

AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

Disease Strategy

Porcine reproductive and respiratory syndrome

Version 3.0, 2006

AUSVETPLAN is a series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.

Primary Industries Ministerial Council

This disease strategy forms part of:

AUSVETPLAN Edition 3

This strategy will be reviewed regularly. Suggestions and recommendations for amendments should be forwarded to:

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IMPORTANT NOTE:

Important regulatory information is contained in the OIE Terrestrial Animal Health Code for porcine reproductive and respiratory syndrome, which is updated annually and is available on the internet at the OIE website: http://www.oie.int/eng/normes/en_mcode.htm. Further details are given in Appendix 3 of this manual.

DISEASE WATCH HOTLINE

1800 675 888

The Disease Watch Hotline is a toll-free telephone number that connects callers to the relevant state or territory officer to report concerns about any potential emergency disease situation. Anyone suspecting an emergency disease outbreak should use this number to get immediate advice and assistance.

Preface

This disease strategy for the control and eradication of **porcine reproductive and respiratory syndrome** (PRRS) is an integral part of the **Australian Veterinary Emergency Plan**, or **AUSVETPLAN (Edition 3)**. AUSVETPLAN structures and functions are described in the **AUSVETPLAN Summary Document**.

This strategy sets out the disease control principles that have been approved by the Animal Health Committee of the Primary Industries Ministerial Council (PIMC) at meeting 9 on 26 October 2005 for use in an animal health emergency caused by the occurrence of PRRS in Australia.

PRRS is included on the OIE (World Organisation for Animal Health, formerly Office International des Epizooties) list of notifiable diseases as a swine disease. This obliges OIE member countries to notify the OIE within 24 hours of confirming the presence of PRRS. OIE-listed diseases are diseases with the potential for international spread, significant mortality or morbidity within the susceptible species and/or potential for zoonotic spread to humans.¹ The principles contained in this document for the diagnosis and management of an outbreak of PRRS conform with the *OIE Terrestrial Animal Health Code* (see Appendix 3).

In Australia, PRRS is included as a Category 4 emergency animal disease in the *Government and Livestock Industry Cost Sharing Deed In Respect of Emergency Animal Disease Responses* (EAD Response Agreement).²

Category 4 diseases are diseases that could be classified as being mainly production loss diseases. While there may be international trade losses and local market disruptions, these would not be of a magnitude that would be expected to significantly affect the national economy. The main beneficiaries of a successful emergency response to an outbreak of such a disease would be the affected livestock industries. For this category, the costs will be shared 20% by governments and 80% by the relevant industries (refer to the EAD Response Agreement for details).

Detailed instructions for the field implementation of AUSVETPLAN are contained in the disease strategies, operational procedures manuals, management manuals and wild animal manual. Industry-specific information is given in the relevant enterprise manuals. The full list of AUSVETPLAN manuals that may need to be accessed in an emergency is:

¹ These criteria are described in more detail in Chapter 2.1.1 of the *OIE Terrestrial Animal Health Code* (http://www.oie.int/eng/normes/mcode/en_chapitre_2.1.1.htm).

² Information about the EAD Response Agreement can be found at <http://www.animalhealthaustralia.com.au/programs/eadp/eadra.cfm>

Disease strategies

Individual strategies for each disease

Operational procedures manuals

Decontamination
Destruction of animals
Disposal procedures
Public relations
Valuation and compensation

Management manuals

Control centres management
(Volumes 1 and 2)
Animal Health Emergency Information
System
Laboratory preparedness

Enterprise manuals

Animal quarantine stations
Artificial breeding centres
Aviaries and pet shops
Feedlots
Meat processing
Poultry industry
Saleyards and transport
Veterinary practices
Zoos

Wild animal manual

Wild animal response strategy

Summary document

In addition, *Exotic Diseases of Animals: A Field Guide for Australian Veterinarians* by WA Geering, AJ Forman and MJ Nunn, Australian Government Publishing Service, Canberra, 1995 is a source for some of the information about the aetiology, diagnosis and epidemiology of the disease.

Earlier versions of this manual were prepared by a writing group with representatives from the Australian national, state and territory governments and the pig industry. For Version 3.0, the document has been reviewed and updated by Chris Bunn. Scientific editing was by Dr Janet Salisbury of Biotext, Canberra.

The revised manual has been reviewed and approved by:

Government

Commonwealth of Australia
State of New South Wales
State of Queensland
State of South Australia
State of Tasmania
State of Victoria
State of Western Australia
Northern Territory
Australian Capital Territory

Industry

Australian Pork Limited

The complete series of AUSVETPLAN documents is available on the internet at:
<http://www.animalhealthaustralia.com.au>

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1 Nature of the disease

Porcine reproductive and respiratory syndrome (PRRS) is characterised by a marked increase in late-term abortions, stillborn and weak pigs; lowered farrowing rates, severe respiratory disease and high death rates in suckling and weaned pigs; and deaths and a delayed return to oestrus among sows. However, in some herds it is asymptomatic.

1.1 Aetiology

The aetiological agent of PRRS is an RNA virus of the order Nidovirales, family Arteriviridae, genus *Arterivirus*. The virus is closely related to equine arteritis virus. There are two related but antigenically and genetically distinguishable strains of the virus: the Lelystadt virus associated with the European outbreak of the disease (see Section 1.3 below) and VR 2332, the prototype of strains recovered in North America and Asia.

The virus causes disease by infecting macrophages, compromising the cellular immune response and damaging mucosal surfaces.

When a new host has been infected, the virus replicates in mucosal, pulmonary or regional lymphoid macrophages. Within 12 hours, the virus reaches regional lymph nodes and is systemically distributed to mononuclear cells and tissue macrophages. Clinical signs of infection usually occur within 4–8 days of exposure.

1.2 Susceptible species

The pig (*Sus scrofa*), whether domestic or feral, is the only species known to be naturally susceptible to this disease. There is a report of faecal shedding by mallard ducks experimentally exposed to PRRS virus in drinking water, indicating that mallards are susceptible to infection with the virus (Zimmerman et al 1997).

1.3 World distribution and occurrence in Australia

PRRS was first diagnosed in Canada in 1979 (retrospectively) and spread rapidly through North America in the late 1980s. In Europe, a similar disease caused by a related, but genetically distinct, arterivirus spread rapidly during 1990–92, although serological evidence from Germany suggested the virus was present in 1988.

Other names applied to the syndrome since its emergence include:

- mystery swine disease;
- blue ear; and
- swine reproductive and fertility syndrome.

Over a period of 10 years, PRRS virus entered and became endemic in most of the world's pig population. The virus is now present throughout the world, with the exceptions of Australia, New Zealand, Sweden, Switzerland, Norway and Finland. The disease has been recognised in Korea and in Japan. Retrospective analysis of sera indicated that it was present in pigs imported by Korea in 1985 and in Japan in 1988.

PRRS has never been diagnosed in Australia. In 1996, a serological survey of 875 samples from 163 herds across all states and territories showed no evidence of PRRS virus antibodies (Garner et al 1997).

1.4 Diagnostic criteria

See the Glossary for terms not defined in the text.

1.4.1 Clinical signs

The clinical signs of PRRS vary with the strain of virus, the immune status of the herd and management factors. Infection may also be asymptomatic.

Clinical disease in a herd is a consequence of acute viraemia in individuals and transplacental transmission of virus from viraemic dams to their foetuses, which occurs most efficiently in the last third of pregnancy.

Acute infection in adults is characterised by some or all of the following:

- reduced appetite
- fever
- blotchy cutaneous hyperaemia
- laboured breathing
- premature farrowing or abortion
- death in up to 10% or more of sows
- loss of balance (ataxia), circling and falling to one side.

Affected litters show the following signs:

- stillborn pigs
- mummified pigs
- variably sized weak-born pigs
- chemosis (excessive swelling of the mucous membranes that line the eyelids and surface of the eyes), especially in animals less than three weeks old
- high pre-weaning mortality.

In weaned pigs the clinical signs are:

- loss of appetite
- lethargy
- obvious failure to thrive
- respiratory distress
- cutaneous hyperaemia
- rough hair coats.

Concurrent infection with other microorganisms and high mortality rates are evident in weaned pigs infected with PRRS virus.

In sows, the disease episode occurs in phases. The first, which lasts about two weeks, is a period of acute illness characterised by lethargy and reduced appetite. The disease spreads quickly through a herd over 7–10 days.

As sows become infected and farrow infected litters, the second, or reproductive, phase of the disease occurs as a result of the transplacental transmission of the virus. This phase is characterised by late-term reproductive failure and can last from one to four months. Pigs that survive the pregnancy and neonatal phase usually succumb to infection after weaning, although this stage may be masked or exacerbated by concurrent infection with another disease agent, such as *Haemophilus parasuis* (Glasser's disease).

Although this description of the progression of the disease implies that there is some predictability about the clinical signs evident during an outbreak, the opposite is closer to the truth. In fact, there is no single consistent feature of PRRS virus infection in pigs. Given that the Australian pig herd is naive to PRRS virus, diagnosis will rely strongly on the recovery and identification of the infective agent. Nonetheless, in the first instance, recognition of the clinical syndrome and positive serum antibodies will likely precede virus isolation.

1.4.2 Pathology

Pathogenesis

PRRS virus gains access to its host via mucosal surfaces, after which replication occurs in local macrophages with subsequent viraemia and distribution to regional lymphoid tissues. PRRS virus has a tropism for macrophages: it has been shown that the virus replicates mainly in macrophages of the lymphoid tissues and lungs in the acute phase of infection and persists in lung macrophages (Duan et al 1997). PRRS virus antigen has been found in the resident macrophages of a variety of tissues, as well as in other cells, including muscle tissues.

Gross lesions

PRRS virus produces a multisystemic infection in pigs, but gross lesions are usually only observed in respiratory and lymphoid tissues. Both gross and microscopic lesions are most marked in neonatal and young weaned pigs. The gross pathology observed after uncomplicated infection of PRRS virus in finishing pigs may be unremarkable (Rossow 1998).

