FOR POVERTY ALLEVIATION — CHINA

This two-year project aims to alleviate poverty for poor rural women in two townships in rural China by training them to raise sheep and by establishing a community-based sheep breeding support station. This support station will, among other things, provide veterinary support. In the first year of the project Australia provided A$77 250. The project is expected to cost $273 000 in total. It is being implemented by the Women’s Federation of Jinxian County.

Agricultural research in the aid program

The Australian government aid program funds agricultural research through the ACIAR, an Australian government agency that operates within the Ministry of Foreign Affairs and Trade. ACIAR was established in June 1982 to assist and encourage Australia’s agricultural scientists to use their skills for the benefit of developing countries and, at the same time, to resolve Australia’s own agricultural problems. ACIAR’s mandate is to improve the well-being of people in developing countries and Australia through international collaboration in research and related activities that develop sustainable agricultural systems and appropriate strategies for natural resource management. Funded research aims to help developing countries to help themselves, thus contributing to their well-being and general economic growth.

ACIAR is a small organisation that does no research itself. It commissions research groups in Australia and in partner developing countries to collaborate in studying problems in common to their mutual advantage. Its 11 research program managers are involved in developing, commissioning, monitoring and reviewing projects, a process that usually spans about five years for each project.

Most projects are located in Southeast Asia and the South Pacific. Bilateral research resources are allocated to developing countries as follows:

- Southeast Asia 50–60%;
- Papua New Guinea and Pacific Island Nations 10–20%;
- China 10–20%;
- South Asia 10–20%;
- and Africa 5–10%.

Projects are carefully focused and the topics chosen so that the results will have a wide impact and a maximum of applicability in other countries in any region. Animal health projects are coordinated within the Animal Sciences Program, while aquatic animal health projects are coordinated within the Fisheries Program.

ANIMAL SCIENCES PROGRAM

The ACIAR Animal Sciences Program aims to assist research organisations in Australia and in developing countries to work together in a farming systems and multidiscipline context to find sustainable solutions to shared animal production and health problems. The program has three major components: sustainable integrated agricultural production systems; large ruminant production and health; and small ruminant production and health. Present Animal Sciences Program projects related to animal health are shown in Table 23.

Shepherds with livestock taking part in the sheep and goat pox diseases project, India
### Table 23: Research projects related to animal health — Animal Sciences Program, Australian Centre for International Agricultural Research

<table>
<thead>
<tr>
<th>Project</th>
<th>Project title</th>
<th>Participating organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-006</td>
<td>Control of pasteurellosis in pigs and poultry</td>
<td>University of Queensland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Institute of Veterinary Research, Hanoi, Vietnam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Veterinary Company, Ho Chi Minh City, Vietnam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Veterinary Research Institute, Peradeniya, Sri Lanka</td>
</tr>
<tr>
<td>96-021</td>
<td>Control of footrot in small ruminants in Nepal: vaccination and serosurveillance</td>
<td>University of Sydney</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lumile Agricultural Research Centre, Nepal</td>
</tr>
<tr>
<td>94-022</td>
<td>Prolific worm-resistant meat sheep for Maharashtra, India</td>
<td>Department of Animal Sciences, University of New England</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nimbikar Agricultural Research Institute, India</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Chemical Laboratory, India</td>
</tr>
<tr>
<td>97-027</td>
<td>Genetic and immunological characterisation of high resistance to internal parasites in Indonesian Thin Tail sheep</td>
<td>Department of Biochemistry and Molecular Biology, Monash University</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Central Research Institute for Animal Sciences, Indonesia</td>
</tr>
<tr>
<td>94-038</td>
<td>Livestock diseases in Lao People's Democratic Republic and Yunnan Province, People's Republic of China</td>
<td>CSIRO Australian Animal Health Laboratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Livestock and Fisheries, Lao People's Democratic Republic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yunnan Veterinary General Station, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Livestock Development, Thailand</td>
</tr>
<tr>
<td>98-049</td>
<td>Lameness in sheep and other ruminants in Bhutan</td>
<td>University of Sydney</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ministry of Agriculture, Crop and Livestock Division, Bhutan</td>
</tr>
<tr>
<td>94-051</td>
<td>Development and standardisation of rapid diagnostic tests and vaccines for the control of sheep and goat pox diseases in India and Australia</td>
<td>CSIRO Division of Animal Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BAIF Development Research, India</td>
</tr>
<tr>
<td>96-090</td>
<td>Bovine babesiosis and anaplasmosis: studies on field performance of live vaccines, diagnosis methods and host responses to infection</td>
<td>Queensland Department of Primary Industries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Veterinary Services, Zimbabwe</td>
</tr>
<tr>
<td>96-096</td>
<td>Investigations into the control of Newcastle disease in village chickens in Mozambique</td>
<td>Department of Veterinary Pathology, University of Queensland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National Veterinary Research Institute, Ministry of Agriculture and Fisheries, Mozambique</td>
</tr>
<tr>
<td>94-113</td>
<td>Antigenic competition and vaccine failure in small ruminant vaccines in India: a preliminary investigation</td>
<td>Centre for Sheep Health Research and Extension, University of Sydney</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indian Veterinary Research Institute, Iznatnagar</td>
</tr>
<tr>
<td>94-121</td>
<td>Smallholder pig production in the Philippines</td>
<td>Department of Farm Animal Medicine and Production, University of Queensland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department of Animal Science and Veterinary Medicine, Visayas State College of Agriculture, Philippines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>College of Veterinary Medicine, Benguet State University, Philippines</td>
</tr>
<tr>
<td>Project</td>
<td>Project title</td>
<td>Participating organisations</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>96-160</td>
<td>Control of fasciolosis in cattle and buffaloes in Indonesia, Philippines and Cambodia</td>
<td>Australia: Department of Biomedical and Tropical Veterinary Science, James Cook University, University of Queensland Overseas: National Veterinary Diagnostic Laboratory, Department of Animal Health and Production, Cambodia, Research Institute for Veterinary Science, Indonesia, University of Southern Mindanao, Philippines, Carabao Center, Central Mindanao University, Philippines</td>
</tr>
</tbody>
</table>

Table 23 Research projects related to animal health — Animal Sciences Program, Australian Centre for International Agricultural Research (continued)

*Interviewing shepherds as part of the sheep and goat pox diseases project, India*
The ACIAR Fisheries Program aims to develop and coordinate research to solve key problems constraining the productive use and sustainability of fisheries and aquatic resource systems in developing countries. It also aims to maximise benefits for target groups in developing countries and to contribute to regional research initiatives. The Fisheries Program spans a diversity of production strategies and environments. These encompass management of wild-caught marine and freshwater fisheries, to aquatic farming systems, mariculture and fisheries enhancement. Present Fisheries Program projects related to animal health are shown in Table 24.

### Table 24 Research projects related to animal health — Fisheries Program, Australian Centre for International Agricultural Research

<table>
<thead>
<tr>
<th>Project</th>
<th>Project title</th>
<th>Participating organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>91-030</td>
<td>Improving fish production in freshwater aquaculture and in estuaries by reducing losses due to epizootic ulcerative syndrome</td>
<td>New South Wales Fisheries, Wollongbar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>94-011</td>
<td>Prawn health management and disease control to sustain hatchery and pond production systems</td>
<td>Queensland Dept of Primary Industries, Oonoonba Veterinary Laboratory, Townsville</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96-099</td>
<td>Temperature related immunosuppression of epizootic ulcerative syndrome</td>
<td>University of Tasmania, Launceston</td>
</tr>
<tr>
<td>96-098</td>
<td>Diagnostic tests and epidemiological probes for prawn viruses in Thailand and Australia</td>
<td>CSIRO Division of Tropical Agriculture, Long Pocket Laboratories; James Cook University; CSIRO Division of Animal Health</td>
</tr>
<tr>
<td>97-125</td>
<td>Integrated disease control programs for prawn farms in Indonesia and Australia: A pilot study</td>
<td>New South Wales Fisheries, Regional Veterinary Laboratory; University of Western Sydney</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 6
Consumer protection

Introduction

Australia produces, exports and imports significant amounts of meat and other foods. Domestic and overseas consumers are protected by government and industry programs to assure the safety of both locally produced and imported foods.

In 1992, the former Commonwealth Department of Primary Industries and Energy, now Agriculture, Fisheries and Forestry — Australia (AFFA), formed the Food Safety Management Committee to coordinate food safety issues and develop an action plan to manage food safety. The Food Safety Emergency Action Plan is now in place to help identify emerging issues and to provide a rapid and effective response.

The National Office of Food Safety is promoting the development of closer links between all sectors of the food industries — from primary producers to processors, exporters and importers — to increase understanding of food safety issues and to encourage the adoption of practices to maintain and improve food safety.

International standards

Australia continued to work within the Codex Alimentarius Commission framework. In cooperation with the Australia New Zealand Food Authority, other government agencies and the food-producing and associated primary industries, AFFA works through Codex to ensure that Australia’s requirements are met within scientifically based international food standards.

Consumer and other interest groups were also able to participate in the work of Codex in Australia through a broad consultative process.

The seventh session of the Codex Committee on Food Import and Export Inspection and Certification Systems was hosted and chaired by Australia in February 1999. The work of the committee focused on proposed draft guidelines for developing equivalence agreements, and the committee considered inspection and certification systems at length.

Meat

Australia is a major producer of meat and meat products, and has a highly developed domestic and export meat industry. Significant resources are devoted to maintaining and developing a meat inspection program to service this industry and to provide a high level of consumer protection.

Australia is the world’s largest exporter of beef and veal, and the second largest exporter of sheep meat. Meat production statistics during 1999 are shown in Table 25.

For the same period Australia also exported smaller quantities of meat from goats, kangaroos, emus, ostriches, deer, wild boar, possums, crocodiles and camels.

<table>
<thead>
<tr>
<th>Type of meat</th>
<th>Total production (kilotonnes)</th>
<th>Exports (kilotonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef and veal</td>
<td>2 011</td>
<td>1 950</td>
</tr>
<tr>
<td>Mutton</td>
<td>302</td>
<td>306</td>
</tr>
<tr>
<td>Lamb</td>
<td>312</td>
<td>309</td>
</tr>
<tr>
<td>Pork</td>
<td>370</td>
<td>357</td>
</tr>
<tr>
<td>Poultry</td>
<td>604</td>
<td>628</td>
</tr>
</tbody>
</table>

a Preliminary data

Information is available on the Internet on the following meat industries:

- farming in general (www.nff.org.au/default.htm)
- red meat industry (www.mla.com.au/default.cfm)
- pig industry (www.pca.org.au)
- poultry industry (www.ansc.une.edu.au/poultry/links.html-1)
- deer industry (www.diaa.org)
- kangaroo industry (www.kangaroo-industry.asn.au)
- ostrich industry (www.aoa.asn.au)

**Domestic meat inspection**

Australian State or Territory governments are responsible through the relevant authority for meat inspection and standards at all domestic meat premises. Hazard analysis critical control point (HACCP)-based quality assurance systems have been introduced to all domestic abattoirs. In general these systems help ensure the maintenance of food safety through meat inspection, hygiene and sanitation controls.

