Rift Valley fever

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EMERGENCY ANIMAL DISEASE WATCH HOTLINE: 1800 675 888

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

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Contents

Tables

Figures

Lamb in Victoria, Australia.

1 Introduction

1.1 This manual

1.1.1 Purpose

As part of AUSVETPLAN (the Australian Veterinary Emergency Plan), this response strategy contains the nationally agreed approach for the response to an incident – or suspected incident – of Rift Valley fever (RVF) in Australia. It has been developed to guide decision making to ensure that a fast, efficient and effective response can be implemented consistently across Australia with minimal delay.

1.1.2 Scope

This response strategy covers RVF caused by Rift Valley fever virus.

This response strategy provides information about:

- the disease (Section 2)
- the implications for Australia, including potential pathways of introduction; social, environmental, human health and economic effects; and the critical factors for a response to the disease (Section 3)
- the agreed policy and guidelines for agencies and organisations involved in a response to an outbreak (Section 4)
- declared areas and premises classifications (Section 5)
- biosecurity controls, including quarantine and movement controls (Section 6)
- response surveillance and establishing proof of freedom (Section 7).

The key features of RVF are described in the **Rift Valley fever fact sheet** (Appendix 1).

1.1.3 Development

The strategies in this document for the diagnosis and management of an outbreak of RVF are based on risk assessment. They are informed by the recommendations in the World Organisation for Animal Health (OIE) *Terrestrial animal health code* (Chapter 8.15) and the OIE *Manual of diagnostic tests and vaccines for terrestrial animals* (Chapter 3.1.18). The strategies and policy guidelines are for emergency situations and are not applicable to policies for imported animals or animal products.

This manual has been produced in accordance with the procedures described in the **AUSVETPLAN *Overview***, and in consultation with Australian national, state and territory governments; the relevant livestock industries; nongovernment agencies; and public health authorities, where relevant.

In this manual, text placed in square brackets [xxx] indicates that that aspect of the manual remains unresolved or is under development; such text is not part of the official manual. The issues will be worked on by experts and relevant text included at a future date.

1.2 Other documentation

This response strategy should be read and implemented in conjunction with:

- other AUSVETPLAN documents, including the operational, enterprise and management manuals; and any relevant guidance and resource documents. The complete series of manuals is available on the Animal Health Australia website[1]
- relevant nationally agreed standard operating procedures (NASOPs).[2] These procedures complement AUSVETPLAN and describe in detail specific actions undertaken during a response to an incident. NASOPs have been developed for use by jurisdictions during responses to emergency animal disease (EAD) incidents and emergencies
- relevant jurisdictional or industry policies, response plans, standard operating procedures and work instructions
- relevant Commonwealth and jurisdictional legislation and legal agreements (such as the Emergency Animal Disease Response Agreement – EADRA[3]), where applicable.

1.3 Training resources

EAD preparedness and response arrangements in Australia

The EAD Foundation Online course[4] provides livestock producers, veterinarians, veterinary students, government personnel and emergency workers with foundation knowledge for further training in EAD preparedness and response in Australia.

1 www.animalhealthaustralia.com.au/ausvetplan

2 www.animalhealthaustralia.com.au/nationally-agreed-standard-operating-procedures

3 www.animalhealthaustralia.com.au/eadra

4 www.animalhealthaustralia.com.au/online-training-courses

2 Nature of the disease

Rift Valley fever (RVF) is an acute arthropod-borne viral disease, mainly affecting ruminants, camels and humans. RVF infection in ruminants causes abortion in pregnant animals and high mortality in young animals. RVF was first identified during an outbreak of sudden deaths and abortions among sheep along the shores of Lake Naivasha in the greater Rift Valley of Kenya in 1930.

OIE listing

RVF is a World Organisation for Animal Health (OIE)–listed disease.[5]

2.1 Aetiology

RVF is caused by infection with RVF virus, which is a negative-sense, tri-segmented, enveloped RNA virus within the order Bunyavirales, family *Phenuiviridae*, genus *Phlebovirus*.

2.2 Susceptible species

RVF virus is highly pathogenic for sheep and cattle. Newborn lambs, newborn goat kids, puppies and kittens are reported to be extremely susceptible to infection and disease, with high mortality. Goats, buffalo and camels are important hosts. Donkeys, horses, pigs, adult dogs and cats, and rodents can be infected during large outbreaks, but they are considered unlikely to play a major role during RVF epizootics; for example, horses show inapparent infection following a low-grade viraemia, and pigs are relatively resistant (so do not represent a major source of virus for vectors). Other species known to be susceptible include antelopes, monkeys and hippopotami; however, infections in these species are usually subclinical. These latter species may be important in the zoo environment.

The susceptibility of Australian native fauna is not known.

2.2.1 Zoonotic potential

RVF is zoonotic. Disease in humans is typically asymptomatic or mild, but can occasionally be fatal. Direct contact with carcasses and blood is a major source of infection (eg veterinarians undertaking postmortem examinations).

5 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. OIE member countries that have been free from a notifiable disease are obliged to notify the OIE within 24 hours of confirming the presence of the disease.

2.3 World distribution

For the latest information on the distribution of RVF, refer to the OIE World Animal Health Information System.[6]

2.3.1 Distribution outside Australia

Until 2000, RVF was restricted to the African continent (especially sub-Saharan areas) and Madagascar. A major outbreak occurred in Egypt in 1977–78, causing heavy animal losses and a large number of human cases; a less severe outbreak followed in 1993. Periodic large-scale epidemics have been reported from Senegal and Mauritania in 1987 and 1998, Madagascar in 1990–91, and east Africa (Kenya, Somalia and Tanzania) in 1997–98. The east African epidemic affected approximately 200 000 people, caused 589 deaths and resulted in meat shortages (Gerdes 2004). South Africa reported the disease in buffalo in January 1999.

In 2000, RVF was detected in Saudi Arabia and Yemen – the first reported occurrence of RVF outside the African continent. During that year, there were 516 human cases and 87 deaths in Saudi Arabia, while Yemen reported 1087 suspected human cases and 121 deaths (WHO 2018, Petrova et al 2020). Since 2000, the disease has been reported in Saudi Arabia and Yemen, resulting in approximately 800 human deaths, with a mortality rate of 14%. In 2006–07, a large outbreak occurred in Kenya and Somalia. In 2008, RVF was suspected or confirmed in South Africa, Yemen, Saudi Arabia (Madani et al 2003), Sudan, Malawi, Mozambique, Madagascar, Union of the Comoros, Mayotte, Swaziland, Democratic Republic of the Congo, Mauritania and Cameroon.[7] Outbreaks in cattle associated with abortions have also been reported in Zimbabwe and Zambia, where sentinel cattle monitoring suggests that emergence of the virus is an annual occurrence, with antibody prevalence reaching 20% (Gerdes 2004). Once there is evidence of previous virus activity, countries are likely to remain permanently infected.

2.3.2 Occurrence in Australia

RVF has never occurred in Australia.

2.4 Epidemiology

RVF is a viral disease affecting mainly wild and domestic ruminants and humans. It is transmitted by insect vectors (primarily mosquitoes), or direct contact with organs or fluids of infected animals. The virus appears capable of causing outbreaks in a wide range of ecological zones.

The disease usually presents in an epizootic form over large areas of a country following heavy rains and sustained flooding, or linked to the construction of irrigation schemes and hydrological dams, which are suitable breeding sites for vector populations.[8]

Once RVF becomes endemic in a country, periodic epidemics occur every 4–10 years, associated with heavy rainfall and flooding. This results in increased hatching of infected *Aedes* and *Culex* spp. mosquito eggs that have remained viable while buried in the soil (Kariuki & Bett 2019).

A recently identified method of RVF virus maintenance during periods between epidemics is low-level cycling of virus between susceptible vertebrate hosts (domestic animals and wildlife) and humans, transmitted by mosquito vectors (Kariuki Njenga & Bett 2019).

6 https://wahis.oie.int/#/home

7 OIE World Animal Health Information System (www.wahis.oie.int/#/dashboards/country-or-disease-dashboard)

8 www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/RIFT_VALLEY_FEVER.pdf

Calves are extremely susceptible to RVF virus.

Serological evidence suggests that low-level endemic transmission occurs regularly throughout much of the African continent, but most remains unrecognised because of inadequate surveillance and healthcare facilities (Meegan & Bailey 1988).

There has been no evidence of outbreaks of RVF in urban areas (WHO 2018).

2.4.1 Incubation period

Sheep and cattle

Viraemia in lambs can begin within 8–12 hours after exposure to the virus, and a febrile response can occur by 24–36 hours after inoculation. In cattle, the febrile response can occur from days 2–6 after inoculation. Young animals rapidly develop clinical signs and die within 2–6 days.

Humans

The incubation period in humans is stated to vary from 2–6 days (WHO 2018).

OIE incubation period

For the purposes of the OIE *Terrestrial animal health code*, the infective period[9] for RVF is 14 days.

9 In the OIE Terrestrial animal health code, 'incubation period' means the longest period that elapses between the introduction of the pathogenic agent into the animal and the occurrence of the first clinical signs of the disease (see www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=glossaire.htm).

2.4.2 Persistence of agent and modes of transmission

General properties

The RVF virus particle is relatively large and has a lipid-containing envelope, making it susceptible to a range of disinfectants, including detergents. The virus survives in freeze-dried and aerosolised forms at 24 °C and 50–85% humidity. It can also survive contact with 0.5% phenol at 4 °C for 6 months (OIE Technical Disease Card, 2019[10]).

The virus can be maintained in the eggs of certain arthropod vectors during interepidemic periods.

Environment (including windborne spread)

Characteristics of RVF virus in the environment are as follows:

- RVF virus is resistant to alkaline pH but is very susceptible to acid pH, being inactivated below pH 6.8. It is most stable within the pH range of 7–8.
- RVF virus rapidly loses titre at 56 °C, but the presence of high levels of proteins, as found in whole serum or plasma, can greatly stabilise the virus.
- Survival times of 120 minutes at 56 °C, 21 days at 37 °C and 4 months at 25 °C have been reported (Brès 1981). The virus may be able to survive in dried discharges for up to 3 months, and it was reported that workers were infected when scraping the walls of an animal room used 3 months earlier for RVF studies (Pfeiffer et al 2005). Where blood has been spilt, the contaminated area should be disinfected with appropriate chemicals by personnel wearing suitable personal protective equipment.
- RVF is highly stable in aerosol form at temperatures of 24 °C and relative humidity of 50–85% (Miller et al 1963).
- The virus is inactivated by lipid solvents (ether, chloroform, sodium deoxycholate), low concentrations of formalin and strong solutions of sodium or calcium hypochlorite (residual chlorine should exceed 5000 ppm).
- The virus is destroyed by strong sunlight and ultraviolet radiation.

A high rate of RVF infection in people involved in slaughter, postmortem examination or laboratory handling of tissues from infected animals shows that aerosol transmission is an important means of infection. Evidence of virus transmission through exposure to infectious aerosols under laboratory conditions has also been reported (Brown et al 1981).

Live animals

In adult animals, virus is rapidly cleared from the blood by day 6–9 after infection.

Despite being a potential pathway, contact transmission is not believed to play a significant role in the spread of RVF between live animals or humans, even though virus may be present in the nasal discharges and saliva of viraemic animals (Gerdes 2004).

Carcasses

Virus has been detected in spleen and liver after 21 days, and presumably can be transferred to humans at slaughter of an infected animal. Direct contact with carcasses, organs of freshly slaughtered sick animals and aborted materials has regularly caused disease in humans. Direct contact with blood and viscera of infected animals during slaughter or shortly afterwards poses a significant likelihood of infection via a wound from a contaminated knife, contact with broken skin or inhalation of aerosols (see 'Environment (including windborne spread)', above).

10 www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/RIFT_VALLEY_FEVER.pdf

Animal products

Meat, meat products and casings, including use as animal feed

The RVF virus content of meat decreases rapidly following slaughter, as a result of the decrease in pH with storage of the meat. Consuming or contacting raw meat and meat products from an infected animal can be a potential risk. Chilled or frozen meat is not likely to present a human health hazard.

Milk and dairy products, including use as animal feed

RVF virus is excreted in milk during the viraemic phase in animals – a study conducted in 1951 suggests that virus can be found in acutely infected cattle milk for 3–5 days – and there is circumstantial evidence that consumption of raw milk is a source of infection in humans (Gerdes 2004). However, pasteurisation inactivates the virus.

Animal byproducts

Hides, skin, wool and other fibres

Little or no information is available about the possible role of wool (and other fibres, such as mohair), bones, skins and manure in the transmission of RVF virus. However, since wool, bones and skins might contain some blood, they have the potential to spread the virus. It is not known how long the virus would survive on wool after it is pressed into bales. Fibrous products can be decontaminated by scouring and carbonisation. The amount of viral contamination of wool and other fibres would be less than that of bones and skins.

Semen and embryos from live susceptible animals

The virus is likely to be present in semen, and transmission may occur. It is known to be present in ova but is probably not transmitted via embryo transfer (see the **AUSVETPLAN enterprise manual *Artificial breeding centres***). An experimental study demonstrated that RVF virus can be transmitted vertically in the absence of detectable maternal viraemia (Antonis et al 2013).

Liquid nitrogen tanks used to store and transport genetic material may preserve viruses, bacteria and fungal spores for extended periods. Experimental studies have shown that cross-contamination of germplasm can occur if it is stored in unsealed vials in contaminated tanks (Bielanski & Vajta 2009). Consideration should be given to disinfection – before movement or subsequent use – of liquid nitrogen tanks used to store and transport genetic material that is infected or potentially infected with RVF virus.

People

The vast majority of human infections result from direct or indirect contact with the blood or organs of infected animals. The virus can be transmitted to humans during handling of animal tissue during slaughtering or butchering, assisting with animal births, conducting veterinary procedures, or disposing of carcasses or fetuses. Certain occupational groups, such as herders, farmers, slaughterhouse workers and veterinarians, are therefore at higher risk of infection. The virus infects humans through inoculation – for example, via a wound from an infected knife or through contact with broken skin – or through inhalation of aerosols produced during the slaughter of infected animals. The aerosol mode of transmission has also led to infection in laboratory workers.

There is some evidence that humans may become infected with RVF virus by ingesting the unpasteurised or uncooked milk of infected animals (WHO 2018).

Human infections have also resulted from the bites of infected mosquitoes, most commonly *Aedes* spp.

To date, no human-to-human transmission of RVF virus has been documented, and no transmission of RVF to healthcare workers has been reported when standard infection control precautions have been in place.

Equipment, including personal items

No data are available on persistence of RVF virus on equipment or personnel. However, the virus may be able to survive in dried discharges on walls for up to 3 months (Pfeiffer et al 2005).

Similarly, no data are available on transmission of RVF virus by equipment or personnel. However, anecdotal reports suggest that the virus may be spread between animals by contaminated needles.