Lungs are mottled, tan and red, and fail to collapse; the cranioventral lobes are most affected. Lymph nodes are moderately to severely enlarged and tan in colour. Those in the cervical, cranial, thoracic and inguinal regions are most obvious at postmortem.

Under field conditions, most PRRS virus infected pigs are co-infected with one or more pathogens, which complicates the diagnosis of PRRS based on pathology.

Microscopic lesions (histopathology)

Microscopic examination reveals moderate to severe multifocal interstitial pneumonia characterised by:

- alveolar septal infiltration by a mixed population of mononuclear cells;
- hypertrophy and hyperplasia of pneumocytes (cells lining the alveoli in the lungs); and
- marked mixed inflammatory and necrotic alveolar exudate.

Lymph nodes show marked follicular hyperplasia, foci of follicular necrosis, increased numbers of tingible (stained) macrophages and karyorrhectic (fragmented) nuclear debris within follicles. For more detail, see Benfield et al (1999a).

1.4.3 Laboratory tests

Specimens required

Specimens from younger rather than older animals are preferred. The following specimens should be collected.

- *For virus isolation* – whole blood and also serum, lung, respiratory tract, spleen and tonsils (samples from mummified or aborted litters are unlikely to yield virus).
- *For antibody testing (serology)* – serum from 20 exposed animals in the herd.
- *For histopathology and immunohistochemistry* – a full range of tissues in neutral-buffered formalin taken from affected pigs killed immediately before autopsy and from pigs that have recently died.

Unpreserved specimens should be chilled and forwarded unfrozen on water ice or with frozen gel packs.

Transport of specimens

Specimens should initially be sent to the state or territory diagnostic laboratory, from where they will be forwarded to the CSIRO Australian Animal Health Laboratory (CSIRO-AAHL), Geelong for emergency disease testing, after obtaining the necessary clearance from the chief veterinary officer (CVO) of the state or territory experiencing the disease outbreak and after informing the CVO of Victoria about the transport of the specimens to Geelong.

See the **Laboratory Preparedness Management Manual** for details about transport of specimens.

Laboratory diagnosis

Virus isolation

Buffy coat, serum, lung, lymph nodes, spleen and tonsils are the specimens of choice for virus isolation. The virus grows well on swine pulmonary alveolar macrophages and Marc 145 cells. Cytopathic effects are evident in 1–4 days. Perform two 7-day passages.

Serological tests

IgM can be detected within 7 days of infection and IgG can be detected within 14 days. Humoral antibody titres reach a maximum about 5–6 weeks after infection. The test used in Australia is the IDEXX Laboratories, Inc ELISA antibody assay. AAHL can also perform immunodetection on virus-infected, fixed Marc 145 cells.

Histopathology

An experimental polymerase chain reaction (PCR) is available at AAHL.

Molecular tests

A PCR test suitable for large-scale screening is available at AAHL.

Table 1 Laboratory tests currently available at CSIRO-AAHL for the diagnosis of PRRS

Test	Specimen required	Test detects	Time taken to obtain result
Virus isolation	buffy coat, serum, lung, lymph nodes, spleen, tonsils	virus	3 days
IDEXX serum ELISA test	serum of EDTA blood	antibody	1 day
Immunohistochemistry	full range of tissues in neutral buffered formalin	viral antigen	2 days
PCR	lung	viral RNA	2 days

Source: Information provided by CSIRO-AAHL, 2003. Refer to CSIRO-AAHL for most up-to-date information.

1.4.4 Differential diagnosis

In the field, suspicion of PRRS is based on clinical signs of reproductive failure and high levels of neonatal mortality. Analysis of farm records will provide helpful information.

The following diseases must be considered in the differential diagnosis of PRRS:

- any cause of ill thrift (failure to thrive); and
- any cause of abortion, mummification, stillbirths or weak piglets, including
 - leptospirosis
 - porcine parvovirus
 - porcine enterovirus
 - haemagglutinating encephalomyelitis
 - Aujeszky's disease

- classical swine fever
- foot-and-mouth disease.

The respiratory and postweaning form of the disease needs to be differentiated from:

- swine influenza
- enzootic pneumonia
- proliferative and necrotising pneumonia
- *Haemophilus parasuis* infection
- haemagglutinating encephalomyelitis virus
- porcine respiratory coronavirus
- syncytial pneumonia and myocarditis
- postweaning multisystemic wasting syndrome
- Nipah virus infection.

1.4.5 Treatment of infected animals

There is no specific treatment for PRRS.

1.5 Resistance and immunity

1.5.1 Innate and passive immunity

Seropositive sows transmit antibodies to their offspring via the colostrum. Passive immunity appears to decline and gives way to infection soon after weaning, but the age at which pigs seroconvert is variable and in some herds pigs as old as 12 weeks are still seronegative.

1.5.2 Active immunity

The large variation in clinical signs is usually caused by variations in the virulence of different strains of the virus, rather than in the immune status of the pig population. Pigs infected with PRRS virus show an immune response, which is easily detected by the presence of serum antibodies, within 7-14 days after infection. ELISA antibody titres reach maximal levels after 30-50 days and then decline to low or non-detectable levels after 4-6 months. Animals that recover are immune and protected from subsequent infection with the same serotype. Cross-protection decreases as the differences between serotypes increase. However, even in an infected herd where some older, previously infected sows may be seronegative, seropositive pigs are present in other age groups.

In an infected herd, the proportion of pigs that give a positive ELISA test is high. In herds where susceptible and infected animals are mixed, a large proportion (80-100%) of the pigs become infected and therefore seropositive. The immune response that develops following infection with the PRRS virus protects the clinically recovered pig from subsequent homologous challenge, but does not prevent the establishment of persistent infection (Benfield et al 1999a).

1.5.3 Vaccination

Attenuated live virus and killed virus vaccines are available overseas to control PRRS and, used judiciously, they may be of value in preventing and controlling the disease. Unless vaccines improve dramatically in efficacy, they should not be relied on to control or prevent the disease.

Genetic and antigenic differences between vaccine and field strains have been identified. However, transmission of vaccine viral strains has been reported from vaccinated sows to unvaccinated sows and from vaccinated herds to unvaccinated herds, with development of virus vaccine-induced reproductive failure (Bøtner et al 1997).

There are no vaccines currently approved for use in Australia.

1.6 Epidemiology

The PRRS virus is highly infectious. Following infection, the virus rapidly becomes systemic. The intranasal experimental infective dose is very low, with only a small number of viral particles required to initiate infection. However, spread from pig to pig or from farm to farm is less certain. Indeed, some pockets of pigs in infected herds can remain seronegative for extended periods.

The virus spreads most easily by direct contact. Transmission can be by inhalation, ingestion, coitus, needles or possibly bite wounds. Epidemiological evidence and virus tracing suggest that the virus can be spread experimentally by aerosol up to 150 metres (Lager et al 2002, Dee et al 2003) (see Section 1.6.3).

Using a rigorous program of serological monitoring and strict control measures, the French held herd prevalence below 2% for nearly two-and-a-half years after PRRS virus had entered the Loire region (Le Potier et al 1997).

1.6.1 Incubation period

Experimentally, the incubation period for individual animals is 4–8 days (Geering et al 1995), but signs may take longer to emerge in a herd. The OIE Terrestrial Code does not include a maximum incubation period for regulatory purposes (see Appendix 3). For example, reproductive failure may not occur for 25 days after infection. In addition, it is hard to pick infection in an individual pig, although the disease becomes more obvious when many pigs are affected.

Exposure of mucosal surfaces to virus results in viraemia within 12 hours of challenge. Virus is shed in saliva, urine, semen and mammary secretions. Sows inoculated intranasally showed decreases in macrophage and lymphocyte numbers within three days and were ill 4–8 days after exposure (Meredith 1995).

One-week-old gnotobiotic (pathogen-free) pigs become ill 4–5 days after infection with PRRS virus. Six-month-old specific pathogen-free pigs became ill within two days of contact with infected sows (Meredith 1995).

In field outbreaks, the interval from the introduction of infected stock to the first obvious inappetence in the herd ranged from three to 37 days (Benfield et al 1999a, Meredith 1995).

Infection with the PRRS virus can also produce clinically normal but chronically infected animals for as long as 22 weeks after exposure (Christopher-Hennings et al 1995).

1.6.2 Persistence of agent

General properties

PRRS virus is most stable between pH 5.5 and pH 6.5. Virus infectivity is reduced by over 90% at a pH lower than 5 or higher than 7. In culture medium at pH 7.5, the half-life of the European strain of PRRS virus was 140 hours at 4°C, 20 hours at 21°C, 3 hours at 37°C and 6 minutes at 56°C (Bloemraad et al 1994).

The virus is also unstable in low concentrations of detergents and is rapidly inactivated by solvents such as chloroform and ether.

Environment

The virus can survive in water for 11 days but is unlikely to survive in the environment for extended periods because it cannot withstand drying and is quickly inactivated in the absence of moisture (Benfield et al 1999a).

Live animals

Infection may be prolonged. The virus is shed for an extended period in saliva (42 days), urine (14 days) and semen (43 days). Using PCR, viral RNA has been detected 92 days after exposure (Christopher-Hennings et al 1995). Pigs have transmitted disease to commingled susceptible sentinel pigs 22 weeks after originally being infected. Virus has been recovered from the oropharyngeal area 157 days after experimental infection.

Viral RNA has been demonstrated as late as 210 days after birth in the serum of pigs infected in utero (Benfield et al 1999b).

Animal products and byproducts

PRRS virus has been isolated from muscle and lymphoid tissue. The virus survives freezing in cell culture for a prolonged period and has been isolated after one month from muscle frozen at -20°C, but levels of virus decrease with cooling, hardening and freezing. PRRS virus can be recovered from muscle tissues 0-24 hours after slaughter but not from muscle held at 4°C for 48 hours. Virus will, however, survive in bone marrow for several weeks when stored at 4°C (Bloemraad et al 1994).