Previous mandatory codes of practice have now been updated to ‘Australian Standards’. These publications prescribe the minimum mandatory standards for the slaughter, transport and processing of red meat and have been brought into force through legislation in all States and Territories.

The national ‘Australian Standards’ approach to meat safety focuses on performance-based standards using internationally accepted HACCP systems as a mandatory requirement, together with greater industry self-regulation. Further details are available on the Internet.27

**Export meat inspection**

AQIS provides meat inspection to an export industry that generates annual export earnings of about $A3800 million, with markets in more than 100 countries. Inspection services are provided to registered export abattoirs, independent boning rooms, meat processing establishments, and cold stores. It also issues veterinary health certification for edible and inedible animal products (including hides, skins and wool, rendered meals and animal food) as required by importing country authorities.

Source: Australian Quarantine and Inspection Service

For an overview of AQIS’s meat inspection activities see the AQIS report to clients publication at its website.28

AQIS meat inspection services employ 100 veterinary officers and 420 food standards officers (full-time equivalents) to service the meat processing industry’s inspection requirements. Inspection costs are recovered on a fee-for-service basis and through annual registration fees for establishments.

Source: Australian Quarantine and Inspection Service


The major regulatory controls over the export of meat from Australia are in fact the requirements specified by the authorities of countries to which Australia exports. These requirements are reflected in Australian legislation. The export of prescribed goods such as meat from Australia is subject to the requirements of the *Export Control Act 1982*.²⁹

AQIS works in conjunction with State and Territory departments of agriculture, the SAFEMEAT group and the National Office of Animal and Plant Health in the implementation of animal health, food safety, and chemical residue control measures. The ability of the AQIS to certify meat to as wide a range of the world’s markets as possible is underpinned by these measures.

**Meat hygiene controls**

Australian industry and government recognise the need to continually update rules, regulations and industry practices to react to the latest international and national developments in food safety. The last decade has seen meat inspection and production in Australia undergo significant change.

Australia has gradually introduced new meat inspection initiatives such as process controls based on HCCP, that increasingly focus on minimisation of the level of enteric pathogens on carcases and further processed meat. The elements that are essential to the proper operation of these systems have been exhaustively trialed in the export sector since 1994.

AQIS has encouraged the Australian meat industry to progressively adopt quality management systems, which closely align with international standards (the ISO 9000 series). These systems are designed to ensure that industry assumes greater responsibility for the quality of its product and the accuracy of its documentation. This HACCP-based quality assurance approach allows AQIS and the export meat industry to demonstrate effective control and guarantee the integrity of its certification to trading partners.

In order to meet all of the requirements, establishments are required to implement standard operating procedures, objective meat hygiene assessment and develop work instructions. Further details are available at the AQIS website.³⁰

AQIS continued to modify and implement systemic control mechanisms in the export meat industry through 1998–99, modifying the scheme for corrective action after consultations with industry and fully introducing the Meat Hygiene Assessment Program (see the AQIS website).³¹ A performance target of a rejection rate for contamination and pathology of less than 0.1% was set for 1999, which was achieved, as shown in Figure 17.

**Microbial monitoring**

In recent years AQIS and industry have implemented and refined microbial testing of carcase surfaces for generic *Escherichia coli* and *Salmonella* spp as an indicator of the effectiveness of process monitoring and pathogen reduction programs. Monitoring of carcase surfaces allows early detection of adverse trends and an early institution of corrective processing measures. Microbial monitoring was extended to game meat in 1999.³¹

---


---

![Figure 17 AQIS meat rejection rates (per cent), 1992–99](image)
Until 1998, *E. coli* results were analysed using a three-class sampling plan based on the performance criteria established under the Food Safety Inspection Service program. AQIS has since adopted a chart technique based on statistical process control.

As part of this exercise, it has been decided that all participating laboratories, whether external or on-plant abattoir, need to be accredited for microbial testing by the National Association of Testing Authorities (NATA). On-plant laboratories were required to have NATA accreditation by the end of 1999 and comply with ISO/IEC Guide 25.

Results from every export abattoir are analysed on-plant, but are then entered into a national database for trend plotting and analysis. In addition, abattoirs are required to use statistical process control to evaluate their performance against control limits based on national performance averages. This process has led to continuous self-improvement of abattoirs to the extent that generic *E. coli* results show that the performance of most establishments was significantly better during 1999 than the defined regulatory limits.

**Meat Safety Enhancement Program**

Australia has been refining its Meat Safety Enhancement Program since 1996 and has promoted the concept and model to all countries importing Australian meat. The model integrates HACCP-based quality assurance systems and routine meat inspection under an AQIS-approved quality assurance system that is establishment specific, using qualified meat inspectors as online meat inspectors with full-time supervision, verification and certification by AQIS officers.

The principle of Meat Safety Enhancement Program has been acknowledged by the quadrilateral countries (United States, New Zealand, Canada and Australia) and was endorsed in 1999 by the World Congress on Red Meat and Poultry Inspection.

In June 1999, the United States Department of Agriculture’s Food Safety and Inspection Service formally recognised the Meat Safety Enhancement Program as equivalent to its own inspection system. This recognition potentially allows company-employed staff to carry out inspection duties currently performed by AQIS staff at as many as 31 export meatworks across Australia.

**Meat inspection technical reform**

The meat inspection reform process, which began in 1997 with the formation of a separate AQIS Meat Inspection Division, has been progressed in 1999 with technical reforms that have saved about $7.4 million in the program’s costs. Specific reforms included:

- continuing the review of meat inspection functions, including inspection for tuberculosis and brucellosis, frequency of species testing, microbiological testing, security and water testing;
- reducing overhead costs;
- developing and implementing a three-year staff training strategy focused on veterinary staff to ensure standards of technical competency and staff behaviour during a period of significant reform;
- developing flexible new export meat orders to overhaul existing prescriptive legislation; and
- assuming responsibility for management of the previous licensing functions managed by the Australian Meat and Livestock Corporation and integrating this with the AQIS export registration system.

**Electronic documentation**

Facsimile signatures introduced in 1997–98 on electronically generated paper health certificates from AQIS’s electronic export documentation system (EXDOC), now cover about 90% of Australia’s export meat destinations. Their use has also translated into a reduction in the number of veterinarians required to sign documents.
About 36 000 SANCRT (electronic sanitary/phytosanitary certification) health certificates were transmitted to Japan in 1998–99. The arrangement with Japan is a world first that is expected to lead to other major meat trading partners entering into similar arrangements. AQIS is negotiating with administrations in United States, Canada and some Asian countries to institute SANCRT pilot arrangements in 1999–2000.

EXDOC is being extended to cover the major nonmeat commodity sectors: dairy, grains, fish and horticulture.

**Cattlecare and Flockcare**

The Cattlecare Code of Practice (CATTLECARE®), which has been has been conducted since May 1995,33 was initiated by the Cattle Council of Australia and developed as a national minimum standard for quality assurance systems for beef producers. It is based on HACCP principles, and complies with the ISO 9002 standard.

Cattlecare requires producers to comply with 15 elements designed to minimise the occurrence of chemical contamination, bruising, hide damage and faecal and mud contamination in cattle at slaughter. All elements of the program are auditable, and an external audit of the program is essential for a producer to be registered with Cattlecare.

The Flockcare™ system34 was initiated by the Sheepmeat/Wool Council of Australia to help producers meet the realities of marketing sheepmeat products today. Flockcare recognises the fact that many property owners run both sheep and cattle and is compatible with the Cattlecare Code of Practice.

Flockcare is an on-farm system designed to help producers demonstrate their commitment to quality assurance and to meet the expected standards for lambs and mutton sheep for slaughter, live sheep sales, exports and sheepskins. Flockcare is a quality assurance system of ‘proven responsibility’ that takes into account:

- food safety, chemicals and residues;
- animal health, husbandry and welfare; and
- preparation, presentation and transport.

**Management of pathogenic* Escherichia coli***

An *Escherichia coli* strategic plan was developed in consultation with key stakeholder groups to address emerging concerns over enterohaemorrhagic* E. coli*, with the aim of protecting public health and maintaining confidence in the hygiene and safety of Australian meat. This plan led to the development of an effective, nationally coordinated communications network, strategically directed industry and government research to study the prevalence and ecology of pathogenic* E. coli* in Australian meat animals, and the validation of control measures for these hazards.

Research in Australia and overseas has led to the conclusion that risks due to pathogenic* E. coli* and other enteric bacteria can be effectively managed by preventing the faecal contamination of meat carcasses through hygienic slaughter and dressing practices, and through the hygienic chilling, storage and transport of carcases and meat. In addition, generic* E. coli* have been shown to be a sensitive indicator of poor hygienic practice, and the test for generic* E. coli* is therefore used to verify the efficacy of HACCP-based pathogen management programs at export abattoirs.

**International requirements for BSE and scrapie**

In recent years, Australia has implemented a number of activities to ensure that the country remains free from transmissible spongiform encephalopathies (TSEs) affecting animals and to ensure that our animal and public health status is maintained. In 1999 in particular, improvements to surveillance and monitoring programs were implemented.

The following data and activities support Australia’s freedom from TSEs.

- There has been no clinical case of bovine spongiform encephalopathy (BSE) in Australia, and no clinical case of scrapie in Australia since 1952.
- BSE and scrapie are both notifiable.

TSE surveillance (BSE and scrapie) has demonstrated that Australia is free of these diseases.
• There is an effective and continuous surveillance and monitoring system for TSEs in cattle in accordance with the OIE International Animal Health Code chapter on BSE, and a similar program for sheep and goats.  
• Australia has implemented a risk management strategy to address any risk.  
• Since 1962, Australia has only imported meat and bonemmeal from New Zealand.  
• As a precautionary measure, Australia has banned the feeding of specified mammalian material to ruminants.  
• A national coordinator for monitoring and surveillance activities continues to ensure a high level of awareness about TSEs in the Australian farming communities, livestock industry groups and the veterinary profession.  
• The Australian livestock industries and Animal Health Australia are providing monetary incentives to encourage the submission of field samples and to cover the cost of laboratory examinations.  
• The Australian Animal Health Laboratory maintains a contemporary diagnostic capability.  
• Australian State and Territory authorities conduct awareness programs on the clinical signs in animals for those involved in the livestock industries.  
• AQIS has also provided awareness training on the identification of the clinical signs for its veterinarians who undertake ante- and postmortem inspection of animals slaughtered for human consumption at abattoirs servicing the export market.

Information on the National Transmissible Spongiform Encephalopathies Surveillance Program is included in Chapter 3 of this report.

Notwithstanding the increased surveillance activity, TSEs have not been confirmed in animals in Australia during 1999, and Australia continues to be free from clinical TSEs affecting animals. A high-level task force comprising the Chief Veterinary Officer, Chief Medical Adviser and Australia and New Zealand Food Authority meets regularly to address the risks associated with BSE, variant Creutzfeld–Jacob disease (vCJD, which is the form of CJD that appears to have been transmitted to humans from BSE-infected cattle in Europe). Australia has prepared a comprehensive disease preparedness strategy as part of AUSVETPLAN for the control and eradication of BSE.  