Arthropod vectors

Biological transmission

Biological transmission by insects is the major means of transmission of RVF to animals, but a less important means of transmission to humans. More than 40 mosquito species in six genera collected in the field (Meegan & Bailey 1988) have been shown to be capable of transmitting the virus naturally and under experimental conditions (Moutailler et al 2008, Turell et al 2010). Approximately 40 other arthropod species have demonstrated vector competency in the laboratory. In epizootic situations in Africa, the virus has been isolated from *Aedes*, *Anopheles*, *Mansonia* and *Culex* mosquito species. Where the disease is regarded as enzootic, the virus has been isolated from *Aedes* and *Eretmapodites* mosquitoes (Shope et al 1982). Virus has also been isolated from *Culicoides* biting midges and *Simulium* black flies.

Little is known about the dynamics of the virus in its vectors. One trial with *Culex pipiens* demonstrated that, when the mosquitoes were allowed to feed on viraemic lambs, infection rates were very high (above 86%), but transmission rates were much lower (around 30%), and this rate declined in the subsequent days after infection (Vloet et al 2017).

Adult mosquitoes that become infected with an arbovirus will usually remain so for life. At least one mosquito species has been shown to transmit RVF virus 36 days after oral infection. The daily survival rate of a field population of mosquitoes is governed by a range of factors, such as temperature, rainfall, wind and availability of hosts. All these would need to be considered to determine how long adult mosquitoes could survive and maintain RVF virus. However, in general, survival of mosquitoes beyond about 4 weeks is unlikely. Transovarial transmission is also an important factor for persistence of RVF virus in the field (see 'Vertical transmission in vectors', below).

The ability of Australian biting insects to transmit RVF virus is not fully known. Some common Australian mosquito species, including *Aedes notoscriptus*, *A. vigilax*, *C. annulirostris* and *C. quinquefasciatus*, have been shown to be competent vectors for RVF virus (Turell & Kay 1998), and it is possible that other mosquito species may also be competent. Experimental studies elsewhere have demonstrated that *A. aegypti* and *A. albopictus* mosquitoes, and *Stomoxys calcitrans* (stable fly) are capable of mechanically transmitting RVF virus to laboratory animals (Hoch et al 1985, Turell et al 1988).

The role of argasid and ixodid ticks is still under consideration in light of their capacity to transmit other zoonotic viruses, both transovarially and mechanically.

Mechanical transmission

Experimental mechanical transmission of RVF virus has been shown for three mosquito species, a biting midge species (*Culicoides*), a phlebotomine sandfly, black flies (*Simulium* spp.), a tsetse fly, the stable fly (*S. calcitrans*) and ticks. The explosive nature of epidemics of RVF suggests that mechanical transmission is a probable means of spread (Hoch et al 1985).

RVF virus is reported to have a relatively short transmission window (6–9 days) in non-insect hosts, although the OIE Terrestrial Code quotes an infective period of 14 days.

Vertical transmission in vectors

RVF virus has been isolated from male *Aedes* mosquitoes that emerged from dormant eggs after flooding of breeding sites. This demonstrates that RVF virus can be transmitted vertically between generations of mosquitoes without a stage in a vertebrate host and, in particular, can be transmitted into eggs (transovarial transmission).

Transovarial transmission in floodwater *Aedes* mosquitoes (primarily the *Neomelaniconion* subgenus) allows RVF virus to persist between seasons. These mosquitoes lay eggs in which the first-stage larvae develop to the point of being ready to hatch but then enter a resting phase until the egg is flooded. As a further aid to long-term survival of the species, not all eggs will hatch with the first flooding. Transovarial transmission has important implications for persistence of the virus in the field if it becomes established in an *Aedes* mosquito population. There is no evidence to show how long RVF virus can survive in mosquito eggs, but it may be months or even years.

Effects of vector infection on feeding

Culex pipiens mosquitoes infected with RVF virus are adversely affected by the virus (Turell et al 1985). One sign of this is a reduced ability to engorge with blood, leading to increased probing behaviour and increased likelihood of feeding on a greater number of hosts, both of which can produce a higher transmission rate. Turell et al (1984a) also demonstrated that infected *C. pipiens* could be separated into two distinct groups: those with a disseminated infection and those with a nondisseminated infection limited to the gut. Only mosquitoes with a disseminated infection were shown to be capable of transmitting virus.

Preferential feeding

An experimental study in Kenya demonstrated that cattle attracted three times more mosquitoes of species that are competent vectors for RVF than sheep or goats. However, the number found to be fully fed was independent of the number attracted, demonstrating that there are likely other factors that contribute to attraction of the host (Tchouassi et al 2016).

Mosquitoes are more likely to feed on lambs that are infected with RVF than on uninfected controls (Turell et al 1984b). There was a positive correlation between mosquito feeding and the higher temperature of the viraemic animal in very young lambs (3 days old) but not in older lambs (6–8 weeks old).

2.4.3 Factors influencing transmission

Infection rates of vectors are directly proportional to the titre of the virus in the circulating blood of the host. The high titres that occur in vertebrates infected with RVF virus are conducive to high infection rates in a range of vectors. For instance, the experimental infection rate of *C. pipiens*, the likely main vector in the epidemics of RVF in Egypt in 1977–78, was 86% (Vloet et al 2017). High titres of circulating virus are also an essential requirement for mechanical transmission.

Effects of rainfall

In southern Africa, outbreaks are usually associated with wet seasons with above-average, widespread and persistent rainfall, often over several months or even 1–2 years. This leads to flooding of large ground formations known as dambos, with subsequent large increases in mosquito numbers. Such widespread rain helps to explain the simultaneous outbreaks of RVF in widely separated areas. The 2006–07 outbreak in Kenya and Somalia was accurately predicted months in advance by NASA scientists from weather observations in the Pacific and Indian oceans. The predicted rainfall resulted in an ideal environment for rapid vector multiplication.

The outbreaks in northern Africa have not been associated with heavy rain but have been mainly along the irrigation areas of the Nile River, where suitable breeding sites produce high numbers of vectors. Irrigation in RVF endemic areas provides conditions that are conducive to resting and breeding for vectors of RVF virus and other endemic arboviruses (Mbotha et al 2018).

Since surface water facilitates breeding of vectors, improved drainage and removal of such water from the area may be necessary to control an RVF outbreak.

The initial spread of RVF after heavy rain could be initiated by *Aedes* mosquitoes emerging from eggs, which may have been infected transovarially (Davies et al 1985). This can lead to rapid spread of RVF because mosquitoes with an existing infection at adult emergence can transmit virus at their first blood meal without the need to encounter a viraemic host, and then go through an incubation period for virus multiplication and dissemination. Recent studies indicate that RVF virus continues to cycle through the vertebrate host and is transmitted by mosquitoes at very low levels during low-rainfall conditions. The heavy rainfall seasons cause an increase in breeding sites for vectors, leading to an increase in vectors and viral transmission (Kariuki Njenga & Bett 2019).

Effects of wind

Windborne dispersal of infected vectors has been proposed as a means of spread of RVF virus. In the week immediately preceding the first outbreaks of the Egyptian epidemic in 1977, prevailing winds were from Sudan in the south, where infections had been recorded previously. The distance travelled would have been 450–500 km (Sellers et al 1982). However, Abd El-Rahim et al (1999) suggested that the infection could have resulted from the continuous importation of infected animals into Aswan Province at a time when a large population of insect vectors was present.

2.5 Diagnostic criteria

2.5.1 Clinical signs

Animals

Cattle, sheep and goats

In Africa, indigenous ruminants, including sheep, goats and *Bos indicus* cattle, are relatively resistant to RVF virus infection and display few clinical signs. Introduced ruminant species and their crosses act as indicator species, because they develop clinical signs following infection. The susceptibility of Australian-bred *Bos indicus* cattle and their composites is unknown.

In cattle, sheep and goats, the disease is most severe in young animals, in which high mortalities can occur. In peracute (very acute) cases, animals are found dead, or collapse and die when moved. In acute cases, the incubation period may be less than 24 hours, and is followed by fever, weakness, unsteady gait, bilateral mucopurulent nasal discharge and vomiting. Death follows in less than 24 hours.

Infected sheep demonstrate various clinical signs.

Clinical signs in affected lambs can include anorexia, reluctance to stand and bloody diarrhoea. Adult sheep have been reported to demonstrate a high temperature, unsteady gait, bloody diarrhoea, nasal discharge, vomiting and jaundice. Not all of these clinical signs are seen in every individual case. In lambs up to 1 week old, mortalities can reach 95%. Mortalities may reach 40–60% in weaner lambs and 15–30% in adult sheep. During the RVF epizootic in South Africa in 1950–51, 100 000 sheep are reported to have died and 500 000 aborted (Bouloy 2001, Swanepoel & Coetzer 2004).

Affected calves and adult cattle exhibit fever (40–41 °C). Calves have a loss of appetite and weakness, and mortality among affected calves may reach 70%. In adult animals, subacute disease is more common, and the mortality rate is usually less than 10% (Jouan et al 1989). For both the acute and subacute forms of the disease, fever is followed by weakness and anorexia. Jaundice, abdominal pain, and gastroenteritis with foetid diarrhoea may be observed in older calves and adult cattle, and there is a drop in milk production.

Abortion (up to 85% in cattle) is a very common consequence of RVF virus infection in sheep and cattle.

The disease in goats is similar to that in sheep, although adult goats are reported to be less likely to display clinical signs and, depending on the breed, inapparent infections are reported to be more common (Gerdes 2004).

Buffalo, camels, horses, donkeys, pigs, cats, dogs and rodents

Buffalo and camels are susceptible to infection and will abort. Infections in nonpregnant animals are often inapparent, and death rates are low.

Horses, donkeys, pigs, and adult cats and dogs are low on the susceptibility scale, and inapparent infections are the most likely outcome.

Mice and hamsters are highly susceptible to infection with RVF virus by subcutaneous or intraperitoneal injection, leading to fulminant hepatitis and a late-developing encephalitis. These species have been used as animal models to study the pathogenicity of RVF virus.

Some rodent species have demonstrated a limited resistance to infection. These animals could potentially act as hosts in the maintenance cycle of RVF virus in nature.

Table 2.1 shows the susceptibility of vertebrate hosts to RVF infection.

Table 2.1 Susceptibility of vertebrate hosts to Rift Valley fever virus

Extremely susceptible (70–100% mortality)	Highly susceptible (20–70% mortality)	Moderately susceptible (<10% mortality)	Resistant (infection inapparent)	Refractory (not susceptible)
• Newborn lambs • Newborn kids • Puppies • Kittens • Mice • Hamsters • Certain rodents	• Calves • Adult sheep • Certain rodents	• Adult cattle • Adult goats • Camels (dromedary) • Buffalo (al species) • Asian monkeys • South American monkeys • Humans	• Equines • Pigs • Adult dogs • Adult cats • African monkeys • Guinea pigs • Rabbits • Certain rodents	• Birds • Reptiles • Amphibians

Sources: Gerdes 2004, Pfeiffer et al 2005

Humans

RVF in humans may present as a mild or severe form. The mild form is most common and is either asymptomatic or presents with flu-like symptoms such as fever, and muscle and joint pain. The severe form occurs in a small percentage of patients, usually presenting as one of three distinct syndromes: ocular disease, meningoencephalitis or haemorrhagic fever. The fatality rate is less than 1%, usually in people who develop the haemorrhagic fever form (WHO 2018).

2.5.2 Pathology

Gross lesions

The main sites for viral replication are reported to be the liver and spleen, although the brain can also be involved (Peters & Anderson 1981).

At postmortem examination, affected animals have petechial and ecchymotic haemorrhages on the serosal surfaces and in the internal organs, including liver, gall bladder, lymph nodes and kidneys.

The liver, which is swollen, congested and friable, contains necrotic, greyish-white foci (about 1 mm in diameter) associated with haemorrhages under the outer layer. These are more severe in young animals than in adults. There may be ascites, hydropericardium, hydrothorax and pulmonary oedema. The fluid is frequently bloodstained, and the carcass may be jaundiced. There is a variable level of intestinal inflammation, which may include haemorrhages (see Geering et al 1995, DAFF 2007, OIE 2009).

Microscopic lesions

In the livers of young animals, including fetuses, peracute liver damage is seen (Easterday et al 1962). This is characterised by well-defined primary foci of severe coagulative necrosis, which may be centrilobular. These are accompanied by diffuse and massive pan-necrosis involving most (or all) of the rest of the parenchyma. Some livers also show mineralisation of scattered (or small groups of) necrotic hepatocytes. The primary necrotic foci are later infiltrated by histiocytes, lymphocytes and neutrophils, many with marked pyknosis and karyorrhexis. Intracytoplasmic Councilman-like bodies may be present in degenerate hepatocytes or free in sinusoids. Eosinophilic inclusion bodies are often found in the nuclei of cells that are still recognisable as hepatocytes (Geering et al 1995).

In older animals, the hepatic necrosis may be less extensive and confined to focal areas of individual lobules (Geering et al 1995).

Haematology

The presence of RVF is indicated by:

- leucopaenia
- elevated blood enzymes associated with severe liver damage
- thrombocytopaenia.

2.5.3 Differential diagnosis

Animals

Disease outbreaks in ruminants characterised by abortions; deaths in young animals, with liver necrosis; and an acute febrile illness in humans handling sick animals are highly suggestive of RVF.

The following diseases and conditions should be considered in differential diagnosis of RVF:

Exotic

- Wesselsbron disease
- Nairobi sheep disease
- heartwater
- bacterial septicaemias
- Middelburg virus disease
- ovine enzootic abortion
- bovine brucellosis
- malignant catarrhal fever
- peste des petits ruminants
- any disease capable of causing widespread outbreaks of abortion in sheep or cattle.

Present in Australia

- enterotoxaemia of sheep
- vibriosis
- trichomoniasis
- poisoning by toxic plants
- bovine ephemeral fever
- bluetongue
- leptospirosis.

Humans

In humans, the clinical signs of RVF are diverse. The differential diagnosis will vary between the mild, meningoencephalitic, ocular and haemorrhagic forms, and should include:

Exotic

- malaria
- Lassa fever
- Ebola fever
- Marburg haemorrhagic fever
- Crimean–Congo haemorrhagic fever
- Nipah virus.

Present in Australia

- dengue fever (including dengue haemorrhagic fever)
- brucellosis
- influenza
- Hendra virus.

Other viral encephalitides, including Murray Valley encephalitis, should be considered if there are encephalitic signs or symptoms. It is particularly important that malaria be considered in any patient presenting with a fever within 12 months of leaving a malarious area.

2.5.4 Laboratory tests

Because the blood and tissues of infected animals may carry a high concentration of virus during the viraemic phase, this material must be processed in a biocontainment laboratory, preferably by staff vaccinated against RVF. Such facilities are only available in Australia at:

- the CSIRO Australian Centre for Disease Preparedness (CSIRO-ACDP), Geelong, Victoria – for animal specimens
- the National High Security Quarantine Laboratory in the Victorian Infectious Diseases Reference Laboratory, or the Communicable Diseases unit of Queensland Health Forensic and Scientific Services – for human material.