Equipment and personnel

As the virus cannot withstand drying, it does not persist on equipment or other fomites beyond one day.

Vectors

See Section 1.6.3 for information on the role of mallard ducks, rodents and insects in the spread of PRRS.

1.6.3 Modes of transmission

Live animals and semen

PRRS is spread mostly by direct contact with infected animals. PRRS virus is highly infectious but not highly contagious. Transmission among pen mates, which are in direct contact with each other, occurs far more readily than transmission across even a small (eg one-metre) aisle. Viral excretion persists *beyond* the time when specific antibodies have developed (see Section 1.6.2).

Aerosol spread over distances of up to 20 km was once thought possible but pig-to-pig transmission, even over a distance as small as one metre, has been difficult to repeat experimentally. Although most (45%) infected herds have been within 500 metres of the postulated source, evidence suggests that the disease can move up to a kilometre from an initial outbreak (Le Potier et al 1997). Aerosol transmission of the PRRS virus, particularly in conditions of high humidity, low wind speed and low ambient temperature, has been reported (Mortensen et al 2002).

Pregnant sows exposed to PRRS virus can pass the virus in utero to their piglets, which are highly likely to develop the disease and excrete virus for extended periods (see Section 1.6.2).

Foetuses infected at about 90 days of gestation and surviving to 21 days of age may be persistently infected.

Detection of PRRS virus field and vaccine strains in semen of infected intact and vasectomised boars has been documented (Rossow 1998). Virus can be recovered from semen before seroconversion and after cessation of viraemia. Except in the period soon after infection, boars excreting virus in semen are antibody positive.

Transmission of PRRS virus via artificial insemination from infected boars was suspected on epidemiological grounds for some time, and recently has been confirmed experimentally (Benfield et al 1999a , Gradil et al 1996).

The virus is more likely to persist in boars than in sows because it can survive in apparently immunoprivileged sites in testes and bulbourethral glands.

Animal products and byproducts

The transmission of PRRS virus to pigs fed infected meat has been confirmed by research commissioned by Biosecurity Australia. Twenty-four 8-week-old pigs were infected by intranasal inoculation with either a European or American strain of PRRS virus (12 pigs per group). The pigs were all viraemic at five days post-inoculation, and were slaughtered at 11 days. Virus was detected in the semimembranosus muscle from seven of the 12 infected with the European strain and from five of those infected with the American strain. The muscle was frozen until use in the feeding experiment. Five hundred grams of raw semimembranosus muscle from each experimentally infected pig was fed over a two-day period to each of two receiver pigs (48 receiver pigs). Transmission of both strains of PRRS virus via the feeding of meat was demonstrated (Martin and Steverink 2002).

Equipment and personnel

The role of fomites in the transmission of the PRRS is uncertain. However, the virus does not persist in the environment or survive on fomites under dry conditions.

Vectors

Mallard ducks have been shown experimentally to be capable of excreting PRRS virus in their faeces, but their role in the spread of the disease in pigs is uncertain. (Zimmerman et al 1997).

A survey of rats and mice collected from pig sheds during epidemic and endemic phases of PRRS has indicated that rodents are not a reservoir for the disease (Hooper et al 1994).

It has been shown experimentally that mechanical transmission of PRRS virus from viraemic to susceptible pigs via mosquitoes (Otake et al 2002), needles and houseflies (Otake et al 2003) may occur. Mechanical spread is theoretically possible but unlikely, given the nature of the virus.

1.6.4 Factors influencing transmission

PRRS can spread rapidly through intensive pig herds by aerosol transmission. Windborne spread and movement of infected pigs are the major factors in transmission of the disease. Studies have shown that risk of infection increases significantly with exposure from PRRS-infected neighbouring herds; purchase of animals from herds incubating infection; and purchase of semen from boars at PRRS-infected AI centres (Mortensen et al 2002).

It is not yet known whether pigs can become chronic carriers, although the virus can be shed for extended periods in some animals, including convalescent sows.

1.7 Manner and risk of introduction to Australia

The most likely means of PRRS entry to Australia or a herd is with subclinically or asymptotically infected live pigs, or via semen. There is also a risk that PRRS virus could be introduced into Australia in uncooked pork products if they were fed to domestic pigs.

There is always a risk that the disease could find its way into the feral pig population. If this were to happen, the virus could be difficult to contain. Its spread to domestic pigs could be limited by using sound perimeter fencing.

2 Principles of control and eradication

2.1 Introduction

The disease control options appropriate for a particular outbreak of porcine reproductive and respiratory syndrome (PRRS) will depend on practical factors, including:

- the density of pigs in an infected area;
- the multi-site organisation of many pig farms;
- the need to move pigs interstate for slaughter; and
- the practicality, after slaughter, of processing infected pigs by cooking.

No country in which PRRS occurs has attempted eradication of the PRRS virus. In France, the disease has been held at a low level by using conventional tests and movement controls. Reports in the literature indicate that eradication from herds or subpopulations may be possible using depopulation, or partial depopulation, and eradication by controlled exposure and careful monitoring for the presence of virus (Gramer et al 1999). Overseas exposure suggests that these measures are not always successful (Dee et al 2001, Lager et al 2002).

The disease moves relatively slowly within a herd. Provided that a PRRS incursion is detected quickly, there is time to define the extent of infection using serology (ELISA test) and make an epidemiological assessment before embarking on any course of action. Serology will also identify those herds that are free of the disease and can be used as sentinels, and provides an added layer of security for those involved in the purchase and movement of pigs.

Herds can be protected against exposure by the isolation and serological testing of introduced breeding stock, followed by a 30-day quarantine period and retesting before entry to the herd (serum antibodies are detectable 7–14 days after exposure and reach maximum levels at 30–50 days).

PRRS virus does not survive drying in the environment; it only survives in live pigs and semen and may survive for a limited time in uncooked meat products. Therefore, eradication and control efforts should be focused on live animals.

In addition, although the disease is highly infectious, it is not highly contagious; transmission normally occurs where pigs are in direct contact with each other. Aerosol spread is unlikely (see Section 1.6.3). There is therefore no need to apply disease control measures to abattoirs, meat processing premises or saleyards, and routine cleaning is all that is needed for decontamination of farm premises.

The elements of a control and eradication program for PRRS are:

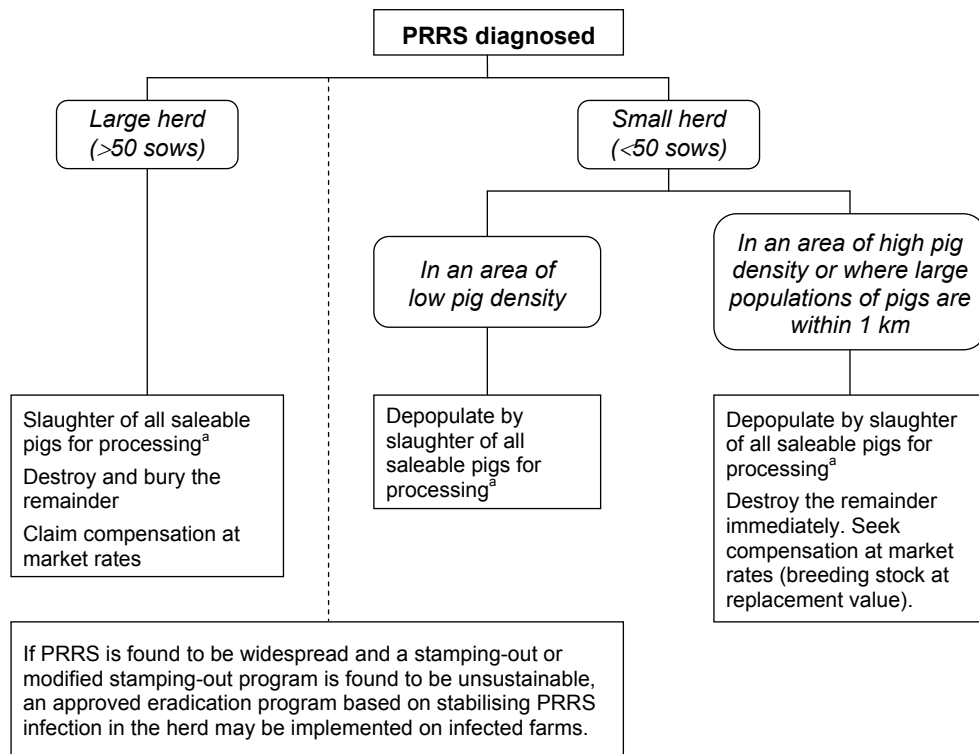
- early recognition and laboratory confirmation of the disease (see Section 1.4);
- early identification of infected and potentially infected pig farms (see Section 2.2.2 and Appendix 1);

- rapid imposition of effective quarantine on infected and potentially infected premises (see Section 2.2.1);
- immediate cessation of stock movements until the status of the outbreak is established;
- elimination of infection through *either* stamping out *or* modified stamping out – modified stamping out is a controlled depopulation of breeding stock and slaughter of pigs as they reach a marketable age or weight (there is no need for immediate and total depopulation, although this may be a prudent approach if the index case is in an area densely populated by pigs);
- the swift designation and effective policing of control areas to prevent movements of pigs carrying virus, or potentially carrying virus (see Appendixes 1 and 2); and
- restriction of pork from PRRS-infected farms to processing as cooked products – this may be difficult to implement in some cases; special arrangements with abattoirs and processors may need to be made and this may have implications for the sale value of the pigs or carcasses.

A decision tree showing the factors that may affect the control strategy used for PRRS and the possible control measures (see Figure 1), will help to clarify disease control decisions.