Australia awaits the outcome of a submission lodged with the OIE seeking formal recognition of BSE country freedom in accordance with the terms of the current OIE Code chapter for this disease. Australia has also made submissions to the European Commission to enable assessments of geographical risk with respect to BSE.

Chemical residues

Australian National Residue Survey

The Australian National Residue Survey (NRS) is conducted by the Residues and Standards Branch of the National Office of Food Safety in AFFA. The primary function is to monitor chemical residues and environmental contaminants in the products of participating industries.

Residue monitoring is an important part of an overall national strategy to minimise unwanted residues and environmental contaminants in food. It also identifies potential problems and indicates where follow-up action is required to maintain Australia’s reputation as a producer of high quality food. The data collected facilitates certification of commodities for export (where this is required) and ensures compliance with the domestic market requirements of the Australian Standards for Hygienic Production of Meat for Human Consumption. Surveys also serve as a yardstick against which industry-operated, quality assurance schemes can be validated.

The NRS is involved in three kinds of programs:

• Monitoring surveys — to obtain a statistically valid profile of the occurrence of a residue (or residues) in a commodity, by a randomised sampling process.
• Surveillance surveys — to obtain information about a known or potential residue problem, by a targeted (nonrandom) sampling process.
• Compliance programs — regulatory control measures to prevent the normal marketing, from specific sources, of product that is known to be contaminated.

Information about operations and results is available at the NRS. Many documents, including reports on the results of monitoring programs are available and printed versions are available on request.

36 www.aahc.com.au
39 www.nrs.gov.au
Joint Expert Technical Advisory Committee on Antibiotic Resistance

The Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR) was established jointly by the Ministers of Health and Aged Care and the then Minister of the Department of Primary Industries and Energy (now AFFA), in April 1998. The terms of reference were focused on the use of antibiotics in animals, particularly the use of antibiotics as growth promotants. The members of JETACAR included medical and veterinary epidemiologists, infectious disease experts and scientists with expertise in microbiology and molecular genetics.

JETACAR submitted its report to the ministers in October 1999. It contained 22 recommendations for strategic management proposals, based on a regulatory, monitoring and surveillance, infectious disease control, education, and research and development framework. The report is unique among those on this topic published to date as it deals with both animal and human antibiotic use and suggests a complementary approach to husbanding antibiotic use to minimise the development of antibiotic resistance. The full report (The Use of Antibiotics in Food-Producing Animals: Antibiotic-Resistant Bacteria in Animals and Humans) is available on the Internet.40

Meat safety and hygiene

The Commonwealth Government and the meat industry have been working together to implement reforms to meat industry institutional arrangements.


These reforms are quite significant and are aimed at enhancing the industry’s competitiveness, particularly in overseas markets. One of the entities to emerge from the reform process is the SAFEMEAT partnership, which formally started on 1 July 1998. The SAFEMEAT partnership is based on the successful Residue Management Group model and comprises the most senior leaders from industry and government working together.

SAFEMEAT’s primary role is to provide strategic policy advice on whole-of-chain meat safety and hygiene issues, including residue issues. A 3-year business plan has been developed to ensure the beef and sheepmeat industries continue to meet the demands of domestic consumers and overseas customers for safe, nutritious meat products.

The business plan places a strong emphasis on initiatives aimed at minimising the risk of pathogens or residues entering the food chain. The plan also covers standards and regulations, research and development, emergency management, systems development and implementation, biotechnology, and communication and awareness of meat safety and hygiene issues.

SAFEMEAT management activities include:

- developing and/or reviewing of residue management/monitoring programs;
- reviewing and updating the international strategy for dealing with residues problems, including a stronger focus on the Codex forum;
- developing of Commonwealth legislation for emergency response activities;
- undertaking a risk analysis and assessment of imported products and ingredients;
- reviewing national and international requirements for national residue testing;
- monitoring and evaluation of the implementation of agricultural chemicals and veterinary drugs standards which may impact on meat;
- developing a red meat position on animal feedstuffs that meets consumer expectations on the safety and integrity of red meat products;
- standardising microbiological testing nationally and assisting with its implementation;
- promulgating appropriate research and development progress to ensure the red meat industry can proactively address microbiology food safety related issues;
- monitoring of international developments in microbiological testing and contributing to the development of international standards;

The NRS is responsible for monitoring chemical residues and other contaminants in Australian livestock products.
• developing a strategic approach to biotechnology and its implications to red meat safety and hygiene; and
• monitoring international requirements for BSE/TSE and development of appropriate strategies to protect public health and trade interests.

SAFEMEAT has developed a meat emergency manual, which has procedures relating to emergency management of incidents relating to pathogens, plant toxins, residues etc.

Australia has developed and implemented the National Livestock Identification System (NLIS). This outcome represents a coordinated and integrated approach by industry and governments to address the challenges faced by the meat industry in international markets (see Chapter 7).

The success of NLIS has seen a proposal for a similar system for the sheep industry. The introduction of a national sheep and lamb identification system is being driven by commercial and market access pressures now at work on the Australian sheepmeat sector.

Microbial food safety

Microbial food safety is becoming an increasingly important issue. Trends in patterns of food consumption, the emergence of new pathogens and demographic changes, such as an increasing proportion of elderly and immunocompromised people in the population, have increased the potential for foodborne illness. Consumers are becoming more aware of microbial food safety issues and have a right to expect that the food they purchase will be safe. Industry and government programs are either in place or are being developed to enhance Australia’s capacity to ensure the safety of food produced in Australia for export and domestic consumption, and of imported food.

National Safe Food Working Group

The National Safe Food Working Group was established jointly by the then agriculture, fisheries and health ministers in 1996 to develop an inclusive, nationally coordinated, integrated, whole-of-chain approach to food safety.

The proposed National Safe Food System model proposes integrates, streamlines and enhances Australia’s current food safety arrangements and initiatives, and emphasises the importance of the partnership between industry, governments, institutions and consumers in further developing the system. It is underpinned by risk assessment and promotes a consistent, risk-based approach to food safety across the whole food supply chain.

The Food Safety Standards, developed by the Australia New Zealand Food Authority, are an important element of the model. They provide a means of ensuring, as far as possible, that businesses in the manufacturing, retail and service sectors of the food industry produce safe food.

Agriculture and fisheries ministers will ensure that primary industry sectors meet the principles and objectives of the food safety standards, using food safety risk management mechanisms appropriate for industry-driven or market driven sectors and compatible with existing regulatory food safety arrangements.

In mid-1999, to give effect to that commitment, the Risk Analysis Team and Communications Advisory Team were established to progress mechanisms to facilitate safe food production in the primary industry sector. Both teams reported in October/November 1999. Their reports will be considered by agriculture and fisheries ministers when they meet early in 2000.

The recommendations of these reports are expected to provide an important contribution to the implementation of the government’s response to the Food Regulation Review Report within the primary industry sector, particularly with respect to ensuring the production of safe food in that sector. The Council of Australian Government’s decision on the proposed new food regulatory system will, therefore, have implications for future activities.
Food Regulation Review

The Food Regulation Review was established by the Prime Minister in mid-1997 to examine ways of reducing the regulatory burden on the food sector, while at the same time ensuring that public health and safety are protected. Its primary focus was on food safety with structural integration of current agency responsibilities at the Commonwealth government level and a national food safety regulation framework.

In recognition of the cross-portfolio and inter-governmental issues involved in the review, the prime minister asked for a whole-of-government response to the report to be developed through the Council of Australian Governments (COAG). To this end, the Senior Officials Working Group on Food Regulation, led by the Secretary of AFFA, was established in March 1999.

Following its establishment in 1998, the National Office of Food Safety has assumed the role of managing and coordinating key food safety and quality issues across the agriculture, fisheries and forestry portfolio. An important part of this role has been to manage and coordinate AFFA’s input into the processes leading to the development a whole-of-government response to the Food Regulation Review.

The Senior Officials Working Group reported to COAG Senior Officials on 8 November 1999 with a proposal for a model for an improved national food regulatory system for consideration in responding to the Food Regulation Review. In developing its report, the group also took into account the Food Safety Standards and the Model Food Act developed by the Australia New Zealand Food Authority. The COAG is expected to respond to the review report in April/May 2000.

Processed foods

Processed food exports

Australia is a major producer and exporter of processed foods, including fish, dairy and egg products, processed fruits and vegetables and dried fruits. Both the processed food industry and government are committed to ensuring that Australia’s image as a source of clean, quality food is maintained by providing safe and hygienically produced products.

Premises that are used for the production and storage of processed food products for export must be registered with AQIS and comply with requirements outlined in export legislation. In 1999, the AQIS processed food program covered more than 600 export registered land-based establishments (fish, dairy, eggs etc) and 700 fishing vessels. Thirty-two full-time AQIS inspection staff deliver export inspection services for processed food products at major ports around Australia, including administrative and professional support, audit of export inspection programs, development of policy and negotiation of market access.

The AQIS Report to Clients covers details of the processed foods inspection program for 1999.41

The Australian approach to export inspection is risk based and focused on food safety and truth in labelling. The system is backed by firm controls over construction and hygiene of export processing and storage premises, good manufacturing practice, food standards and product certification.

Quality assurance programs

Exporters of dairy, fish and egg products have a choice of three export inspection arrangements. An approved quality assurance arrangement provides AQIS with audits of company’s quality assurance systems, which must be fully documented in a quality manual to ensure that products meet export requirements. The second arrangement is the food processing accreditation inspection system, under which a company must document its process controls in a process flow chart and a HACCP table. AQIS inspects the company for compliance with its process control documentation and good manufacturing practice. A third party inspection option for companies accredited to an ISO 9000 system is also now available.

### Food imports

Since mid-1993, all food imports into Australia have been liable to point-of-entry inspection. The intensity of inspection applied is determined by the assessed risk of the particular food in question. The Australia New Zealand Food Authority conducts the risk assessments and AQIS inspectors undertake inspections. All costs are borne by the importers.

The program defines three levels of risk — risk-categorised, active surveillance and random surveillance. Foods included in each category are assessed every six months. Details of the imported food program and a guide to importing biological products and foodstuffs are on the Internet.\(^42\)

**Risk-categorised foods** are those that have the potential to pose a high or medium risk to public health. Foods in this category monitored for chemical residues include selected species of fish (mercury), crustaceans (cadmium), scallops (biotoxins), canned tuna (histamines) and peanut (aflatoxin). Foods monitored for the presence of pathogenic microorganisms include selected cheeses, coconut, cooked crustaceans, molluscs intended for consumption without further heat treatment, selected spices, and smoked vacuum-packed fish.

**Active surveillance foods** are those that have the potential to pose a risk to public health but for which few data are available. Foods in this category monitored for chemical residues include cereal-based products like pasta (cadmium, mercury and lead), dried fruits such as sultanas (lead), coffee and tea (pesticide residues) and peanut-based sauces (aflatoxin). Active surveillance foods monitored for the presence of microorganisms of public health significance include cheese, preserved vegetables and fruits, soups, bottled water, ice cream and miscellaneous food preparations.