Samples required

Whole blood, liver, lymph nodes and spleen are the tissues of choice for isolation of the virus. Blood samples (about 20 mL each) should be collected from febrile animals into ethylenediaminetetraacetic

acid (EDTA) or heparin. Duplicate samples of liver and spleen should be collected aseptically, and placed in sterile containers for virus isolation, and in neutral buffered formalin for histopathology (Geering et al 1995). These samples should be taken from both freshly dead animals at postmortem examination and aborted fetuses (if available).

Transport of specimens

Specimens should be submitted in accordance with agreed state or territory protocols. Specimens should initially be forwarded to the state or territory laboratory for appropriate analysis, and assessment of whether further analysis will be required by the CSIRO Australian Centre for Disease Preparedness (CSIRO-ACDP), Geelong.

If the state or territory laboratory deems it necessary, duplicate samples of the specimens should be forwarded to CSIRO-ACDP for emergency disease testing, after the necessary clearance has been obtained from the chief veterinary officer (CVO) of the state or territory of the suspect case, and after the CVOs of Victoria and Australia have been informed about the case and the transport of the specimens to Geelong (for the first case). Sample packaging and consignment for delivery to CSIRO-ACDP should be coordinated by the relevant state or territory laboratory.

For further information, see the **AUSVETPLAN management manual *Laboratory preparedness***.

Packing specimens for transport

Blood and unpreserved samples should be transported at 4 °C. If delays of more than 48 hours are expected, unpreserved tissue specimens should be frozen and transported on dry ice.

Blood samples should be collected from febrile animals.

2.5.5 Laboratory diagnosis

The disease agent can be identified, and virus isolated, from fresh tissue samples.

Histopathology can provide further confirmation of RVF diagnosis. Formalin-fixed sections of liver from infected animals are examined; if multiple foci of diffuse necrosis are seen in hepatic cells, a diagnosis of RVF is supported.

A highly specific immunocapture enzyme-linked immunosorbent assay (ELISA) (van Vuren & Paweska 2009) has been developed to detect RVF virus antigen. The antigen may also be detected by direct or indirect immunofluorescence tests on impression smears or cryostat sections of liver, spleen and brain. A rapid diagnosis can sometimes be made by agar gel immunodiffusion tests on fresh tissues. Histochemical staining of cryostat sections or formalin-fixed tissues, and polymerase chain reaction (PCR) (see below) are also widely used for RVF diagnosis.

The ELISA test has replaced the haemagglutination inhibition test, immunofluorescence assay and serum neutralisation test as the test of choice, although serum neutralisation is still used as a confirmatory test.

A reverse transcriptase PCR test is now available for detecting viral genetic material. The sequence of the NSS protein can be used for phylogenetic analysis of isolates.

CSIRO-ACDP tests

The testing method used by CSIRO-ACDP is shown in Figure 2.1. Further details of tests currently available at CSIRO-ACDP are shown in Table 2.2.

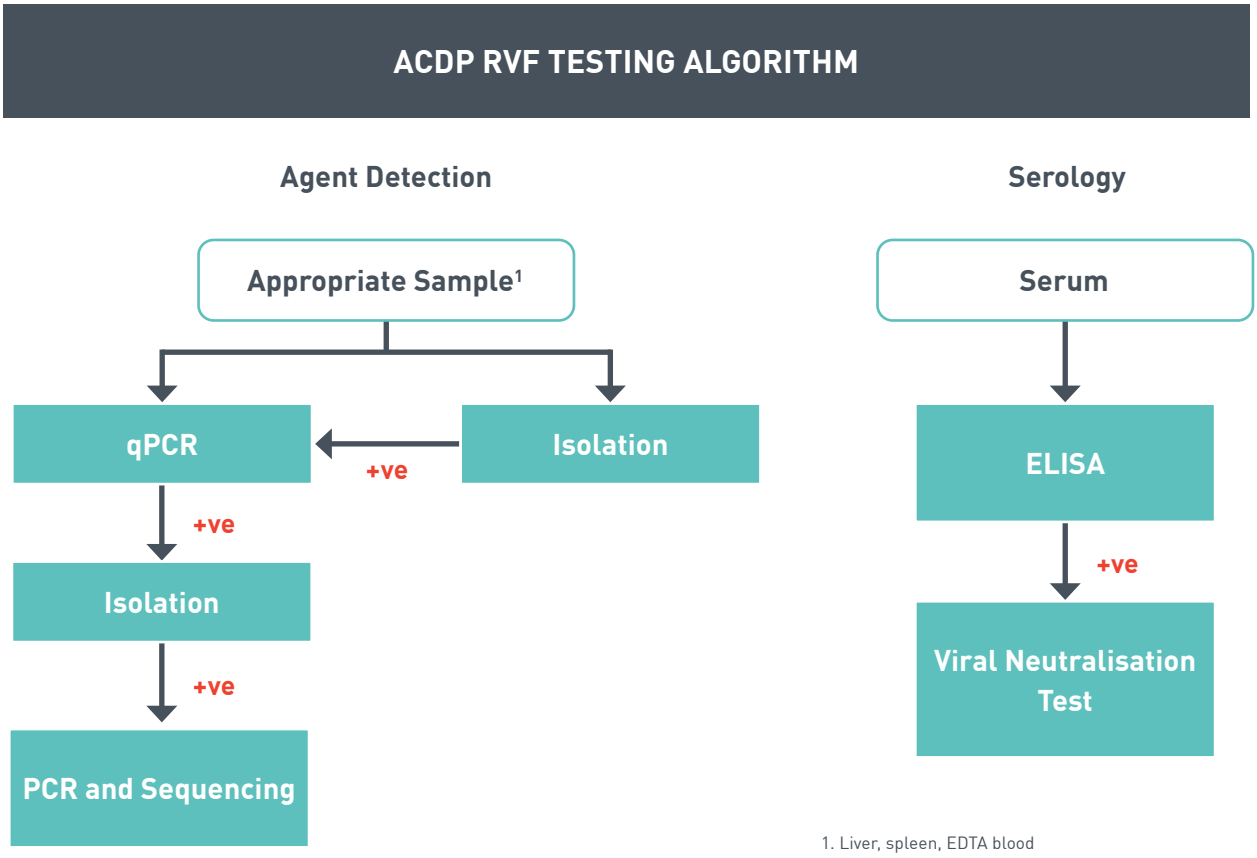

Figure 2.1 The current approach to diagnostic testing at CSIRO-ACDP

Table 2.2 Laboratory tests currently available at CSIRO-ACDP for diagnosis of Rift Valley fever

Test	Specimen required	Test detects	Time taken to obtain result
Agent detection			
Real-time RT-PCR	Blood, tissues	Viral RNA	6 hours
Immunofluorescence	Tissues	Viral antigen	1 day
Electron microscopy	Tissues	Viral antigen	12 hours
Histopathology	Tissues	Microscopic changes	2 days
Agent characterisation			
Virus isolation and identification	Whole EDTA blood Fresh brain/spleen/liver	Virus	5–10 days
RT-PCR and sequencing	Tissue or virus isolate	Viral RNA	2–3 days
Serology			
ELISA	Serum	Antibody	1 day
Virus neutralisation	Serum	Antibody	3–5 days

EDTA = ethylenediaminetetraacetic acid; ELISA = enzyme-linked immunosorbent assay; PCR = polymerase chain reaction; RT-PCR = reverse transcriptase polymerase chain reaction

Source: Information provided by the then CSIRO-AAHL, 2012 (refer to CSIRO-ACDP for most up-to-date information).

2.6 Resistance and immunity

Innate immunity

Passive immunity can be transferred from mother to offspring in colostrum. However, the mother needs to have a sufficient level of antibody, produced by previous exposure to the disease or by vaccination with an attenuated ('live') virus vaccine. Inactivated virus vaccines do not usually produce a sufficient level of antibody.

Acquired immunity

A high level of immunity is produced in animals following exposure to the virus. This immunity appears to be lifelong.

2.7 Vaccination

At present, no RVF vaccine is approved for animal use in Australia. Refer to Appendix 5 for more information on vaccines used overseas.

2.8 Treatment of infected animals

There is no effective animal treatment.

2.9 Control overseas

Control measures recommended overseas include prevention of the slaughter of susceptible species during epizootics of RVF, appropriate disposal of dead animals, use of insecticides and insect repellents, and public information campaigns to minimise the chance of people becoming infected – especially those at most risk (eg farmers, veterinarians, abattoir workers, butchers) (ECDC 2020).

3 Implications for Australia

3.1 Potential pathways of introduction

The most likely direct pathway for an incursion of Rift Valley fever (RVF) into Australia is entry of infected vectors (eg hitchhikers on a vessel) or fomites (eg imported equipment that has not been properly treated). Transovarial transmission of RVF virus occurs in at least some vectors, so it is possible that any stage of the insect's lifecycle could be infected.

Australia's biosecurity procedures include disinsectation of all inbound overseas vessels to minimise the risk of introduction of vectors and viruses. Although this disinsectation procedure might not be 100% effective, the probability of introduction of RVF into Australia via vectors is very low.

3.2 Social, economic and environmental effects

An uncontrolled outbreak of RVF would cause serious stock losses in the sheep, cattle and goat industries. The resulting financial losses would have a major effect on the local economy in the area of the outbreak. Job losses both on farms and in support industries would occur (Pépin et al 2010).

Some export markets may place embargoes on meat and other animal products from Australia, and certification agreements would need to be renegotiated. This would take time and could have significant effects on the Australian economy.

If RVF became endemic, continuing economic losses would occur as a result of reproductive losses, mortalities and the cost of ongoing vaccination. Permanent loss of some markets would be expected, with associated downturn in the rural economy and increased rural unemployment.

Movement restrictions will cause loss of market opportunities, and associated financial losses to nonaffected properties in the area and support industries (such as the stock transport industry). This effect might be reduced by implementation of zoning and/or vaccination (if it is used in the outbreak).

The socioeconomic consequences of RVF in people would result mainly from its public health importance. Death of people from RVF, along with lost production and income due to increased time off work, may have a significant effect.

3.3 Critical factors for an Australian response

- Introduction of RVF to Australia is unlikely to occur naturally from long-distance travel of insect vectors on wind currents unless the disease considerably expands its present distribution.
- The incubation period varies from 1 to 6 days.

- RVF virus has a relatively short transmission window (6–9 days) in non-insect hosts.
- Immunity derived from infection is lifelong.
- A number of species of mosquito that are present in Australia are potentially competent vectors for RVF virus. These are widespread in their distribution and are known to feed on a wide variety of hosts.
- Mechanical transmission by a number of insects, including *Culicoides* spp., *Simulium* spp. and ticks, has been demonstrated experimentally.
- RVF virus is susceptible to a range of disinfectants and detergents.
- The virus content of meat decreases rapidly following slaughter, as a result of the fall in pH.
- RVF virus is excreted in milk but can be inactivated by pasteurisation or treatment with acid.
- RVF is primarily a disease of ruminants. Goats, buffalo, camels and rodents are also important hosts and may play a significant role as reservoir hosts if RVF becomes established in Australia.

4 Policy and rationale

4.1 Introduction

Rift Valley fever (RVF) is a World Organisation for Animal Health (OIE)–listed disease that has the potential for rapid spread, with significant production losses. It is important in the international trade of cattle, sheep and goats, and is of major public health significance.

4.1.1 Summary of policy

The default policy with regard to an outbreak of RVF is to eradicate RVF in the shortest possible time using stamping out or, if the disease is widespread when diagnosed, to implement a control policy using modified stamping out until RVF can be eradicated. Implementation of this policy will involve a range of strategies, including:

- early recognition and laboratory confirmation of cases
- an immediate assessment of the epidemiological situation, including vector monitoring and serosurveillance of susceptible animals to determine the zone of active transmission
- destruction and disposal of infected animals
- destruction, disposal and decontamination of animal products likely to be contaminated, to reduce the source of infection
- quarantine and movement controls for animals in declared areas
- treatment and husbandry procedures to control vector attack on susceptible animals, minimise health and production effects, and provide animal welfare in declared areas
- decontamination of fomites (facilities, products and things) to eliminate the virus on infected premises and to prevent human infection
- tracing and surveillance to determine the source and extent of infection in both animals and insects, and to provide proof of freedom from the disease
- vaccination to create buffer zones for the protection of noninfected susceptible animals, protect against clinical disease and facilitate livestock movement; if an approved vaccine is available, vaccination is likely to be a key component of any control program
- vector control measures in declared areas to reduce the spread of disease by insects
- zoning to define infected and disease-free areas
- an awareness campaign to encourage cooperation from industry and the community, raise awareness of the public health risks and the need to follow public health guidelines, and, where necessary, assure consumers of product safety.

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

4.1.2 Case definition

For the purpose of this manual, a case of RVF is defined as laboratory-confirmed infection with RVF virus in a susceptible ruminant with or without clinical signs.

Notes:

- Positive serology in the absence of detection of RVF virus, with no clinical or epidemiological evidence supporting infection, does not constitute a definition of a case.
- AUSVETPLAN case definitions guide when a response to an emergency animal disease (EAD) incident should be undertaken. AUSVETPLAN case definitions do not determine when international reporting of an EAD incident is required.
- At the time of an outbreak, revised or subsequent case definitions may be developed with the agreement of the Consultative Committee on Emergency Animal Diseases (CCEAD).

4.1.3 Cost-sharing arrangement

In Australia, RVF is included as a Category 2 emergency animal disease in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (EAD Response Agreement – EADRA).[11] When cost sharing of the eligible response costs of an incident is agreed, Category 2 diseases are those for which costs will be shared 80% by government and 20% by industry.

4.1.4 Criteria for proof of freedom

Any approach to declaring proof of freedom should be based on the OIE *Terrestrial Animal Health Code* chapters on RVF (Chapter 8.15) and animal health surveillance (Chapter 1.4).

See Section 7 for further information on proof of freedom.

4.1.5 Governance

Governance arrangements for the response to EADs are outlined in the **AUSVETPLAN *Overview***.

Information on the responsibilities of a state coordination centre and local control centre is available in the **AUSVETPLAN management manual *Control centres management* (Parts 1 and 2)**.

4.2 Public health implications

As for other viral haemorrhagic fevers, a human case of RVF would be notified to the appropriate state or territory health authority. This authority, in collaboration with the Communicable Diseases Network Australia, will undertake epidemiological studies and liaise with the Australian Government. Epidemiological studies are essential to trace both the source of the infection and possible secondary cases.

The state and national health authorities will notify agricultural authorities in their respective jurisdictions, and liaise as required to minimise the impact on the agricultural sector.

Since many species of zoo animals are susceptible to RVF, biosecurity measures will need to be enforced in zoos to prevent spread of the disease to humans.

11 Information about the EAD Response Agreement can be found at www.animalhealthaustralia.com.au/eadra

Stamping out RVF will require close liaison with all affected industries.

4.3 Control and eradication policy

The policy is to control and eradicate RVF through stamping out, and to re-establish the RVF-free status of Australia as quickly as possible.

Any strategy must be supported by close liaison with all affected industries, public health authorities, the media and the public.