In the event that the virus becomes widespread before it is detected, the key elements of control are:

- identification of infected farms by serological survey;
- supervision of individual herd eradication by a veterinarian;
- quarantine of the infected herds to prevent movement of live animals, except to slaughter;
- an approved control program that may involve vaccination of seronegative replacement breeding stock 60–90 days before introduction, and breeding to stabilise infection and eliminate it over a three-year period;
- introduction of seronegative sentinel pigs to test for viral shedding; and
- multi-site production systems to separate susceptible progeny from the breeding herd.



a Process by cooking at the temperatures given in Section 2.2.6.

Figure 1 PRRS control strategy decision tree

2.2 Methods to prevent spread and eliminate pathogens

2.2.1 Quarantine and movement controls

PRRS virus is spread mainly by direct contact with infected pigs or via infected semen. Quarantine should therefore be imposed on all farms on which infection is either known or suspected while health status is assessed.

To achieve the required level of security for infected premises (IPs) or dangerous contact premises (DCPs), no pigs should be moved onto the property and the only pigs allowed off should be those destined for immediate slaughter. If one part of a multi-site farm is infected, all parts should be considered to be a suspect premises (SP) in the first instance. Later decisions can be made on the basis of serological sampling and disease control options.

Movement controls include:

- pig movements off the IP, DCP and SP only allowed under permit (including movement between the different sections of a multi-site farm); and
- control of movement of carcasses for further processing (by cooking).

All vehicles used to transport infected pigs should be decontaminated, but otherwise there is no need to disinfect trucks or fomites. Effluent may be removed from the property, provided it goes to a property that does not have any pigs.

For people, it is sufficient to insist on a change of boots and clothing as they leave the premises.

A restricted area (RA) and control area (CA) should be declared to allow eradication measures to be implemented. The RA should include the IPs and the DCPs. The size of the declared areas will depend on epidemiological information at the time of the outbreak and should be as large as is necessary for satisfactory control. A ban on live pig sales within the RA should be implemented.

For further information on declared areas, quarantine and movement controls, see Appendixes 1 and 2.

Zoning

If the disease is endemic in only part of a country, it is possible to establish diseased and disease-free zones. Tight controls on the movement of pigs must be enforced between zones. Zoning is of most benefit when there are implications for international trade. However, because most countries are infected, PRRS infection is not considered an impediment in international meat trading, with the possible exception of trade to New Zealand, which is free of the disease. However, the small export market in breeding stock may be affected.

Zoning may help to prevent spread of infection between regions of Australia. It may also help or hinder domestic trade, depending on whether the state or region is a net exporter or importer of pigs or pig products. Zoning restrictions placed along state borders would severely restrict existing marketing arrangements, which often involve the long-distance and interstate transport of breeding and slaughter pigs.

Product movement does not need to be restricted.

2.2.2 Tracing

When infection is suspected or confirmed in a piggery, trace-back and trace-forward identify other infected piggeries. Because people and fomites are not important vectors in an outbreak of PRRS, the most important tracing would be of pig movements. Pork products are only worth following up if swill feeding is suspected. In general, they can be considered a low priority.

Trace-back should extend to those piggeries receiving pigs from infected properties from 60 days before the first recorded clinical case.

2.2.3 Surveillance

Initial surveillance should aim to assess the spread of infection, thereby assisting the development of the control strategy. Further surveillance may be needed during implementation of the strategy.

Live pig and semen movements are the most likely route of disease spread, so special attention should be paid to piggeries with a history of recent introductions, artificial insemination stations, and piggeries selling breeding or grower stock.

The purpose of surveillance is to identify any infected piggeries not already identified by tracing. Activities include locating piggeries, physically inspecting

pigs, blood-sampling a statistically significant number of pigs, and examining production records for evidence of reproductive failure, stillborn pigs and neonatal mortalities.

Serosurveillance will be of most value in herds in which the clinical syndrome is asymptomatic. In areas where feral pigs are evident and in contact with domestic pigs, serological sampling is indicated.

2.2.4 Treatment of infected animals

There is no treatment for PRRS.

2.2.5 Destruction of animals

Stamping out

Stamping out is only an option when:

- the infected herd is small and isolated;
- the infected herd is the first case in an area with a dense pig population; or
- there are multiple farms within a one-kilometre radius of an IP.

Under a stamping-out policy, live pigs would not be permitted to move from the IPs or DCPs. Only carcasses could be moved, either to another property for burial or to an approved place for rendering.

Modified stamping out through salvage and slaughter

Modified stamping out requires initial quarantine of the IP, followed by slaughter of all saleable pigs at an abattoir. The fate of the remaining pigs on the farm could include one or more of the following:

- destruction of unsaleable pigs on the IP, with compensation, *or* allowing growing pigs to grow out under prescribed restrictions or quarantine;
- slaughter of nonpregnant sows; and
- slaughter of pregnant sows *or* allowing pregnant sows to farrow and wean their litters to grow out under prescribed restrictions or quarantine.

The decisions made will reflect the logistics of further processing, by cooking, of relatively small numbers of sows or growing pigs.

Pigs showing clinical symptoms cannot be sent to an abattoir and would need to be destroyed on the IP, or held in quarantine until the symptoms pass. Pigs could be moved to an approved off-site finishing unit if that unit is part of the farm's production system (for example in a multi-site system), or to assist in the clean-up and restocking of an IP. Approval for pigs to be moved to another premises should only be granted if that premises is more than two kilometres from other pigs.

Pigs can be permitted to move to an approved abattoir, however, as long as they are slaughtered within 4–6 hours of arrival. This will minimise the contamination of lairages by pigs shedding PRRS virus, thereby preventing infection of pigs coming to the abattoirs from other piggeries. Killing all pigs from an IP within four

hours of arrival at the abattoirs and after at least six hours off feed (whichever is the later) will also minimise the spread of infection and the number of viraemic carcasses entering the food chain.

Carcasses of pigs from IPs must be processed by cooking at temperatures described in Section 2.2.6. Rendered animal products must be treated according to the same principles.

In some cases, the interstate movement of pigs for slaughter and further processing (by cooking) will be necessary. This can be allowed under permit.

The need for destruction of animals on farm premises will depend on which policy is adopted for the eradication of PRRS (see Figure 1). If the stamping-out policy is adopted, pigs will be slaughtered on IPs, and possibly on DCPs, according to circumstances. If the modified stamping-out policy for salvage and slaughter is adopted, pigs will be transferred to an abattoir for slaughter. However, even under the modified policy, unsaleable or clinically affected pigs not suitable for abattoir slaughter, or not able to be grown out under quarantine for later slaughter, would be destroyed on IPs. See the **Destruction Manual** for appropriate methods for the destruction of pigs.

Because there is experimental evidence that ducks can be infected with PRRS virus (see Section 1.2), any ducks on the premises should be isolated or removed.

Destruction of animals other than pigs and possibly ducks is unnecessary. Destruction of property is unnecessary, as PRRS virus is susceptible to high temperature, desiccation, cleaning and disinfection.

2.2.6 Treatment of animal products and byproducts

Processing of pig products using cooking, curing and rendering techniques is sufficient to inactivate PRRS virus; such products present minimal threat of spreading disease. A more serious threat is from the meat of viraemic pigs when it is fed raw to susceptible pigs (see Section 1.6.3). Hence, intensified publicity and policing of swill-feeding bans is appropriate during an outbreak.

Meat or meat products from pigs from IPs should be heated to a minimum core temperature of 56°C for at least 60 minutes, or the equivalent as shown in Table 2.

Table 2 Minimum core temperatures and times for treating meat or meat products from pigs from infected premises

Temp (°C)	Time (minutes)	Temp (°C)	Time (minutes)
56	60	64	22
57	55	65	20
58	50	66	17
59	45	67	15
60	40	68	13
61	35	69	12
62	30	70	11
63	25		

Note: The temperature and time used must be recorded. The temperature recording equipment should be checked during the cooking process and found to be in good order. Records should confirm that the times and temperatures specified above were achieved.

2.2.7 Disposal of animal products and byproducts

There are no special considerations in disposal of PRRS virus infected pigs. Pig carcasses may be rendered (see the **Disposal Manual**).

2.2.8 Decontamination

PRRS virus is susceptible to temperature and a range of chemicals (see the **Decontamination Manual**).

Decontamination is only appropriate after piggeries have been depopulated. Routine cleaning of the pig accommodation areas using a commercially available phenolic or organic acid disinfectant is all that is required. Detergents are recommended to assist cleaning.

Thorough cleaning and disinfection of vehicles used to transport infected pigs, loading ramps at abattoirs and other potentially infected areas will minimise the spread of infection.

2.2.9 Vaccination

Vaccines have been used overseas, but not in eradication campaigns. Import of vaccine into Australia would be subject to approval from the Australian Pesticides and Veterinary Medicines Authority and the Australian Quarantine and Inspection Service. The efficacy of current PRRS virus vaccines is questionable.

2.2.10 Wild animal control

As there is experimental evidence that ducks can be infected with PRRS virus (see Section 1.2), any ducks on the premises should be removed or isolated. No other species have been implicated in the spread of the disease.

Perimeter fencing will prevent the spread of disease to feral pigs. In feral populations, it is expected that the disease would be spread by direct contact and involve clinical signs similar to those observed in domestic pigs. Infected feral pigs can be prevented from re-infecting the domestic herd by one-metre high ringlock perimeter fencing.

Protection of the domestic herd from feral pigs would be the best and most cost-effective strategy if the disease should enter the feral pig population.

2.2.11 Vector control

Apart from ducks, no other disease vectors are implicated (see Section 1.6.3).

2.2.12 Sentinel and restocking

Destocked piggeries can be restocked without risk of reinfection a minimum of 14 days after decontamination procedures have been completed and the pens and buildings allowed to dry out.

As a safety measure, and to demonstrate eradication success, newly stocked farms should be serologically tested 60 days after restocking and again six weeks later.

2.2.13 Public awareness

Outbreaks of PRRS should be well publicised, with emphasis on the dangers of feeding animal products to pigs and the fact that unlicensed swill feeding is illegal. People caught feeding or providing material for swill should be prosecuted promptly and successful cases publicised. Security at municipal garbage tips should be tightened to prevent wild pigs gaining access to domestic food scraps.