**Random surveillance foods** are those not included in the risk-categorised or active surveillance categories. Foods in this category monitored for chemical residues include all meat and meat products (pesticide residues, antibacterials and stilbenes); dairy foods (pesticide residues, antibacterials and heavy metals); fish, crustaceans and molluscs (pesticide residues, heavy metals, biotoxins, histamines, and antibacterials in farmed products); honey (pesticide residues, antibacterials and heavy metals); fruit and vegetable products (pesticide residues, antibacterials, heavy metals and biotoxins) and cereal products (pesticide residues, heavy metals and biotoxins). Random surveillance foods monitored for the presence of microorganisms of public health significance include dairy foods, prepared vegetables, spices, chocolate and confectionery.

Regardless of the risk category into which a food has been placed, all consignments of imported food referred to AQIS for inspection are examined for the presence of foreign or extraneous matter, integrity of packaging and for compliance with relevant labelling requirements.

Imported food inspection applies the standards of the Australian Food Standards Code and the general food safety criteria of the *Imported Food Control Act 1992*. The imported food program includes provision to enter into certification arrangements with overseas authorities. These arrangements are based on assurances that their controls can meet Australian requirements subject to auditing of selected product on arrival.

---

This chapter reports on the importation and export of livestock and livestock products apart from foods intended for human consumption (which were described in detail in Chapter 6).

**Imports**

**Legislative framework for imports**

Imports of animals and animal products into Australia are regulated by the Australian Quarantine and Inspection Service (AQIS) under the *Quarantine Act 1908*, and its subordinate legislation; and Environment Australia under the *Wildlife Protection (Regulation of Exports and Imports) Act 1982* and its subordinate legislation. The *Quarantine Act* covers measures for the inspection, exclusion, detention, observation, segregation, isolation, protection, treatment, sanitary regulation and disinfection of vessels, installations, persons, goods, things, animals or plants. Its objective is to prevent the introduction and establishment of diseases or pests affecting humans, animals or plants.

As a member of the World Trade Organization, Australia must ensure that its import policies are in line with its international obligations under the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement).

**Quarantine policy**

In its response to the recommendations of the 1996 report of the Quarantine Review Committee, *Australian Quarantine: A Shared Responsibility*, the Commonwealth Government provided additional resources to AQIS to develop and review quarantine policies through a structured import risk analysis process.

The approach of AQIS to the development of new quarantine requirements or the review of existing conditions is set out in *The AQIS Import Risk Analysis Process: Handbook*. AQIS initially assesses access requests to determine whether proposed imports fit within established quarantine conditions or precedents. Most requests fit in this category and can be evaluated readily and approved (under specified conditions) without delay. AQIS evaluates new products or new product–country combinations for which relevant information is not available, through a process of import risk analysis that includes six key principles:

- conducted in a consultative framework;
- a scientific process and therefore politically independent;
- a transparent and open process;
- consistent with both government policy and Australia’s international obligations under the SPS Agreement;
- harmonised, through taking account of international standards and guidelines; and
- subject to appeal on the process.

---


At the end of 1999, AQIS’s Animal Quarantine Policy Branch had 37 import risk analyses under way. Of these, 11 were nonroutine, involving risk analysis panels, and 26 were routine. During 1999, nine import risk analyses were completed, including three aquatic ones (nonviable salmonids, nonviable marine finfish and ornamental finfish), which were accelerated due to the exceptional circumstances of the World Trade Organization finding on Canadian salmon.

More information on quarantine requirements for the importation of animals and animal products into Australia and on import risk analyses being undertaken by AQIS can be obtained from the AQIS website.

Quarantine stations

The Commonwealth Government currently owns, staffs and operates animal quarantine stations at Eastern Creek (Sydney, New South Wales), Spotswood (Melbourne, Victoria), Torrens Island (Adelaide, South Australia), and Byford (Western Australia). With access to genetic material and the costs of quarantine, the demand for use of the high security offshore Cocos (Keeling) Islands animal quarantine station has fallen away. It has not been used since 1998, and is to be sold.

Eastern Creek is the major facility for dogs and cats, a major station for horses, and the only bee quarantine facility in Australia. It includes contingency space in the event of an outbreak of rabies in an exporting country or another animal quarantine station. Spotswood is the major mainland facility for imported cattle and live birds, a major facility for horses, and a significant facility for dogs and cats. It is also used from time to time for pre-embarkation isolation of cattle and horses before export. Byford is a dog and cat facility, with some yards for livestock. Torrens Island is a dedicated facility for importing fertile bird eggs.

Animal quarantine stations can be categorised broadly as primary quarantine stations, secondary quarantine stations or private low-security stations used for special purposes. Primary quarantine stations are those where observation and testing are needed for a range of diseases, and where importations are from countries that have significant diseases judged to warrant primary quarantine on arrival. They include the medium-security stations at Spotswood, Eastern Creek, Torrens Island and Byford (for importations where disease risks warrant less intense security) and private low- or medium-security stations (for importations where disease risks can be addressed adequately by quarantine surveillance and testing on private premises). The Cocos Islands was a high-security facility for importations where disease risks were judged to warrant maximum quarantine security, including windborne and insect vector security.

Secondary quarantine stations are used for continued quarantine surveillance and testing of animals after they are released from a primary quarantine station, to address residual risks posed by one or more diseases. Examples of this type of station are those established to exclude scrapie from sheep and goats and tuberculosis from alpacas. Private stations for special purposes include aquaria, zoos and scientific institutions.

---

Biologicals

‘Biologicals’ include products for laboratory, therapeutic, diagnostic, analytical or environmental use that contain or are derived from microorganisms or from animals (including humans), plants or their products. AQIS aims to minimise the quarantine controls on lower-risk products and change emphasis to ensure that more stringent controls are applied only to those biologicals considered to represent a potential higher risk.

Import permits are required for most biologicals. It is anticipated that this requirement will be discontinued for lower-risk products that are declared on quarantine entry, are accurately and adequately described, and meet specified conditions. At present, each application is assessed and, if entry is permitted, a permit is issued stipulating the quarantine requirements under which importation may occur. Assessments are fast-tracked if applications demonstrate that they meet requirements for the product. Applications for higher-risk products that do not meet the requirements can be expected to take considerably longer to assess, and approval — if forthcoming — could involve the development of specific quarantine requirements for the product in question.

Imports of microorganisms, cell lines, animal serum, blood proteins, enzymes, hormones, tissue extracts and other animal products are essential for research, therapeutics, analytical analysis and environmental use, but can also represent a quarantine risk. To enable these products to continue to be imported, AQIS requires that importers have adequate controls over their end use, so that they are handled safely — with no direct or indirect exposure of animals — and are disposed of safely. The postimport conditions required by AQIS depend on the quarantine risks posed by the material being imported. Those considered of lower risk have minimum postimport conditions imposed, compared with higher-risk and restricted importations.

AQIS has approved several hundred scientific institutions and laboratories in Australia to receive and handle restricted imported biological material. Restricted material refers to biological products that may be supplied only to quarantine-approved institutions or laboratories. Approval is granted only if there are adequate facilities and controls in place for the safe handling and disposal of potentially contaminated material.

Most imported biologicals are for in vitro use only and are subject to minimal import controls unless they are restricted biological materials. Applications to import biologicals for in vivo use are assessed in much greater detail and, in most cases, biologicals can be used only under limited and well-defined conditions.

Quarantine response to the East Timor crisis

The sudden increase in movement of people, equipment and vehicles from East Timor to Australia altered the quarantine risk profile for Australia, and Darwin in particular. AQIS responded to this increased risk with the deployment of additional experienced operational officers in Darwin and later in Dili, and by performing a rapid but science-based risk evaluation. Timor has been a part of the Northern Australia Quarantine Strategy area of interest since inception of the program. Activities have included surveys for animal and plant pests and diseases, sentinel animal herds and exchange of animal and plant health information. From Northern Australia Quarantine Strategy activities it is known that significant exotic diseases are endemic in East Timor. Classical swine fever, hypervirulent infectious bursal disease, haemorrhagic septicaemia, screw-worm fly, surra, bovine brucellosis and canine encephalitis are just some of the diseases that are known to be present.

RISK EVALUATION

The risk evaluation looked at the pathways for entry of quarantine hazards and identified the movement of refugees, military personnel from Australia and other countries involved in Interfet, aid agencies and increasingly commercial operators together with their goods and equipment as the potential pathways. The potential quarantine hazards were then identified. These included animal pathogens and vectors, human pathogens and vectors (by the Department of Health and Aged Care), weeds, plant pests and pathogens and marine pests known or suspected of being endemic in East Timor and absent from Australia. Each identified hazard was assessed for probability of entry and establishment in Australia and ranked as high, moderate or low risk.

Weeds, exotic mosquitoes, the giant African snail, honeybees and bee mites were identified as high-risk hazards. The impact of establishment of the high-risk weeds and pests was assessed.

Screw-worm fly, rodents and *Culicoides* were assessed as moderate risk. The risks of entry of the identified animal diseases were considered moderate and no higher than for normal passenger and goods movements from infected countries. The method of spread of these hazards is generally by the movement of infected animals and contaminated animal products and animal equipment. The likelihood of these
products being carried by military personnel is low. There is a moderate risk however that returning Australian military personnel may wish to bring home souvenirs that contain animal products, such as feathers, animal skin and eggs. Also, there is a moderate risk that refugees may be inclined to attempt to carry with them local food products. There is no dairy industry in East Timor.

Surra is transmitted mechanically by biting flies but trypanosomes only survive for up to 15 minutes on the mouthparts of a fly. Hence, the risk of surra entering by this route is negligible. The risks of entry of other diseases carried by insects are managed by the measures applied for mosquitoes, flies and Culicoides. Canine ehrlichiosis could potentially enter Australia with an infected live dog or an infected tick. The importation of dogs from East Timor is not permitted (other than military dogs under specific quarantine conditions) so the probability of introducing E. canis with an imported dog is negligible. The probability of the introduction of an infected tick is low because the tick rarely attaches to any animal other than a dog.

The East Timor risk evaluation document is available on the AQIS website.47

RISK MANAGEMENT

Hazards assessed as carrying moderate risk were considered to be managed by the strict application of current quarantine procedures. Risk management options were explored for the high-risk hazards. Options included offshore inspection, barrier inspection and increased surveillance in high-risk sites onshore. Ships, aircraft, personnel, personal effects, military equipment and cargo equipment were considered separately for management of the high-risk category.

The operational response needed to be rapid. Collaboration between Interfet forces, the Australian Defence Forces and AQIS enabled accelerated training to take place. There were 4500 troops, 1000 heavy vehicles and 10 000 pallets of equipment to return to Australia. Initially Interfet personnel cleaned returning vehicles and equipment and the cleaning

was verified by quarantine officers in Darwin where an extra 18 quarantine officers were stationed. Later, 10 quarantine officers were deployed in Dili to supervise cleaning and carry out inspections. A single vehicle can take up to eight hours to clean. There are 20 washing stations operating as many as 18 hours a day with between 200 and 300 staff. Mail items from East Timor are subject to inspection or radiographic examination on arrival.

AQIS and State/Territory authorities implemented additional monitoring at locations where military equipment from East Timor is present. Around Darwin, there is increased surveillance for screw-worm fly and Culicoides at the sea port, airport, Tindal airbase, Robertson barracks and the site of the refugee camp.