4.3.1 Epidemiological assessment

Epidemiological investigation or assessment draws on multiple sources of information to build understanding of the disease and how it is behaving in an outbreak. This helps inform response decision making.

The key objectives for an epidemiological assessment will be to identify:

- the spatial distribution of infected and free animal populations
- potential vectors involved, including as potential amplifying hosts
- the source of infection
- the prevalence of infection
- pathways of spread and the likely size of the outbreak
- risk factors for the presence of infection and susceptibility to disease (including weather and insect populations).

Epidemiological assessment, and tracing and surveillance activities (see Section 4.3.3) in an EAD response are interrelated activities. Early findings from tracing and surveillance will be inputs into the initial epidemiological assessment (eg considering spatial distribution of infection). The outcomes of

the initial epidemiological assessment will then guide decisions on subsequent tracing and surveillance priorities.

The outcomes of the epidemiological assessment will also be used initially to determine the feasibility of eradication versus long-term control and to guide the selection of other appropriate response measures (including the application of movement controls) and assess the progress of disease control measures.

Ongoing epidemiological assessment is important for any EAD response to aid evaluation of the continued effectiveness and value of response measures, and assessment of the progress of disease control measures. Ongoing epidemiological assessment will consider the outcomes of tracing and surveillance activities, and will contribute evidence to support any later claims of disease freedom.

4.3.2 Quarantine and movement controls

See Section 5 and 6 for details on declared premises and areas, and recommended quarantine and movement controls.

Quarantine

Quarantine will be immediately imposed on all premises and areas on which infection is either known or suspected.

Premises will be declared (see Section 5.3). A restricted area (RA) and control area (CA) will be declared around the infected premises (IP) (see Section 5).

Movement controls

Movement controls are best implemented through the declaration of declared areas and linking permitted movements to each area. As a general principle, the aim of movement controls is to reduce the spread of disease by preventing the movement of infected animals, infected animal products and infected vectors (where relevant for the disease), and by allowing movements that pose a minimal risk.

Section 6.4 provides details on movement controls for live animals, reproductive material (semen and in vivo–derived embryos), animal products and byproducts, waste products and effluent, and other items that might be contaminated.

Wool or fibre will be permitted to leave IPs, dangerous contact premises (DCPs), suspect premises (SPs) and trace premises (TPs) if it can be treated to render it safe, or if it is shown that it was harvested well before the trace-back period and that no subsequent contact with infected animals or things was possible.

4.3.3 Tracing and surveillance

Tracing

Trace-back will involve tracing the movements of susceptible animals, people and products for at least 14 days before the detection of the first clinical case. Trace-forward will involve movements from 14 days before the first clinical case to the time that quarantine is imposed. Tracing will include both livestock and animal products such as blood, milk, semen and embryos (where virus may persist and be infective). Since infected humans could play a role in the transmission of RVF virus, it may be necessary to trace both animals and people who have come into contact with RVF virus.

It is possible that the first reported animal case will not be the index case, and trace-back will identify other animal or human cases. Stock owners should be encouraged to maintain records of stock movements to facilitate tracing.

Surveillance

Surveillance will need to be undertaken on animals, including wild animals, on and around IPs and DCPs, to determine the sizes of the transmission area (TA), RA and CA. Surveillance in these areas will also be required if zoning is introduced. This information will play a major role in establishing proof of freedom.

Livestock in the TA and RA will be observed daily, where feasible, for clinical signs of disease. Blood will be taken at weekly intervals from a statistically valid sample of unvaccinated animals and tested for antibodies to RVF virus. This testing will commence following the index case and continue for 14 days following the last confirmed case. Serological monitoring will then be continued at monthly intervals for the next 12 months, and then quarterly for a further 2 years.

Surveillance for RVF in humans will be undertaken jointly by national and state/territory health authorities under the auspices of the Communicable Diseases Network Australia. Relevant data will be published by the Australian Government.

The state/territory and national health authorities will also notify agricultural authorities in their respective jurisdictions of human cases detected and potential sources of infection, and liaise as required to minimise the impact on the agricultural sector.

4.3.4 Zoning and compartmentalisation for international trade

Where it is not possible to establish and maintain disease freedom for the entire country, establishing and maintaining disease-free subpopulations, through zoning and/or compartmentalisation,[12] may be considered.

In the case of a limited disease outbreak, a containment zone[13] may be established around the areas where the outbreak is occurring, with the purpose of maintaining the disease-free status of the rest of the country outside the containment zone.

All zoning applications would need to be prepared by the Australian Government in conjunction with the relevant jurisdiction(s) and agreed to by the CCEAD. Zoning is usually negotiated after a disease outbreak has begun.

Compartmentalisation applications typically need to be negotiated before an outbreak occurs, and will require input from the relevant industries.

Recognition of both zones and compartments must be negotiated between the Australian Government and individual overseas trading partners. Zoning and compartmentalisation would require considerable resources that could otherwise be used to control an outbreak. Careful consideration will need to be given to prioritising these activities, because the resulting competition for resources could delay the quick eradication of the disease and recognition of disease freedom.

Agreements between trading partners take time to develop, consider and finalise, because of the need to provide detailed information on activities such as biosecurity, surveillance, traceability and diagnostics to support the approach that is developed. An importing country will need assurance that its animal health status is not compromised if it imports from an established disease-free zone in Australia. Trading partners may not accept a zoning or compartmentalisation proposal, regardless of the information provided. Eradication of disease may be achieved before zoning or compartmentalisation applications are finalised.

12 With zoning, disease-free subpopulations are defined primarily on a geographical basis. With compartmentalisation, disease-free subpopulations are defined primarily by management practices (such as the biosecurity plan and surveillance practices of enterprises or groups of enterprises).

13 The OIE defines a 'containment zone' as an infected zone within a previously free country or zone, which includes all suspected or confirmed cases that are epidemiologically linked and where movement control, biosecurity and sanitary measures are applied to prevent the spread of, and to eradicate, the infection or infestation. The Australian Government Department of Agriculture, Water and the Environment commissioned a report on what would be required for the establishment of containment zones in Australia. This report is available at www.ausvet.com.au/tools-resources.

The OIE guidelines for zoning and compartmentalisation are in Chapter 4.4 and Chapter 8.15 of the OIE *Terrestrial animal health code*.

4.3.5 Vaccination

General considerations

Importation of RVF vaccines is subject to the issuing of import permit(s) from the Australian Government Department of Agriculture, Water and the Environment. Supply and use of the vaccine in Australia will require an emergency permit and consent to import from the Australian Pesticides and Veterinary Medicines Authority. Importation, distribution, use and disposal of a vaccine that is a genetically modified organism must also be licensed by the Office of the Gene Technology Regulator, or permitted under an Emergency Dealing Determination by the minister responsible for gene technology, or other relevant and appropriate processes.

Vaccination will be approved by the National Management Group based on the recommendation of the CCEAD.

Specific considerations

At present, no RVF vaccine is approved for use in Australia, but vaccination may be used during an outbreak, under emergency use provisions, to protect animals in the immediate area of the index case. If an approved vaccine is available, all ruminants on farms within the RA, including properties within the TA, will be vaccinated as soon as possible with a suitable RVF vaccine in accordance with the manufacturer's directions (eg administered twice at an interval of 2–4 weeks). Vaccination of ruminants in the CA may follow. Consideration should be given to vaccination of zoo and high-value animals within the CA.

See Appendix 5 for further details on RVF vaccines.

4.3.6 Treatment of infected animals

There is no effective treatment for RVF.

4.3.7 Treatment of animal products and byproducts

Treatment of animal products from the RA and CA will be necessary.

Animals in the TA or RA will not be slaughtered for meat while transmission is occurring because of the high risk to humans from the slaughtering process. Animals can be slaughtered for meat only after transmission ceases.

However, animals in the CA may be sent to slaughter at an approved abattoir. Chilled or frozen meat is safe for consumption following storage and cooking.

Milk from certain premises in the TA (see Section 6.4.4) may be collected and transported under permit to an approved processing facility (APF) for pasteurisation. Milk from the RA and CA must be pasteurised before consumption. The product from the pasteurised milk may then be distributed without restriction. If the milk cannot be pasteurised, it must be disinfected by acidification and disposed of appropriately (refer to the **AUSVETPLAN operational manual *Disposal***).

Processing plants in the RA must comply with increased biosecurity protocols (refer to the relevant enterprise manuals, and the **AUSVETPLAN operational manuals *Decontamination*** and ***Disposal***) to continue receiving milk from any area, and be approved as an APF.

Since it is not known how long RVF virus can survive on wool after it is pressed into bales, all contaminated wool will be required to be decontaminated by chemical treatment, or isolation and storage. Where decontamination is not possible, the wool will be disposed of by burial or burning. Wool harvested within the TA during the period of virus transmission should be despatched for scouring, or scouring and carbonisation. Other fibres such as mohair should be treated by an equivalent process. Refer to the resource document ***Operational guidance on the decontamination of wool and wool facilities***.

Wool that is harvested within the period between diagnosis and 21 days before the onset of clinical signs will be considered to be contaminated. Although it is unlikely that RVF virus will survive outside the host for an extended time, all contaminated wool will be required to be decontaminated by chemical treatment, or isolation and storage; where decontamination is not possible, it will be disposed of by burial or burning. Wool can be considered to pose no risk after 30 days have elapsed since the last exposure to contamination. Biosecure isolation and storage of contaminated wool should be considered where suitable infrastructure is available. The storage time required, based on the susceptibility of the virus to desiccation and high temperatures, should be 30 days. During this time, the bales will remain in situ but isolated from contact. Scouring of wool (application of a water-soluble detergent at 60–70 °C) is effective in deactivating RVF virus. Scouring would be carried out in a commercial facility to which the wool would be transported under permit.

Skins, bones and manure from IPs will be regarded as contaminated, and therefore will be disinfected and disposed of as described in the **AUSVETPLAN operational manual *Disposal***.

4.3.8 Destruction of animals

Stamping out

Destruction of all susceptible animals on an IP (stamping out) will be undertaken only when it is believed that the disease has not become widespread and the virus has not established in insect vector populations. If the virus has not spread beyond the index property and stamping out is considered feasible, it will be carried out in association with movement controls, decontamination, vector control, and tracing and surveillance.

If stamping out is not considered feasible because the disease was widespread when diagnosed or it is believed that the virus has become established in the insect population, a modified stamping-out policy will be implemented. Within this overall policy, the strategies selected will depend on a thorough assessment of the epidemiological situation at the time, and will need to be reassessed during the course of the outbreak and altered if necessary. The selected strategies must be directed to containing and eliminating the virus, and protecting animal and public health.

It is very important that the timing and sequence of operations are such that they provide the greatest chance of eliminating RVF virus from IPs. Clinical cases will be destroyed first, followed by animals in direct contact with clinical cases, then the remaining susceptible animals (see the **AUSVETPLAN operational manual *Destruction of animals***).

Aerosols created by blood splash during destruction and disposal of animals present a considerable danger to operators. Safety precautions that minimise exposure to blood and other body fluids will need to be adopted, and only staff (including vaccinated staff) wearing appropriate personal protective equipment (PPE) should handle the animals.

4.3.9 Disposal of animals, and animal products and byproducts

Disposal of carcasses, animal products and animal byproducts should be in accordance with the **AUSVETPLAN operational manual *Disposal***, after consideration of factors such as topography, soil type and water table depth. The preferred method for milk that has been identified for disposal within a TA is by acidification and appropriate disposal. See the *Disposal* manual for further details.

Dead animals on farms outside the TA will be disposed of without postmortem examination. If a postmortem is to be performed, staff will need to be adequately protected against exposure to the virus by appropriate PPE, and have current vaccination (vaccinated people should still use PPE). Healthy animals on properties adjacent to the index farm should not be slaughtered.

Composting may be used for disposal, provided that temperatures within the pile reach at least 65 °C. Any assessment of the appropriateness of composting must include consideration of the persistence of RVF virus in proteinaceous substances exposed to heat, the risk to workers from aerosols, and the ability to monitor the composting process – in particular, temperature. Large-scale compost sites can be developed with minimal worker exposure and health risks (Eamens et al 2011).

Effective methods of decontamination should be considered to enable salvage of wool and other fibres and to prevent unnecessary destruction or disposal of the products (refer to the **AUSVETPLAN operational manual *Decontamination***).

4.3.10 Decontamination

For human health reasons and the necessity to demonstrate proof of freedom, property decontamination will be carried out, preferably using an acidic disinfectant such as 2% acetic acid (see Section 2.4.2).

Sheds and structures where animals have been held will be decontaminated. These include buildings used to house livestock, dairies, woolsheds, yards, and all areas used for destruction and disposal activities. It is important to ensure that blood-spattered areas are decontaminated by spraying with a suitable disinfectant (eg 2% acetic acid). At all stages of decontamination, steps need to be taken to prevent the generation and dispersal of infective dusts and aerosols.

After destruction of animals, the area and clothing can be decontaminated using formalin, glutaraldehyde-based disinfectants or acids. Enclosed premises may be fumigated with paraformaldehyde; alternatively, a suitable liquid disinfectant can be used.

See the **AUSVETPLAN operational manual *Decontamination*** and the ***Operational guidance on the decontamination of wool and wool facilities*** resource document for further details.

4.3.11 Wild animal management

Epidemiological investigations to determine the distribution and abundance of wild and feral animals (especially goats, camels and water buffalo) will need to be undertaken early in the outbreak to assess which (if any) wild animals are likely to be in contact with domestic stock and/or insect vectors, and the likely role of these animals in the outbreak. Initially, these investigations will focus on the IP, followed by sites throughout the TA. If wild animals pose a threat, the presence and extent of antibody or virus in the various populations will be determined. This may involve intensive trapping, baiting and shooting operations.

If serological or virological evidence of RVF virus is found in wild animals, more extensive and systematic epidemiological studies will be undertaken to monitor the extent and spread of the disease in the wild

animal populations. If a large wild animal population is found to be infected, the disease would be considered endemic, and wild animal controls would not be implemented.

If wild animals are considered to be a risk factor in the dissemination of infection, programs aimed at reducing contact between infected vectors, wild animals and uninfected susceptible livestock will be initiated as soon as possible. This is because wild animals may remain a mobile reservoir of virus that could be transmitted by insects to domestic livestock.

See the **AUSVETPLAN operational manual *Wild animal response strategy*** for details on performing wild animal population surveys, containment, control and disease surveillance.

4.3.12 Vector management

In the event of an outbreak, surveillance of vectors will need to be conducted for virus isolation and to record the current population of biting insects. A range of collection techniques, including carbon dioxide light traps, truck traps and larval sampling, will be necessary.

To limit the spread of the virus, vector control will need to be attempted as rapidly as possible after diagnosis of RVF. The methods used will be determined by the particular circumstances, including the available equipment and insecticide, the target species, the location, the weather and, in the case of systemic or pour-on insecticides, stock density and accessibility (see Appendix 3).