Piggery owners should be advised to adopt adequate precautions to prevent the entry of PRRS virus. Best-practice precautions are:

- no pig introductions (unless from herds known to be free of PRRS virus);
- minimal numbers of visitors (with those who enter to use boots and overalls held at the piggery);
- perimeter fences to exclude feral and domestic animals;
- no feed bins on perimeter fences – secure feed bins to prevent feral animal access;
- pig-loading facilities at perimeter fences; and
- cleaning and disinfection of pig-carrying trucks after unloading.

For further information, see the **Public Relations Manual**.

2.3 Feasibility of control in Australia

In a PRRS outbreak, authorities may attempt to intervene actively or may allow the industry to develop and adopt its own control measures with minimum regulation. The disease is expected to behave as it has done in other countries: there is nothing special about the Australian pig industry that would change the way PRRS virus is spread.

If control of the disease is left to individual producers, it is likely that many will elect to 'live with' the disease. Some will avoid the disease through herd security measures. Others will elect to take their chances and fail to invest in any significant security measures (as occurs with diseases presently endemic in the domestic pig population). The movement of replacement breeding stock and semen around the country will increase the risk of spread, as it has in other countries experiencing PRRS epidemics.

Following infection, some producers could be expected to eliminate infection through farm-based depopulation programs combined with salvage and slaughter. Vaccination strategies could also be employed to control the disease to the point where eradication from a farm becomes possible. The success of these programs relies on a high level of planning, skilled farm management, informed veterinary advice, and the availability of effective vaccines and replacement breeding stock free of PRRS virus.

In the United States, the disease has been successfully eradicated from individual herds or subpopulations following depopulation or controlled exposure and segregated early weaning (Harris 2000). Eradication using controlled exposure

may be feasible, but only after the infection has spread through the breeding herd and has been stabilised. However, this approach to control is new, and it would be premature to use it in a country where the disease has been detected for the first time and where there is a chance to eradicate the disease before it becomes endemic.

Notwithstanding this, there is a likelihood that an index case will occur in a herd that contains illegally imported pigs, that has had illegally imported semen introduced, or that has been illegally swill-fed. In such a case, the criteria favouring successful eradication (ie rapid diagnosis and limited spread) may not be met. An understanding of how far the disease may have spread will increase the chances of success of the eradication effort. This will be determined by serological surveillance and tracing.

3 Policy and rationale

3.1 Overall policy

Porcine reproductive and respiratory syndrome (PRRS) is an OIE-listed disease that, if introduced into Australia, would significantly increase the cost of production in infected piggeries.

The overall policy is to control and then eradicate PRRS by the most cost-effective method, using stamping out or modified stamping out.

Stamping out, which could be applied in exceptional circumstances, involves quarantine, slaughter of all infected and exposed susceptible animals on infected premises, and sanitary disposal of destroyed animals and contaminated animal products.

Modified stamping out (slaughter and salvage) involves quarantine, immediate slaughter with salvage of all saleable exposed pigs at approved abattoirs, slaughter of the remaining pigs as they grow to a saleable weight, a requirement for pigs from affected farms to be processed by cooking, and prohibition of the sale of pigs from affected farms for fresh pork.

These strategies will be supported by:

- ☞ *quarantine and movement controls* on animals, on semen and on vehicles that transport pigs on infected and suspect premises, to prevent spread of infection;
- ☞ *decontamination* of facilities, equipment and other items to eliminate the spread of the disease agent from infected animals and premises;
- ☞ *tracing and surveillance* to determine the source and extent of infection;
- ☞ *testing and treatment of infected animals* until all susceptible animals on infected premises are confirmed to be free of infection; and
- ☞ *an awareness campaign* to facilitate cooperation from the industry and the community.

Vaccination will not be used unless the eradication program fails and the disease becomes endemic, and effective vaccines are available. If PRRS becomes established in Australia, its eradication will require special industry commitment and regulatory controls.

Successful implementation of the policy will depend on total industry cooperation and compliance with all control and eradication measures.

PRRS is an Animal Health Australia Category 4 disease under the government-industry EAD Response Agreement for cost-sharing arrangements. Category 4 diseases are those for which costs will be shared 20% by government and 80% by industry.

The chief veterinary officer (CVO) in the state or territory in which the outbreak occurs will be responsible for developing an Emergency Animal Disease Response Plan. This plan will be approved for technical soundness and consistency with AUSVETPLAN by governments and affected livestock industry technical representatives on the Consultative Committee on Emergency Animal Diseases (CCEAD). The plan will ultimately be approved and cost-shared by government chief executive officers and industry leaders through the national management group (NMG) of government and industry representatives established for the incident.

CVOs will implement disease control measures as agreed in the EAD Response Plan and in accordance with relevant legislation. They will make ongoing decisions on follow-up disease control measures in consultation with the CCEAD and the NMG. The detailed control measures adopted will be determined using the principles of control and eradication (Section 2) and epidemiological information about the outbreak.

For information on the responsibilities of the state or territory disease control headquarters and local disease control centres, see the **Control Centres Management Manual, Part 1**.

3.2 Strategy for control and eradication

The preferred strategy is to use stamping out sparingly and to attempt to salvage as many animals as possible.

Tracing and surveillance will be important to determine the distribution of the disease and the herd prevalence, so that the best strategy may be selected.

3.2.1 Stamping out versus slaughter and salvage

Stamping out will only be considered in circumstances where the disease is restricted to a few herds, the herds are small, the disease is contained and stamping out is highly likely to eradicate the disease quickly. The slaughtered animals will be disposed of by the most appropriate means for the particular situation. Slaughter and salvage of saleable carcasses is the preferred option.

These options are discussed in Section 2.2.5.

3.2.2 Quarantine and movement controls

The disease can spread rapidly between farms if quarantine of infected premises (IPs) and movement controls are not immediately introduced. Quarantine and movement controls will therefore be imposed on IPs, dangerous contact premises (DCPs) and suspect premises (SPs) as these are identified through tracing and surveillance (see Appendix 1).

A restricted area (RA) and a control area (CA) will be declared to provide the necessary control to enable eradication measures to be implemented. The RA should include the IPs, DCPs and as many of the SPs as possible, and should be as large as is necessary for satisfactory control.

The movement of pigs within the RA will be restricted. Normally, pig movements from the RA should be permitted only if they are direct to slaughter, unless serological testing and other conditions are met (see Appendix 2). The CA will be declared with the express purpose of facilitating access to slaughter for infected stock, and therefore could cross state borders.

Pigs from IPs, DCPs and SPs should not be moved off the premises except for direct transfer to an abattoir. They should be slaughtered within four hours of arrival at the abattoir, or more than six hours off feed, whichever is the later. Live pig sales within the RA will be banned to reduce the possibility of spread. All movements of pigs will be subject to permit. There is no need to impose restrictions on other premises in the RA once they have been cleared of pigs and have been cleaned and disinfected.

Ducks present a very minor risk of spreading the disease and are unlikely to be the focus of an eradication effort. Where ducks are present on an infected farm, they should be destroyed or slaughtered for sale as meat to reduce any local viral contamination.

See Appendix 1 for further details on declared areas.

See Appendix 2 for further details on quarantine and movement controls.

Zoning

It is not expected that zoning would assist Australia in the event of a PRRS virus incursion (see Section 2.2.1). Although zoning might provide some advantages in limiting the spread of the disease and enabling better control of the movements of live animals, there would be little advantage for international trade and some major disadvantages for producers and processors in the domestic market from restrictions on trade product movement. A better option is to ensure that major controls are maintained on IPs to prevent spread beyond these premises or outside the RA.

Zoning is only likely to be an advantage for specific international markets, in which individual countries may demand certain requirements. The worth of these markets must be balanced against the cost to domestic trade. The same may also apply if individual states impose restrictions.

3.2.3 Tracing and surveillance

The movement of live pigs to and from IPs must be traced from at least 60 days before the first clinical signs were observed in neonatal pigs to the time quarantine is imposed. This timespan allows for a period of asymptomatic infection in sows before clinical signs emerge in their litters. Live pigs and semen are the main sources of infection, and tracing should focus on them.

Surveillance needs to be undertaken on premises that have received any pigs from the IP and on other premises, particularly breeder properties, so that other IPs, DCPs or SPs can be identified.

Where premises have been destocked they can, with the approval of the CVO, be restocked a minimum of 14 days after decontamination is completed. Surveillance

of restocked animals will be maintained for 60 days, with follow-up serology six weeks later.

Surveillance will need to be maintained throughout the eradication period and continue afterwards, so that proof of freedom can be supported with reliable scientific information.

See Appendix 4 for further details on surveillance.

3.2.4 Vaccination

The use of vaccines is contraindicated because of the risk that vaccine strains will cause disease in susceptible naive populations of pigs (see Section 1.5.3). Vaccines will not be permitted as part of the first stages of an eradication strategy. However, in the longer term, if the disease were to become established and if vaccines were known to be effective, their use could be permitted under controlled conditions.

See Sections 1.5.3 and 2.2.9 for further details on vaccination.

3.2.5 Treatment of infected animals

There is no effective treatment for PRRS.

3.2.6 Treatment of animal products and byproducts

Animals with clinical signs must not be sent to slaughter. Animals sent to abattoirs for immediate slaughter must be handled with care to prevent contamination of meat with intestinal contents. The head and neck meat with lymph nodes should be removed and disposed of by rendering and the other meat processed by cooking (see Section 2.2.6) to inactivate the virus, which might otherwise survive in muscle tissue and cause spread of the disease.

Infected or possibly infected semen should be destroyed.

Extra policing of swill-feeding regulations is advisable during and after an outbreak.

3.2.7 Disposal of animal products and byproducts

There are no special considerations in disposal of PRRS virus infected pigs or products. See Section 2.2.6 for appropriate treatment of animal products.