A scientific team, including a veterinarian, visited Dili in January 2000. The veterinarian collected sera from pigs and chickens for testing for vector-borne diseases primarily of risk to people and therefore to Australian and other troops. While there, the United Nations interim administration requested that the reported death of 60 buffalo in the Viqueque district in the southeast of the country should be investigated. No autopsy material was available and the history and description of the signs pointed to haemorrhagic septicaemia. Reports from various sources indicate that the administration wants veterinary services to be available as early as possible. There are obvious benefits for Australian animal health as well as benefits for East Timor if Australians are involved in the service.

**Exports**

**Legislative framework for animal exports**

The *Export Control Act 1982* provides for the control of the export of agricultural products, including live animals and meat. Powers under the legislation are delegated to the Secretary of AFFA. Authorised officers employed by AQIS have powers and authorities under the act.

**Export policy for live animals and reproductive material**

AQIS facilitates the export of live animals and reproductive material by ensuring that Australia’s export controls and importing countries’ requirements are met, and that approved animal welfare practices are used. This is achieved by:

- identifying technical barriers to trade in overseas markets and, where possible, assisting in their resolution;
- negotiating effective export protocols with veterinary authorities of importing countries;
- providing export animal health certification as required by importing countries;
- ensuring that all Australian legislative requirements have been met; and
- ensuring conformity with community animal welfare standards.
Market access
AQIS continued a joint program with industry to make representations to many importing countries to gain new, improve current or maintain existing market access. Negotiations involve changes to import health conditions and these typically involve simpler disease-testing requirements, less onerous restrictions on the farm or region of origin, and other modifications designed to facilitate animal exports while ensuring they do not pose an animal health risk to the importing country.

Maintaining market access continues to be an important priority. New requirements imposed by importing authorities can have a severe impact on existing trade, as demonstrated by interruptions to exports of poultry, chicken meat and other avian products following outbreaks of Newcastle disease in New South Wales in September 1998 and April 1999. Without the successful negotiation of more favourable access conditions, based on effective eradication measures, continued access to many established markets in New Zealand, Asia, the Pacific and Europe would have been denied for a disproportionately long period.

AQIS continued its efforts to influence the setting of international rules that affect Australia’s trading interests:

- in relation to irradiated food, AQIS is contributing to international harmonisation of sanitary and phytosanitary treatment of food and feedstuff and the requirements and supplementary international labelling provisions proposed for irradiated foods;
- AQIS continued to contribute to the process of drafting new, and amending existing, chapters and articles of the OIE International Animal Health Code, and to the development of international standards for quarantine.

More information on quarantine and export certification activities during 1998–99 is available from the AQIS Report to Clients. 48

Introduction

Australia has long recognised the need for a comprehensive system of national coordination of disease control and eradication, with the assistance of Commonwealth Government funding. State and Territory government veterinary authorities have the major responsibility and resources to combat any incursion of an exotic disease and any significant outbreak of an endemic disease (either known or newly identified). Coordination is achieved through the Consultative Committee on Emergency Animal Diseases where chief veterinary officers from the Commonwealth Government and each State/Territory government and the head of the Australian Animal Health Laboratory collaborate to ensure the most effective response is launched.

Emergency Animal Disease Preparedness Program

The Emergency Animal Disease Preparedness Program is managed by Animal Health Australia, a public company set up by the Commonwealth Government, State and Territory governments and the peak livestock industry organisations. This program is funded in a tripartite arrangement involving each of the above sectors and provides a coordinated strategy embracing all aspects of emergency animal disease preparedness.

The Emergency Animal Disease Preparedness Program is managed via a business plan that outlines the key objectives, strategies, outcomes, business principles, performance indicators and management of the program via projects that address:

- maintenance of the Australian Veterinary Emergency Plan (AUSVETPLAN);
- awareness amongst livestock producers of emergency animal diseases;
- training of government staff, private veterinarians and livestock industry personnel;
- development of a new national emergency disease information management system; and
- development of a funding model to more appropriately distribute response costs.

AUSVETPLAN

The Australian Animal Diseases Emergency Plan (AUSVETPLAN) is the nationally agreed arrangement for responding in a consistent manner to an outbreak, or suspected outbreak, of an exotic animal disease anywhere in Australia. AUSVETPLAN has been developed and agreed by the Commonwealth Government and State and Territory governments, in consultation with industry to ensure that a prompt, efficient and effective response can be implemented with minimal delay.

AUSVETPLAN provides a comprehensive package of agreed documentation that sets out the roles, responsibilities, coordination arrangements, financial arrangements (where applicable), policies (based on detailed technical support) and procedures that will be followed by all agencies in any exotic animal disease response. The whole of AUSVETPLAN (Edition 2.0), comprising 48 manuals, is available on the Animal Health Australia website.49

In 1999, the Summary Document was updated as well as two enterprise manuals:

- Saleyards and Transport
- Artificial Breeding Centres.

One revised operational procedures manual was released:

One new disease manual was released:
- Australian Bat Lyssavirus Manual

**Specific preparedness programs**

Historically, Australia’s emergency animal disease preparedness programs have been targeted at foot-and-mouth disease. Although vesicular diseases remain an important focus of activity, other exotic diseases have also received specific attention because of increased risks or the need for different containment methods. Currently major specific preparedness programs include bluetongue, screw-worm fly, and diseases in wildlife.

**BLUETONGUE**

A revised, integrated bluetongue preparedness strategy for Australia was released in July 1999.\(^5\)\(^0\) It addresses issues for the management of the presence of bluetongue virus and the potential for clinical bluetongue disease in livestock in Australia.

The strategy outlines action required to implement an integrated approach for the management of bluetongue, taking into account the current situation, international coordination, national preparedness and response issues, the development of a vaccine strategy, a research and development program and a management and communication strategy.

**SCREW-WORM FLY**

The Old World screw-worm fly, *Chrysomya bezziana*, is distributed across much of Africa, the Middle East, southern Asia, and as close to Australia as Papua New Guinea. Because of its proximity and the high annual cost of the establishment of screw-worm fly to beef, dairy and sheep producers and the social and environmental impacts, Australia has developed a comprehensive strategy to enhance its long-term preparedness for such an emergency.

The Malaysian and Australian governments have a collaborative research program into the control of screw-worm fly. The Australian livestock industry has also made substantial funding contributions to the project, through Meat and Livestock Australia, the Dairy Research and Development Corporation and the Australian Wool Research and Promotion Organisation. The pilot-scale screw-worm fly production facility in Malaysia was evaluated and production systems for mass rearing sterile insects modified during the year. The facility started building up production for a field trial on a Malaysian government cattle farm to validate control by the sterile insect technique, the only technology currently available for eradication.

A laboratory-adapted colony derived from flies collected from cattle in Malaysia is well established and monitoring has continued during 1999 on the field trial site to provide baseline data on the density and distribution. This trial aims both to prove the effectiveness of the sterile insect release method for controlling the parasite and to assess practical control procedures in the local environment. Postrelease monitoring will permit assessment of the effectiveness of the technique.

The research and trial results will bring direct benefits to Malaysia, which hopes to eliminate screw-worm fly from its territory, and perhaps from the region. It is also planned that the laboratory will become a centre of excellence for screw-worm fly research and control for the Southeast Asian region.

Australia continues to cooperate with international agencies on control, including the Food and Agricultural Organization and the International Atomic Energy Agency of the United Nations and with the United States Department of Agriculture. Field work was undertaken to evaluate a range of formulations of modern macrocyclic lactone insecticides for screw-worm fly control. Results of this work, to be published soon, will provide some additional control methods.

**WILDLIFE AND EXOTIC DISEASES**

The Wildlife and Exotic Diseases Preparedness Program has been a joint Commonwealth–State/Territory program since 1984–85. It aims to develop practical field strategies for the eradication, control and management of wild animals in the event of any outbreak of exotic or other emergency animal disease that could threaten Australia’s livestock industries. Its mission is to improve Australia’s emergency animal disease preparedness by supporting AUSVETPLAN through the development of strategies to monitor, prevent, control or eradicate disease incursions in wildlife and feral animals.

Progress in 1999 included:
- further work on contact rates between feral goats and domestic livestock in eastern environments to clarify possible rates of disease transmission;
- surveillance of mega- and microchiroptera in northern and western Australia for evidence of infection with Australian bat lyssavirus, equine morbillivirus, Menangle virus, Japanese encephalitis and specified arboviruses;

---

further development of flaviviral monitoring strategies in northern animal ecosystems as part of Japanese encephalitis preparedness; and  
training in the use of generic models for wildlife exotic disease management — these models have been developed to facilitate management of disease incursions; the next step is training.

The Wildlife and Exotic Diseases Preparedness Program still deals with issues of national importance but the major issues confronting it have changed since its inception and are now not adequately covered by the original terms of reference or its modus operandi. A workshop was held in December 1999 to canvass a possible Australian wildlife health centre as part of a more comprehensive strategy for dealing with diseases of wildlife.

Exotic disease awareness
A major part of Australia’s exotic disease preparedness program aims to improve awareness and understanding of exotic disease issues. The extent of training depends on the target audience.

EXOTIC ANIMAL DISEASES BULLETINS
Exotic animal diseases bulletins are published each year in the Australian Veterinary Journal. These bulletins provide updates on exotic animal disease events around the world to practising veterinarians throughout Australia. The bulletins also provide regular updates on major animal diseases occurring overseas and on key investigations undertaken in Australia, detailed reports on animal health programs for exotic diseases, both within Australia and abroad, information on veterinarians involved in national training efforts, and the outcomes of national training events and programs.

Articles in the 1999 bulletins included:
• the 1997 avian influenza outbreak in Hong Kong;
• emergency disease planning in Indonesia;
• Nipah virus in Malaysia; and
• AQIS plans for the Olympic horse events

IMPROVING AWARENESS OF LIVESTOCK PRODUCERS
The component of the Emergency Animal Disease Preparedness Program concerned with maintaining livestock producers’ awareness of the importance of emergency animal diseases and appropriate actions to be taken when one is suspected is delivered via a specific week of activities. Protect Australian Livestock Week was again held in 1999 targeting the cattle, sheep, horse, poultry, pig, goat, deer, alpaca, ostrich and emu industries.

The experience and preparation for the first protect Australian Livestock Week held in 1998 were capitalised upon and some materials produced during 1997–98 were re-used to reduce costs. Additional activities were funded including a larger supply of pamphlets for the States and Territories.

There were several media releases during the year and included a major news release, 15 industry viewpoints, and three feature stories distributed to 813 media outlets across Australia. Feature stories focusing on the Australian Animal Health Laboratory’s work with Newcastle disease, experiences with equine emergency diseases, and the foot-and-mouth disease work being done by CSIRO veterinarians based in Southeast Asia generated immediate media interest.

There was a significant increase in the number of ‘advocates’ used (livestock industry leaders prepared to speak publicly in support of the initiative) and over 300,000 brochures were printed for distribution through print media, government departments and industry organisations. A video news release was complementary to paid advertising using the television commercial generated during the 1998 campaign and both were provided to 51 regional television stations around the country in the days before the week started.