If spraying is undertaken, the appropriate people or groups – including the local council, local landholders, police and beekeepers operating in the area – will need to be advised. Mosquito populations can be reduced by draining areas of still water and applying controls over the use of water for irrigation. Susceptible animals should be kept away from areas known to be mosquito breeding grounds, such as bogs and other wetlands. Where water cannot be drained, larvicides can be applied. (For details regarding insecticide application, see Appendix 2.)

Treatment of all domestic livestock in the area with either a systemic insecticide, such as ivermectin (Standfast et al 1984), or a topical insecticide will reduce the population of some of the potential vector species. These chemicals have withholding periods that will need to be observed.

Targeted vector suppression measures could be considered around valuable commercial animals (eg high-value genetic stock), or rare or valuable animals or herds (eg zoo animals).

4.3.13 Public awareness and media

Public awareness programs will be mounted by the appropriate state or territory human and animal health authorities, in collaboration with the Australian Government. Because of the public health significance of RVF, the public must be kept fully and accurately informed.

Producers will need to be informed of the symptoms of RVF and what to do if they suspect it in their herd or their workers.

The public awareness programs must advise people in high-risk occupations – such as pastoralists, abattoir workers, butchers and veterinarians – of the measures to be applied to reduce the potential for human exposure to disease.

A media information kit similar to those recommended in the ***Biosecurity incident public information manual*** needs to be available as soon as the disease is diagnosed.

4.3.14 Other strategies

Where destocking has been used as a means of disease control, the period before the introduction of sentinel animals will depend on whether transovarial transmission within an insect vector is considered likely (see Section 2.4.2). If transovarial transmission is unlikely, a period of 6 weeks will be used. If transovarial transmission is likely, the period may be extended to up to 1 year, depending on the weather (particularly rainfall) and ongoing vector monitoring.

Serological monitoring of unvaccinated animals will be necessary at monthly intervals for 1 year and quarterly for the following 2 years to demonstrate freedom from the disease (see Section 7).

A decision on when to allow full restocking will be made after taking epidemiological factors into account (eg the presence and type of vectors, and the presence or absence of disease elsewhere).

Strategy if the disease becomes established

If RVF becomes endemic in Australia, the most effective control strategy would be to vaccinate animals with a suitable RVF vaccine.

At present, no RVF vaccine is approved for animal use in Australia, and there is no specific therapeutic agent for the disease. Therefore, control strategies would be:

- vector control (adult and larval)
- public education about vector control and means of preventing exposure to vectors (eg insect repellents and mosquito nets)
- public education about the risks of occupational exposure
- strengthening of surveillance and intervention programs.

Vector control programs should be undertaken at the state/territory government, local government and individual levels. Public education would be the responsibility of the state and territory governments.

4.4 Funding and compensation

Details of the cost-sharing arrangements can be found in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses.[14] Details of the approach to the valuation of, and compensation for, livestock and property in disease responses can be found in the **AUSVETPLAN operational manual *Valuation and compensation***.

14 www.animalhealthaustralia.com.au/eadra

5 Declared areas and premises

When an emergency animal disease (EAD) is first suspected, the premises involved would undergo a clinical and/or epidemiological investigation. If the case definition, as defined in the relevant AUSVETPLAN response strategy, is met (ie the index case[15]), the relevant chief veterinary officer (CVO) or their delegate will determine the premises classification and may declare the premises an infected premises (IP).

After the identification of the first IP, a restricted area (RA) and a control area (CA) may be declared.[16] A transmission area (TA) may also be defined, if appropriate. All premises within these areas will be classified.

At the beginning of an EAD incident, the initial premises classifications would be IP, at-risk premises (ARP), premises of relevance (POR), unknown status premises (UP) and zero susceptible species premises (ZP).

Any premises within the RA or CA will have only one classification at any one time. After an epidemiological investigation, clinical assessment, risk assessment or completion of control measures, a premises may be reclassified.

Once the first IP has been identified, intelligence gathering through veterinary epidemiological investigations would quickly lead to the identification of suspect premises (SPs) and trace premises (TPs). These would be high priorities for follow-up investigation by the relevant state or territory authorities. In a worst-case scenario, an SP could become an IP; therefore, SPs need to be investigated as a matter of very high priority. Similarly, investigation and risk assessment of a TP might identify it as an IP, dangerous contact premises (DCP) or dangerous contact processing facility (DCPF). An SP or TP might also be assessed as negative and qualified as SP-AN or TP-AN, and eventually reclassified as an ARP, POR or ZP.

All premises classifications are subject to change as a result of a modification in the case definition(s) or investigation(s) as the incident response proceeds.

Classifications should be applied with information needs of managers in mind. They should assist managers to monitor and report progress. Premises classifications to be used should be agreed early in a response, so that control centre personnel can apply the correct and consistent classifications and definitions from the outset of the investigation and response.

15 The first case to come to the attention of investigators

16 This is invariably the case with highly contagious diseases (eg foot-and-mouth disease, equine/avian/swine influenza, classical swine fever) but may not apply to less contagious diseases (eg Hendra virus, anthrax, Australian bat lyssavirus).

5.1 Declared areas

Maintaining movement restrictions on areas for long periods has important implications for resource management, animal welfare, business continuity, and socioeconomic impacts on producers and regional communities.

During the course of an EAD response, it may become necessary for a CA or RA to be expanded, as additional geographical areas or new foci of infection are identified. Later in the response, as control is achieved, mechanisms for gradually reducing the size of the CA and RA can be introduced.

An EAD may involve multiple foci of infection, with several jurisdictions potentially involved. Since disease might be controlled at different rates in different areas, there may be the opportunity to progressively lift restrictions on an area basis. This would involve reclassifying previously declared areas (RAs and CAs), with a staged approach to lifting of movement restrictions. This is a key step in the recovery process and will have positive benefits on the community.

5.1.1 Restricted area (RA)

An RA will be a larger legally declared area around the TA. The boundary of the RA does not have to be circular or parallel to that of the TA but should be at least 'y' km from the boundary of the TA; this distance may be influenced by World Organisation for Animal Health (OIE) standards or an official control program. The RA can include areas of known competent vector distribution. In general, surveillance may be less intense than in the TA, but movement controls will be the same.

The boundary of the RA will be adjusted as confidence about the extent of the incident increases. It will take into account the relevant OIE *Terrestrial animal health code* chapter on the disease and, if appropriate, OIE standards on zoning and compartmentalisation (Chapter 4.4).[17]

5.1.2 Control area (CA)

A CA is a legally declared area where the disease controls, including surveillance and movement controls, applied are of lesser intensity than those in an RA (the limits of a CA and the conditions applying to it can be varied during an incident according to need).

A CA is a disease-free buffer between the RA and the outside area (OA). Specific movement controls and surveillance strategies will be applied within the CA to maintain its disease-free status and prevent spread of the disease into the OA.

An additional purpose of the CA is to control movement of susceptible livestock for as long as is necessary to complete tracing and epidemiological studies, to identify risk factors and forward and backward risk(s).

The CA will be a larger declared area around the RA(s) – initially, possibly as large as the state or territory in which the incident occurs – where restrictions will reduce the risk of disease spreading from the RA(s). The CA will have a minimum radius of 250 km, encompassing the RA(s). It may be defined according to geography, climate and the distribution of relevant wild (including feral) animals. The boundary will be adjusted as confidence about the extent and distribution of the incident increases.

In general, surveillance and movement controls will be less intense in the CA than in the RA, and disease-susceptible animals and their products may be permitted to move under permit within and out of the area.

17 www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access

Aedes mosquitoes are a primary RVF vector.

5.2 Other areas

It is possible that other types of areas (eg vaccination area or surveillance area), which are not legally declared, may be used for disease control purposes in some jurisdictions.

5.2.1 Transmission area (TA)

A TA is not a legally declared area but will include all IPs and, where possible, all SPs, TPs, DCPs and DCPFs. In the presence of competent vectors, a TA of 150 km radius should be drawn. The TA does not need to be circular but can have an irregular perimeter, provided that the boundary is initially an appropriate distance from the nearest IP, DCP, DCPF, SP or TP. This distance will depend on the information gained about vector numbers and competence, environmental factors (eg prevailing winds, rainfall, temperature, humidity), and the number and distribution of infected and/or susceptible animals. In the absence of competent vectors, the TA may be reduced in size.

5.3 Premises classifications

Detailed guidelines for classifying premises statuses are provided in the **AUSVETPLAN guidance document *Declared areas and allocation of premises classifications in an EAD response***, and the definitions are in the Glossary.

5.3.1 Premises status classifications

For Rift Valley fever (RVF), the premises classifications to be used are:

- infected premises (IP)
- suspect premises (SP)
- trace premises (TP)
- dangerous contact premises (DCP)
- dangerous contact processing facility (DCPF)
- approved processing facility (APF)
- approved disposal site (ADS)
- at-risk premises (ARP)
- premises of relevance (POR)
- resolved premises (RP)
- unknown status premises (UP)
- zero susceptible species premises (ZP).

5.3.2 Qualifiers

Please also refer to the **AUSVETPLAN guidance document *Declared areas and allocation of premises classifications in an EAD response*** for more detail on qualifiers.

For Rift Valley fever (RVF), the qualifiers to be used are:

- assessed negative (AN)
- sentinels on site (SN)
- vaccinated (VN).

5.4 Reclassifying premises and previously declared areas

Maintaining movement restrictions on areas for long periods has important implications for resource management, animal welfare, business continuity, and socioeconomic impacts on producers and regional communities. Therefore, attention should be given to reclassifying premises and previously declared areas as quickly as possible.

Detailed guidelines for reclassifying previously declared areas are provided in the **AUSVETPLAN guidance document *Declared areas and allocation of premises classifications in an EAD response***.

5.4.1 Reclassifying previously declared areas

The lifting of restrictions in declared areas is managed by jurisdictions according to their local legislation, regulations and processes.

The key principles for reclassifying a previously declared area during a response should include the following, noting that not all will be relevant for some diseases:

- The area should be epidemiologically distinct from other declared areas.
- All TPs and SPs have been investigated and reclassified, and all IPs, DCPs and DCPFs in the area have been reclassified as RPs.
- All tracing and surveillance associated with EAD control has been completed satisfactorily, with no evidence or suspicion of infection in the area.
- A minimum period of 28 days[18] has elapsed since predetermined disease control activities and risk assessment were completed on the last IP or DCP in the area.
- An approved surveillance program (including the use of sentinel animals, if appropriate) has confirmed no evidence of infection in the RA (see below).
- For vector-borne diseases, vector monitoring and absence of transmission studies indicate that vectors are not active.

Lifting of restrictions is a process managed by the combat CVO under jurisdictional legislation and consistent with the most current agreed Emergency Animal Disease Response Plan. When the appropriate conditions are satisfied, a combat jurisdiction can, in consultation with the Consultative Committee on Emergency Animal Diseases (CCEAD), reduce the size of the RA or lift all restrictions. The previous part of the RA would then become part of the CA. Jurisdictions should be able to present documented evidence that the appropriate conditions have been met.

When an RA is lifted and becomes part of the CA, it will have a lower risk status, and the movement restrictions that apply will be consistent with those applying within the CA. Over time, all of the RAs will be reduced and lifted.

If more than one combat jurisdiction is involved, each will use its own appropriate legal jurisdictional mechanisms to lift the declaration of the RA or CA, coordinating with each other and consulting with the CCEAD to ensure wide communication and coordination.

After a further period of surveillance and monitoring, and provided that the additional surveillance and monitoring find no evidence of infection, a jurisdiction, in consultation with the CCEAD, could lift the CA. This would result in the lifting of all the remaining regulatory controls associated with the response, and a return to business as usual.

18 The minimum period uses, or is based on, the disease-specific incubation periods defined by the OIE – two incubation periods is a common guideline. In this case, two infective periods is recommended.

6 Movement controls

6.1 Principles

The principles for the recommended quarantine practices and movement controls are as follows:

- Containment and eradication of Rift Valley fever (RVF) is the highest priority. Therefore, 'normal business movements' are not allowed.
- Live animals pose the greatest risk of disease spread; therefore, their movements from all premises within the restricted area (RA) and control area (CA) must be strictly controlled.
- The outside area (OA) should remain as 'clean' as possible. Therefore, movement of animals from the RA to the OA is prohibited, and movement of products is generally prohibited. Movement of animals and products from the CA to the OA will also be restricted.
- Trace premises (TP) and suspect premises (SP) are temporary classifications, and every effort should be made to resolve the status of these premises as soon as possible.
- The numbers of susceptible animals within the RA should be minimised. Therefore, movements of animals into the RA will be limited and usually for slaughter only.
- Movement restrictions are more stringent within the RA than within the CA, and will be more stringent in the early stages of the response.
- Movement controls may be varied during a response from those listed here. However, this will involve a variation to the agreed Emergency Animal Disease Response Plan, with endorsement by the Consultative Committee on Emergency Animal Diseases (CCEAD) and the National Management Group (NMG).
- Recommended movement controls apply to any movement off a premises, whether on foot or by vehicle, that involves either public or private land.
- All movement control matrixes and narratives are for guidance.
- Application for a movement permit does not automatically mean that one will be granted.
- In emergency or exceptional circumstances, any proposed movement may be considered by the jurisdictional chief veterinary officer (CVO) on a risk-assessed case-by-case basis.
- Interstate movements will need to meet the import requirements of the receiving jurisdiction.

6.2 Guidelines for issuing permits

In an emergency animal disease (EAD) event, quarantine and movement controls must strike a balance between quick and effective disease control and business continuity. Therefore, it is not appropriate to simply prohibit all movement of animals and products. On the other hand, diligence needs to be applied to minimise the risk of further spread of the disease.

Recommended biosecurity and movement controls in each AUSVETPLAN response strategy provide guidance on which movements can be allowed and under what conditions. This is based on an analysis of the disease risks that are presented by a specific movement, of a specific commodity, at a specific time during the EAD response phase. Each disease strategy will indicate whether a proposed movement is:

- allowed (under normal jurisdictional, including interstate, requirements)
- prohibited – except under the conditions of a general, special or emergency permit
- prohibited.

Permits may not be available until the relevant CVO provides approval for movements, and this may not be available in the early stages of a response. When assessing risk for the purposes of issuing a permit, the elements to consider may include:

- sources of risk
  - risk material such as live or dead susceptible animals, semen, embryos, meat, meat products, waste products, offal, paunch screenings, manure, render material, fertiliser, biological specimens, casings, used wrappers and cartons, effluent, fomites (vehicles, people, nonsusceptible animals, crops, grains, hay silage and mixed feeds)
  - presence of the disease agent on both the originating and destination premises, and uncertainty
  - location of source and destination premises
  - fate at destination premises (eg for slaughter vs for growing out)
  - current vector activity, if relevant
  - organisation and management issues (ie confidence in animal tracing and surveillance, biosecurity)
  - proposed use of the animals or products
  - proposed transport route
  - vaccination status of the animals, if relevant
  - security and monitoring at the destination
  - environment and natural events
  - community and human behaviour
  - risk of sabotage
  - technology
  - regulations and standards
  - available resources for compliance and enforcement
- areas of impact
  - livestock health (health of affected species, including animal welfare)
  - human health (including work health and safety)
  - trade and economic impacts (including commercial and legal impacts)
  - environmental impacts
  - organisational capacity
  - political impacts
  - reputation and image
  - proposed risk treatment measures
  - vaccination

- destruction of animals
- processing of product
- disinfection or other treatment of animals, vehicles and fomites
- vector control, if relevant
- security
- communication.