3.2.8 Decontamination

The PRRS virus does not survive in the environment for an extended period. The normal day-to-day disinfection procedures of commercial pig farms will reduce the risk of recurring infection when herds are restocked.

There is no special decontamination requirement for people, fomites and vehicles that are not involved in the transport of pigs, apart from ensuring that they are free from contamination with pig excreta. Fomites do not appear to be implicated in the spread of PRRS, especially in climates similar to Australia's.

3.2.9 Wild animal/vector control

Should the disease enter the feral pig population, the best and most cost-effective method for disease control would be enhanced biosecurity of domestic herds, including perimeter fencing and control of duck populations on farms. For feral pig control methods, refer to the **Wild Animal Response Strategy**.

3.2.10 Public awareness and media

The veterinary authorities must explain the control measures to the industry and to individuals who are directly affected, in order to gain their confidence in the measures being imposed. The media and public must be informed about the disease and the control arrangements so that buyer confidence in the product is maintained and any effect on the market reduced.

A special publicity campaign should be instituted about the swill-feeding regulations and the potential role of untreated swill in PRRS infection.

See Section 2.2.13 for further details on what to include in a public awareness campaign.

3.3 Social and economic effects

The social and economic effects of a PRRS outbreak would be restricted mainly to its effects on farm productivity. When introduced into a herd for the first time, PRRS causes significant reproductive failure, deaths of younger pigs, and reduced growth rates in weaner and grower pigs. There are no published estimates of the costs of a PRRS outbreak in the Australian pig industry. The impact can be extrapolated from a study by Cutler (1992) based on a typical scenario from United States disease outbreaks. In this scenario, PRRS increased neonatal mortality by 2% and postweaning mortality by 8%, and decreased feed conversion efficiency by 20% for the four-month period of the disease outbreak, equating to an annual loss of approximately A\$120 per sow in 1992 – representing an increase in the cost of production for the first year of about 8 cents per kilogram liveweight. The study did not consider the substantial impact of recurring disease in a herd over a longer period.

Although the major effects would be felt in the first year following infection in most herds, the disease is likely to persist in herds, with regular clinical recurrence. The presence of PRRS in a breeding herd would affect the marketability of breeding stock. Although there is no reason for abattoirs to be unwilling to slaughter and process pigs from IPs, local pressures may disrupt some trade practices. Restrictions that force pork from IPs or DCPs to be processed by cooking may cause inconvenience and financial penalties in the pork production chain.

Because PRRS is present in most pork-producing countries, its presence in Australia should not affect the export of pork products. However, trade of Australian breeding stock to countries free of PRRS virus would probably be affected.

A decrease in consumption of pork and pork products can be anticipated, at least in the short term. A public awareness campaign will be appropriate, stating that PRRS does not infect humans, cause disease in domestic pets or affect meat quality.

Where herds are depopulated, either by stamping out or by being sold for slaughter, producers will suffer financial loss through interruption to production flow.

Movement controls will be largely restricted to IPs and will not cause major disruptions, other than by prohibiting live pig sales. Zoning will potentially interrupt the free movement of breeding stock, the movement of pigs to slaughter at preferred markets, and the movement of pig meat to markets.

3.4 Criteria for proof of freedom

Declaration of freedom may allow the resumption of trade in live breeding stock to countries that are PRRS free.

After an outbreak of PRRS, a statistically valid serological survey would have to be undertaken to demonstrate proof of freedom. The survey would concentrate on the RA(s) in which disease was present and on high-risk herds, based on the results of tracing and pig movements.

See Appendix 4 for further details on proof of freedom.

3.5 Funding and compensation

PRRS is classified as a Category 4 emergency animal disease under the EAD Response Agreement between the governments of Australia and the livestock industries.

Category 4 diseases are diseases that could be classified as being mainly production loss diseases. While there may be international trade losses and local market disruptions, these would not be of a magnitude that would be expected to significantly affect the national economy. The main beneficiaries of a successful emergency response to an outbreak of such a disease would be the affected livestock industries. For this category, the costs will be shared 20% by governments and 80% by the relevant industries (refer to the EAD Response Agreement for details).³

Information on the cost-sharing arrangements can be found in the **Summary Document** and in the **Valuation and Compensation Manual**.

3.6 Strategy if the disease becomes established

Individual producers will see significant production benefits from preventing PRRS virus from establishing in their herds. The strategy to prevent PRRS entering previously uninfected herds is the same as for many other pig diseases: single-source supply of breeding stock, a quarantine process for new introductions, and

³ Information about the EAD Response Agreement can be found at <http://www.animalhealthaustralia.com.au/programs/eadp/eadra.cfm>

perimeter fencing. In addition, considerable productivity improvements can be gained by eliminating PRRS virus from infected herds.

However, the costs of disease eradication programs such as depopulation and repopulation are high. Availability of clean replacement stock and risks of reinfection need to be incorporated into a cost-benefit analysis before this course of action is taken.

The objective, while CCEAD considers it feasible, will be to eradicate the disease. PRRS has never been eradicated from a country in which it has become established. However, provided that tracing and surveillance can identify the infected herds and the industry has the will to apply strict movement controls and good hygiene and management practices, eradication is possible.

CCEAD would advise the NMG if the disease is endemic. The combat jurisdiction(s) would then lift some or all of the regulatory restrictions and would move to a disease management strategy.

Appendix 1 Guidelines for classifying declared areas

Premises

Infected premises (IP)

A premises classified as an IP will be a defined area (which may be all or part of a property) having separate facilities and management in which PRRS or PRRS virus exists, or is believed to exist. An IP will be subject to quarantine served by notice and to eradication and control procedures.

Dangerous contact premises (DCP)

Premises classified as DCPs will be those that contain animals that have recently been introduced from an IP (up to 60 days before the premises were declared infected) and are likely to be infected or contaminated.

Suspect premises (SP)

Premises classified as SPs will be those that contain animals that have possibly been exposed to PRRS virus, such that quarantine and surveillance, but not pre-emptive slaughter, are warranted; OR animals not known to have been exposed to PRRS virus but showing clinical signs requiring differential diagnosis.

In an outbreak of PRRS, premises within one kilometre of an IP will be classified as SPs pending further investigation. All parts of a multi-site enterprise containing an IP should be declared SPs until their infection status is defined.

'Suspect premises' is a temporary classification because the premises contains animals that are suspected of having the disease. High priority should be given to clarifying the status of the suspect animals so that the SP can be reclassified either as an IP and appropriate quarantine and movement controls implemented, or as free from disease, in which case no further disease control measures are required.

Areas

Restricted area (RA)

An RA will be a relatively small declared area (compared to a *control area*) around infected premises that is subject to intense surveillance and movement controls. Movement out of the area will, in general, be prohibited, while movement into the area would only be by permit (see Appendix 2). Multiple RAs may exist within one CA.

The RA does not need to be circular but can have an irregular perimeter and should include as many IPs, DCPs and SPs as possible. This distance will vary with the size and nature of the potential source of disease agent, but in the case of PRRS will have a minimum radius from the IP of two kilometres, depending on the density of premises. The boundary could be the perimeter fence of the IP if the IP is

in an isolated location. The boundary in a densely populated area will take into account the distribution of susceptible animals, traffic patterns to markets, service areas and abattoirs, and areas that constitute natural barriers to movement.

Control area (CA)

The CA will be a larger declared area around the RA(s) and, initially, possibly as large as a state or territory where restrictions will reduce the risk of disease spreading from the RA(s). The boundary of the CA will be adjusted as confidence about the extent of the outbreak increases but must remain consistent with the OIE Terrestrial Code chapters on surveillance and zoning (Chapters 1.3.5 and 1.3.6; see Appendix 3). In general, surveillance and movement controls will be less intense and animals and products may be permitted to move under permit from the area.

One purpose of the CA for PRRS is to facilitate access to abattoirs for infected farms. The declaration of a CA also helps to control the spread of the outbreak from within the RA. The CA is a buffer zone between the RA and the rest of the industry. The boundary does not have to be circular or parallel to that of the RA but should be at least two kilometres from the boundary of the RA and should incorporate the nearest abattoir. In general, the movement of possibly contaminated items and materials within the CA is allowed but movement out of the CA is prohibited without CVO approval (see Appendix 2 for details). This type of control area allows reasonable commercial activities to continue.

Appendix 2 Recommended quarantine and movement controls

Premises

Note: DCPs and SPs will be treated as IPs until there is sufficient serological evidence to change their classification.

Quarantine/movement controls	Infected, suspect and dangerous contact premises
------------------------------	--

Movement out of:

- | | |
|------------------------------------|---|
| - susceptible pigs | <p>No pig from an IP or DCP should be moved to another premises unless the movement is under permit or prescribed restrictions.</p> <p>Pigs on an IP or DCP can be moved out under permit direct to an abattoir for slaughter within 4–6 hours of arrival.</p> <p>In the initial stages of the disease declaration, pigs from DCPs can be moved and slaughtered under the same provisions as those covering IPs. After a negative serological test, DCPs can be considered free of PRRS and the pigs moved for slaughter and normal processing.</p> |
| - people | <p>Protective clothing, including boots, should be provided on the property for visitors. Before leaving, visitors should wash their hands in a soapy or disinfectant solution. The hygiene standards that apply are those employed in regular good farm practice.</p> |
| - dead pigs | <p>Dead pigs may be removed from the premises for rendering or burial only.</p> |
| - vehicles, equipment and effluent | <p>No restriction on vehicles (subject to effective cleaning and disinfection), but movements should be kept to a minimum. Veterinary instruments used on the IP or DCP should be sterilised before being taken from the premises.</p> <p>Effluent can be applied to paddocks as long as there is no pig contact with the effluent for two weeks after it is applied.</p> |

Movement in and out of:

- | | |
|-----------------------------|---|
| - specified animal products | <p>Infected or potentially infected semen will be destroyed. Movement of semen is not permitted.</p> <p>After slaughter, meat from pigs originating from IPs must be processed by cooking (see Section 2.2.6, Table 2).</p> |
|-----------------------------|---|

Quarantine/movement controls	Infected, suspect and dangerous contact premises
- other animals	There are no movement restrictions on other animals on the IP or DCP, except ducks. All animals other than pigs on an IP or DCP must be kept separate from the piggery or the pigs in a manner that prevents direct contact.
- crops and grains	No restrictions on movement of crops and grains.
<i>Movement in of:</i>	
- susceptible pigs	Approved under permit.
- people	Movement should be restricted to essential visitors only. Protective clothing, including boots, should be provided on the property for visitors.