Evaluation of a national sample of 500 producers showed that almost all respondents (96%) were aware of the importance of contacting either a relevant government officer or private veterinarian in the event of an emergency disease outbreak.
This was a significant increase over 1998. The percentage of respondents who could recall a recent item in the media on emergency animal diseases increased significantly from 33% in 1998 to 45% in 1999.

The Disease Watch Hotline — a toll-free telephone number (+61 1800 675 888) that connects callers to the relevant State or Territory officer to report concerns about any potential exotic disease situation — continued to operate successfully in 1999.

Senior government veterinary officers also gave lectures on exotic disease preparedness to veterinary students at Melbourne, Queensland, and Murdoch universities.

**National Emergency Animal Disease Training Program**

During 1998, Animal Health Australia, in conjunction with stakeholders, developed a national competency-based approach to assessment and training for emergency animal disease preparedness (the National Emergency Animal Disease Training Program). The competency-based system includes:

- a framework of competency standards which describe the skills and knowledge for all the key roles identified as part of emergency responses;
- systems of assessment to identify individuals with the skills and knowledge required to function as part of a response team; and
- a system of national training to develop skills and knowledge specific to emergency animal disease preparedness.

This part of the program was completed in early 1999 and in May a National Emergency Animal Disease Preparedness Program Training Coordinator was appointed to:

- promote the National Emergency Animal Disease Training Program by developing sound communications and liaison with each relevant organisation and its staff and preparing appropriate information about the program;
- ensure that implementation of the National Emergency Animal Disease Training Program addresses gaps in knowledge and skills by conducting a needs analysis with the Commonwealth Government, the State and Territory governments, the livestock industries and the Australian Veterinary Association;
- ensure nationally consistent and objective assessment and training by assisting relevant organisations to identify assessors and trainers and organising appropriate training;
- introduce a national register of personnel competent to participate in emergency responses by developing an assessment and training recording system and maintaining a database of skills;
- enhance recognition of the role and importance of competencies by initiating, in conjunction with relevant organisations, a system to formally recognise the achievement by individuals of relevant competencies;
- promote the national delivery of appropriate training by facilitating (and, where appropriate, organising) the delivery of prioritised training;
- ensure the experience gained in implementation is reflected in the competency standards, assessment tools and training modules by maintaining and updating the competency standards and training resources as necessary; and
- promote efficient development and application of training programs by developing and maintaining a national collection of training and resource materials and providing ready access to relevant organisations.

The National Emergency Animal Disease Training Coordinator liaises closely with the Commonwealth, State and Territory coordinators, and livestock industry representatives and manages the business of a national Training Steering Committee.

During the year, the National Emergency Animal Disease Training Coordinator and a representative of Focus Learning Systems visited chief veterinary officers and their senior staffs to consolidate and build further on previous commitment to the training program and to discuss resource allocation and respective responsibilities.

With the national training coordinator appointed and the competency standards and supporting documentation finalised, the process of assessment commenced in those jurisdictions where agreement on resource allocation has been achieved.

The Training Steering Committee met in June 1999 and endorsed the commencement of competency assessments. An accredited workplace assessor and a technical expert conducted these initially.

The role of the Training Steering Committee is an important component of the program. While the committee’s main role is to oversee the introduction of competency-based training and assessment, it also serves as a forum for jurisdictions to have input into the direction of the program and the allocation of resources.
Nominations for assessors were called for from relevant organisations for the first assessors’ training course held in September 1999. Trained assessors were then available to conduct assessments in their jurisdiction. Some organisations already have trained workplace assessors and their training need for assessors may be less than expected.

The coordinating committee identified the assessment of controllers (control centre managers) and site supervisors (infected premises managers) as the two key roles where there was a critical need for expertise and where there were likely to be training needs.

**TRAINING FOR VETERINARIANS**

Two weekend practitioner training events were held in 1999 — one in Launceston, Tasmania and another at Magnetic Island, in Queensland. Victoria arranged training for equine practitioners at three different locations (two country venues and metropolitan Melbourne). Dr Colin Cargill from South Australia was selected to attend an international symposium on Aujeszky's disease and porcine reproductive and respiratory syndrome as well as undertaking a study into aspects of exotic pig diseases.

The Australian Animal Health Laboratory ran two exotic disease training courses for about 20 official veterinarians, providing first-hand experience in the recognition of a range of exotic diseases. The course in October introduced the concept of competency-based training and assessment to the program.

**IMPROVING COMMUNICATION AND COLLABORATION**

A second national workshop funded by Emergency Management Australia and Animal Health Australia was held at Mount Macedon, Victoria, in November 1999 to continue to improve the communication between the livestock industries, emergency services and animal health authorities. Discussion identified the complexities of animal disease emergencies and their implications for the wider community.

**Emergency animal disease information system**

Following an information management workshop held in Adelaide in July 1997, a Working Party met with consultants on two occasions to commence the development of a new system to replace the Animal Emergency Information System (ANEMIS) that was unpopular in some jurisdictions. The new system will be more ‘user friendly’ and attractive to users. The requirements specification was almost finalised but little other progress was achieved due to competing priorities.

**Funding of animal health emergencies**

Certainty of funding arrangements for managing emergency disease outbreaks is critical to the success of proposed eradication measures. The move to a new shared arrangement between governments and the livestock industries was a major activity during the year. The process to move to a new funding arrangement for disease emergencies commenced in 1997 when the development of a new funding model started. This model was discussed at a workshop in August 1998 where agreement was sought to broad principles and a framework for a new cost-sharing agreement that would apply to all nationally significant exotic or emergency disease outbreaks.

Good progress was achieved during 1999 in the development of these new arrangements. The objective is to facilitate a rapid response with funding provided through a partnership of the Commonwealth Government, State and Territory governments and the livestock industries.

In July 1999, an independent expert group reported on issues outstanding from government–industry consideration of a 1998 commissioned report on a model and framework for the new arrangements. There was a general convergence of Animal Health Australia member views on the group’s recommendations, including:

---

• the four categories of disease and the cost-sharing proportions between government and industry for each category;
• all eligible costs subject to cost-sharing, with the exception of core or normal animal health-related resources; and
• triggers for the start and finish for cost-sharing in the event of an outbreak.

A second workshop with stakeholders was held on 24 April 1999 where participants provided broad acceptance of the proposals and considered the draft recommendations of the expert group. The expert group completed its review in July and the report of their findings was incorporated into the ongoing continuing discussions.

During the year a series of circulars identifying matters of concern and suggested ways of handling them were distributed widely to industry organisations and governments. This was done to ensure that all likely parties and their constituents remained aware of the concerns raised by others and open and frank discussion continued throughout the period until the proposed deed of agreement was developed.

In August 1999, SCARM/ARMCANZ endorsed the proposed framework and principles, providing a significant boost to the likelihood of achieving the desired outcome.

Senior representatives of Animal Health Australia achieved broad commitment to the new arrangements in November. They endorsed a timetable leading to a 30 June 2000 commencement for the new arrangements, and agreed to the formation of a taskforce representative of all the parties to negotiate and progressively resolve issues.

Emergency animal disease responses

A list of investigations into suspected emergency animal disease undertaken in Australia in 1999 is provided as Appendix 2.

The following disease confirmations during 1999 resulted in emergency animal disease responses being mounted.

Newcastle disease

A detailed report of outbreaks of virulent Newcastle disease during 1999 is included in Chapter 5.

Hendra virus

A diagnosis of Hendra virus (HeV or equine morbillivirus) in a horse was confirmed by the Australian Animal Health Laboratory.

The case involved an adult, thoroughbred mare kept for polocrosse. The mare died early on 18 January 1999 after an illness lasting 24 hours. Clinical signs included anorexia, depression, gait abnormality, ataxia and facial oedema. At death, large quantities of froth flowed from the nostrils.

The horse was one of two kept in a small paddock within the residential area of Cairns. The second horse tested negative.

From the history of these horses and the disease’s epidemiological pattern, it seems clear that infection of this mare did not originate from another horse, nor had any lateral spread occurred to other horses.

It has been demonstrated that HeV antibody can occur in flying foxes (large bats of the genus Pteropus). The paddock in which the horses were kept contained trees that are occasionally visited by spectacled flying foxes. It seems likely that spread has occurred in this case from a natural host, probably a flying fox.

Such an occurrence is a very rare event, with only three known foci of infection having been recorded.

Infectious bursal disease

Infectious bursal disease is a widespread immunosuppressive disease of the domestic fowl. Mild strains occur in Australia, but the hypervirulent or very virulent (vvIBD) form has not been reported here. In August authorities investigated a suspect occurrence of vvIBD on the north coast of New South Wales. A team from NSW Agriculture examined the property and forwarded samples to the Australian Animal Health Laboratory. The history and bursal lesions were strongly suggestive of vvIBD. However, it was reported that the infectious bursal disease strain was of Australian origin, but with a higher level of virulence than that of the usual Australian isolates.

Asian honeybee (Apis cerana)

The Asian honeybee is considered a serious threat to the Australian commercial honey industry, because it potentially carries a number of parasitic mites that could destroy Australian beehives.

In September, Asian honeybees were detected on a ship (ex Singapore, Lae and Port Moresby) berthed in Brisbane. This was the second time that Asian honeybees have been detected on the Australian mainland. Last year an incursion at Darwin was successfully eradicated.

A quarantine area was established and an intensive surveillance program initiated. So far no further Asian honeybees have been detected (see Chapter 3).
Appendix 1
Animal health contacts in Australia

Commonwealth

AUSTRALIAN CHIEF VETERINARY OFFICER
Dr Gardner Murray
Managing Director National Offices/
Chief Veterinary Officer
National Office of Animal and Plant Health
Agriculture, Fisheries and Forestry — Australia
GPO Box 858
CANBERRA ACT 2601
Phone: 61-2-6272 5848
Fax: 61-2-6272 5697
E-mail: gardner.murray@affa.gov.au

AUSTRALIAN QUARANTINE AND INSPECTION SERVICE
Mr Paul Hickey
Executive Director
Australian Quarantine and Inspection Service
GPO Box 858
CANBERRA ACT 2601
Phone: 61-2-6272 5455
Fax: 61-2-6272 5753
E-mail: paul.hickey@aqis.gov.au

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL
RESEARCH ORGANISATION
Dr Mike Rickard
Chief, CSIRO Division of Animal Health
Australian Animal Health Laboratory
Private Bag 24
GEELONG VIC 3220
Phone: 61-3-5227 5050
Fax: 61-3-5223 1011
E-mail: suzie.perilli@dah.csiro.au

State and Territory

AUSTRALIAN CAPITAL TERRITORY
VETERINARY OFFICER
Dr Will Andrew
Veterinary Officer
ACT Veterinary Services
PO Box 726
JAMIESON ACT 2614
Phone: 61-2-6207 2357
Fax: 61-2-6207 2361
E-mail: w.andrew@dynamite.com.au

NEW SOUTH WALES CHIEF VETERINARY OFFICER
Dr Dick Jane
Chief Veterinary Officer
NSW Agriculture
Locked Bag 21
ORANGE NSW 2800
Phone: 61-2-6391 3717
Fax: 61-2-6361 9976
E-mail: dick.jane@agric.nsw.gov.au