6.3 Types of permits

Permits are either general or special. Emergency permits are a form of special permit. Permits are legal documents that describe the animal(s), commodities or things to be moved, the origin and destination, and the conditions to be met for the movement. Either type of permit may include conditions. Once permit conditions have been agreed from an operational perspective, all permit conditions must be met for every permit. Both general and special permits may be in addition to documents required for routine movements between or within jurisdictions (eg health certificates, waybills, consignment notes, National Vendor Declarations – NVDs).

General permit

General permits (GPs) are used for lower-risk movements, and create a record of each movement to which they apply. They are granted without the need for direct interaction between the person moving the animal(s), commodity or thing and a government veterinarian or gazetted inspector of stock. The permit may be completed via a webpage or in an approved place (such as a government office or commercial premises). A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. GPs may not be available until the relevant CVO gives approval for general movements, and this may not be available in the early stages of a response.

Special permit

Special permits (SpPs) are issued by the relevant government veterinarian or gazetted inspector of stock. They are used for higher-risk movements, and therefore require formal application and individual risk assessment. SpPs describe the requirements for movement of an animal (or group of animals), commodity or thing, for which a specific assessment has been conducted by the relevant government veterinarian or gazetted inspector of stock. A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements.

Emergency permit

An emergency permit is an SpP that specifies strict legal requirements for an otherwise high-risk movement of an animal, to enable emergency veterinary treatment to be delivered, to enable animals to be moved for animal welfare reasons, or to enable any other emergency movement under exceptional circumstances. These permits are issued on a case-by-case basis under the authorisation of the relevant CVO.

Other movement requests

Movements not reflected within any of the movement control matrixes or narratives may be considered by the relevant jurisdictional CVO on a risk-assessed case-by-case basis.

6.4 Recommended movement controls

Effective quarantine and movement controls are essential to minimise spread of RVF virus by animals. Initially, stringent controls on the movement and congregation of susceptible livestock will be imposed. These may be relaxed once the situation has been fully assessed.

The results of the epidemiological investigation will determine whether continuing quarantine and movement controls are warranted. It is important to be aware of possible trade concerns about the movement of animals from the vicinity of the outbreak area to free areas, even if such movements carry negligible disease risk. Any movement restrictions placed on live animals might be influenced more by trade considerations than by disease risk. Affected jurisdictions may wish to act conservatively until the epidemiological investigation is complete, and the full extent of the disease risk and the trade risk is known.

Movement controls will be maintained to some degree until the disease is either eradicated or declared endemic. If a vaccination campaign is carried out, far fewer restrictions will apply to vaccinated animals (once their immunity is established) than to unvaccinated animals.

This section offers a guide for common movements of susceptible livestock and livestock transport vehicles; however, a risk assessment of the situation should also be done and any necessary changes made to suit the situation.

See Appendix 4 for the permit conditions.

Commodity groups

Commodity groups for which no movement controls apply include animal products (eg milk, meat and meat products, wool and leather) that have been subject to appropriate treatment at an approved processing facility (APF).

Commodity groups for which movement controls apply are:

- live ruminants (pregnant and nonpregnant)
- live ruminants for slaughter
- nonruminants
- ruminant reproductive material
- vehicles used for livestock transport
- raw milk and milk products
- untreated meat and meat products
- untreated animal byproducts
- untreated wool and fibres
- untreated hides and skins
- untreated carcases
- specimens.

Control of vector movement

Infected vectors can be mechanically transferred in vehicles, containers, crates and so on. For any movement of any item, steps should be taken to stop the mechanical movement of competent vectors with that item. Usually, this would comprise use of knockdown or residual insecticidal treatments.

This precaution should be applied to all species – both those requiring a permit to move and those that are not subject to movement controls.

As well, a communication strategy should be considered to inform affected communities of strategies to reduce this risk so that people can take their own steps to prevent the spread of infected vectors – for example, spraying the interior of vehicles before leaving a transmission area (TA).

Treatment of vectors as part of movement controls is outlined in the movement control matrixes in the following sections.

6.4.1 Live susceptible animals

Live ruminants and other susceptible animals not being sent to slaughter

Table 6.1 describes the recommended movement controls for live ruminants and other susceptible animals, apart from those being sent to slaughter, within and between declared areas.

Table 6.1 Recommended movement controls for live ruminants and other susceptible animals not being sent to slaughter

To → / From ↓	TA	RA	CA	OA
TA	Prohibited, except under SpP – conditions 1, 4, 5, 7, 9, 10, 14, 15, 16, 21	Prohibited, except under SpP – conditions 1, 4, 5, 7, 9, 10, 14, 15, 16, 21	Prohibited	Prohibited
RA	Prohibited, except under SpP – conditions 1, 4, 5, 7, 9, 10, 14, 15, 16, 21	Prohibited, except under SpP – conditions 1, 4, 5, 7, 9, 10, 14, 15, 16, 21	Prohibited	Prohibited
CA	Prohibited, except under SpP – conditions 1, 6, 7, 10, 16, 21	Prohibited, except under SpP – conditions 1, 6, 7, 10, 16, 21	Prohibited, except under GP – conditions 1, 7, 8, 15, 16, 21	Prohibited, except under GP – conditions 1, 7, 8, 15, 16, 21
OA	Prohibited, except under SpP – conditions 1, 6, 7, 10, 16, 21	Prohibited, except under SpP – conditions 1, 6, 7, 10, 16, 21	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements

CA = control area; GP = general permit; OA = outside area; RA = restricted area; SpP = special permit; TA = transmission area

Live ruminants and other susceptible animals being sent to slaughter

Table 6.2 describes the recommended movement controls for live ruminants and other susceptible animals being sent for slaughter within and between declared areas. Care needs to be taken, because the slaughter of viraemic animals may result in human infection.

Table 6.2 Recommended movement controls for live ruminants and other susceptible animals being sent to slaughter

To → / From ↓	TA	RA	CA	OA
TA	Prohibited, except under SpP – conditions 3, 7, 11, 12, 14, 21	Prohibited, except under SpP – conditions 3, 7, 11, 12, 14, 21	Prohibited, except under SpP – conditions 3, 7, 11, 12, 14, 21	Prohibited, except under SpP – conditions 3, 7, 11, 12, 14, 21
RA	Prohibited, except under SpP – conditions 1, 7, 11, 12, 14, 21	Prohibited, except under SpP – conditions 1, 7, 11, 12, 14, 21	Prohibited, except under SpP – conditions 1, 7, 10, 16, 21, 22	Prohibited, except under SpP – conditions 1, 7, 10, 16, 21, 22
CA	Prohibited, except under GP – conditions 1, 7, 8, 13, 21	Prohibited, except under GP – conditions 1, 7, 8, 13, 21	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements
OA	Prohibited, except under GP – conditions 1, 7, 8, 13, 21	Prohibited, except under GP – conditions 1, 7, 8, 13, 21	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements

CA = control area; GP = general permit; OA = outside area; RA = restricted area; SpP = special permit; TA = transmission area

6.4.2 Semen and embryos from live susceptible animals

Table 6.3 describes the recommended movement controls for ruminant reproductive material within and between declared areas.

Table 6.3 Recommended movement controls for ruminant reproductive material

To → / From ↓	TA	RA	CA	OA
TA	Prohibited	Prohibited	Prohibited	Prohibited
RA	Prohibited, except under SpP – conditions 18, 19	Prohibited, except under SpP – conditions 18, 19	Prohibited, except under SpP – conditions 18, 19	Prohibited
CA	Prohibited, except under GP – conditions 1, 8, 17, 20, 21	Prohibited, except under GP – conditions 1, 8, 17, 20, 21	Prohibited, except under GP – conditions 1, 8, 17, 20, 21	Prohibited, except under GP – conditions 1, 8, 17, 20, 21
OA	Prohibited, except under GP – conditions 1, 8, 17, 20, 21	Prohibited, except under GP – conditions 1, 8, 17, 20, 21	Prohibited, except under GP – conditions 1, 8, 17, 20, 21	Prohibited, except under GP – conditions 1, 8, 17, 20, 21

CA = control area; GP = general permit; OA = outside area; RA = restricted area; SpP = special permit; TA = transmission area

6.4.3 Meat and meat products

Meat, meat products and carcases derived from animals from lower-risk premises (at-risk premises – ARPs) within the TA, or any premises within the RA, CA or OA, do not present a significant food safety risk; therefore, movement of these products would generally be allowed from APFs.

Meat, meat products and carcases derived from animals from higher-risk premises within the TA should be subject to maturation at an APF at a temperature of more than 2 °C for a minimum of 24 hours post-slaughter. Following this processing, the meat, meat products and carcases are allowed to be distributed without restrictions.

No meat, meat products or carcases of susceptible animals, including field-shot animals, from premises that are not registered abattoirs or commercial meat processing enterprises should be moved within or out of the TA, RA or CA.

6.4.4 Milk and dairy products

Table 6.4 describes the recommended movement controls for raw milk within and between declared areas.

Pasteurised milk and product from pasteurised milk is allowed to be distributed without restrictions.

Table 6.4 Recommended movement controls for raw milk

To → / From ↓		TA	RA	CA	OA
TA	IP	Prohibited, except under SpP – conditions 9, 10, 23, 24, 31	Prohibited, except under SpP – conditions 9, 10, 23, 24, 31	Prohibited	Prohibited
	DCP, TP, SP, ARP	Prohibited, except under SpP – conditions 1, 10, 25, 26, 27	Prohibited, except under SpP – conditions 1, 10, 25, 26, 27	Prohibited	Prohibited
RA		Prohibited, except under SpP – conditions 1, 10, 26, 27	Prohibited, except under SpP – conditions 1, 10, 26, 27	Prohibited	Prohibited
CA		Prohibited, except under GP – conditions 1, 8, 20, 28	Prohibited, except under GP – conditions 1, 8, 20, 28	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements
OA		Prohibited, except under GP – conditions 1, 8, 20, 28	Prohibited, except under GP – conditions 1, 8, 20, 28	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements

ARP = at-risk premises; CA = control area; DCP = dangerous contact premises; GP = general permit; IP = infected premises; OA = outside area; RA = restricted area; SP = suspect premises; SpP = special permit; TA = transmission area; TP = trace premises

6.4.5 Hides, skin, wool and other fibres

Table 6.5 describes the recommended movement controls for unprocessed hides, skins, wool and fibres within and between declared areas.

Hides, skins, wool and fibres that have been appropriately treated are allowed to be distributed without restriction.

Table 6.5 Recommended movement controls for unprocessed hides, skins, wool and fibres

To → / From ↓		TA and RA	CA	OA
TA and RA		Prohibited, except under SpP – conditions 9, 10, 29, 30	Prohibited	Prohibited
CA	SP, TP	Prohibited, except under SpP – conditions 9, 10, 29, 30	Prohibited	Prohibited
	POR	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements
OA		Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements	Allowed under normal jurisdictional (including interstate) requirements

CA = control area; OA = outside area; POR = premises of relevance; RA = restricted area; SP = suspect premises; SpP = special permit; TA = transmission area; TP = trace premises

6.4.6 Other animal byproducts

Movements of animal byproducts derived from animals from higher-risk premises within the TA would only be allowed to an APF within the TA for disposal (which may include rendering).

Animal byproducts derived from animals from lower-risk premises (ARPs) within the TA, or any premises within the RA, CA or OA, do not present a significant food safety risk or risk of spread of the disease; therefore, movement of these products would generally be allowed from APFs.

No animal byproducts of susceptible animals, including field-shot animals, from premises that are not registered abattoirs or commercial meat processing enterprises should be moved within or out of the TA, RA or CA.

6.4.7 Vehicles, including empty livestock transport vehicles and associated equipment

Vehicles transporting nonsusceptible animals should meet the requirements for livestock transport if they have had any contact with susceptible animals.

For vehicles transporting live animals, cleaning and treating for vectors involves cleaning to remove manure after each load, then treating with an appropriate insecticide that is effective against vectors.

Disinfection of containers, crates and so on involves removing blood and body fluids, then treating with an appropriate insecticide that is effective against vectors. For details of appropriate insecticide treatments, refer to the **AUSVETPLAN operational manual *Decontamination***.

Table 6.6 describes the requirements for treatment of empty vehicles, containers, crates and other things by transport operators. On presentation of a decontaminated vehicle, container, crate or other thing to an inspector, the operator can apply for a decontamination certificate (see Appendix 3 for further information on disinsectation procedures).

Table 6.6 Treatment of vehicles, including empty livestock transport vehicles and associated equipment

To → / From ↓	TA	RA	CA	OA
TA	Clean and treat for vectors	Clean and treat for vectors	Clean and treat for vectors	Clean and treat for vectors
RA	Clean and treat for vectors	Clean and treat for vectors	Clean and treat for vectors	Clean and treat for vectors
CA	Not required	Not required	Not required	Not required
OA	Not required	Not required	Not required	Not required

CA = control area; OA = outside area; RA = restricted area; TA = transmission area

6.4.8 Nonsusceptible animals

Care must be taken to avoid transport of infected vectors with any movement of nonsusceptible animals (birds, reptiles and amphibians).

6.4.9 Specimens

Specimens should be collected according to Section 2.5.4, and packed and transported according to guidelines of the International Air Transport Association.

6.4.10 Animal movements for emergency (including welfare) reasons

For emergency veterinary treatment of susceptible animals, the first preference is for veterinarians to visit the property.

If a susceptible animal has to be transported for emergency veterinary treatment, the animal should be treated with an insecticide before movement. At the destination, an attempt should be made to control vectors.

If other emergency animal welfare movements are required (eg because of lack of food or water, or overcrowding), these should be assessed and permits issued on a case-by-case basis.

7 Surveillance and proof of freedom

7.1 Surveillance

A statistically valid sample of animals from herds within the restricted area (RA), including the transmission area (TA), must be sampled weekly until 30 days following the last confirmed case. Thereafter, the samples may be collected monthly for the next 12 months and quarterly for a further 2 years.

In a widespread outbreak where vaccination is used, because of the sheer logistics, the amount of sampling may have to be reduced until no more clinical cases are being detected. In this case, the monthly sampling may begin at this time.

Statistical formulae for the sampling rate have not been determined, although the need for a confidence limit of 95% or higher can be assumed. To some extent, the sampling rate will depend on livestock density, climate and insect populations in the RA.

Surveillance of vectors may be carried out as described in Section 4.3.3 and Appendix 2.

Sentinel animals

In an isolated outbreak where the index farm has been slaughtered out, sentinel animals will be placed on the farm 6 weeks after destocking. However, if transovarial transmission in an insect population is considered a possibility, this period could be extended to up to 1 year.