Area

Quarantine/ movement control	Restricted area (if declared)	Control area (if declared)
<i>Movement out of:</i>		
- susceptible pigs	<p>No pigs from an RA should be moved to another farm unless the movement is under permit or prescribed restrictions.</p> <p>Pigs in an RA can be moved out under permit direct to an abattoir for slaughter within 4-6 hours of arrival.</p>	<p>No pigs from a CA can be moved out of the CA. However, the CA will be established such that abattoir or slaughter facilities will be located within it. Pigs can be moved, under permit, within the CA for slaughter.</p> <p>Other movements within a CA are permitted, provided that the herds of origin are tested negative at a statistically significant level (see Appendix 4).</p>
<i>Movement into and within of:</i>		
- susceptible pigs	Restrictions depend on the selected strategy for control. For example, pigs from infected sow herds could be moved to infected grow-out facilities in an RA.	<p>Pigs can be moved into a CA for slaughter, for breeding and for management purposes. Within the CA, pigs can be moved from farm to farm, subject to a seronegative test on a statistically significant sample of the group (see Appendix 4).</p>

Quarantine/ movement control	Restricted area (if declared)	Control area (if declared)
<i>Movement through of:</i>		
- susceptible pigs	Pigs can move through a declared area under permit.	Pigs can move through a declared area under permit.
<i>Movement of specified products</i>	Movement of semen banned.	Semen from pigs in a CA can be moved out if the herd has been tested negative.
<i>Movement of people</i>	Biosecurity arrangements enforced.	Biosecurity arrangements enforced.
<i>Movement of vehicles and equipment</i>	No restriction (subject to effective cleaning and disinfection).	No restriction (subject to effective cleaning and disinfection).

Notes:

- (1) Approval for pig movements under permit only.
- (2) All pigs to be consigned directly to an approved abattoir for slaughter within 4–6 hours.
- (3) Multiple consignments per truck will be prohibited unless by special approval from the local disease control centre controller, subject to:
 - the IP or DCP being the last pick-up;
 - the whole consignment being for immediate slaughter (within 4 hours of arrival);
 - the truck being cleaned and disinfected to the satisfaction of a meat inspector at the abattoir; and
 - no movements being allowed to saleyards or to other properties.

Example scenarios:

1. *An infected breeder farm wants to supply pigs to a linked grow-out facility within the RA until all pregnant sows have farrowed, and infected and exposed progeny have been slaughtered.*
Approved
2. *An infected grow-out farm wants to ship pigs to an abattoir in the same CA.*
Approved
3. *An infected farm wants to ship pigs to an abattoir outside the CA.*
Not approved because this would risk spread of the disease. The CA has been designed with the purpose of providing farms with practical access to abattoirs.

4. *A breeding company multiplier in a CA wants to ship pigs or semen to customers outside the CA.*
Approved subject to seronegative test on the herd within 60 days.
5. *A breeding company in an RA wants to ship pigs to customers outside the area.*
Approved subject to a 30-day seronegative test on a statistically significant sample of the herd or regular kill at slaughter (Appendix A4) and all the pigs in the shipment, and a regular 30-day seronegative test on all the pigs in the artificial insemination program if artificial insemination was used. The shipment of semen from the RA is banned.
6. *A producer wants to move early weaned pigs from an RA to a second-stage farm outside the CA.*
Approved subject to a seronegative test on the herd of origin.
7. *A clean farm wants to send pigs for finishing to an infected herd within the same management group and so prolong the life of the grow-out population.*
Not approved because this movement would add to an infective burden already present in the herd and the immediate area and also increase the duration of infection on the farm.
8. *A clean farm wants to send pigs to an infected farm in an RA as part of a supply arrangement.*
Not recommended because of the adverse consequences for performance of the susceptible pigs, but may be unavoidable due to management and housing considerations.

Appendix 3 OIE animal health code and diagnostic manual for terrestrial animals

OIE Terrestrial Code

The objective of the *OIE Terrestrial Animal Health Code* is to prevent the spread of animal diseases, while facilitating international trade in live animals, semen, embryos and animal products. This annually updated volume is a reference document for use by veterinary departments, import/export services, epidemiologists and all those involved in international trade.

The OIE Terrestrial Code is amended in May each year and the current edition is published on the OIE website at:

http://www.oie.int/eng/normes/mcode/A_summry.htm

Although PRRS is an OIE-listed disease, there is no chapter of the code devoted to the disease. The following chapters are relevant to this manual:

Chapter 1.3.5. Zoning and regionalisation

Chapter 1.3.6. Surveillance and monitoring of animal health

OIE Terrestrial Manual

The purpose of the *OIE Manual of Standards for Diagnostic Tests and Vaccines for Terrestrial Animals* is to contribute to the international harmonisation of methods for the surveillance and control of the most important animal diseases. Standards are described for laboratory diagnostic tests and the production and control of biological products (principally vaccines) for veterinary use across the globe.

The OIE Terrestrial Manual is updated approximately every four years. The 4th edition was published in 2000 and is available on the OIE website at:

http://www.oie.int/eng/normes/mmanual/A_summry.htm

The following chapter is relevant to this manual:

Chapter X.12 Porcine reproductive and respiratory syndrome

Appendix 4 Procedures for surveillance and proof of freedom

Proof of freedom

Proof of freedom relies on serological evidence of freedom, resulting from a valid national survey.

Sample sizes should be adequate to detect a 1% prevalence with 95% confidence, as shown in Table A4.

Table A4 Sample sizes required to detect PRRS-infected pigs at 1% prevalence with 95% confidence

8 week pre-slaughter population	Sample size	8 week pre-slaughter population	Sample size
20	20	500	225
50	50	600	235
70	70	700	243
100	96	800	249
120	111	900	254
160	136	1000	258
180	146	2000	277
200	155	3000	284
300	189	4000	288
400	211	5000	290

Example: The expected number of positives is at least 1%. The population size is 190; use 200. 155 pigs must be tested.

Sentinel animals (ideally 20–40 weaner pigs) must be seronegative.

Surveillance

In farrow-to-finish facilities, the presence or absence of clinical signs of the disease needs to be ascertained. As confirmation, serum samples must test negative.

In units with only fatter pigs, serological testing is the only way to confirm freedom from PRRS.

Glossary

All-in-all-out production	A method of production in which all stock leave the premises (or area), followed by total restocking.
Animal byproducts	Products of animal origin that are not for consumption but are destined for industrial use (eg hides and skins, fur, wool, hair, feathers, hooves, bones, fertiliser).
Animal Health Committee	A committee comprising the CVOs of Australia and New Zealand, Australian state and territory CVOs, Animal Health Australia, and a CSIRO representative. The committee provides advice to PIMC on animal health matters, focusing on technical issues and regulatory policy (formerly called the Veterinary Committee). <i>See also</i> Primary Industries Ministerial Council (PIMC)
Animal products	Meat, meat products and other products of animal origin (eg eggs, milk) for human consumption or for use in animal feedstuff.
Australian Chief Veterinary Officer	The nominated senior veterinarian in the Australian Government Department of Agriculture, Fisheries and Forestry who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. <i>See also</i> Chief veterinary officer
AUSVETPLAN	<i>Australian Veterinary Emergency Plan</i> . A series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.
Chief veterinary officer (CVO)	The senior veterinarian of the animal health authority in each jurisdiction (national, state or territory) who has responsibility for animal disease control in that jurisdiction. <i>See also</i> Australian Chief Veterinary Officer
Compensation	The sum of money paid by government to an owner for stock that are destroyed and property that is compulsorily destroyed because of an emergency animal disease.

Consultative Committee on Emergency Animal Diseases (CCEAD)	A committee of state and territory CVOs, representatives of CSIRO Livestock Industries and the relevant industries, and chaired by the Australian CVO. CCEAD convenes and consults when there is an animal disease emergency due to the introduction of an emergency animal disease of livestock, or other serious epizootic of Australian origin.
Contagious	Capable of being transmitted from animal to animal.
Control area	A declared area in which the conditions applying are of lesser intensity than those in a restricted area (the limits of a control area and the conditions applying to it can be varied during an outbreak according to need). <i>See Appendix 1 for further details</i>
Cost-sharing arrangements	Arrangements agreed between governments (national and states/territories) and livestock industries for sharing the costs of emergency animal disease responses. <i>See also Compensation, Emergency Animal Disease Response Agreement</i>
Dangerous contact animal	A susceptible animal that has been designated as being exposed to other infected animals or potentially infectious products following tracing and epidemiological investigation.
Dangerous contact premises	Premises that contain dangerous contact animals or other serious contacts. <i>See Appendix 1 for further details</i>
Declared area	A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. Types of declared areas include <i>restricted area, control area, infected premises, dangerous contact premises and suspect premises</i> . <i>See Appendix 1 for further details</i>
Decontamination	Includes all stages of cleaning and disinfection.
Depopulation	The removal of a host population from a particular area to control or prevent the spread of disease.
Destroy (animals)	To slaughter animals humanely.
Disinfectant	A chemical used to destroy disease agents outside a living animal.
Disease agent	A general term for a transmissible organism or other factor that causes an infectious disease.
Disease Watch Hotline	24-hour freecall service for reporting suspected incidences of exotic diseases – 1800 675 888
Disinfectant	A chemical used to destroy disease agents outside a living animal.