NORTHERN TERRITORY CHIEF VETERINARY OFFICER
Dr Brian Radunz
Director of Animal Health
Department of Primary Industry and Fisheries
GPO Box 990
DARWIN NT 0801
Phone: 61-8- 8999 2130
Fax: 61-8-8999 2089
E-mail: brian.radunz@nt.gov.au

QUEENSLAND CHIEF VETERINARY OFFICER
Dr Kevin Dunn
Executive Director
Animal and Plant Health Service
Queensland Department of Primary Industries
GPO Box 46
BRISBANE QLD 4001
Phone: 61-7-3239 3546
Fax: 61-7-3239 3558
E-mail: dunnk@dpi.qld.gov.au
SOUTH AUSTRALIAN CHIEF VETERINARY OFFICER
Dr Robin Vandegraaff
Chief Veterinary Officer
Primary Industries and Resources South Australia
GPO Box 1671
ADELAIDE SA 5001
Phone: 61-8-8207 7970
Fax: 61-8-8207 7852
E-mail: vandegraaff.robin@sa.gov.au

TASMANIAN CHIEF VETERINARY OFFICER
Dr Rod Andrewartha
Chief Veterinary Officer
Department of Primary Industry, Water and Environment
13 St Johns Avenue
NEW TOWN TAS 7001
Phone: 61-3-6233 6836
Fax: 61-3-6233 3843
E-mail: Rod.Andrewartha@dpiwe.tas.gov.au

VICTORIAN CHIEF VETERINARY OFFICER
Dr Andrew Turner (Retired January 2000)
Chief Veterinary Officer
Department of Natural Resources and Environment
475-485 Mickleham Road
ATTWOOD VIC 3049
Phone: 61-3-9217 4247
Fax: 61-3-9217 4322

WESTERN AUSTRALIAN CHIEF VETERINARY OFFICER
Dr John Edwards
Chief Veterinary Officer
Division of Animal Industries
Agriculture Western Australia
Locked Bag No 4
Bentley Delivery Centre
WA 6983
Phone: 61-8-9368 3535
Fax: 61-8-9367 6248
E-mail: sbirkbeck@sp.agric.wa.gov.au

Animal Health Australia
Dr Geoff Neumann
Chief Executive Officer
Animal Health Australia
Unit 15
26-28 Napier Close
DEAKIN ACT 2600
Phone: 61-2-6203 3999
Fax: 61-2-6232 5511
E-mail: geoff.neumann@aahc.com.au
Appendix 2
Investigations of suspected exotic and other emergency diseases in 1999

The table below shows the comprehensive coverage of Australia for situations when an exotic or emergency endemic disease is considered a possible diagnosis. Of particular note is the number of poultry and horse diseases investigated.