The time of full restocking can only be decided after all epidemiological factors have been taken into account. In a worst-case scenario, it could be as long as 3 years after destocking. This would be in the case of a small, isolated outbreak where *Aedes* spp. mosquitoes are abundant but where there is no apparent spread to other farms and virus is not isolated from any trapped insects. The 3-year period would be to ensure that virus was not maintained in the area by transovarial transmission in the mosquito population.

7.2 Proof of freedom

Following an outbreak of Rift Valley fever (RVF), surveillance will be required to demonstrate that infection has been eradicated from the population. Proof of freedom may also be needed to satisfy trading partners and regain access to international markets. The World Organisation for Animal Health (OIE) *Terrestrial animal health code* (Chapter 8.15) lists the criteria for a country or zone to be considered free from RVF virus infection. Reinstatement of Australia's official RVF-free status would be on the basis of self-declaration to the OIE, as per Article 1.6.1 of the Terrestrial Code.

A1 Appendix 1

RIFT VALLEY FEVER FACT SHEET

Disease and cause

Rift Valley fever (RVF) is caused by infection with RVF virus.

Occurrence in Australia

RVF has never occurred in Australia.

Species affected

RVF virus is highly pathogenic for sheep and cattle. Donkeys, horses, pigs, adult dogs and cats, and rodents can be infected during large outbreaks, but they are considered unlikely to play a major role during RVF outbreaks.

The susceptibility of Australian native fauna is not known.

Key signs

In cattle, sheep and goats, the disease is most severe in young animals, in which high mortalities can occur. In peracute (very acute) cases, animals are found dead or collapse and die when moved.

Spread

RVF is transmitted by insect vectors (primarily mosquitoes) or direct contact with organs or fluids of infected animals.

Persistence of the agent

The RVF virus particle is relatively large and has a lipid-containing envelope, making it susceptible to a range of disinfectants, including detergents.

Impacts for Australia

An uncontrolled outbreak of RVF would cause serious stock losses in the sheep, cattle and goat industries. The resulting financial losses would have a major effect on the local economy in the area of the outbreak and job losses both on farms and in support industries would occur.

A2 Appendix 2

PROCEDURES FOR VECTOR MONITORING AND CONTROL

Monitoring

Vector monitoring to identify the species of vector present, and their distribution and relative abundance should be one of the first steps in a response to a vector-borne disease. Polymerase chain reaction (PCR) testing of trapped vectors may indicate whether they are carrying disease agents. Vector monitoring could also indicate the effectiveness of disinsectation and vector-control strategies.

At the national level, facilities for monitoring are limited, so resources need to be deployed to achieve maximum effect. Advice must be taken from specialists in this area.

Because of the broad spectrum of genera and species of biting insects from which Rift Valley fever (RVF) virus has been isolated, all blood-sucking insects should be considered as potential vectors, although mosquitoes will be the prime suspects.

Carbon dioxide–baited light traps have been used for vector sampling in a number of African studies. Health and local government authorities in most Australian states and territories currently use similar traps for arbovirus and adult mosquito monitoring programs. The preference would be to base monitoring on sampling of adult mosquitoes using carbon dioxide–baited traps. CSIRO uses light traps designed to collect *Culicoides* biting midges, and should be able to supply adequate numbers of these. The actual numbers of traps used will depend on the area to be sampled. Analysis of collections will be limited by the availability of staff with appropriate expertise.

Larval mosquito sampling can be considerably more time-consuming than adult sampling and is often less reliable as a measure of prevalence.

If collections are to be processed for virus isolation, insects will need to be collected live. If they are purely for population analysis, they should be placed into 70% ethanol. The technology to allow virus isolation from specimens preserved in alcohol is currently being refined.

Collections should aim to provide information on:

- all the potential vector species present
- the relative abundance of these species
- breeding sites of these species.

Much of this type of information may be available from health and local government authorities, which routinely conduct arbovirus disease control programs.

Control

The main aim of any vector control program must be breaking the transmission cycle by rapidly reducing the numbers of all insects that are capable of taking up virus from vertebrate hosts. The main types of insecticide application to control adult insects are:

- ultra-low volume (ULV) application from the ground
- ULV application from the air
- thermal fogs or mists from the ground
- systemic or topical treatment of livestock.

The principal mosquito control measure would most likely be ground-based ULV spraying of adult mosquitoes using malathion (Maldison®). The efficiency of such treatment depends on:

- identification and elimination of significant breeding sites of the important vector species
- the prevailing weather
- machinery access (for ground-based spraying)
- environmental concerns, especially if treating urban and adjacent areas.

Similar measures are probably appropriate for the control of adult biting midges. Local government authorities in many mosquito-prone areas own or have access to machinery suitable for the control measures above.

Aerial application of insecticides may be necessary because of access difficulties or the need to cover large areas quickly. However, costs are considerably greater than for ground-based application.

Control of peri-domestic species, such as *Aedes aegypti* (present in Queensland only), *A. notoscriptus* and *Culex quinquefasciatus*, may require more resources, to mobilise house owners and landowners, and to provide sufficient personnel and equipment for rapid control. Indoor spraying might be needed to eradicate these species.

Larval mosquito control would be based on application (low-volume spray or granule) of temephos insecticides (Abate®) or the more environmentally benign *Bacillus thuringiensis* var. *israelensis* (Bti)–based products. Malathion could be considered as a back-up insecticide for larval control.

Appropriate protection should be provided for spray operators, and use of such protection should be compulsory. Staff must follow recommended safety guidelines when using insecticides, and adequate first aid measures must be on hand. When systemic or topical insecticides are used, the requisite withholding periods must be observed.

A control program should also include promotion of personal protection measures, such as use of repellents (products containing up to 20% DEET (N'N diethyl-m-toluamide) are the most effective) and long, loose clothing, and avoidance of areas where and when vectors are prevalent.

A3 Appendix 3

PRINCIPLES OF DISINSECTATION

Disinsectation means the destruction of insect pests, usually with a chemical agent.

During an emergency animal disease response in Australia, disinsectation may be useful:

- to support movement controls
- to suppress or eliminate vectors within a defined or declared area
- to assist disease control on a premises.

Supporting movement controls

The following techniques may be used, together with measures such as vector-proof housing:

- individual animal treatment – for example, systemic application of ivermectin, topical application of a chemical to animals for quick and short-term knockdown, treatment or spraying of the immediate airspace around animals with an insecticide such as permethrin
- vehicle and equipment treatment – for example, pretreatment with a residual chemical (eg permethrin), use of rapid knockdown spray just before movement
- environmental control to reduce vector numbers in areas where stock, vehicles or equipment are held before movement – for example, use of residual sprays (with environmental agency approval) or light traps (as used by the National Arbovirus Monitoring Program).

Vector-proof housing may include the following elements:

- physical barriers to vectors, and entry and exit
- vector screens coated with insecticide
- vector surveillance and control within and around the property
- measures to eliminate potential vector breeding sites.

Vector suppression

The techniques used, or the application of these techniques, may depend on whether vector eradication or vector suppression in an area is required.

Another consideration is how long the area needs to be free (or nearly free) from vectors and whether

this is feasible – removing vectors may create a 'vacuum' that is reinfested from surrounding areas.

For environmental control in an area, residual sprays, knockdown sprays, or compounds that inhibit growth or breeding may be useful, but use of these chemicals would need approval from the relevant environmental agency. Light traps (as used by the National Arbovirus Monitoring Program) could be used to monitor progress.

For treatment of individual animals, all animals, or a percentage of animals (calculated from epidemiological information), would need to be treated. A long-term control program would be required (eg through use of ivermectin or other long-acting compounds, or a program of regular spraying or dipping with a suitable chemical).

Movement controls would be required to prevent vectors moving into the area with livestock.

Vector suppression can be expensive compared with merely treating animals before movement. The benefits of such techniques therefore need to be assessed in relation to their costs, likely effectiveness, ease of application, legal authority and chemical availability before they are advocated.

Assisting disease control

Treatment of livestock with ivermectin and/or insect repellents may protect animals following vaccination until immunity develops.

Ivermectin will be effective in controlling midges for approximately 2 weeks after dosing. Since a viraemic animal may remain infective for up to 50–60 days, more than one dose of ivermectin may be needed if there is a risk of a viraemic animal being present.

Use of vector-proof housing may be considered for valuable animals.

Other issues to consider

Emergency use permits may be required if the chemical or compound is not specifically registered for use against all insect species.

For pretreatment of vehicles, containers and transports with a residual insecticide, the Australian Government Department of Agriculture, Water and the Environment provides information on treatments and procedures required for vessels entering Australian territory. Please refer to the department's website for further information.[19]

Further information

Veterinary Medicines Directorate: www.gov.uk/government/organisations/veterinary-medicines-directorate

19 www.agriculture.gov.au/biosecurity/avm; www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/guidelines-aircraft.pdf

A4 Appendix 4

PERMIT CONDITIONS

Condition	Requirements
1	No evidence of clinical disease in animals up to and including the day of being moved or the day of transport of raw milk.
2	No evidence of clinical disease in animals on the premises.
3	No evidence of clinical disease in the TA within the previous 30 days.
4	Animals are not pregnant, or were immune as a result of vaccination or natural infection before mating.
5	Animals fully vaccinated plus 14 days after last vaccination, if vaccine available, OR tested seropositive plus 28 days from the date of test.
6	Animals fully vaccinated plus 14 days after last vaccination, if vaccine available.
7	Physical identification of animals (eg National Livestock Identification System (NLIS) or other ear tag, brand), with appropriate accompanying movement documentation (eg National Vendor Declaration (NVD), waybill, PigPass, Sheep Health Statement).
8	Animals (including donor animals for artificial breeding) were born on the property or resident on the property for the consecutive 28 days immediately before movement.
9	Agreed transport route, with no spelling en route, and no stopping at other premises en route.
10	Destination advised and agreed.
11	Movement directly to abattoir (the abattoir must be an APF).
12	Animals slaughtered as soon as possible.
13	Animals consigned to an abattoir must be slaughtered within 48 hours.

Cont'd

14	Vector control to stop adult competent vectors travelling with animals: • animals treated to control vectors • for animals sent to slaughter, a withholding period or export slaughter interval is required before slaughter • livestock transport cleaned and treated for vectors • disinsectation or vector suppression appropriate for the proposed movement (not for animals being sent to slaughter).
15	Animals are not permitted to move again for a period of 28 days (ie they must remain resident at destination for a minimum of 28 days).
16	Any animals that develop any clinical signs during the 28 days following movement must be reported to a government veterinary officer.
17	Any donor animals that develop any clinical signs during the 28 days following collection must be reported to a government veterinary officer.
18	Reproductive material is collected in a way that meets industry standards and satisfies International Embryo Transfer Society (IETS) requirements (ie is collected at licensed or accredited premises).
19	All donors are tested in agreement with IETS and World Organisation for Animal Health (OIE) requirements.
20	All material (including raw milk) moving is individually identified and specified on the permit for traceability and other purposes.
21	The permit must accompany the livestock during movement, and the person responsible for the livestock must retain a copy of the permit, consistent with the legal requirements of the jurisdiction.
22	Animals fully vaccinated plus 14 days after last vaccination, if vaccine available, OR it has been 28 days since the animal tested seropositive.
23	For disposal of milk only.
24	Milk is decontaminated before leaving the premises.
25	For movement of raw milk to APFs (where agreed biosecurity protocols are in force) only.
26	Agreed transport route, with stops permitted at other premises of similar status en route
27	Milk is pasteurised at destination.
28	The permit must accompany the raw milk during movement, and the person responsible for the raw milk must retain a copy of the permit, consistent with the legal requirements of the jurisdiction.
29	For treatment or disposal of hides, skins, wool or fibre only.
30	Biosecure transport and storage.
31	Decontamination of the milk tanker following dispatch of decontaminated milk at the disposal site.

A5 Appendix 5

Inactivated ('killed') vaccines

Inactivated vaccines have usually been treated with formalin or ß-propiolactone to inactivate the virus. South Africa has produced an inactivated vaccine for veterinary use that protects sheep against Rift Valley fever (RVF) challenge. It has been used to prevent spread of RVF in South African sheep (Barnard & Botha 1977). The vaccine gives lower antibody responses than live vaccines and would require regular vaccination to maintain immunity. Cattle develop a marginal virus-neutralising response and are protected for a short time.

Attenuated ('live') vaccines

Attenuated vaccines have been produced by serial passage of RVF virus through laboratory animals, usually mice, and in cell cultures. The Smithburn virus strain, used in South Africa since 1952, produces a high level of immunity and has been used extensively as a veterinary vaccine.

Although more effective than inactivated vaccines, attenuated vaccines are not used in pregnant animals because of undesirable reactions (abortions and fetal abnormalities) in susceptible sheep. Other considerations relating to attenuated vaccines are the need to ensure that the vaccine is free from exotic agents, the possibility of insect transmission and the possibility of reversion to virulence. Attenuated vaccines are produced in South Africa, Egypt and Kenya.

The MP-12 vaccine was promoted as an alternative to the RVF Smithburn vaccine. This vaccine was developed by the United States Army Medical Research Institute for Infectious Diseases (USAMRIID) with the aim of producing a vaccine for both human and veterinary use. It is only available in limited quantities and is not approved for use in Australia.

Novel vaccines

There are three types of novel vaccines. Type I vaccines are composed of antigens produced by recombinant nucleic acid technology; type II consist of genetically attenuated viruses created by deletion of genes encoding virulence factors or proteins dispensable for virus replication; and type III consist of live viruses into which DNA encoding protective antigens has been introduced (Faburay et al 2017).

An example of a type II vaccine is the RVF arMP-12ΔNSm, a modified MP-12 vaccine developed to improve safety. It was derived using mutagen attenuation from a human field isolate from Egypt. It is immunogenic and nonabortogenic in pregnant ewes, and immunogenic and nonpathogenic in neonatal lambs when exposed to virulent challenge (Turell & Rossi 1991, Faburay et al 2017).

Another type II vaccine, clone 13, has been derived from a field strain from a naturally mild human case. In trials of the vaccine involving vaccinated pregnant ewes, the animals failed to develop fever or any other clinical signs of RVF, including abortion. This vaccine recently became available in South Africa and is undergoing field trials in RVF endemic areas (FAO 2011).

Glossary

Disease-specific terms

Ecchymotic haemorrhage	Small round spots or purplish discolouration caused by bleeding or bruising in the skin or mucous membrane.
Haemagglutination inhibition test	A serological test for the presence of antibody in a sample by its ability to inhibit agglutination of red blood cells.
Meningoencephalitis	Inflammation of the brain, spinal cord and spinal nerves.
Petechial haemorrhages	Tiny flat red or purple spots in the skin or mucous membrane caused by bleeding from small blood vessels.