Disinfection	The application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses; applies to premises, vehicles and different objects that may have been directly or indirectly contaminated.
Disposal	Sanitary removal of animal carcasses, animal products, materials and wastes by burial, burning or some other process so as to prevent the spread of disease.
Emergency animal disease	A disease that is (a) exotic to Australia or (b) a variant of an endemic disease or (c) a serious infectious disease of unknown or uncertain cause or (d) a severe outbreak of a known endemic disease, and that is considered to be of national significance with serious social or trade implications. <i>See also</i> Endemic animal disease, Exotic animal disease
Emergency Animal Disease Response Agreement	Agreement between the Australian and state/territory governments and livestock industries on the management of emergency animal disease responses. Provisions include funding mechanisms, the use of appropriately trained personnel and existing standards such as AUSVETPLAN. <i>See also</i> Compensation, Cost-sharing arrangements
Endemic animal disease	A disease affecting animals (which may include humans) that is known to occur in Australia. <i>See also</i> Emergency animal disease, Exotic animal disease
Enterprise	<i>See</i> Risk enterprise
Enzyme-linked immunosorbent assay (ELISA)	A serological test designed to detect and measure the presence of antibody or antigen in a sample. The test uses an enzyme reaction with a substrate to produce a colour change when antigen-antibody binding occurs.
Epidemiological investigation	An investigation to identify and qualify the risk factors associated with the disease. <i>See also</i> Veterinary investigation
Exotic animal disease	A disease affecting animals (which may include humans) that does not normally occur in Australia. <i>See also</i> Emergency animal disease, Endemic animal disease
Exotic fauna/feral animals	<i>See</i> Wild animals
Fomites	Inanimate objects (eg boots, clothing, equipment, instruments, vehicles, crates, packaging) that can carry an infectious disease agent and may spread the disease through mechanical transmission.
Hyperaemia	An increase in the amount of blood in a tissue or organ due to dilation of the supplying arteries.
Immunoglobulins	Antibody proteins

- IgG	The main form of immunoglobulin produced in response to an antigen. It is mainly found in body fluids.
- IgM	High molecular weight immunoglobulin; IgM antibodies are the first to be synthesised and released in response to a primary antigenic stimulation.
In-contact animals	Animals that have had close contact with infected animals, such as non-infected animals in the same group as infected animals.
Incubation period	The period that elapses between the introduction of the pathogen into the animal and the first clinical signs of the disease.
Index case	The first or original case of the disease to be diagnosed in a disease outbreak on the index property.
Index property	The property on which the first or original case (index case) in a disease outbreak is found to have occurred.
Infected premises	A defined area (which may be all or part of a property) in which an emergency disease exists, is believed to exist, or in which the infective agent of that emergency disease exists or is believed to exist. An infected premises is subject to quarantine served by notice and to eradication or control procedures. <i>See Appendix 1 for further details</i>
Infectious	Able to invade and multiply in body tissues.
Local disease control centre (LDCC)	An emergency operations centre responsible for the command and control of field operations in a defined area.
Macrophage	Large mononuclear phagocyte derived from bone marrow cells and involved in the immune response. Macrophages become mobile in the tissues when stimulated by inflammation, immune reactions and microbial products.
Monitoring	Routine collection of data for assessing the health status of a population. <i>See also Surveillance</i>
Movement controls	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
Multi-site enterprise	A business entity being run at different geographical locations.
Mummified foetus	Dry/shrivalled foetus

National management group (NMG)	A group established to direct and coordinate an animal disease emergency. NMGs may include the chief executive officers of the Australian Government and state or territory governments where the emergency occurs, industry representatives, the Australian CVO (and chief medical officer, if applicable) and the chairman of Animal Health Australia.
Native wildlife	See Wild animals
OIE Terrestrial Code	<i>OIE Terrestrial Animal Health Code</i> . Reviewed annually at the OIE meeting in May and published on the internet at: http://www.oie.int/eng/normes/mcode/a_summry.htm See Appendix 3 for further details
OIE Terrestrial Manual	<i>OIE Manual of Standards for Diagnostic Tests and Vaccines for Terrestrial Animals</i> . Describes standards for laboratory diagnostic tests and the production and control of biological products (principally vaccines). The current edition is published on the internet at: http://www.oie.int/eng/normes/mmanual/a_summry.htm See Appendix 3 for further details
Operational procedures	Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.
Owner	Person responsible for a premises (includes an agent of the owner, such as a manager or other controlling officer).
Polymerase chain reaction (PCR)	A method of amplifying and analysing DNA sequences that can be used to detect the presence of virus DNA.
Premises	A tract of land including its buildings, or a separate farm or facility that is maintained by a single set of services and personnel.
Prescribed restrictions	Restrictions that enable a (quarantined) farm to move pigs for slaughter or other purposes.
Prevalence	The proportion (or percentage) of animals in a particular population affected by a particular disease (or infection or positive antibody titre) at a given point in time.
Primary Industries Ministerial Council (PIMC)	The council of Australian national, state and territory and New Zealand ministers of agriculture that sets Australian and New Zealand agricultural policy (formerly the Agriculture and Resource Management Council of Australia and New Zealand). See also Animal Health Committee
Processing	Further production of pork products that occurs after the pig has been slaughtered and dressed at an abattoir and the carcase boned out.

Quarantine	Legal restrictions imposed on a place or a tract of land by the serving of a notice limiting access or egress of specified animals, persons or things.
Rendering	Processing by heat to inactivate infective agents. Rendered material may be used in various products according to particular disease circumstances.
Restricted area	A relatively small declared area (compared to a control area) around an infected premises that is subject to intense surveillance and movement controls. <i>See Appendix 1 for further details</i>
Risk enterprise	A defined livestock or related enterprise, which is potentially a major source of infection for many other premises. Includes intensive piggeries, feedlots, abattoirs, knackeries, saleyards, calf scales, milk factories, tanneries, skin sheds, game meat establishments, cold stores, AI centres, veterinary laboratories and hospitals, road and rail freight depots, showgrounds, field days, weighbridges, garbage depots.
Salvage	Recovery of some (but not full) market value by treatment and use of products, according to disease circumstances.
Sensitivity	The probability that a test will correctly identify animals that have been exposed to the disease (true positives). Exposed animals that do not give a positive test response are referred to as false negatives. <i>See also Specificity</i>
Sentinel animal	Animal of known health status that is monitored to detect the presence of a specific disease agent.
Seroconversion	The appearance in the blood serum of antibodies (as determined by a serology test) following vaccination or natural exposure to a disease agent.
Serosurveillance	Surveillance of an animal population by testing serum samples for the presence of antibodies to disease agents.
Serotype	A subgroup of microorganisms identified by the antigens carried (as determined by a serology test).
Specificity	The probability that a test will correctly identify animals not exposed to the disease (true negatives). Non-exposed animals that test positive are referred to as false positives. <i>See also Sensitivity</i>
Stamping out	Disease eradication strategy based on the quarantine and slaughter of all susceptible animals that are infected or exposed to the disease.

State or territory disease control headquarters	The emergency operations centre that directs the disease control operations to be undertaken in that state or territory.
Surveillance	A systematic program of investigation designed to establish the presence, extent of, or absence of a disease, or of infection or contamination with the causative organism. It includes the examination of animals for clinical signs, antibodies or the causative organism.
Susceptible animals	Animals that can be infected with a particular disease
Suspect animal	An animal that may have been exposed to an emergency disease such that its quarantine and intensive surveillance, but not pre-emptive slaughter, is warranted. OR An animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.
Suspect premises	Temporary classification of premises containing suspect animals. After rapid resolution of the status of the suspect animal(s) contained on it, a suspect premises is reclassified either as an infected premises (and appropriate disease-control measures taken) or as free from disease. <i>See Appendix 1 for further details</i>
Swill	Food scraps of placental mammal origin that have not been obtained from approved slaughter facilities or treated by an approved process.
Swill feeding	The feeding of swill to pigs. Unlicensed swill feeding is illegal in Australia.
Tracing	The process of locating animals, persons or other items that may be implicated in the spread of disease, so that appropriate action can be taken.
Vaccination	Inoculation of healthy individuals with weakened or attenuated strains of disease-causing agents to provide protection from disease.
Vaccine	Modified strains of disease-causing agents that, when inoculated, stimulate an immune response and provide protection from disease.
Vaccine, attenuated	A vaccine prepared from infective or 'live' microbes that have lost their virulence but have retained their ability to induce protective immunity.

Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A <i>biological</i> vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A <i>mechanical</i> vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. <i>See also</i> Epidemiological investigation
Viraemia	The presence of viruses in the blood.
Wild animals	
- native wildlife	Animals that are indigenous to Australia and may be susceptible to emergency animal diseases (eg bats, dingoes, marsupials).
- feral animals	Domestic animals that have become wild (eg cats, horses, pigs).
- exotic fauna	Nondomestic animal species that are not indigenous to Australia (eg foxes).
Zoning	The process of defining disease-free and infected areas in accord with OIE guidelines, based on geopolitical boundaries and surveillance, in order to facilitate trade.
Zoonosis	A disease of animals that can be transmitted to humans.

Abbreviations

AAHL	Australian Animal Health Laboratory
ANEMIS	Animal Health Emergency Information System
AUSVETPLAN	Australian Veterinary Emergency Plan
CA	control area
CCEAD	Consultative Committee on Emergency Animal Diseases
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	chief veterinary officer
DAFF	Department of Agriculture, Fisheries and Forestry (Australian Government)
DCP	dangerous contact premises
ELISA	Enzyme-linked immunosorbent assay
Ig	immunoglobulin
IP	infected premises
LDCC	local disease control centre
NMG	national management group
OIE	World Organisation for Animal Health (Office International des Epizooties)
PRRS	porcine reproductive and respiratory syndrome
RA	restricted area
SDCHQ	state or territory disease control headquarters
SP	suspect premises

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