<table>
<thead>
<tr>
<th>Disease suspected</th>
<th>Month</th>
<th>State</th>
<th>Species</th>
<th>Response</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax</td>
<td>Feb</td>
<td>Queensland</td>
<td>bovine</td>
<td>2</td>
<td>anthrax excluded</td>
</tr>
<tr>
<td>Aujeszky’s disease</td>
<td>Apr</td>
<td>Western Australia</td>
<td>porcine</td>
<td>3</td>
<td>negative for porcine reproductive and respiratory syndrome/ Aujeszky’s disease</td>
</tr>
<tr>
<td>Aujeszky’s disease</td>
<td>May</td>
<td>Western Australia</td>
<td>porcine</td>
<td>3</td>
<td>negative for Aujeszky’s disease</td>
</tr>
<tr>
<td>Aujeszky’s disease</td>
<td>Nov</td>
<td>Western Australia</td>
<td>porcine</td>
<td>3</td>
<td>negative for Aujeszky’s disease/Hendra virus</td>
</tr>
<tr>
<td>Aujeszky’s disease</td>
<td>Dec</td>
<td>Western Australia</td>
<td>porcine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Feb</td>
<td>Northern Territory</td>
<td>canine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Jun</td>
<td>Western Australia</td>
<td>fauna</td>
<td>2</td>
<td>negative for bat lyssavirus/Hendra</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Aug</td>
<td>Queensland</td>
<td>canine</td>
<td>2</td>
<td>negative for lyssavirus</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Aug</td>
<td>Western Australia</td>
<td>fauna</td>
<td>3</td>
<td>negative for bat lyssavirus/Hendra</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Sep</td>
<td>Western Australia</td>
<td>fauna</td>
<td>3</td>
<td>negative for bat lyssavirus/Hendra</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Sep</td>
<td>South Australia</td>
<td>fauna</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Sep</td>
<td>Western Australia</td>
<td>fauna</td>
<td>3</td>
<td>negative for bat lyssavirus/Hendra</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Nov</td>
<td>Western Australia</td>
<td>fauna</td>
<td>3</td>
<td>negative for bat lyssavirus/Hendra</td>
</tr>
<tr>
<td>Australian bat lyssavirus</td>
<td>Nov</td>
<td>Western Australia</td>
<td>fauna</td>
<td>2</td>
<td>negative for bat lyssavirus/Hendra</td>
</tr>
<tr>
<td>Bluetongue</td>
<td>Jan</td>
<td>New South Wales</td>
<td>ovine</td>
<td>3</td>
<td>polioencephalomalacia</td>
</tr>
<tr>
<td>Bluetongue</td>
<td>Apr</td>
<td>Western Australia</td>
<td>ovine</td>
<td>3</td>
<td>negative for bluetongue</td>
</tr>
<tr>
<td>Bluetongue</td>
<td>Aug</td>
<td>Victoria</td>
<td>ovine</td>
<td>2</td>
<td>photosensitisation</td>
</tr>
<tr>
<td>Bovine brucellosis</td>
<td>Apr</td>
<td>Northern Territory</td>
<td>bovine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Bovine spongiform encephalopathy</td>
<td>Jul</td>
<td>Western Australia</td>
<td>bovine</td>
<td>3</td>
<td>negative for BSE</td>
</tr>
<tr>
<td>Bovine spongiform encephalopathy</td>
<td>Aug</td>
<td>Western Australia</td>
<td>bovine</td>
<td>2</td>
<td>negative for BSE</td>
</tr>
<tr>
<td>Bovine spongiform encephalopathy</td>
<td>Oct</td>
<td>Western Australia</td>
<td>ovine</td>
<td>2</td>
<td>negative for BSE</td>
</tr>
<tr>
<td>Contagious bovine pleuropneumonia</td>
<td>Feb</td>
<td>Western Australia</td>
<td>bovine</td>
<td>2</td>
<td>pasteurellosis</td>
</tr>
<tr>
<td>Contagious bovine pleuropneumonia</td>
<td>Mar</td>
<td>Northern Territory</td>
<td>bovine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Contagious bovine pleuropneumonia</td>
<td>Nov</td>
<td>South Australia</td>
<td>bovine</td>
<td>3</td>
<td>pasteurellosis</td>
</tr>
<tr>
<td>Contagious caprine pleuropneumonia</td>
<td>Jan</td>
<td>Western Australia</td>
<td>caprine</td>
<td>2</td>
<td>mycoplasma arthritis</td>
</tr>
<tr>
<td>Equine influenza (virus type A)</td>
<td>Dec</td>
<td>Victoria</td>
<td>equine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Jan</td>
<td>Queensland</td>
<td>porcine</td>
<td>1</td>
<td>contact dermatitis</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Feb</td>
<td>Queensland</td>
<td>caprine</td>
<td>2</td>
<td>scabby mouth</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Jun</td>
<td>Queensland</td>
<td>bovine</td>
<td>2</td>
<td>lantana poisoning</td>
</tr>
<tr>
<td>Disease suspected</td>
<td>Month</td>
<td>State</td>
<td>Species</td>
<td>Response</td>
<td>Finding</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>------------------</td>
<td>---------</td>
<td>----------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Jun</td>
<td>Queensland</td>
<td>caprine</td>
<td>2</td>
<td>scabby mouth</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Oct</td>
<td>Victoria</td>
<td>equine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Oct</td>
<td>New South Wales</td>
<td>bovine</td>
<td>3</td>
<td>mucosal disease</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Nov</td>
<td>Victoria</td>
<td>bovine</td>
<td>2</td>
<td>bovine virus diarrhoea</td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Nov</td>
<td>Queensland</td>
<td>bovine</td>
<td>1</td>
<td>calf dietary problems</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Jan</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Jan</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Mar</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Mar</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Apr</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>May</td>
<td>Queensland</td>
<td>equine</td>
<td>2</td>
<td>bronchopneumonia</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Jun</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>nonsuppurative encephalitis</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Jun</td>
<td>Queensland</td>
<td>equine</td>
<td>2</td>
<td>abdominal disorder</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Jul</td>
<td>Queensland</td>
<td>equine</td>
<td>4</td>
<td>Hendra virus excluded; colic</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Aug</td>
<td>Queensland</td>
<td>equine</td>
<td>4</td>
<td>purpura haemorrhagica</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Nov</td>
<td>Queensland</td>
<td>equine</td>
<td>3</td>
<td>bronchopneumonia</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Nov</td>
<td>New South Wales</td>
<td>equine</td>
<td>3</td>
<td>ruptured stomach</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Dec</td>
<td>Tasmania</td>
<td>equine</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Dec</td>
<td>New South Wales</td>
<td>equine</td>
<td>2</td>
<td>myocarditis</td>
</tr>
<tr>
<td>Hendra virus</td>
<td>Jan</td>
<td>Queensland</td>
<td>equine</td>
<td>7</td>
<td>Hendra virus confirmed</td>
</tr>
<tr>
<td>Infectious bursal disease</td>
<td>Aug</td>
<td>New South Wales</td>
<td>poultry</td>
<td>3</td>
<td>low-virulence infectious bursal disease</td>
</tr>
<tr>
<td>Infectious bursal disease</td>
<td>Aug</td>
<td>New South Wales</td>
<td>poultry</td>
<td>3</td>
<td>low-virulence infectious bursal disease</td>
</tr>
<tr>
<td>Japanese encephalitis</td>
<td>Apr</td>
<td>Queensland</td>
<td>equine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Japanese encephalitis</td>
<td>Apr</td>
<td>Victoria</td>
<td>equine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Japanese encephalitis</td>
<td>Apr</td>
<td>Victoria</td>
<td>equine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Maedi-visna</td>
<td>Feb</td>
<td>Western Australia</td>
<td>ovine</td>
<td>2</td>
<td>interstitial pneumonia</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Jan</td>
<td>New South Wales</td>
<td>poultry</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Mar</td>
<td>New South Wales</td>
<td>poultry</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Mar</td>
<td>Victoria</td>
<td>poultry</td>
<td>1</td>
<td>pasteurellosis</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Mar</td>
<td>New South Wales</td>
<td>poultry</td>
<td>7</td>
<td>Newcastle disease</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Apr</td>
<td>Victoria</td>
<td>avian</td>
<td>2</td>
<td>bacterial infection</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Apr</td>
<td>Western Australia</td>
<td>avian</td>
<td>2</td>
<td>negative for avian influenza/ Newcastle disease</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>May</td>
<td>Victoria</td>
<td>avian</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Jun</td>
<td>Queensland</td>
<td>avian</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Jul</td>
<td>Queensland</td>
<td>poultry</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Jul</td>
<td>Western Australia</td>
<td>avian</td>
<td>2</td>
<td>negative for Newcastle disease virus</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Aug</td>
<td>New South Wales</td>
<td>poultry</td>
<td>6</td>
<td>Newcastle disease</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Aug</td>
<td>Victoria</td>
<td>poultry</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Disease suspected</td>
<td>Month</td>
<td>State</td>
<td>Species</td>
<td>Response</td>
<td>Finding</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------</td>
<td>------------------------</td>
<td>---------</td>
<td>----------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Aug</td>
<td>South Australia</td>
<td>poultry</td>
<td>3</td>
<td>severe mycoplasmosis</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Sep</td>
<td>Western Australia</td>
<td>avian</td>
<td>2</td>
<td>negative for Newcastle disease virus</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Sep</td>
<td>Victoria</td>
<td>poultry</td>
<td>2</td>
<td>Marek’s disease</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Sep</td>
<td>Victoria</td>
<td>poultry</td>
<td>2</td>
<td>Infectious laryngotracheitis</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Oct</td>
<td>Victoria</td>
<td>poultry</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Nov</td>
<td>Queensland</td>
<td>avian</td>
<td>2</td>
<td>Marek’s disease</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Nov</td>
<td>New South Wales</td>
<td>avian</td>
<td>3</td>
<td>nonsuppurative meningo-encephalitis</td>
</tr>
<tr>
<td>Newcastle disease</td>
<td>Dec</td>
<td>Western Australia</td>
<td>avian</td>
<td>2</td>
<td>negative for avian influenza/ Newcastle disease</td>
</tr>
<tr>
<td>Porcine reproductive and respiratory syndrome</td>
<td>Jul</td>
<td>New South Wales</td>
<td>porcine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Porcine reproductive and respiratory syndrome</td>
<td>Sep</td>
<td>New South Wales</td>
<td>porcine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Rabies</td>
<td>Jan</td>
<td>Queensland</td>
<td>equine</td>
<td>2</td>
<td>hepatoencephalopathy</td>
</tr>
<tr>
<td>Rabies</td>
<td>Feb</td>
<td>Tasmania</td>
<td>bovine</td>
<td>3</td>
<td>listerial encephalitis</td>
</tr>
<tr>
<td>Rabies</td>
<td>Mar</td>
<td>New South Wales</td>
<td>canine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Rabies</td>
<td>Mar</td>
<td>Victoria</td>
<td>feline</td>
<td>1</td>
<td>negative</td>
</tr>
<tr>
<td>Rabies</td>
<td>May</td>
<td>New South Wales</td>
<td>feline</td>
<td>3</td>
<td>trauma</td>
</tr>
<tr>
<td>Rabies</td>
<td>Aug</td>
<td>New South Wales</td>
<td>canine</td>
<td>3</td>
<td>meningoencephalitis</td>
</tr>
<tr>
<td>Rabies</td>
<td>Sep</td>
<td>New South Wales</td>
<td>canine</td>
<td>2</td>
<td>behaviour change</td>
</tr>
<tr>
<td>Rabies</td>
<td>Sep</td>
<td>New South Wales</td>
<td>canine</td>
<td>2</td>
<td>behaviour change</td>
</tr>
<tr>
<td>Rabies</td>
<td>Dec</td>
<td>Victoria</td>
<td>canine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Rabies</td>
<td>Dec</td>
<td>New South Wales</td>
<td>canine</td>
<td>3</td>
<td>lead poisoning</td>
</tr>
<tr>
<td>Rinderpest</td>
<td>Jul</td>
<td>Queensland</td>
<td>bovine</td>
<td>2</td>
<td>St George disease</td>
</tr>
<tr>
<td>Scrapie</td>
<td>Jan</td>
<td>Queensland</td>
<td>ovine</td>
<td>2</td>
<td>negative for scrapie</td>
</tr>
<tr>
<td>Scrapie</td>
<td>Apr</td>
<td>New South Wales</td>
<td>caprine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Mar</td>
<td>Queensland</td>
<td>canine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Mar</td>
<td>Queensland</td>
<td>canine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Mar</td>
<td>Northern Territory</td>
<td>canine</td>
<td>2</td>
<td>negative</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Sep</td>
<td>Queensland</td>
<td>bovine</td>
<td>2</td>
<td>Australian flies</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Oct</td>
<td>Queensland</td>
<td>bovine</td>
<td>1</td>
<td>non-screw-worm fly myiasis</td>
</tr>
<tr>
<td>Screw-worm fly</td>
<td>Dec</td>
<td>Queensland</td>
<td>bovine</td>
<td>2</td>
<td>Chrysomyia saffranea</td>
</tr>
<tr>
<td>Sheep pox and goat pox</td>
<td>Mar</td>
<td>Queensland</td>
<td>caprine</td>
<td>6</td>
<td>orf/staph dermatitis</td>
</tr>
<tr>
<td>Sheep pox and goat pox</td>
<td>Mar</td>
<td>Queensland</td>
<td>caprine</td>
<td>6</td>
<td>orf/staph dermatitis</td>
</tr>
<tr>
<td>Sheep scab</td>
<td>Oct</td>
<td>New South Wales</td>
<td>other</td>
<td>2</td>
<td>chorioptic mange</td>
</tr>
<tr>
<td>Tropical canine pancytopenia</td>
<td>Apr</td>
<td>Northern Territory</td>
<td>canine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Tropical canine pancytopenia</td>
<td>Aug</td>
<td>Northern Territory</td>
<td>canine</td>
<td>3</td>
<td>negative</td>
</tr>
<tr>
<td>Tropialaelaps clareae</td>
<td>Dec</td>
<td>Queensland</td>
<td>apine</td>
<td>5</td>
<td>varroa mites on Asian honeybees</td>
</tr>
<tr>
<td>Varroa mite</td>
<td>Sep</td>
<td>Queensland</td>
<td>apine</td>
<td>5</td>
<td>ongoing operation</td>
</tr>
<tr>
<td>Varroasis</td>
<td>Mar</td>
<td>Victoria</td>
<td>apine</td>
<td>1</td>
<td>sticky pollen</td>
</tr>
<tr>
<td>Vesicular disease</td>
<td>Feb</td>
<td>Tasmania</td>
<td>ovine</td>
<td>2</td>
<td>mucosal disease</td>
</tr>
<tr>
<td>Disease suspected</td>
<td>Month</td>
<td>State</td>
<td>Species</td>
<td>Response</td>
<td>Finding</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------</td>
<td>---------------------</td>
<td>---------</td>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Vesicular disease</td>
<td>Apr</td>
<td>Northern Territory</td>
<td>ovine</td>
<td>2</td>
<td>trauma</td>
</tr>
<tr>
<td>Vesicular disease</td>
<td>May</td>
<td>Tasmania</td>
<td>bovine</td>
<td>2</td>
<td>warts</td>
</tr>
<tr>
<td>Vesicular disease</td>
<td>May</td>
<td>Victoria</td>
<td>bovine</td>
<td>2</td>
<td>bovine virus diarrhoea</td>
</tr>
<tr>
<td>Vesicular stomatitis</td>
<td>Oct</td>
<td>Victoria</td>
<td>equine</td>
<td>3</td>
<td>equine herpes virus (EHV4)</td>
</tr>
<tr>
<td>Vesicular stomatitis</td>
<td>Oct</td>
<td>Victoria</td>
<td>equine</td>
<td>3</td>
<td>autoimmune condition</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Mar</td>
<td>Queensland</td>
<td>avian</td>
<td>2</td>
<td>negative for avian influenza/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Newcastle disease</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Aug</td>
<td>Queensland</td>
<td>poultry</td>
<td>3</td>
<td>all negative</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Jan</td>
<td>Western Australia</td>
<td>avian</td>
<td>2</td>
<td>vitamin E deficiency</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Jan</td>
<td>Queensland</td>
<td>avian</td>
<td>3</td>
<td>Marek’s disease</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Feb</td>
<td>Queensland</td>
<td>avian</td>
<td>2</td>
<td>infectious coryza</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Feb</td>
<td>Queensland</td>
<td>avian</td>
<td>2</td>
<td>mycoplasmosis</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Mar</td>
<td>Queensland</td>
<td>avian</td>
<td>2</td>
<td>negative for avian influenza/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Newcastle disease</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Mar</td>
<td>Queensland</td>
<td>avian</td>
<td>3</td>
<td>enteritis</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Mar</td>
<td>Queensland</td>
<td>avian</td>
<td>3</td>
<td>enteritis</td>
</tr>
<tr>
<td>Virulent avian influenza</td>
<td>Nov</td>
<td>South Australia</td>
<td>poultry</td>
<td>3</td>
<td>vitamin E deficiency</td>
</tr>
</tbody>
</table>

**KEY:**

- **Level of response**
  1. Field investigation by government officer
  2. Investigation by government veterinary laboratory
  3. Specimens sent to national laboratories
  4. Specimens sent to overseas reference laboratories
  5. Regulatory action (eg quarantine) taken
  6. Alert or standby
  7. Eradication
Acronyms and abbreviations

AAHL  Australian Animal Health Laboratory
ABARE  Australian Bureau of Agricultural and Resource Economics
ABS   Australian Bureau of Statistics
ACIAR  Australian Centre for International Agricultural Research
AFFA  Agriculture, Fisheries and Forestry — Australia
AQIS  Australian Quarantine and Inspection Service
AQUAPLAN  National Aquatic Animal Health Plan
ARMCANZ  Agriculture and Resource Management Council of Australia and New Zealand
AusAID  Australian Overseas Aid Program
AUSVETPLAN  Australian Veterinary Emergency Plan
BSE   bovine spongiform encephalopathy
CA    control area
CCEAD  Consultative Committee on Emergency Animal Diseases
CDC   Centers for Disease Control and Prevention (United States)
COAG  Council of Australian Government
CSIRO Commonwealth Scientific and Industrial Research Organisation
FAO   Food and Agriculture Organization of the United Nations
FMD   foot-and-mouth disease
HACCP  hazard analysis critical control point
IEC   International Electrotechnical Commission
ISO   International Organization for Standardization
JE    Japanese encephalitis
JETACAR Joint Expert Technical Advisory Committee on Antibiotic Resistance
LDCC  local disease control centre
MGN   monogon ganglioneuritis
NAHIS National Animal Health Information System
NCEEP Northern Cattle Export Enhancement Project
NLIS  National Livestock Identification System
NRA   National Registration Authority for Agricultural and Veterinary Chemicals
NRS   National Residue Survey
NTSESP National Transmissible Spongiform Encephalopathy Surveillance Program
OIE   World Organisation for Animal Health (Office International des Epizooties)
RA    restricted area
SCARM Standing Committee on Agriculture and Resource Management
SPS   Sanitary and Phytosanitary Agreement (of the World Trade Organization)
TSE   Transmissible spongiform encephalopathy
vvIBD Very virulent infectious bursal disease
WHO   World Health Organization of the United Nations