Standard AUSVETPLAN terms

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, hoofs, bones, fertiliser).
Animal Health Committee	A committee whose members are the chief veterinary officers of the Commonwealth, states and territories, along with representatives from the CSIRO Australian Centre for Disease Preparedness (CSIRO-ACDP) and the Australian Government Department of Agriculture, Water and the Environment. There are also observers from Animal Health Australia, Wildlife Health Australia, and the New Zealand Ministry for Primary Industries. The committee provides advice to the National Biosecurity Committee on animal health matters, focusing on technical issues and regulatory policy. *See also* National Biosecurity Committee

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Animal products	Meat, meat products and other products of animal origin (eg eggs, milk) for human consumption or for use in animal feedstuff.
Approved disposal site	A premises that has zero susceptible livestock and has been approved as a disposal site for animal carcasses, or potentially contaminated animal products, wastes or things.
Approved processing facility	An abattoir, knackery, milk processing plant or other such facility that maintains increased biosecurity standards. Such a facility could have animals or animal products introduced from lower-risk premises under a permit for processing to an approved standard.
At-risk premises	A premises in a restricted area that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, dangerous contact premises, dangerous contact processing facility, suspect premises or trace premises.
Australian Chief Veterinary Officer	The nominated senior veterinarian in the Australian Government Department of Agriculture, Water and the Environment who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. *See also* Chief veterinary officer
AUSVETPLAN	Australian Veterinary Emergency Plan. Nationally agreed resources that guide decision making in the response to emergency animal diseases (EADs). It outlines Australia's preferred approach to responding to EADs of national significance, and supports efficient, effective and coherent responses to these diseases.
Carcase	The body of an animal slaughtered for food.
Carcass	The body of an animal that died in the field.
Chief veterinary officer (CVO)	The senior veterinarian of the animal health authority in each jurisdiction (national, state or territory) who has responsibility for animal disease control in that jurisdiction. *See also* Australian Chief Veterinary Officer
Compartmentalisation	The process of defining, implementing and maintaining one or more disease-free establishments under a common biosecurity management system in accordance with OIE guidelines, based on applied biosecurity measures and surveillance, to facilitate disease control and/or trade.

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Compensation	The sum of money paid by government to an owner for livestock or property that are destroyed for the purpose of eradication or prevention of the spread of an emergency animal disease, and livestock that have died of the emergency animal disease. *See also* Cost-sharing arrangements, Emergency Animal Disease Response Agreement
Consultative Committee on Emergency Animal Diseases (CCEAD)	The key technical coordinating body for animal health emergencies. Members are state and territory chief veterinary officers, representatives of CSIRO-ACDP and the relevant industries, and the Australian Chief Veterinary Officer as chair.
Control area (CA)	A legally declared area where the disease controls, including surveillance and movement controls, applied 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 incident according to need).
Cost-sharing arrangements	Arrangements agreed between governments (national and state/territory) and livestock industries for sharing the costs of emergency animal disease responses. *See also* Compensation, Emergency Animal Disease Response Agreement
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 (DCP)	A premises, apart from an abattoir, knackery or milk processing plant (or other such facility) that, after investigation and based on a risk assessment, is considered to contain a susceptible animal(s) not showing clinical signs, but considered highly likely to contain an infected animal(s) and/or contaminated animal products, wastes or things that present an unacceptable risk to the response if the risk is not addressed, and that therefore requires action to address the risk.
Dangerous contact processing facility (DCPF)	An abattoir, knackery, milk processing plant or other such facility that, based on a risk assessment, appears highly likely to have received infected animals, or contaminated animal products, wastes or things, and that requires action to address the risk.
Declared area	A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. There are two types of declared areas: restricted area and control area.
Decontamination	Includes all stages of cleaning and disinfection.

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Depopulation	The removal of a host population from a particular area to control or prevent the spread of disease.
Destroy (animals)	To kill animals humanely.
Disease agent	A general term for a transmissible organism or other factor that causes an infectious disease.
Disease Watch Hotline	24-hour freecall service for reporting suspected incidences of exotic diseases – 1800 675 888.
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.
Disinsectisation	The destruction of insect pests, usually with a chemical agent.
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. *See also* Endemic animal disease, Exotic animal disease
Emergency Animal Disease Response Agreement	Agreement between the Australian and state/territory governments and livestock industries on the management of emergency animal disease responses. Provisions include participatory decision making, risk management, cost sharing, the use of appropriately trained personnel and existing standards such as AUSVETPLAN. *See also* Compensation, Cost-sharing arrangements
Endemic animal disease	A disease affecting animals (which may include humans) that is known to occur in Australia. *See also* Emergency animal disease, Exotic animal disease
Enterprise	*See* 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.

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Epidemiological investigation	An investigation to identify and qualify the risk factors associated with the disease. *See also* Veterinary investigation
Epidemiology	The study of disease in populations and of factors that determine its occurrence.
Exotic animal disease	A disease affecting animals (which may include humans) that does not normally occur in Australia. *See also* Emergency animal disease, Endemic animal disease
Exotic fauna/feral animals	See 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.
General permit	A legal document that describes the requirements for movement of an animal (or group of animals), commodity or thing, for which permission may be granted without the need for direct interaction between the person moving the animal(s), commodity or thing and a government veterinarian or inspector. The permit may be completed via a webpage or in an approved place (such as a government office or commercial premises). A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. *See also* Special permit
In-contact animals	Animals that have had close contact with infected animals, such as noninfected animals in the same group as infected animals.
Incubation period	The period that elapses between the introduction of a pathogen into an animal and the first clinical signs of the disease.
Index case	The first case of the disease to be diagnosed in a disease outbreak. *See also* Index property
Index property	The property on which the index case is found. *See also* Index case

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Infected premises (IP)	A defined area (which may be all or part of a property) on which animals meeting the case definition are or were present, or the causative agent of the emergency animal disease is present, or there is a reasonable suspicion that either is present, and that the relevant chief veterinary officer or their delegate has declared to be an infected premises.
Local control centre	An emergency operations centre responsible for the command and control of field operations in a defined area.
Monitoring	Routine collection of data for assessing the health status of a population or the level of contamination of a site for remediation purposes. *See also* Surveillance
Movement control	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
National Biosecurity Committee	A committee that was formally established under the Intergovernmental Agreement on Biosecurity (IGAB). The IGAB was signed on 13 January 2012, and signatories include all states and territories except Tasmania. The committee provides advice to the Agriculture Senior Officials Committee and the Agriculture Ministers' Forum on national biosecurity issues, and on the IGAB.
National Management Group (NMG)	A group established to approve (or not approve) the invoking of cost sharing under the Emergency Animal Disease Response Agreement. NMG members are the Secretary of the Australian Government Department of Agriculture, Water and the Environment as chair, the chief executive officers of the state and territory government parties, and the president (or analogous officer) of each of the relevant industry parties.
Native wildlife	*See* Wild animals
OIE Terrestrial Code	OIE *Terrestrial Animal Health Code*. Describes standards for safe international trade in animals and animal products. Revised annually and published on the internet at: www.oie.int/international-standard-setting/terrestrial-code/access-online.
OIE Terrestrial Manual	OIE *Manual of diagnostic tests and vaccines for terrestrial animals*. Describes standards for laboratory diagnostic tests, and the production and control of biological products (principally vaccines). The current edition is published on the internet at: www.oie.int/en/standard-setting/terrestrial-manual/access-online.

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Operational procedures	Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.
Outside area (OA)	The area of Australia outside the declared (control and restricted) areas.
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 viral 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.
Premises of relevance (POR)	A premises in a control area that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, suspect premises, trace premises, dangerous contact premises or dangerous contact processing facility.
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.
Proof of freedom	Reaching a point following an outbreak and post-outbreak surveillance when freedom from the disease can be claimed with a reasonable level of statistical confidence.
Qualifiers	
– assessed negative	Assessed negative (AN) is a qualifier that may be applied to ARPs, PORs, SPs, TPs, DCPs or DCPFs. The qualifier may be applied following surveillance, epidemiological investigation, and/or laboratory assessment/diagnostic testing and indicates that the premises is assessed as negative at the time of classification.
– sentinels on site	Sentinels on site (SN) is a qualifier that may be applied to IPs and DCPs to indicate that sentinel animals are present on the premises as part of response activities (ie before it can be assessed as an RP).
– vaccinated	The vaccinated (VN) qualifier can be applied in a number of different ways. At its most basic level, it can be used to identify premises that contain susceptible animals that have been vaccinated against the EAD in question. However, depending on the legislation, objectives and processes within a jurisdiction, the VN qualifier may be used to track a range of criteria and parameters.

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Quarantine	Legally enforceable requirement that prevents or minimises spread of pests and disease agents by controlling the movement of animals, persons or things.
Resolved premises (RP)	An infected premises, dangerous contact premises or dangerous contact processing facility that has completed the required control measures, and is subject to the procedures and restrictions appropriate to the area in which it is located.
Restricted area (RA)	A relatively small legally declared area around infected premises and dangerous contact premises that is subject to disease controls, including intense surveillance and movement controls.
Risk enterprise	A defined livestock or related enterprise that 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, artificial insemination centres, veterinary laboratories and hospitals, road and rail freight depots, showgrounds, field days, weighbridges and garbage depots.
Sensitivity	The proportion of truly positive units that are correctly identified as positive by a test. *See also* Specificity
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).
Serum neutralisation test	A serological test to detect and measure the presence of antibody in a sample. Antibody in serum is serially diluted to detect the highest dilution that neutralises a standard amount of antigen. The neutralising antibody titre is given as the reciprocal of this dilution.
Slaughter	The humane killing of an animal for meat for human consumption.

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Special permit	A legal document that describes the requirements for movement of an animal (or group of animals), commodity or thing, for which the person moving the animal(s), commodity or thing must obtain prior written permission from the relevant government veterinarian or inspector. A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. *See also* General permit
Specificity	The proportion of truly negative units that are correctly identified as negative by a test. *See also* Sensitivity
Stamping out	The strategy of eliminating infection from premises through the destruction of animals in accordance with the particular AUSVETPLAN manual, and in a manner that permits appropriate disposal of carcasses and decontamination of the site.
State coordination centre	The emergency operations centre that directs the disease control operations to be undertaken in a state or territory.
Surveillance	A systematic program of investigation designed to establish the presence, extent 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 (SP)	Temporary classification of a premises that contains a susceptible animal(s) not known to have been exposed to the disease agent but showing clinical signs similar to the case definition, and that therefore requires investigation(s).

Cont'd

Swill Also known as 'prohibited pig feed', means material of mammalian origin, or any substance that has come in contact with this material, but does not include:

i. milk, milk products or milk byproducts either of Australian provenance or legally imported for stockfeed use into Australia
ii. material containing flesh, bones, blood, offal or mammal carcases that is treated by an approved process[1]
iii. a carcass or part of a domestic pig, born and raised on the property on which the pig or pigs that are administered the part are held, that is administered for therapeutic purposes in accordance with the written instructions of a veterinary practitioner.
iv. material used under an individual and defined-period permit issued by a jurisdiction for the purposes of research or baiting.

[1] In terms of (ii), approved processes are:

1. rendering in accordance with the Australian Standard for the Hygienic Rendering of Animal Products
2. under jurisdictional permit, cooking processes subject to compliance verification that ensure that a core temperature of at least 100 °C for a minimum of 30 minutes, or equivalent, has been reached
3. treatment of cooking oil, which has been used for cooking in Australia, in accordance with the National Standard for Recycling of Used Cooking Fats and Oils Intended for Animal Feeds
4. under jurisdictional permit, any other nationally agreed process approved by AHC for which an acceptable risk assessment has been undertaken and that is subject to compliance verification.

The national definition is a minimum standard. Some jurisdictions have additional conditions for swill feeding that pig producers in those jurisdictions must comply with, over and above the requirements of the national definition.

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Swill feeding	Also known as 'feeding prohibited pig feed', it includes: • feeding, or allowing or directing another person to feed, prohibited pig feed to a pig • allowing a pig to have access to prohibited pig feed • the collection and storage or possession of prohibited pig feed on a premises where one or more pigs are kept • supplying to another person prohibited pig feed that the supplier knows is for feeding to any pig. This definition was endorsed by the Agriculture Ministers' Council through AGMIN OOS 04/2014.
Trace premises (TP)	Temporary classification of a premises that contains susceptible animal(s) that tracing indicates may have been exposed to the disease agent, or contains contaminated animal products, wastes or things, and that requires investigation(s).
Tracing	The process of locating animals, people or other items that may be implicated in the spread of disease, so that appropriate action can be taken.
Unknown status premises (UP)	A premises within a declared area where the current presence of susceptible animals and/or risk products, wastes or things is unknown.
Vaccination	Inoculation of individuals with a vaccine to provide active immunity.
Vaccine	A substance used to stimulate immunity against one or several disease-causing agents to provide protection or to reduce the effects of the disease. A vaccine is prepared from the causative agent of a disease, its products or a synthetic substitute, which is treated to act as an antigen without inducing the disease.
– adjuvanted	A vaccine in which one or several disease-causing agents are combined with an adjuvant (a substance that increases the immune response).
– attenuated	A vaccine prepared from infective or 'live' microbes that are less pathogenic but retain their ability to induce protective immunity.
– gene deleted	An attenuated or inactivated vaccine in which genes for non-essential surface glycoproteins have been removed by genetic engineering. This provides a useful immunological marker for the vaccine virus compared with the wild virus.

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– inactivated	A vaccine prepared from a virus that has been inactivated ('killed') by chemical or physical treatment.
– recombinant	A vaccine produced from virus that has been genetically engineered to contain only selected genes, including those causing the immunogenic effect.
Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A *biological* vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A *mechanical* vector is one that transmits an infectious agent from one host to another but is not essential to the lifecycle of the agent.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. *See also* 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	Animals of domestic species that are not confined or under control (eg cats, horses, pigs).
– exotic fauna	Nondomestic animal species that are not indigenous to Australia (eg foxes).
Wool	Sheep wool.
Zero susceptible species premises (ZP)	A premises that does not contain any susceptible animals or risk products, wastes or things.
Zoning	The process of defining, implementing and maintaining a disease-free or infected area in accordance with OIE guidelines, based on geopolitical and/or physical boundaries and surveillance, to facilitate disease control and/or trade.
Zoonosis	A disease of animals that can be transmitted to humans.

Abbreviations

Disease-specific abbreviations

RVF	Rift Valley fever

Standard AUSVETPLAN abbreviations

ACDP	Australian Centre for Disease Preparedness
AN	assessed negative
ARP	at-risk premises
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
DCP	dangerous contact premises
DCPF	dangerous contact processing facility
EAD	emergency animal disease
EADRA	Emergency Animal Disease Response Agreement
EADRP	Emergency Animal Disease Response Plan
EDTA	ethylenediaminetetraacetic acid (anticoagulant for whole blood)

Cont'd

ELISA	enzyme-linked immunosorbent assay
GP	general permit
IETS	International Embryo Technology Society
IP	infected premises
LCC	local control centre
NMG	National Management Group
OA	outside area
OIE	World Organisation for Animal Health
PCR	polymerase chain reaction
POR	premises of relevance
RA	restricted area
RP	resolved premises
SCC	state coordination centre
SP	suspect premises
SpP	special permit
TP	trace premises
UP	unknown status premises
ZP	zero susceptible species premises

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